Sydney Science Park – Luddenham Road Intersection

Transport Assessment

Prepared for:

Celestino Developments SSP Pty Ltd

12 May 2023

PROJECT INFORMATION

Project Name:	Sydney Science Park – Luddenham Road Intersection
Client:	Celestino Developments SSP Pty Ltd
Project Number:	2073
Prepared By:	JMT Consulting

DOCUMENT HISTORY

Document Title	Revision	Date issued	Author
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Luddenham Road intersection transport assessment	Issue	13.05.22	JM
Luddenham Road intersection transport assessment	Rev A	05.04.23	JM
Luddenham Road intersection transport assessment	Rev B	12.05.23	JM

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1 Introduction

1.1 Background

JMT Consulting has prepared this document on behalf of Celestino Developments SSP Pty Ltd to support an application for a signalised intersection at Luddenham Road and the proposed access road at the Sydney Science Park (SSP) referred to as LUD3. The proposal includes the construction of a 650m upgrade of part of Luddenham Road including provision of a new interim signalised intersection, relocation of services and associated site works.

The site encompasses a section of the existing road reserve on Luddenham Road (approximately 650m) and land within properties on either side of this section as noted below:

- Lot 204 DP 1280188 (Celestino) known as 581 Luddenham Road, Luddenham
- Lot 206 DP 1280188 (Celestino) known as 599 Luddenham Road, Luddenham
- Lot 205 DP 1280188 (Metro)
- Lot 24 DP1277418 (Metro)
- Lot 26 DP1277418 (Metro)
- Road reserve (Penrith City Council)

The proposal is generally referred as 'LUD3 Intersection'.

Due to construction work scheduled to commence in 2022 for the Sydney Metro – Western Sydney Airport project, the existing access road to the SSP is to be permanently decommissioned and the proposed new intersection is required to maintain access to the development. The proposed intersection location aligns with that identified in the Western Sydney Aerotropolis Precinct Plan released in March 2022.

1.2 Report purpose

The purpose of the report is as follows:

- Describe the traffic modelling undertaken to inform the design of the signalised intersection;
- Document the intersection design prepared by Enspire Solutions; and
- Outline the forecast operation of the signalised intersection during the critical AM and PM commuter peak hours
- Support the proposed interim intersection on Luddenham Road to provide direct and convenient access to SSP in the short to medium term

1.3 Transport for NSW consultation

This report follows detailed consultation with Penrith City Council and Transport for NSW (TfNSW) in relation to the proposed site access arrangements. A meeting was held on 18 March 2022 between Celestino, TfNSW and Council where general support was expressed for the proposed interim intersection arrangements. Minutes of this meeting are provided in Appendix A of this report.

In February 2023 TfNSW provided correspondence noting that the signals proposed and the location of the intersection is acceptable, subject to some design amendments. In response to this correspondence and a subsequent meeting with TfNSW on 7 March 2023 the proposed intersection design and associated traffic modelling was been updated to including the following:

1. Providing for dual lane approaches on Luddenham Road, with the southbound movement achieving a 300m dual lane approach and the northbound movement achieving an 80m dual lane approach.
2. Providing for 250m long departure lane for the northbound movements and 80m long departure lane for the southbound movements
3. Updated slip lane designs to be in accordance with Austroads standards for the road networks speed limit (80km/h)
4. Providing for significantly enhanced traffic capacity for traffic exiting the SSP site. The initial design issued in May 2022 including a single left turn and right turn lane existing SSP. The current design doubles capacity by providing for both dual left and dual right turn lanes for traffic exiting SSP and turning onto Luddenham Road.
5. Updated traffic modelling to reflect a reduced intersection cycle time of 90 seconds.

The updated design and traffic modelling was issued to TfNSW on 9 March 2023. On 14 March 2023 TfNSW issued correspondence via email noting the following:

"*Please be advised that TfNSW is generally satisfied with the redesigned intersection including the location and signal position as per the revised design dated 09 March 2023 and prepared by JMT Consulting. Please proceed with the preparation of the signals plan based on the revised design.*"

The traffic signal plan and civil designs were subsequently issued to TfNSW on 4 April 2023.

On 2 May 2023 the TfNSW Network and Safety Services team issued an Approval in Principle form for the proposed traffic signals – confirming TfNSW's support for the proposal subject to the detailed design review and any amendments following the review.

Relevant TfNSW correspondence is provided as Appendix B of this document.

1.4 Sydney Science Park context

The Sydney Science Park (SSP) development is located at 565-609 Luddenham Road, Luddenham within the Northern Gateway Precinct of the Western Sydney Aerotropolis in the Penrith City Council Local Government Area (LGA), as shown in Figure 1. SSP is comprised of some 287 hectares and contains the future corridor for the Sydney Metro Greater West railway line that is planned to connect the future Western Sydney Airport with St Marys Railway Station. In September 2016, Penrith City Council entered into a Voluntary Planning Agreement (VPA) with Celestino as part of the Rezoning of the land for a mixed-use development to provide a monetary contribution to the upgrade of the intersection by 1 January 2026. This development application seeks to provide an interim signalised intersection to provide access to SSP.

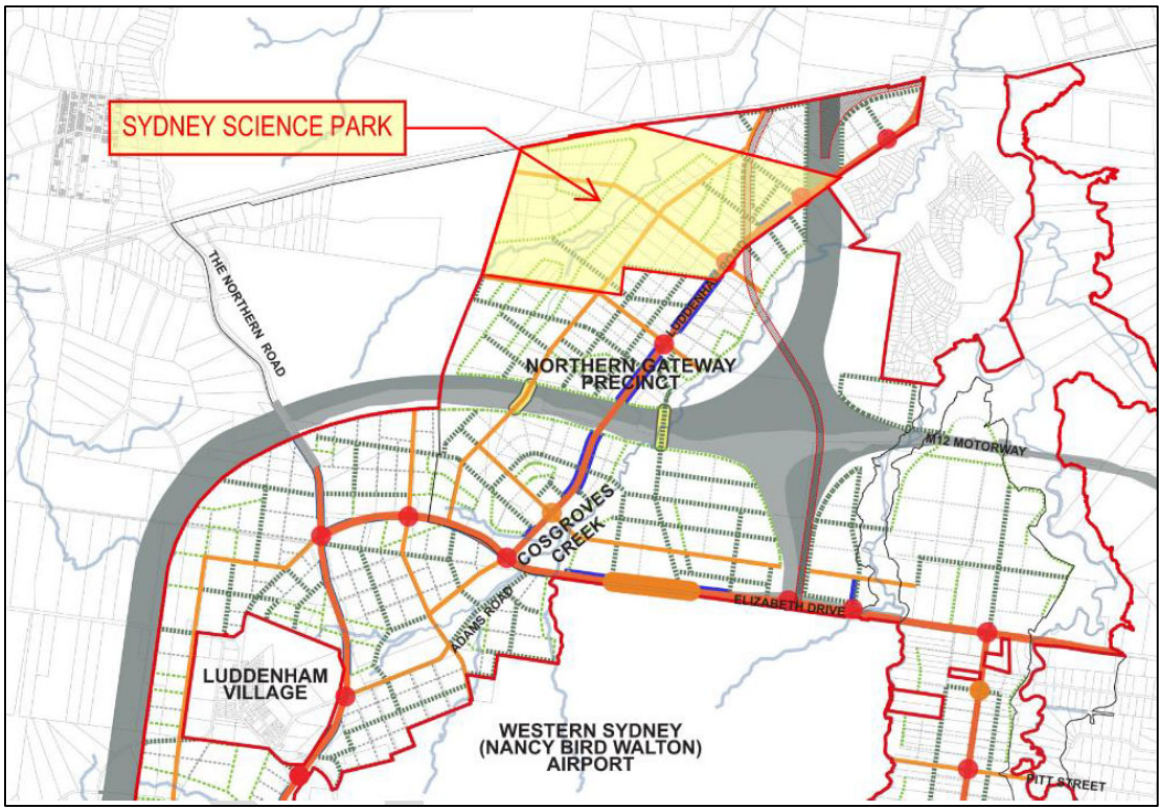


Figure 1 SSP site context

Image source: Western Sydney Aerotropolis Precinct (Plan Figure 10: Street Hierarchy), modified by Enspire

1.5 Proposal description

The proposal involves the construction of a new interim signalised intersection along Luddenham Road. The location of interim intersection aligns with the 'ultimate' intersection location on Luddenham Road as identified in the Western Sydney Aerotropolis Precinct Plan released in March 2022 as shown in Figure 2 below.

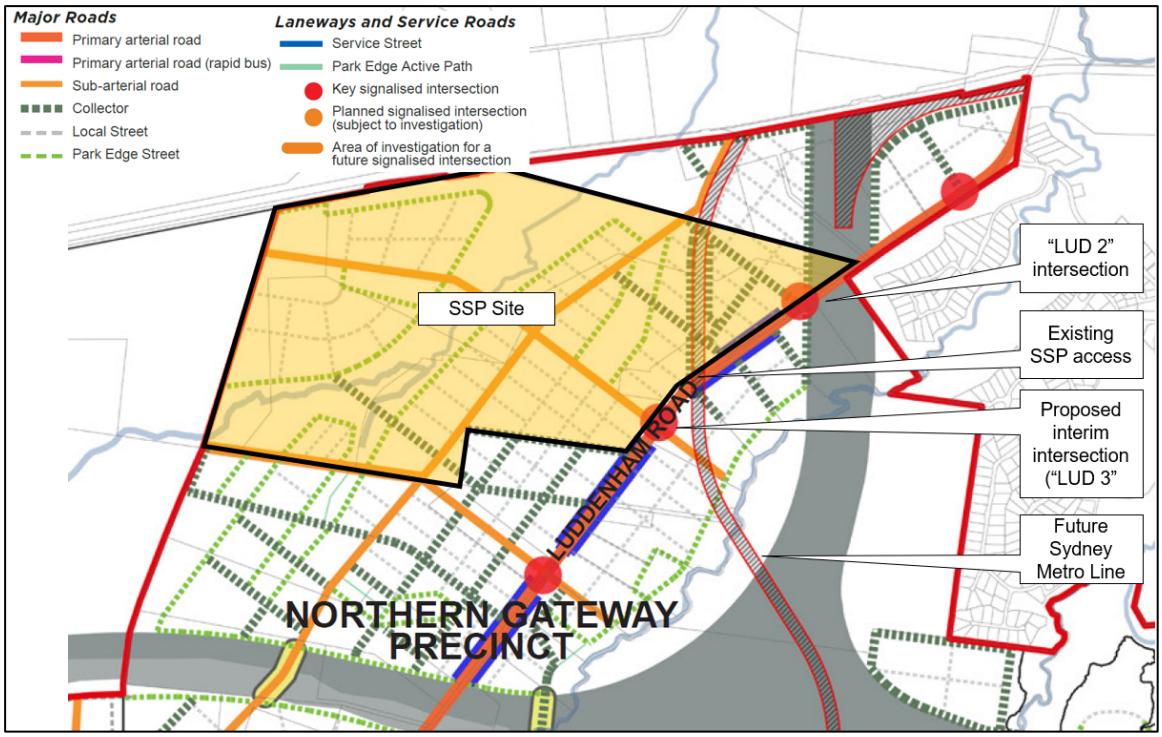


Figure 2 Proposed intersection location

Image source: Western Sydney Aerotropolis Precinct (Plan Figure 10: Street Hierarchy), modified by JMT Consulting

The proposed development seeks development consent for the following works:

- removal of trees and vegetation
- construction of 650m road including the following:
  - road widening to facilitate dual approach and departure lanes on Luddenham Road within an approximate road reserve width of 20m to 31m including kerbs, medians, traffic islands and ~~shared~~ footpaths;
  - provision of a three-way signalised intersection to provide principal access to Sydney Science Park (SSP);
  - provision of a signalised pedestrian crossing on all approaches of the intersection; and
  - installation of safety barrier, signage, line marking and lighting;
- Construction of access road including slip lanes on the western side of Luddenham Road to provide access to SSP. Construction of internal access

track to facilitate access to Sydney Water Corporation Integrated Water Recycling Facility located within SSP;

- Reconstruction of slip lane on eastern side of Luddenham road to maintain construction access to the Metro Viaduct. Reconstruction of temporary left in/left out construction access for Sydney Metro.
- Removal and relocation of the overhead and underground electrical services located in the existing road reserve. Note: The intent is to not relocate an existing 132kV line within the existing Luddenham Road reserve; however, this is subject to detailed design.
- Removal and relocation of the underground telecommunication services located in the existing road reserve.
- Reconfiguration of the existing stormwater inlet and outlet headwalls in the existing road reserve; and
- Associated demolition works, earthworks, environmental management, civil and stormwater management, and landscaping works.

The DA also seeks consent for construction staging works, as noted below:

- Stage 1: Construct northbound carriageway including access road to Sydney Science Park and carry out west verge electrical relocation.
- Stage 2: Divert traffic to northbound lanes with east lane to operate as a southbound lane temporarily during construction work. Demolish existing Luddenham Road pavement and construct southbound carriageway including Metro construction access road. Carry out telecommunications relocation.

