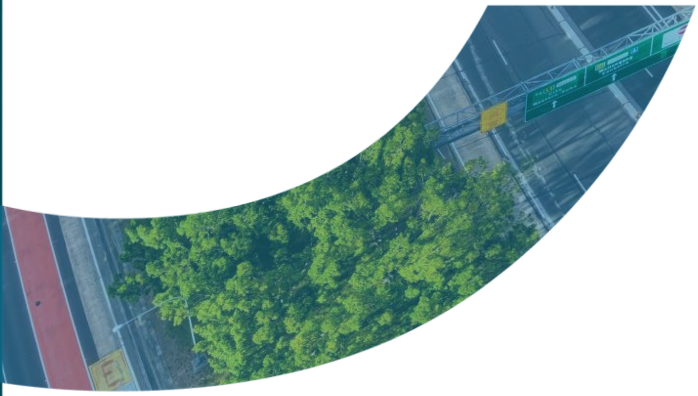
WSA Northern Gateway
Sydney Science Park
LUD3 Interim Intersection

Design Report



**Prepared for Celestino Developments SSP Pty Ltd**

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# 1 Introduction

Enspire Solutions (**Enspire**) has been engaged by Celestino Developments SSP Pty Ltd (**Celestino**) to prepare the Civil Engineering design and documentation in support of a Development Application (**DA**) submission to Penrith City Council (**PCC**) for a new interim signalised intersection along existing Luddenham Road that will facilitate primary access to the Sydney Science Park precinct (**SSP**).

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'.

A general arrangement plan of the Subject Site is shown in **Figure 1**.

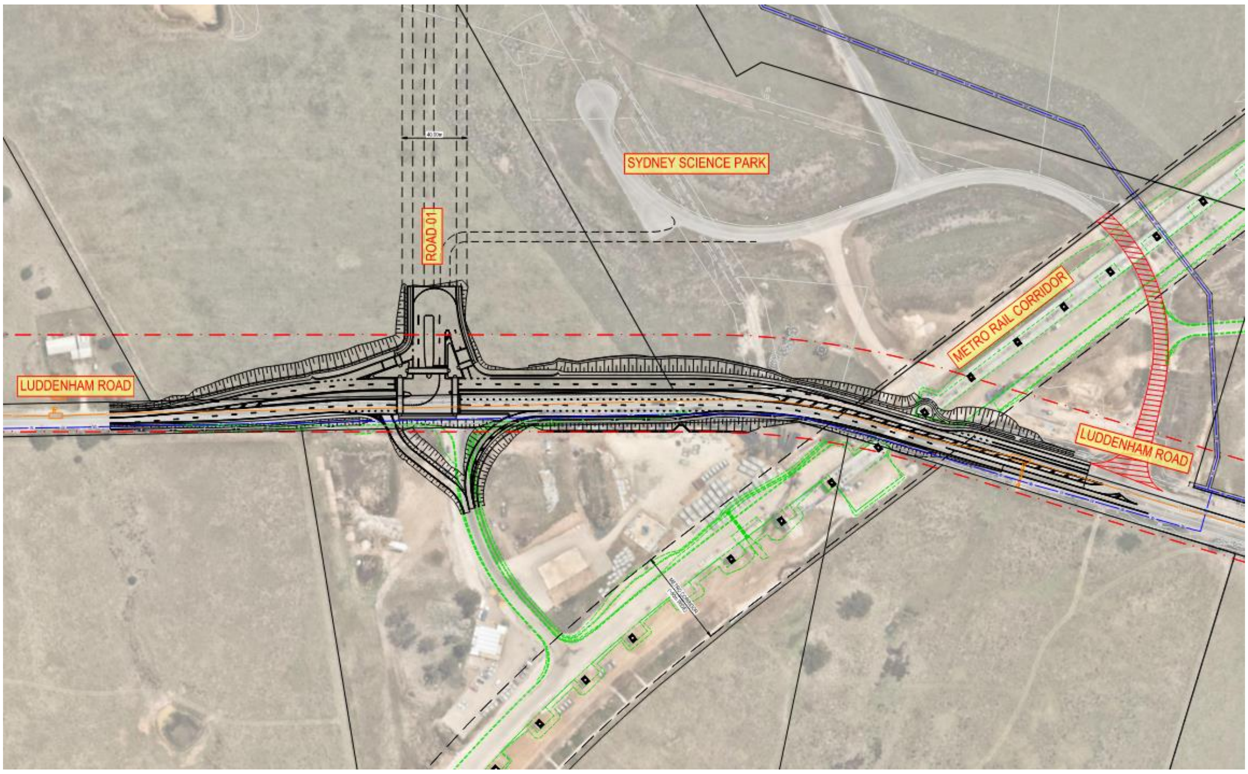



***Figure 1 – Subject Site***

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 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.
  - 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. Construction of a temporary retaining wall to support the reconstructed slip lane.
- 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.
- 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:

- <u>Phase 1:</u> Construct northbound carriageway including access road to Sydney Science Park and carry out west verge electrical relocation.

- <u>Phase 2:</u> 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.

Specifically, the following works are not proposed as part of this application:

1. Subdivision of development lots.
2. Construction of buildings.

# 2 Related Reports and Documents

This report is to be read in conjunction with the following reports and documents:

1. Development Application civil design drawings prepared by Enspire (**Appendix A**).
2. TfNSW Signals In Principal Approval letter (**Appendix B**).
3. Preliminary TCS Plan, prepared by Road Delay Solutions, dated 20/03/2023 (**Appendix D**)
4. Sydney Science Park – Luddenham Road Intersection Transport Assessment, prepared by JMT Consulting, dated 5 April 2023.
5. Western Sydney Aerotropolis Precinct Plan May 2023.
6. Western Sydney Aerotropolis Development Control Plan 2022.
7. Penrith Development Control Plan 2014.
8. Austroads Guide to Road Design Part 3 Geometric Design.
9. Austroads Guide to Road Design Part 4 Intersections and Crossings – General.
10. Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections.
11. Supplement to Austroads Guide to Road Design Part 3, Publication No: RMS 17.435, prepared by TfNSW (No. TS02642.3).
12. Supplement to Austroads Guide to Road Design Part 4, Publication No: RMS 17.335, prepared by TfNSW (No. TS02642.4).
13. Supplement to Austroads Guide to Road Design Part 4A, Publication No: RMS 17.336, prepared by TfNSW (No. TS02642.5).

# 3 The Development

The Subject Site forms part of the Western Sydney Aerotropolis and is located within the Northern Gateway Precinct along existing Luddenham Road. The proposed interim signalised intersection aligns with the key signalised intersection location identified on the Western Sydney Aerotropolis Precinct Plan, Figure 8: Transport Network, dated May 2023 (Refer **Figure 2**).

The interim signalised intersection is a new intersection to be constructed along Luddenham Road and is intended to service the Sydney Science Park development until such time the local government facilitate widening of Luddenham Road to its ultimate 60m wide configuration.

The interim signalised intersection is to replace an existing access road to the