2 Existing Transport Network

2.1 Road network and intersections

SSP is located on Luddenham Road approximately midway between Elizabeth Drive to the south and Mamre Road to the north. Twin Creeks Drive is also located approximately 1km to the northeast.

Luddenham Road is a semi-rural undivided carriageway with one lane in each direction. Signposted at 80 km/hr, this regional sub-arterial road is under the care and control of Penrith City Council and connects Elizabeth Drive with Mamre Road. The following intersections currently exist on Luddenham Road in the vicinity of SSP:

- SSP Access: a priority-controlled “seagull” intersection allowing all movements in and out of the site (see Figure 3). This seagull intersection currently facilitate access for Sydney Water vehicles for the construction of the future Integrated Water Recycling Hub (IWRH) and temporary reservoir;
- Twin Creeks Drive, a single-lane roundabout

Figure 3 Existing vehicle site access to SSP

2.2 Traffic movements

Midblock traffic count data was collected on Luddenham Road just south of the existing SSP access point in September 2022, with the average weekday traffic profile presented in in Figure 4 below. These counts indicate that Luddenham Road carries an average peak hour two-way flow of 530 vehicles per hour in the morning peak (7AM to 8AM) and 560 vehicles per hour in the evening peak (4PM to 5PM). Traffic conditions along Luddenham Road are generally free flow at the location of the Sydney Science Park access and with minimal delays at the intersection of Luddenham Road and Twin Creeks Drive.

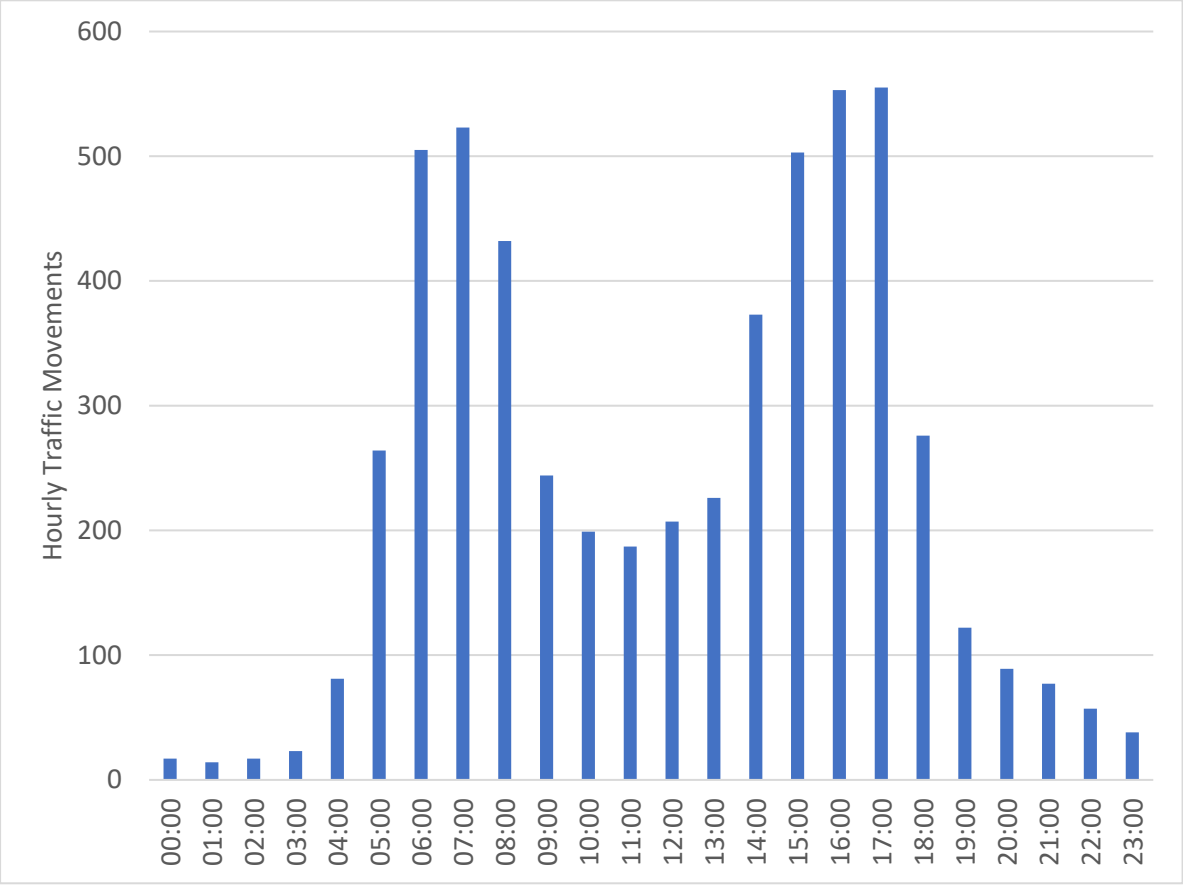


Figure 4 Two way traffic flows on Luddenham Road (September 2022)

2.3 Public transport

Existing local bus services that operate near the SSP include:

- Route 775 Penrith to via UWS, St Marys and Erskine Park (via Mamre Road)
- Route 776 Penrith to Mt Druitt via Napean Hospital and UWS (via Mamre Road)
- Route 779 St Marys to Erskine Park Industrial Area (via Mamre Road)
- Route 789 Penrith to Luddenham (via The Northern Road)
- Route 801 Badgerys Creek to Liverpool (via Elizabeth Drive)

A network of rapid, suburban and local bus routes throughout Western Sydney has been planned as part of Future Transport 2056.

2.4 Walking and cycling

There is currently limited pedestrian and cycling infrastructure in the vicinity of Sydney Science Park. Luddenham Road has a hard shoulder with no kerb-and gutter (rural type road) for the majority of its length and is not amenable for cycling or walking. A 330m painted cycle lane has been built on the western side of Luddenham Road as part of the current seagull intersection of Sydney Science Park access, however there are no dedicated cycle lanes to the north or south of this section of Luddenham Road.

3 Transport Assessment

3.1 Need for future access point

Currently the Sydney Science Park site is accessed via a seagull intersection as previously indicated in Section 2.1 of this document. This access point currently supports vehicle movements to/from the Sydney Water facility that is currently under construction. It was also intended for this access point to service the first stages of development for the Sydney Science Park site.

It is important to note that the current seagull intersection does not align with the SSP site access points as identified in the Western Sydney Aerotropolis Precinct Plan. This precinct plan is the guiding document for road network planning to and within the SSP and the wider Aerotropolis precinct. The proposed interim intersection will be positioned in accordance with the Precinct Plan alignment.

The Luddenham Metro Station and associated rail alignment being constructed as part the broader Sydney Metro - Western Sydney Airport project directly impacts the existing seagull intersection as previously shown in Figure 2 on page 7 of this document. As such, this will result in the access to the SSP development being removed. This will also impact Sydney Water and their access to IWRH. Furthermore, in the interim it is likely that Transport for NSW will require the seagull intersection for their construction vehicles as a point of access from Luddenham Road. Therefore a new access point serving SSP traffic, separate to TfNSW construction is required to service the site.

More broadly TfNSW are currently undertaking planning works for the upgrade of Luddenham Road (between Elizabeth Drive and Mamre Road) to service the growth of the Northern Gateway precinct. As shown in Figure 5 the Western Sydney Aerotropolis Precinct Plan identified Luddenham Road as a ‘primary arterial road’ corridor which will act as a key north-south connection for the precinct. This upgrade of Luddenham Road is unlikely to occur anytime within the next decade and therefore a suitable point of access must be delivered to SSP in the interim, prior to the broader upgrade works taking place.

In this context an ‘interim’ intersection layout, comprising of an intersection controlled by traffic lights with formal pedestrian crossings, is proposed to service the SSP site for a period of approximately 10 years. Beyond this year either or both of the following will occur which will provide further road network capacity:

- The broader Luddenham Road upgrade will take place which will include an upgraded signalised intersection representing the ‘ultimate’ layout
- An additional access point (or points) will be provided into the SSP site to distribute the traffic load across multiple entry/exit locations.

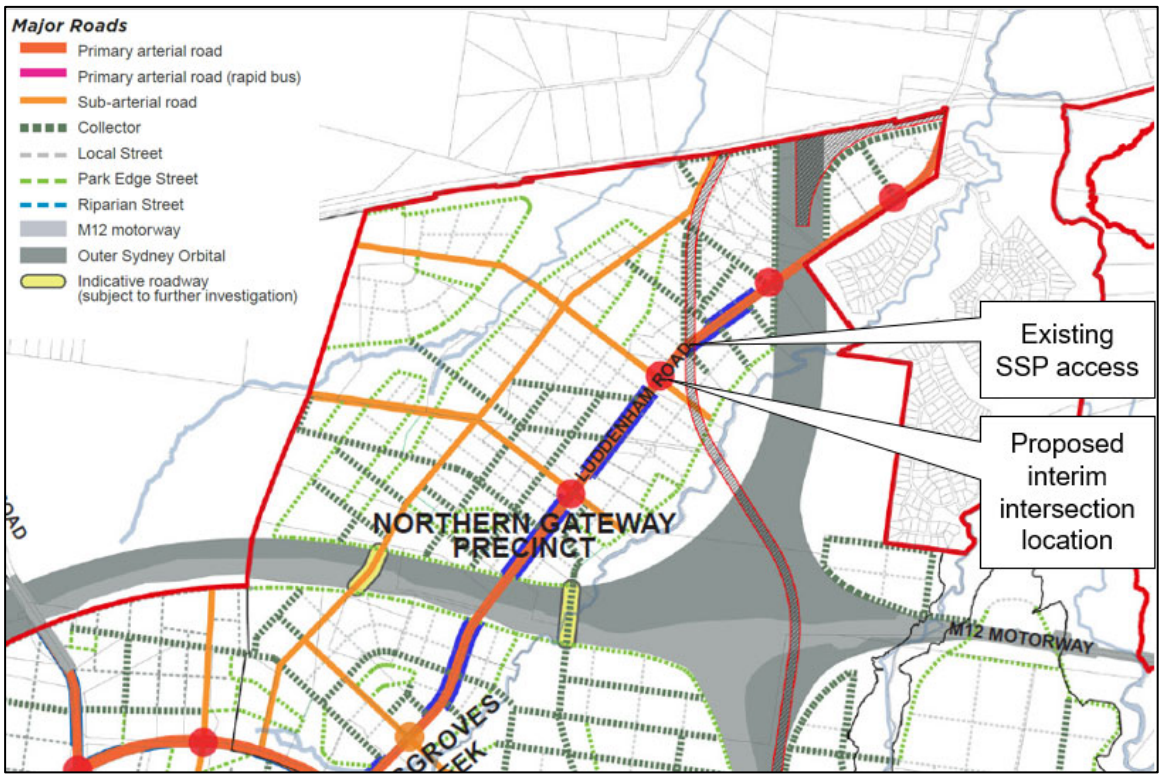


Figure 5 Street hierarchy -Northern Gateway Precinct

Image source: Western Sydney Aerotropolis Precinct (Plan Figure 10: Street Hierarchy), modified by JMT Consulting

3.2 Traffic modelling background

Arup on behalf of Celestino previously developed a micro-simulation traffic model for the road network surrounding the SSP site in May 2016 to inform the extent and timing of works identified in the Voluntary Planning Agreement (VPA) with Penrith City Council, formed in 2016.

Following consultation with Penrith City Council (PCC), Roads and Maritime (RMS) and Transport for New South Wales (TfNSW), it was agreed that the traffic assessment to inform the infrastructure requirements triggered by the development of Sydney Science Park would be undertaken using a two tiered approach, that being:

- Understand future year travel demands (both those of SSP as well as the wider area including that generated by the Broader Western Sydney Employment Area) using the TfNSW owned and operated Sydney Strategy Travel Model (STM); and
- Determine the local traffic impacts using a micro-simulation software (VISSIM) based on the STM outputs.

The methodology undertaken by Arup to inform the outcome of the traffic modelling assessment included:

- Collection of existing traffic data at a number of locations to support the development of a base (2016) traffic model, prepared in VISSIM. This model provides a reflection of current year traffic conditions in the SSP precinct
- Concurrent to the development of the base traffic model, Arup provided relevant inputs (particularly future land use forecasts) to Transport for NSW (TfNSW) to input into their Strategic Travel Model (STM)
- TfNSW provided traffic demand forecasts for all modelled scenarios by extracting results from the STM
- Arup developed Origin-Destination (OD) demand matrices to feed into VISSIM.
- Based on the future year demand flows as outlined in the STM outputs, Arup determined the future year infrastructure requirements necessary to support the SSP development using VISSIM.

Based on the outcomes of the traffic modelling, Celestino and Penrith City Council entered into a Voluntary Planning Agreement (VPA) for Sydney Science Park in September 2016. As part of this agreement the following monetary contributions to surrounding road network upgrades were committed:

- Luddenham Road: Widening between Mamre Road and proposed Sydney Science Park access intersection (5.920 km) by 2031, contribution capped at $13,007,000
- Luddenham Road and Twin Creeks Drive intersection: Upgrade from roundabout to traffic signals by 2026, contribution capped at $580,000
- Luddenham Road and Sydney Science Park access: Upgrade from priority control to traffic signals, contribution capped at $2,000,000
- The timing of the delivery of these monetary contributions is as set out in the VPA, but may be adjusted subject to the findings of a traffic study to be undertaken in 2024 to determine whether these works are warranted by 2026.

The traffic model was independently peer reviewed by WSP in 2017, with the review confirming the extent and timing of the infrastructure items identified in the VPA.

3.3 Intersection layout

The proposed interim intersection layout is illustrated in Appendix E and includes the following:

- 150m long right turn bay for southbound vehicles into the SSP site
- Dual approach and departure lanes for Luddenham Road traffic.
- Two dedicated left turn traffic lanes and two dedicated right turn traffic lanes out of the SSP site onto Luddenham Road

3.4 Future background traffic

Forecast 2036 future traffic volumes on Luddenham Road were prepared by Arup as part of the traffic modelling used to inform the VPA. A summary of forecast future traffic volumes at key locations on Luddenham Road used in the VPA traffic analysis are provided in Table 1. These future traffic flows on Luddenham Road have been adopted as part of the traffic modelling.

Table 1 Forecast future traffic flows on Luddenham Road

Scenario	Period	Luddenham Road adjacent to SSP		
		NB	SB	Total
2018	AM peak hour	440	130	570
	PM peak hour	190	330	520
2036	AM peak hour	1,149	1,277	2,426
	PM peak hour	1,256	856	2,112

3.5 Forecast traffic movements

The forecast level of traffic movements into and out of the SSP site in the year 2030, based on the likely development of the site and outputs from the VPA traffic modelling, is indicated in Figure 6 below.

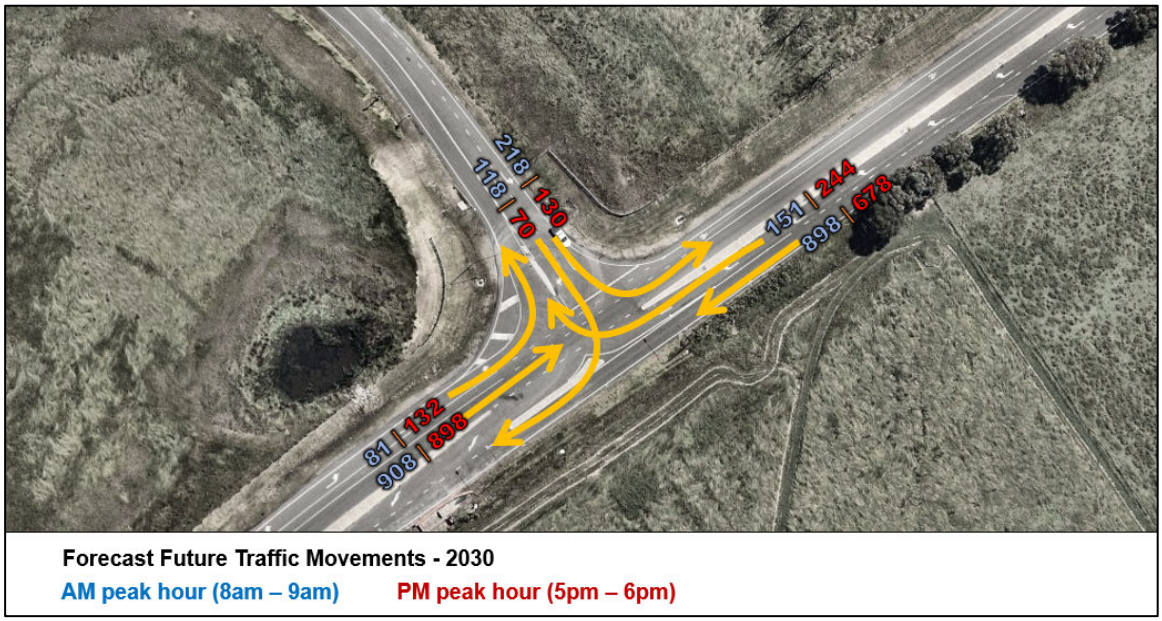


Figure 6 Forecast traffic movements

3.6 Traffic modelling

The performance of the proposed interim intersection during the morning and evening peak period has been assessed using SIDRA Intersection modelling software. Intersection performance is measured on the basis of Level of Service. The Level of Service of an intersection is defined by the average delay for vehicle travelling through the intersection during the peak period. For priority-controlled intersections and roundabouts, the delay for the highest-delay movement is used and for signalised intersections, the weighted average delay for all movements is used. Level of Service D is defined as acceptable operation, with intersections performing at Level of Service E or worse requiring treatment or upgrade. RMS Traffic Modelling Guidelines indicate the average delay relating to each grade, this is outlined in Table 2.

Table 2 Level of service grades / description

Level of service grade	Average delay (seconds)	Description
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity. At signals, incidents will cause excessive delays. Roundabouts require other control mode
F	Greater than 71	Unsatisfactory with excessive queuing

Consistent with recent advice provided by TfNSW, the intersection has been modelled to operate with a 90 second cycle time. Signalised pedestrian crossings are included on all approaches of the intersection, recognising that in the interim (prior to the development of the precinct) pedestrian demands will generally be low and the pedestrian signals are unlikely to be activated frequently.

Outputs of the traffic modelling for the interim intersection are provided in Table 3. Detailed traffic modelling outputs are provided as Appendix C to this report.

Table 3 Intersection performance

Scenario	AM Peak Hour			PM Peak Hour		
	Av. Delay	*Level of Service*	*Max Queue*	*Av. Delay*	*Level of Service*	*Max Queue*
Proposed Layout (90s cycle time)	16s	B	111m	21s	B	144m

The traffic modelling indicates that the interim intersection will operate well with an overall Level of Service ‘B’ during the AM and PM peak hours up to the year 2030, with spare capacity available.

There are a small number of individual turning movements with a LOS D. This LOS is not representative of the movement being at capacity, instead it is a result of the overall 90 second cycle time and longer phase time allocated to the primary north-south movement on Luddenham Road.

LOS is not the only measure that should be considered in reviewing the appropriateness of intersection designs, with the Degree of Saturation (DOS) also relevant to understand whether a particular turning movement is close to or at capacity. The modelling indicates that for movements exhibiting an LOS of D or above, the corresponding Degree of Saturation is less than 0.80 indicating spare capacity is available and therefore an appropriate intersection design.

It should also be noted that the traffic modelling has taken the conservative approach of assuming all SSP traffic enters and exits through the interim intersection. A more likely scenario will be that traffic is distributed between the interim intersection and the nearby LUD 2 intersection which will also serve as a point of access into the SSP development. It is therefore likely the interim intersection will provide appropriate levels of performance well beyond 2030 given the availability of the LUD 2 intersection as an alternate means of access into the SSP site.

3.7 Traffic signal plan

A traffic control signal (TCS) plan has been developed for the proposed interim signalised intersection and is provided as Appendix D to this report.

3.8 Benefits of delivery of traffic signals from 'day 1'

There are a number of benefits from delivering the signalised intersection from 'day 1'. As previously noted a new access point is required to accommodate vehicle access into the SSP site, and it is considered the interim (signalised) intersection provides the most suitable form of access prior to the delivery of the broader Luddenham Road upgrade.

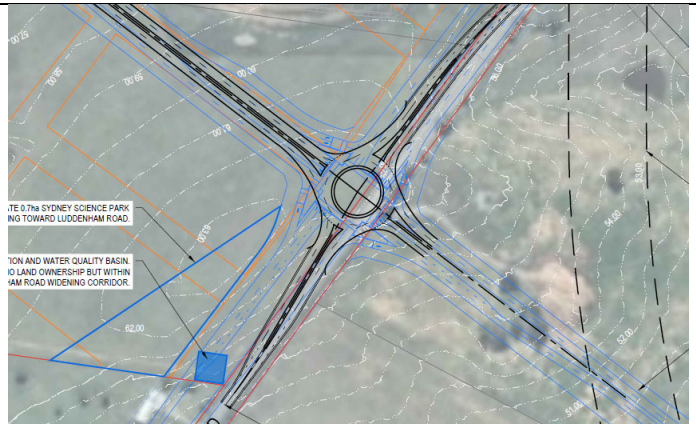
Multiple design options have been explored to balance anticipated traffic growth, intersection performance, construction works associated with future expansion of Luddenham Road, land acquisition, safe design requirements, stakeholder requirements and economic considerations. The proposed interim traffic signals was determined to provide the most appropriate balance with respect to the above items. The key benefits for constructing the interim traffic signals from 'day 1' are as follows:

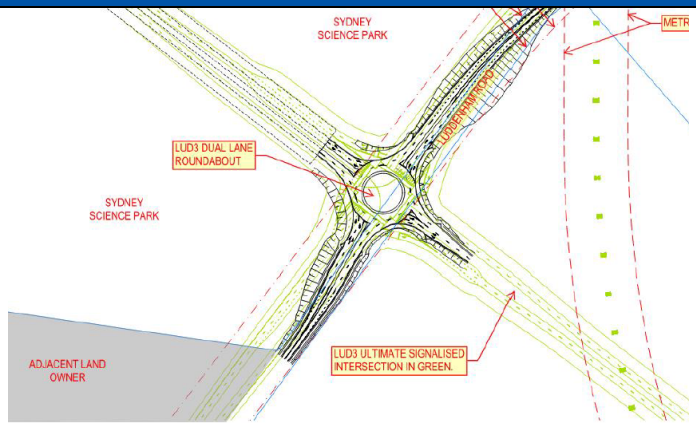
- Traffic modelling indicates acceptable performance up to the year 2030, with no further upgrades anticipated to be necessary.
- Traffic lights provide the best road safety outcome for all road users (vehicles, cyclists, public transport and pedestrians).
- The footprint required for the interim traffic lights will be such that when the ultimate intersection is under construction two-way traffic movements on Luddenham Road could be maintained without impacting the general flow of traffic through the interim intersection. This approach to construction staging facilitated by the interim intersection layout will provide a significant benefit to the broader road network.

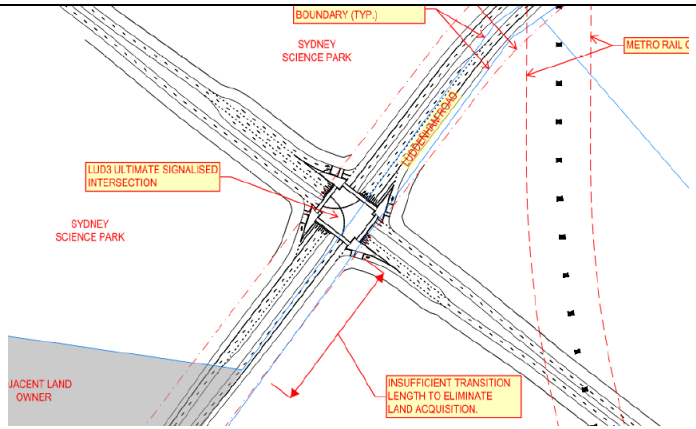
- The interim intersection design has been co-ordinated with the anticipated vertical and horizontal ultimate Luddenham Road alignment to ensure that there is a streamlined transition between the delivery of the interim and ultimate signalised intersections.
- Reduced construction costs, decommissioning and resources to convert to the ultimate signalised intersection.
- Does not require and third party land acquisition to facilitate the construction of the interim traffic signals.
- The design aligns with the Aerotropolis Precinct Plan requirements of key signalised intersection on Luddenham Road
- Traffic signal infrastructure can be installed from day 1.
- There is currently no timing for delivery of the ultimate Luddenham Road, so the interim signals will provide additional resilience (compared to a priority intersection or roundabout) in the event that the intersection remains interim until Luddenham Road is upgraded to ultimate.

A summary of the alternate options considered and the issues identified with these respective options is detailed in Table 4 on the following pages.

Table 4 Alternate intersection arrangements considered

Intersection Arrangement	Potential Layout	Identified Issues
Seagull Intersection (similar to existing		• Traffic modelling indicates the Seagull intersection would require upgrading to accommodate future traffic levels in the year 2028. This therefore does not provide an efficient solution to meet the short to medium term needs of the site • A seagull intersection is a compromise in safety where there are safer alternatives available.
Interim single lane roundabout		• Traffic modelling indicates a single lane roundabout intersection would require upgrading to accommodate future traffic levels in the year 2026. This therefore does not provide an efficient solution to meet the short to medium term needs of the site • While a roundabout is an improvement with respect to safety over a Seagull intersection, it does not provide the safety benefits compared to a signalised intersection

Intersection Arrangement	Potential Layout	Identified Issues
Interim dual lane roundabout		• A dual lane roundabout could accommodate traffic flows to/from the SSP site up until the year 2030 • The required construction footprint and surface level constraints would heavily constrain construction of the ultimate signalised intersection increasing long term construction costs • The footprint required for the dual lane roundabout would not allow for two-way traffic movements on Luddenham Road to be maintained while the ultimate intersection is constructed.

Ultimate signalised intersection		• The feasibility of construction of the ultimate signalised intersection is constrained in the short term due to:
		  • High capital investment required
		  • Required footprint necessitating land acquisition beyond land controlled by Celestino and/or TfNSW
		• When the broader Luddenham Road upgrade is undertaken significant works would be required to the ultimate intersection and there would be reduced capability for TfNSW to adjust design levels to suit the final Luddenham Road upgrade.

A summary of the intersection options considered is provided in the table below.

Table 5 Summary of intersection options considered

Criteria	Ultimate Signalised Intersection	Seagull Intersection	Single Lane Roundabout	Dual Lane Roundabout	Interim Signalised Intersection
Functional in short term traffic projections? (2-5 years)	Yes – Major overperformance	Yes	Yes	Yes	Yes
Functional in medium term traffic projections? (5-10 years)	Yes – Moderate overperformance	No	No	Yes	Yes
Functional in long term traffic projections? (10+ years)	Yes	No	No	No	No
Ease to convert intersection to Ultimate Signalised Intersection?	N/A	Relatively high	Low	Very low	High
Requires land acquisition?	Yes	No	No	No	No
Relative safety of intersection arrangement?	High	Low	Moderate	Moderate	High
Qualitative cost to benefit ratio in short term? (Cost relative to traffic volume serviced)	Not economical	Economical	Economical	Economical	Economical
Qualitative cost to benefit ratio in medium term? (Cost relative to traffic volume serviced)	Economical	Not economical	Economical	Economical	Economical
Qualitative cost to benefit ratio in long term? (Cost relative to traffic volume serviced)	Economical	Not economical l	Not economical	Not economical	Economical

In addition to the benefits to traffic management, it is Celestino's intent to construct an interim signalised intersection that adopts as much of the ultimate signalised intersection horizontal and vertical geometry to improve constructability of the ultimate signalised intersection and minimise sacrificial works overall. This opportunity is not available for a roundabout type intersection while an interim seagull intersection would involve a greater degree of sacrificial work to ensure safety.

3.9 Intersection design

The proposed geometry of the interim signalised intersection has been developed based on an Enspire generated ultimate signalised intersection design at the identified access point into SSP. The ultimate signalised intersection reference design adopts major and minor road cross sections consistent with the Western Sydney Aerotropolis Precinct Plans for the Northern Gateway Precinct and turn lane allowances based on anticipated points of interest (e.g. two turn lanes into and out of SSP). The reference design has been developed in accordance with Austroads Guide to Road Design Part 3 (Geometric Design), Part 4 (Intersections and Crossings – General), Part 4A (Unsignalised and Signalised Intersections) and TfNSW supplementary guidelines. The design has been based on a design speed of 90km/hr, the 20.0m ARV as the design vehicle and the 26.0m B-Double as the check vehicle. Vehicle turning paths are provided as Appendix E and concept design plans per Appendix F of this document.

The vertical geometry has also taken into consideration maximum road elevations under the Metro viaduct (RL57.0m) which has been developed in coordination with Sydney Metro and expected level changes at existing low points to accommodate improved stormwater drainage crossings and achieve post-development flood immunity.

From this reference design, it is intended to construct an interim signalised intersection that adopts as much of the ultimate signalised kerbs, pavements, and levels as is feasible within the site constraints (no third party land acquisition) while incorporating temporary transitions to match existing Luddenham Road toward the north and south ends of the intersection. It is anticipated that this methodology will improve constructability of the ultimate signalised intersection compared to an interim seagull or interim roundabout intersection due to the minimal sacrificial works required and the reduced need for temporary interfaces as part of the ultimate construction sequencing. Further, as the intent is to adopt as much of the ultimate infrastructure as possible, it is anticipated that overall disruption as part of the ultimate signalised intersection construction will be minimised, especially within the centre of the intersection which presents the most conflicts.

The concept demonstrates that the proposed interim signalised intersection can be designed to maximise opportunities for upgrade to the future signalised intersection, minimise total cost and provide greater levels of safety compared to other interim intersection arrangements.

4 Summary

JMT Consulting has prepared this transport assessment on behalf of Celestino Developments SSP Pty Ltd to support an application for a signalised intersection on Luddenham Road to service the Sydney Science Park (SSP) site. A new access point servicing SSP is required given that the existing site entry will be taken over in 2023 to support construction of the new Sydney Metro station at Luddenham. In this context an 'interim' intersection layout, comprising of an intersection controlled by traffic lights with formal pedestrian crossings, is proposed to service the SSP site.

Traffic modelling undertaken for the intersection up to the year 2030, considering future traffic flows on Luddenham Road and into/out of the SSP site, has confirmed that the intersection would operate well with a Level of Service B during both the AM and PM peak hours.

There are a number of benefits from delivering the signalised intersection from 'day 1' (i.e. 2023) with respect to road user safety, construction staging, property acquisition and intersection performance. A number of alternate intersection design options were analysed however none of these options were considered to provide a suitable outcome with respect to the above factors.

Extensive consultation has been undertaken with Transport for NSW in relation to the proposed signals, with TfNSW providing in-principle support for the proposal in March 2023.

In the above context the works contemplated under the proposal are considered appropriate to warrant the proposed signalised intersection from day one.

Appendix A: Meeting Minutes

Include email from TfNSW which acknowledges minutes.

Celestino – SSP LUD3 Meeting Minutes

Date	Friday 18 March 2022
Time	10:00am
Meeting No	1
Prepared by	Tom Herbert

Attendees

Celestino	Jude Adikari (JA)	PCC	John Skaf (JS)
Celestino	Bradley Dekruif (BD)	TfNSW	Laura Van Putten (LVP)
Orion	Phillip Byrum (PB)	TfNSW	Thomas Ng (TN)
PCC	Kathryn Saunders (KS)	TfNSW	Vladimir Shopov (VS)
Enspire Solutions	Shawn Hotong (SH)	TfNSW	Matt Yates (MY)
		TfNSW	Chris Millet (CM)

Item	
1	**Introductions**
2	**LUD2 & LUD3**

JA provided update and sequencing of LUD2 and LUD3.

JA expressed key to have signalised intersections at LUD3 from day 1.

JA noted that current concept allows for connection to the existing Luddenham Road but also will be able to be upgraded to future ultimate 60m wide alignment.

KS queried timing on this. JA advised the DA is intended to lodged the 3rd Quarter of 2022 and advised that a DA will be submitted for a signalised intersection approval.

3	**Ultimate Intersection**

TN asked when the ultimate would be likely to occur. JA Advised the timing is with TfNSW so while corridor is gazetting the timing and funding has not been determined.

JA advised that Celestino's estimate is that the interim signalised intersection will be in operation for at least 10 years.

MY advised that any query around timing of widening is a question for TfNSW planning and not Celestino/Metro.

TN wants to appreciate where the pressure for widening will come from.

MY advised that Metro traffic (cars) load will be low and the demand generated from Metro unlikely to trigger the widening of Luddenham Road.

JA noted that currently, the development is capped at 3,400 dwellings but different DCP controls may increase densities. Noting development will occur across a 30–40-year time span.

4	**Design and Modelling of Intersections**

LVP and CM discussed information around design and modelling of the intersection for review.

CM advised that warrants is something that will be considered but is only one of several factors.

MY suggested the location of LUD3 should not be in question as this is part of the Metro planning already. LVP generally agreed and was aware of past discussions, but the documentation is required to move forward. LVP asked that the documentation include 'when the warrants are met' so the determination can consider this loading.

CM advised that all information is sent to development@transport.nsw.gov.au

JA advised that the information will be issued for TfNSW review prior to the DA and an in-principle agreement for the location and signals from day 1 (not an approval of the design). LVP advised that the initial assessment could be accommodated within 3 weeks, noting a detailed assessment will take longer – perhaps up to 3 months for a design review. LVP wishes to see KS included in all correspondence.

5 DA and Precinct Plan Timing

KS queried timing of DA and timing of precinct plan i.e. Is Celestino comfortable submitting a DA outside of planning approval, noting a possible alignment change.

JA suggested that his understanding of the planning is within 3-4 weeks for final plans well before the DA is lodged.

MY advised that his understanding is that the location of the two intersections (LUD2 and LUD3) are 'locked'.

LVP advised that a formal response will be contingent on the final planning.

6 Technical Overview of Intersection Design

BD noted the grading and connection to existing and future infrastructure.

JS queried intent of DA is only for interim intersection and not ultimate approval. BD advised the ultimate is shown for reference and to demonstrate consideration has been given to the ultimate alignment. BD confirmed we are not proposed to obtain approval for the ultimate intersection.

JS queried vertical grading and whether the grades have been approved or provided by TfNSW. BD confirmed it's Enspire's/Celestino's Engineering design based on anticipated requirements and Aust roads as there is no vertical grading available for Luddenham Road. JS advised that if the intersection is as close to the ultimate design the more comfortable Council will be.

SH advised that Metro has provided Viaduct levels which controls clearance and controls to the Luddenham Road level at the viaduct crossing. This included design controls for 90km/hr design speed. SH noted that regardless of any Luddenham Road Design, the levels are largely fixed here.

JS queried access to Lot 24 and management of access near the intersection. BD confirmed internal discussions has been had and Metro have been engaged as Lot 24 is Metro's land.

KS queried owner's consent. JA confirmed that owner's consent and work with Metro is a key consideration and design deliberately avoids battering outside Metro's or Celestino's land.

7 ACTIONS

Celestino are to package up design information, including:

- Location of intersection
- Modelling for intersection
- When warrants will be met
- Constructability (interim and ultimate)
- Impact to private landowners (batters)

Aiming for DA approval end of 2022

Meeting closed 10:50am

From:	Laura Van putten
To:	Bradley Dekruif; kathryn.saunders@penrith.city; john.skaf@penrith.city; Thomas Ng; Vladimir Shopov; Matt Yates; Chris Millet
Cc:	Philip Byrum; shawn.hotong@enspiresolutions.com.au; Jude Adikari
Subject:	RE: Meeting Minutes - Luddenham Rd Signalised Intersection (LUD3) - Sydney Science Park
Date:	Monday, 28 March 2022 9:14:13 PM
Attachments:	image003.png image004.png 220318 Meeting Minutes_LUD3 Intersection.pdf

Hi Brad

The Minutes appear generally consistent with what was discussed. Therefore supported by TfNSW subject to Council support.

Kind Regards,

Laura van Putten
A/Senior Land Use Assessment Coordinator
Planning and Programs
Greater Sydney
Transport for NSW

M 0429 505 961 **T** (02) 8849 2480 **E** laura.van.putten@transport.nsw.gov.au

transport.nsw.gov.au

27-31 Argyle Street
Parramatta NSW 2750

NSW GOVERNMENT Transport for NSW

From: Bradley Dekruif <Bradley.Dekruif@celestino.net.au>
Sent: Wednesday, 23 March 2022 5:30 PM
To: kathryn.saunders@penrith.city; john.skaf@penrith.city; Laura Van putten <Laura.VAN.PUTTEN@transport.nsw.gov.au>; Thomas Ng <Thomas.Ng@transport.nsw.gov.au>; Vladimir Shopov <Vladimir.SHOPOV@transport.nsw.gov.au>; Matt Yates <Matt.Yates@transport.nsw.gov.au>; Chris Millet <Chris.MILLET@transport.nsw.gov.au>
Cc: Philip Byrum <philip.byrum@orionconsulting.com.au>; shawn.hotong@enspiresolutions.com.au; Jude Adikari <Jude.Adikari@celestino.net.au>
Subject: Meeting Minutes - Luddenham Rd Signalised Intersection (LUD3) - Sydney Science Park

Hi All,

Appendix B: Relevant TfNSW Correspondence

From: Nav Prasad <Nav.Prasad2@transport.nsw.gov.au>
Sent: Tuesday, May 2, 2023 3:01 PM
To: Bradley Dekruif <Bradley.Dekruif@celestino.net.au>
Cc: Pahee Rathan <Pahee.RATHAN@transport.nsw.gov.au>
Subject: RE: SYD22/00560/03 - Intersection Design for Sydney Science Park

Hi Bradley,

Please find attached the Approval in Principle Form for the proposed traffic signals for Sydney Science Park.

Please note that the approval in principle is subject to the detailed design review and any amendments following the review.

Also the approval in principle does not constitute approval under section 87 of the Roads Act. This will follow the finalised approved plans from TfNSW.

If you have any queries, please do not hesitate to contact me.

Regards

Nav Prasad
Development Assessment Officer
Planning and Programs
Greater Sydney
Transport for NSW

Ph. (02) 9983 3193
Level 5, 27 Argyle Street Parramatta NSW 2150

Please not that I am contracted to TfNSW in a part time capacity and generally available Mondays, Tuesdays and Wednesdays only.

Transport for NSW

I recognise and acknowledge that modern New South Wales is an overlay on Aboriginal land and that many of the transport routes of today follow songlines Aboriginal people have followed for tens of thousands of years. I pay my respects to the Aboriginal people of NSW and Elders past and present.

From: Bradley Dekruif [mailto:Bradley.Dekruif@celestino.net.au]
Sent: Tuesday, 4 April 2023 8:54 AM
To: Pahee Rathan <Pahee.RATHAN@transport.nsw.gov.au>; James Douglas <James.Douglas@transport.nsw.gov.au>
Cc: Jude Adikari <Jude.Adikari@celestino.net.au>
Subject: RE: SYD22/00560/03 - Intersection Design for Sydney Science Park

Hi Pahee,

Thank you for your prompt response.

Please see the link below to the pack which includes the requested information. The link includes:

1. Signals Plan
2. Traffic Statement
3. Concept Civil Design
4. Sidra Model

Link: 230404 SSP CCS Package Submission to TfNSW for IPA

Let me know if you can't access the information in the link.

We look forward to receiving the IPA.

Should you have any questions or require any further information, please do not hesitate to contact me.

Kind regards,

Brad Dekruif
Development Manager
Celestino Pty Limited
642 Great Western Highway
Pendle Hill NSW 2145
PO Box 438, Pendle Hill NSW 2145
t 02 9842 1259
m 0415 554 131
e bradley.dekruif@celestino.net.au
w celestino.net.au

CELESTINO

From: Pahee Rathan <Pahee.RATHAN@transport.nsw.gov.au>
Sent: Monday, April 3, 2023 8:50 AM
To: Bradley Dekruif <Bradley.Dekruif@celestino.net.au>; James Douglas <James.Douglas@transport.nsw.gov.au>
Cc: Jude Adikari <Jude.Adikari@celestino.net.au>
Subject: RE: SYD22/00560/03 - Intersection Design for Sydney Science Park

Hi Brad,

Thanks for sending through the signal plans.

James is on leave.

Can I ask you to send Signal Plans, Civil Design Plans and associated modelling as a package?

The abovementioned information is required for review and issue API.

Regards
Pahee

Pahee Rathan
Senior Land Use Assessment Coordinator
Planning and Programs
Sydney Region
Transport for NSW

M 0417 246 510 **E** Pahee.Rathan@transport.nsw.gov.au

transport.nsw.gov.au

27-31 Argyle Street
Parramatta NSW 2150

NSW GOVERNMENT Transport for NSW

I acknowledge the Aboriginal people of the country on which I work, their traditions, culture and a shared history and identity. I also pay my respects to Elders past and present and recognise the continued connection to country.

Please consider the environment before printing this email.

From: Bradley Dekruif [mailto:Bradley.Dekruif@celestino.net.au]
Sent: Monday, 3 April 2023 12:04 AM
To: James Douglas <James.Douglas@transport.nsw.gov.au>
Cc: Pahee Rathan <Pahee.RATHAN@transport.nsw.gov.au>; Jude Adikari <Jude.Adikari@celestino.net.au>
Subject: RE: SYD22/00560/03 - Intersection Design for Sydney Science Park

Hi James,

I hope you are well.

Further to the below email, please see attached the 'Signals Plan' for the LUD3 intersection.

It my understanding that this 'Signals Plan' will enable the release of TfNSW's IPA for the LUD3 intersection.

Our DA application is currently being finalised for submission to Council in April and we are just waiting for the IPA to include as part of this package.

I'll touch base with you tomorrow.

Kind regards,

Brad Dekruif
Development Manager
Celestino Pty Limited
642 Great Western Highway
Pendle Hill NSW 2145
PO Box 438, Pendle Hill NSW 2145
t 02 9842 1259
m 0415 554 131
e bradley.dekruif@celestino.net.au
w celestino.net.au

CELESTINO

From: Bradley Dekruif
Sent: Wednesday, March 15, 2023 4:28 PM
To: 'James Douglas' <James.Douglas@transport.nsw.gov.au>
Cc: Pahee Rathan <Pahee.RATHAN@transport.nsw.gov.au>; Jude Adikari <jude.adikari@celestino.net.au>
Subject: RE: SYD22/00560/03 - Intersection Design for Sydney Science Park

Hi James,

Thank you for your time on the phone and the positive response in your email below.

As discussed, an In Principle Agreement (IPA) for the proposed LUD3 intersection is required to enable lodgement of the DA submission.

As such, we are seeking to obtain TfNSW's IPA on our revised design dated 09 March 2023, prepared by JMT Consulting.

The detailed design of the intersection (which will include the signals plan), will accompany the DA documentation and will be referred to TfNSW for concurrence by Penrith City Council as part of the referral process. The intention is to lodge the DA early April 2023

It would be most grateful if the IPA can be issued at your earliest convenience.

I appreciate your time and work on our LUD3 intersection.

Should you have any questions or wish to discuss any matter further, please do not hesitate to contact me.

Kind regards,

Brad Dekruif
Development Manager
Celestino Pty Limited
642 Great Western Highway
Pendle Hill NSW 2145
PO Box 438, Pendle Hill NSW 2145
t 02 9842 1259
m 0415 554 131
e bradley.dekruif@celestino.net.au
w celestino.net.au

CELESTINO

From: James Douglas <James.Douglas@transport.nsw.gov.au>
Sent: Tuesday, 14 March 2023 2:46 PM
To: Bradley Dekruif <Bradley.Dekruif@celestino.net.au>
Cc: Pahee Rathan <Pahee.RATHAN@transport.nsw.gov.au>
Subject: SYD22/00560/03 - Intersection Design for Sydney Science Park

Good Afternoon Brad,

Please be advised that TfNSW is generally satisfied with the redesigned intersection including the location and signal position as per the revised design dated 09 March 2023 and prepared by JMT Consulting. Please proceed with the preparation of the signals plan based on the revised design. If further clarification is required please reach out to discuss.

Kind Regards,

James Douglas

TRANSPORT

Site Details		
TCS Site #	**Street 1**	**Street 2:**
XXXX	Luddenham Road	Sydney Science Park
Street 3	**Suburb**	**LGA Name**
Click or tap here to enter text.	Penrith	Penrith
Maintenance Group	**State Electoral Boundary**	**UDB/Ref:**
-	-	

Project Details		
Program	**Region**	**3 Cities**
N/A	Greater Sydney	Western Parkland City
Client	**Client Contact**	**Contact Email**

Proposed scope of works

New Traffic Signals

Recommended

	Signature	**Date**
Network Operations Team Leader		**02/05/2023**
Print name: Tim Dewberry		

Comments: Click or tap here to enter text.

Approved	**Signature**	**Date**
Senior Manager Network and Safety Services		**02/05/2023**
Print name: Daryl Ninham		

Comments: Click or tap here to enter text.

Disclaimer:

This form provides Agreement in Principle to the addition or alteration of Traffic Signals at the stated location. As such it has been determined that traffic signals are an appropriate form of time separated traffic control at the stated location. Please note that following the commencement of the detailed design review unforeseen constraints may be identified which significantly affect the delivery of the project agreed to in principal by this form. This includes, but is not limited to, utility works, land ownership, property acquisition, and drainage.

Under normal circumstances this Agreement in Principle expires after the latter of:

- **5 years after the date of the signatures provided above;**
- **5 years after the Notice of the Determination for a Development Application from a Consent Authority.**

In extenuating circumstances, such as where traffic volumes, land use or network changes have substantially altered the road environment, Roads and Maritime reserves the right to withdraw this Agreement in Principle.

Appendix C: Traffic Modelling Outputs

MOVEMENT SUMMARY

Site: 1 [AM Peak Hour (Site Folder: Original Layout Issued May 22' (140s cycle time))]

Luddenham Road_Interim Signalised Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Luddenham Rd N														
11	T1	898	10.0	945	10.0	0.623	4.5	LOS A	22.3	169.4	0.39	0.36	0.39	72.9
12	R2	151	10.0	159	10.0	* 0.484	44.1	LOS D	9.9	75.1	0.95	0.87	0.95	38.0
Approach		1049	10.0	1104	10.0	0.623	10.2	LOS A	22.3	169.4	0.47	0.44	0.47	64.4
NorthWest: SSP Access														
1	L2	218	10.0	229	10.0	0.545	55.6	LOS D	13.7	104.4	0.93	0.82	0.93	30.8
3	R2	118	10.0	124	10.0	* 0.836	82.3	LOS F	9.2	70.2	1.00	0.91	1.28	25.1
Approach		336	10.0	354	10.0	0.836	65.0	LOS E	13.7	104.4	0.95	0.85	1.05	28.5
SouthWest: Luddenham Rd S														
4	L2	81	10.0	85	10.0	0.073	15.4	LOS B	2.0	14.8	0.36	0.70	0.36	54.4
5	T1	908	10.0	956	10.0	* 0.826	16.7	LOS B	44.0	334.1	0.75	0.70	0.75	58.6
Approach		989	10.0	1041	10.0	0.826	16.6	LOS B	44.0	334.1	0.72	0.70	0.72	58.3
All Vehicles		2374	10.0	2499	10.0	0.836	20.6	LOS B	44.0	334.1	0.64	0.60	0.65	52.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
NorthEast: Luddenham Rd N												
P4	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	89.6	32.9	0.37
NorthWest: SSP Access												
P1	Full	50	53	12.0	LOS B	0.1	0.1	0.42	0.42	40.7	37.2	0.91
SouthWest: Luddenham Rd S												
P2	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.9	37.2	0.40
All Pedestrians		150	158	46.9	LOS E	0.2	0.2	0.78	0.78	74.4	35.8	0.48

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1 [PM Peak Hour (Site Folder: Original Layout Issued May 22' (140s cycle time))]

Luddenham Road_Interim Signalised Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Luddenham Rd N														
11	T1	678	10.0	714	10.0	0.483	4.5	LOS A	15.0	114.0	0.34	0.32	0.34	72.9
12	R2	244	10.0	257	10.0	* 0.699	61.1	LOS E	15.7	119.5	0.98	0.99	1.00	32.3
Approach		922	10.0	971	10.0	0.699	19.5	LOS B	15.7	119.5	0.51	0.50	0.52	54.7
NorthWest: SSP Access														
1	L2	130	10.0	137	10.0	0.257	44.6	LOS D	7.0	53.0	0.80	0.77	0.80	34.0
3	R2	70	10.0	74	10.0	* 0.397	70.3	LOS E	4.8	36.7	0.97	0.77	0.97	27.4
Approach		200	10.0	211	10.0	0.397	53.6	LOS D	7.0	53.0	0.86	0.77	0.86	31.3
SouthWest: Luddenham Rd S														
4	L2	132	10.0	139	10.0	0.132	19.4	LOS B	3.9	30.0	0.45	0.72	0.45	51.4
5	T1	898	10.0	945	10.0	* 0.947	48.7	LOS D	68.3	519.3	0.88	0.97	1.07	38.8
Approach		1030	10.0	1084	10.0	0.947	44.9	LOS D	68.3	519.3	0.83	0.94	0.99	40.0
All Vehicles		2152	10.0	2265	10.0	0.947	34.8	LOS C	68.3	519.3	0.70	0.73	0.78	43.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
NorthEast: Luddenham Rd N												
P4	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	90.3	33.9	0.38
NorthWest: SSP Access												
P1	Full	50	53	17.0	LOS B	0.1	0.1	0.49	0.49	48.0	40.2	0.84
SouthWest: Luddenham Rd S												
P2	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.9	37.2	0.40
All Pedestrians		150	158	48.5	LOS E	0.2	0.2	0.80	0.80	77.1	37.1	0.48

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1 [AM Peak Hour (Site Folder: Proposed Layout March 23' (90s cycle time))]

Luddenham Road_Interim Signalised Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Luddenham Rd N														
11	T1	898	10.0	945	10.0	0.445	4.2	LOS A	9.3	70.9	0.34	0.31	0.34	74.6
12	R2	151	10.0	159	10.0	* 0.550	45.8	LOS D	6.6	50.5	0.97	0.80	0.97	37.8
Approach		1049	10.0	1104	10.0	0.550	10.2	LOS A	9.3	70.9	0.43	0.38	0.43	65.4
NorthWest: SSP Access														
1	L2	218	10.0	229	10.0	0.225	31.4	LOS C	3.7	28.2	0.77	0.75	0.77	39.8
3	R2	118	10.0	124	10.0	* 0.554	51.2	LOS D	3.9	29.3	0.99	0.77	1.01	32.2
Approach		336	10.0	354	10.0	0.554	38.3	LOS C	3.9	29.3	0.85	0.75	0.85	36.8
SouthWest: Luddenham Rd S														
4	L2	81	10.0	85	10.0	0.525	21.0	LOS B	14.0	106.4	0.67	0.63	0.67	55.5
5	T1	908	10.0	956	10.0	* 0.525	15.1	LOS B	14.6	110.8	0.68	0.62	0.68	61.0
Approach		989	10.0	1041	10.0	0.525	15.6	LOS B	14.6	110.8	0.68	0.62	0.68	60.5
All Vehicles		2374	10.0	2499	10.0	0.554	16.4	LOS B	14.6	110.8	0.59	0.53	0.59	57.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
NorthEast: Luddenham Rd N												
P4	Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	69.7	39.5	0.57
NorthWest: SSP Access												
P1	Full	50	53	15.6	LOS B	0.1	0.1	0.59	0.59	44.3	37.2	0.84
P1S	Slip/ Bypass	50	53	11.3	LOS B	0.1	0.1	0.50	0.50	32.5	27.6	0.85
SouthWest: Luddenham Rd S												
P2	Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	70.4	40.5	0.57
P2S	Slip/ Bypass	50	53	33.0	LOS D	0.1	0.1	0.86	0.86	51.7	24.3	0.47
All Pedestrians		250	263	27.7	LOS C	0.1	0.1	0.76	0.76	53.7	33.8	0.63

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 1 [PM Peak Hour (Site Folder: Proposed Layout March 23' (90s cycle time))]

Luddenham Road_Interim Signalised Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Luddenham Rd N														
11	T1	678	10.0	714	10.0	0.368	5.6	LOS A	8.1	61.6	0.40	0.35	0.40	72.0
12	R2	244	10.0	257	10.0	* 0.702	45.0	LOS D	11.0	83.8	0.98	0.86	1.04	38.1
Approach		922	10.0	971	10.0	0.702	16.0	LOS B	11.0	83.8	0.55	0.48	0.57	58.3
NorthWest: SSP Access														
1	L2	130	10.0	137	10.0	0.102	23.1	LOS B	1.8	13.5	0.62	0.70	0.62	43.6
3	R2	70	10.0	74	10.0	* 0.188	42.4	LOS C	2.0	15.1	0.90	0.73	0.90	34.8
Approach		200	10.0	211	10.0	0.188	29.9	LOS C	2.0	15.1	0.72	0.71	0.72	40.1
SouthWest: Luddenham Rd S														
4	L2	132	10.0	139	10.0	0.699	29.1	LOS C	18.9	143.8	0.85	0.78	0.85	49.1
5	T1	898	10.0	945	10.0	* 0.699	22.9	LOS B	19.0	144.3	0.85	0.77	0.85	53.6
Approach		1030	10.0	1084	10.0	0.699	23.7	LOS B	19.0	144.3	0.85	0.77	0.85	53.0
All Vehicles		2152	10.0	2265	10.0	0.702	21.0	LOS B	19.0	144.3	0.71	0.64	0.72	53.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
NorthEast: Luddenham Rd N												
P4	Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	70.4	40.5	0.57
NorthWest: SSP Access												
P1	Full	50	53	23.5	LOS C	0.1	0.1	0.72	0.72	54.4	40.2	0.74
P1S	Slip/ Bypass	50	53	16.8	LOS B	0.1	0.1	0.61	0.61	38.1	27.6	0.72
SouthWest: Luddenham Rd S												
P2	Full	50	53	39.3	LOS D	0.1	0.1	0.94	0.94	70.4	40.5	0.57
P2S	Slip/ Bypass	50	53	29.7	LOS C	0.1	0.1	0.81	0.81	48.4	24.3	0.50
All Pedestrians		250	263	29.7	LOS C	0.1	0.1	0.80	0.80	56.4	34.6	0.61

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 1 [AM Peak Hour (Site Folder: Proposed Layout March 23' (140s cycle time))]

Luddenham Road_Interim Signalised Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Luddenham Rd N														
11	T1	898	10.0	945	10.0	0.425	4.5	LOS A	12.0	91.0	0.29	0.26	0.29	74.2
12	R2	151	10.0	159	10.0	* 0.494	63.0	LOS E	9.8	74.8	0.95	0.81	0.95	32.1
Approach		1049	10.0	1104	10.0	0.494	12.9	LOS A	12.0	91.0	0.38	0.34	0.38	62.4
NorthWest: SSP Access														
1	L2	218	10.0	229	10.0	0.229	43.6	LOS D	5.7	43.0	0.77	0.75	0.77	35.1
3	R2	118	10.0	124	10.0	* 0.492	72.2	LOS F	5.7	43.4	0.98	0.77	0.98	27.2
Approach		336	10.0	354	10.0	0.492	53.7	LOS D	5.7	43.4	0.84	0.76	0.84	31.9
SouthWest: Luddenham Rd S														
4	L2	81	10.0	85	10.0	0.506	24.9	LOS B	20.5	156.0	0.62	0.60	0.62	52.5
5	T1	908	10.0	956	10.0	* 0.506	18.8	LOS B	20.5	156.0	0.62	0.57	0.62	57.5
Approach		989	10.0	1041	10.0	0.506	19.3	LOS B	20.5	156.0	0.62	0.57	0.62	57.1
All Vehicles		2374	10.0	2499	10.0	0.506	21.3	LOS B	20.5	156.0	0.54	0.50	0.54	53.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
NorthEast: Luddenham Rd N												
P4	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	94.7	39.5	0.42
NorthWest: SSP Access												
P1	Full	50	53	17.5	LOS B	0.1	0.1	0.50	0.50	46.2	37.2	0.81
P1S	Slip/ Bypass	50	53	13.8	LOS B	0.1	0.1	0.44	0.44	35.0	27.6	0.79
SouthWest: Luddenham Rd S												
P2	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	95.4	40.5	0.42
P2S	Slip/ Bypass	50	53	48.2	LOS E	0.2	0.2	0.83	0.83	66.9	24.3	0.36
All Pedestrians		250	263	41.6	LOS E	0.2	0.2	0.74	0.74	67.6	33.8	0.50

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 1 [PM Peak Hour (Site Folder: Proposed Layout March 23' (140s cycle time))]

Luddenham Road_Interim Signalised Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Luddenham Rd N														
11	T1	678	10.0	714	10.0	0.333	4.8	LOS A	9.2	70.1	0.30	0.26	0.30	73.1
12	R2	244	10.0	257	10.0	* 0.648	60.4	LOS E	16.0	121.6	0.96	0.84	0.96	32.9
Approach		922	10.0	971	10.0	0.648	19.5	LOS B	16.0	121.6	0.47	0.42	0.47	55.2
NorthWest: SSP Access														
1	L2	130	10.0	137	10.0	0.114	34.8	LOS C	2.9	22.0	0.66	0.71	0.66	38.2
3	R2	70	10.0	74	10.0	* 0.227	65.6	LOS E	3.2	24.0	0.93	0.74	0.93	28.5
Approach		200	10.0	211	10.0	0.227	45.6	LOS D	3.2	24.0	0.76	0.72	0.76	34.2
SouthWest: Luddenham Rd S														
4	L2	132	10.0	139	10.0	0.649	32.7	LOS C	28.5	216.4	0.76	0.72	0.76	46.9
5	T1	898	10.0	945	10.0	* 0.649	25.5	LOS B	28.5	216.4	0.73	0.68	0.73	51.6
Approach		1030	10.0	1084	10.0	0.649	26.5	LOS B	28.5	216.4	0.74	0.68	0.74	51.0
All Vehicles		2152	10.0	2265	10.0	0.649	25.3	LOS B	28.5	216.4	0.63	0.57	0.63	50.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
NorthEast: Luddenham Rd N												
P4	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	95.4	40.5	0.42
NorthWest: SSP Access												
P1	Full	50	53	24.1	LOS C	0.1	0.1	0.59	0.59	55.0	40.2	0.73
P1S	Slip/ Bypass	50	53	18.6	LOS B	0.1	0.1	0.52	0.52	39.8	27.6	0.69
SouthWest: Luddenham Rd S												
P2	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	95.4	40.5	0.42
P2S	Slip/ Bypass	50	53	43.3	LOS E	0.2	0.2	0.79	0.79	62.0	24.3	0.39
All Pedestrians		250	263	42.9	LOS E	0.2	0.2	0.76	0.76	69.5	34.6	0.50

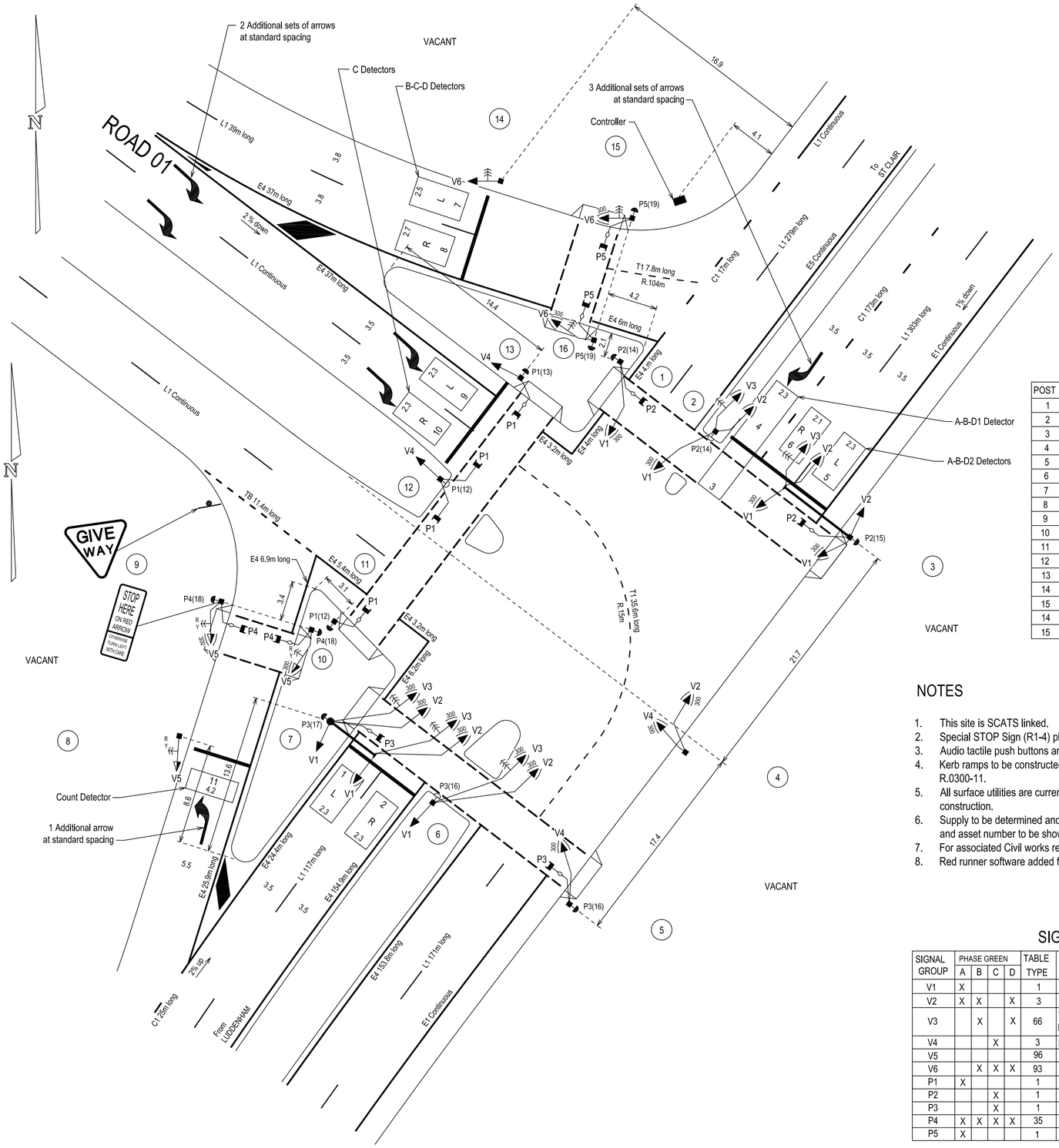
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

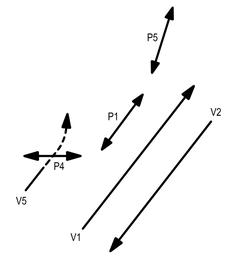
Appendix D: Traffic Control Signal Plan

TCS 0000

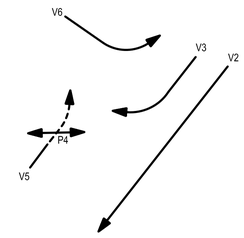
DATE IN SERVICE : 00/00/0000

NSW GOVERNMENT | Transport for NSW

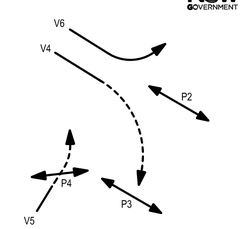




A PHASE



B and D PHASE
(Z+ Introduces D Phase)



C PHASE

MOVEMENTS

POSTS

POST	TYPE	LENGTH	OFFSET	REMARKS
1	8	1.4	0.6	NEW
2	8	4.0	2.8	NEW
3	9	-	1.0	NEW (MA 7m outreach)
4	8	4.0	1.0	NEW
5	8	4.0	1.0	NEW
6	8	4.0	0.6	NEW
7	5L	-	2.0	NEW (MA 5m outreach)
8	8	4.0	1.0	NEW
9	8	4.0	1.0	NEW
10	8	4.0	1.0	NEW
11	8	4.0	1.0	NEW
12	8	4.0	1.0	NEW
13	8	4.0	1.0	NEW
14	8	4.0	1.0	NEW
15	8	4.0	1.0	NEW
14	8	4.0	1.0	NEW
15	8	4.0	1.0	NEW

NOTES

1. This site is SCATS linked.
2. Special STOP Sign (R1-4) placed on Posts 12, 13 and 14.
3. Audio tactile push buttons are located on Posts 1, 3, 5, 7, 9, 10, 11, 13, 15 and 16.
4. Kerb ramps to be constructed at all pedestrian crossings in accordance with Standard Road Drawing R.0300-11.
5. All surface utilities are currently under investigation. All utility services are to be confirmed prior to construction.
6. Supply to be determined and confirmed by an accredited Level 2/3 service provider, prior to construction and asset number to be shown on the Design Layout.
7. For associated Civil works refer to Drawing No. DS0000/000000 prepared by Enspire.
8. Red runner software added for detectors 1 - 11.

SIGNAL GROUP PHASE CHART

SIGNAL GROUP	PHASE GREEN A	B	C	D	TABLE TYPE	REMARKS
V1	X				1	
V2	X	X		X	3	
V3		X		X	66	Timed Red Arrow protection for P1 pedestrians PB on Post 13 extends Red Arrow protection for P1 pedestrians
V4			X		3	Full Red protection for P3 pedestrians
V5					96	Independent sliplane
V6		X	X	X	93	
P1	X				1	Automatic introduction subject to XSF 1
P2			X		1	Automatic introduction subject to XSF 2
P3			X		1	Automatic introduction subject to XSF 3
P4	X	X	X	X	35	Independent sliplane pedestrian movement
P5	X				1	Automatic introduction subject to XSF 4

DETECTOR SPECIFICATION

Detector		Specifications			
A	FN	A(L)	A(E1)		
	SG/PS	$\overline{A}$	A		
	DS	—	—		
A-B-D	FN	A(L)	A(E1)	B(E1)	D(E1)
	SG/PS	$\overline{V2}$	A	B	D
	DS	$\overline{B.D}$	$\overline{B(NEXT).D(NEXT)}$	$\overline{A(NEXT).D(NEXT)}$	$\overline{A(NEXT).B(NEXT)}$
B-C-D	FN	C(PR)	B(E1)		C(E1)
	SG/PS	$\overline{C}$	B		C
	DS	—	$\overline{B\text{-}C\text{-}D(PR).C(NEXT).D(NEXT)}$		—
cont. B-C-D	FN	D(E1)			
	SG/PS	D			
	DS	$\overline{B\text{-}C\text{-}D(PR).C(NEXT).D(NEXT)}$			
B-D	FN	B(L)	D(L)	B(E2)	D(E2)
	SG/PS	$\overline{V3}$	$\overline{V3}$	B	D
	DS	—	Z+	D(NEXT)	B(NEXT)
C	FN	C(L)	C(E3)		
	SG/PS	$\overline{C}$	C		
	DS	—	—		
P1 P.B.	FN	A(PB)	C(L)		
	SG/PS	$\overline{P1(WALK)}$	$\overline{A.P1(WALK)}$		
	DS	—	$\overline{\overline{B.C.D}}$		
P2 P.B.	FN	C(PB)	A(L)		
	SG/PS	$\overline{P2(WALK)}$	$\overline{C.P2(WALK)}$		
	DS	—	$\overline{\overline{A.B.D}}$		
P3 P.B.	FN	C(PB)	A(L)		
	SG/PS	$\overline{P2(WALK)}$	$\overline{C.P2(WALK)}$		
	DS	—	$\overline{\overline{A.B.D}}$		
P5 P.B.	FN	C(PB)	A(L)		
	SG/PS	$\overline{P5(WALK)}$	$\overline{C.P5(WALK)}$		
	DS	—	$\overline{\overline{A.B.D}}$		

PUBLIC UTILITY LEGEND	
HYDRANT	□
STOP VALVE	▲
GAS VALVE	#
SEWER MANHOLE	⊛
COMMS PIT	◪
ELECT LIGHT POLE	☾
POWER POLE	○
STAY POLE	⊘
TELEPHONE BOX	T
COMMS PILLAR	◕

REFERENCE PLANS	
SYMBOLS/ABRVS	VD003-6
STD POSN CMPT	VD001-5
INSTL STOP DET	VC005-17
VEH GROUP OP	TS-TN-019
DET LOGIC OP	TS-TN-020
PED MVT OP	TS-TN-021
SURVEYOR: Enspire	
DATE: 2022	

U.B.D. Ref. Map

I.S.G. CO-ORDS E: 275 666 N: 1 253 627

DESIGNED: GLEN VARLEY, Road Delay Solutions P/L

CHECKED: Shawn Hotong, Enspire

SITE CHECKED

SHAWN HOTONG

RECOMMENDED

DESIGN APPROVAL

APPROVED

NAME GLEN VARLEY

POSITION DIRECTOR

DATE 20.03.2023

DESIGN PREPARED BY

ROAD DELAY SOLUTIONS Pty Ltd
9/81-83 OCEAN BEACH ROAD | WOY WOY NSW 2256
Mobile 0414 800 912 | Email gvarley@tpgcond.com

TFNSW RECOMMENDATION

ROAD DESIGN ENGINEERING

NAME

POSITION

DATE

NETWORK OPERATIONS

NAME

POSITION

DATE

TFNSW ACCEPTANCE

ACCEPTED

NAME

POSITION

DATE

ACCEPTED BY

SECTION

A ORIGINAL ISSUE

TRANSPORT FOR NEW SOUTH WALES

PENRITH COUNCIL AREA
TRAFFIC SIGNALS AT
LUDDENHAM ROAD AND
SIDE STREET
SYDNEY SCIENCE PARK

DESIGN LAYOUT

EXISTING ☐ PROPOSED ☒

CADD FILE: VV0000_1A_DES.dgn

SCALE 5 0 (1:200) 5 10

FILE SF2000/0000000

SUPERSEDES SHEET/ISSUE -

ISSUE A

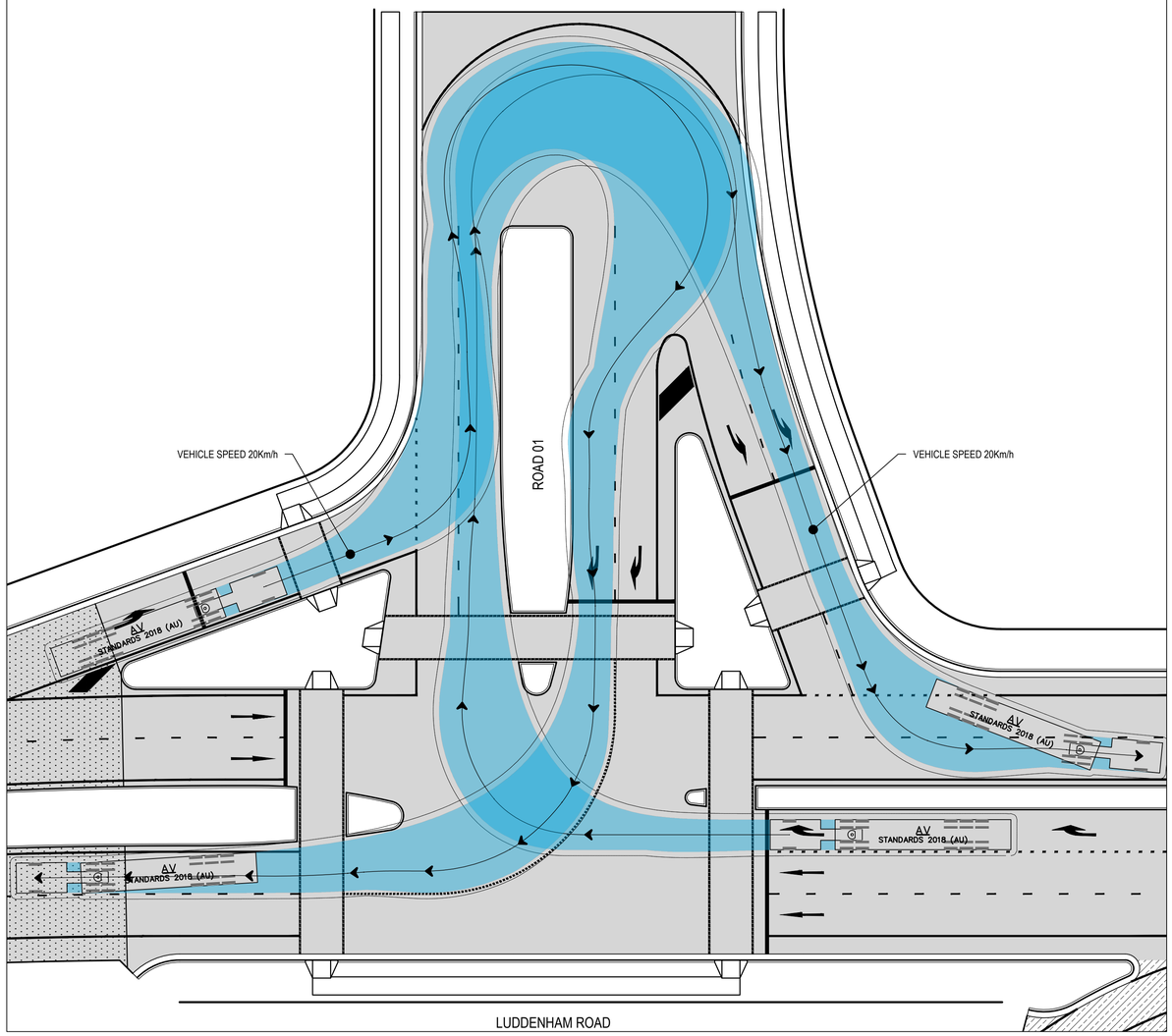
REG No. DS2000/000000

TCS No. 0000

SHEET 1

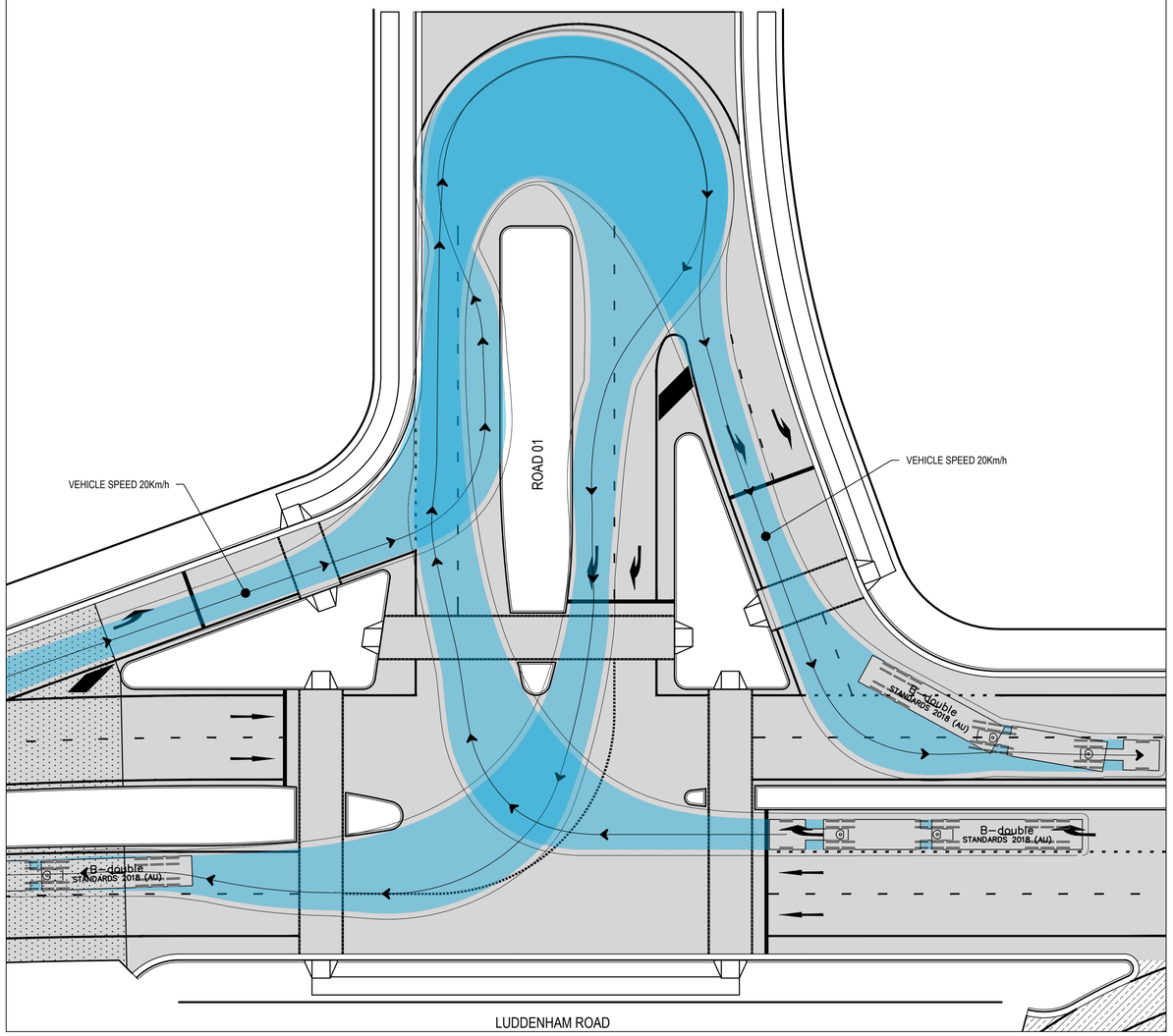
Revision 7 - August 2021

Appendix E: Vehicle Turning Paths



LUDDENHAM ROAD & ROAD 01 INTERSECTION - ARTICULATED VEHICLE MOVEMENTS

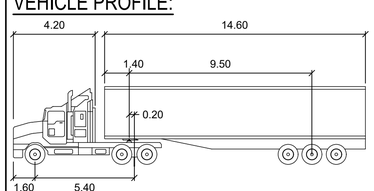
SCALE 1:250



LUDDENHAM ROAD & ROAD 01 INTERSECTION - B-DOUBLE VEHICLE MOVEMENTS

SCALE 1:250

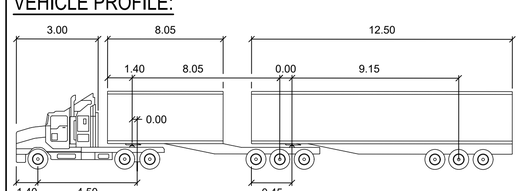
VEHICLE PROFILE:



AV 20m

TRACTOR WIDTH:	2.50m	LOCK TO LOCK TIME:	6.0s
TRAILER WIDTH:	2.50m	STEERING ANGLE:	28.3°
TRACTOR TRACK:	2.50m	ARTICULATING ANGLE:	72.0°
TRAILER TRACK:	2.50m		

VEHICLE PROFILE:



B-DOUBLE 26m

TRACTOR WIDTH:	2.50m	LOCK TO LOCK TIME:	6.0s
TRAILER WIDTH:	2.50m	STEERING ANGLE:	23.4°
TRACTOR TRACK:	2.50m	ARTICULATING ANGLE:	70.0°
TRAILER TRACK:	2.50m		

REV.	DATE	DESCRIPTION	DRN.	DES.	VERIF.	APPD.
3	27/04/2023	ISSUED FOR DEVELOPMENT APPLICATION	GJI	JS	-	SH
2	6/04/2023	90% PROGRESS ISSUE FOR REVIEW	CWH	JS	-	SH
1	23/12/2022	70% PROGRESS ISSUE FOR REVIEW	CWH	JS	-	SH

Client: SYDNEY SCIENCE PARK — CELESTINO

Scale: 0 20 40 60 80 100m — SCALE 1:1000 @A1

North

enspire
Enspire Solutions Pty Ltd
Level 4, 153 Walker Street, North Sydney NSW 2060
ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: TURNING PATH PLAN
SHEET 01

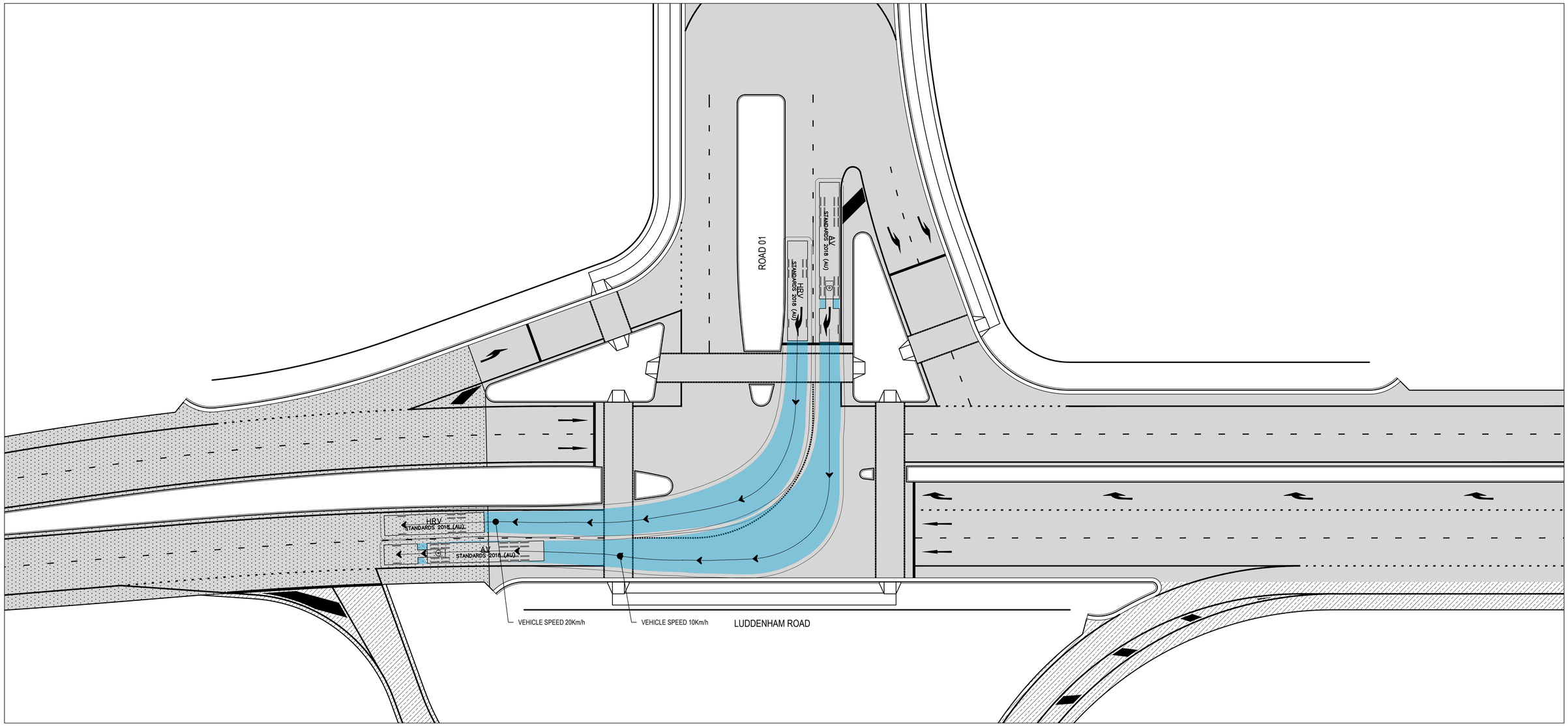
Scale: 1:250
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C25.01
Revision: 3

DATE PLOTTED: 8 May 2023 3:51 PM BY: CIARAN WALKER-HEALION

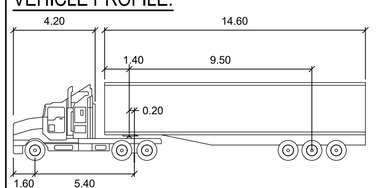
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C25.01-C25.03-TURNING PATH PLAN.dwg



LUDDENHAM ROAD & ROAD 01 INTERSECTION - ARTICULATED VEHICLE & HRV MOVEMENTS

SCALE 1:250

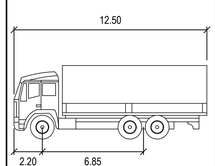
VEHICLE PROFILE:



AV 20m

TRACTOR WIDTH:	2.50m	LOCK TO LOCK TIME:	6.0s
TRAILER WIDTH:	2.50m	STEERING ANGLE:	28.3°
TRACTOR TRACK:	2.50m	ARTICULATING ANGLE:	72.0°
TRAILER TRACK:	2.50m		

VEHICLE PROFILE:



HRV

WIDTH	:2.50m
TRACK	:2.50m
LOCK TO LOCK TIME	:6.0s
STEERING ANGLE	:36.7°

REV.	DATE	DESCRIPTION	DRN.	DES.	VERIF.	APPD.
3	27/04/2023	ISSUED FOR DEVELOPMENT APPLICATION	GJI	JS	-	SH
2	6/04/2023	90% PROGRESS ISSUE FOR REVIEW	CWH	JS	-	SH
1	23/12/2022	70% PROGRESS ISSUE FOR REVIEW	CWH	JS	-	SH

Client: SYDNEY SCIENCE PARK — CELESTINO

Scale: 0 20 40 60 80 100m — SCALE 1:1000 @A1

North

Enspire Solutions Pty Ltd
Level 4, 153 Walker Street, North Sydney NSW 2060
ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Scale: 1:250

Date: 23/12/2022

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Title: TURNING PATH PLAN

SHEET 02

Size: A1

Datum: MGA2020

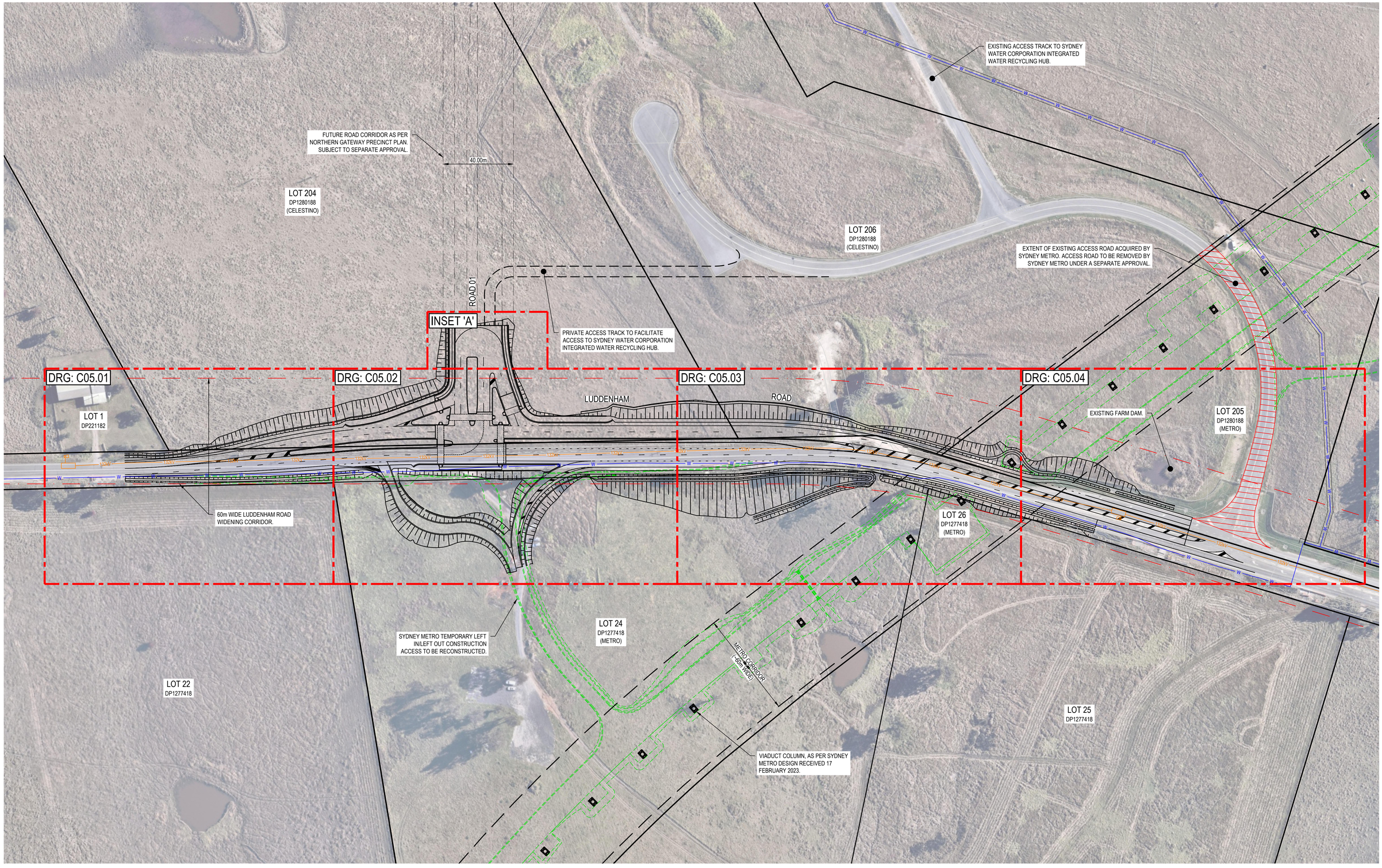
Project Number/Drawing Number: 180001-01-DA-C25.02

Revision: 3

DATE PLOTTED: 8 May 2023 3:51 PM BY : CIARAN WALKER-HEALION

CAD File: P:\180001 SSPID-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C25.01-C25.03-TURNING PATH PLAN.dwg

Appendix F: Concept Design Plans



REV.	DATE	DESCRIPTION	DRN.	DES.	VERIF.	APPD.
4	8/05/2023	ISSUED FOR DEVELOPMENT APPLICATION	CWH	JS	-	SH
3	27/04/2023	ISSUED FOR DEVELOPMENT APPLICATION	GJI	JS	-	SH
2	6/04/2023	90% PROGRESS ISSUE FOR REVIEW	CWH	JS	-	SH
1	23/12/2022	70% PROGRESS ISSUE FOR REVIEW	CWH	JS	-	SH

Client: SYDNEY SCIENCE PARK CELESTINO

Scale: 0 20 40 60 80 100m
SCALE 1:1000 @A1

North

enspire
Enspire Solutions Pty Ltd
Level 4, 153 Walker Street, North Sydney NSW 2060
ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: GENERAL ARRANGEMENT PLAN

Scale: 1:1000
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C01.41
Revision: 4

DATE PLOTTED: 8 May 2023 3:34 PM BY : CIARAN WALKER-HEALION

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C01.41-GENERAL ARRANGEMENT PLAN.dwg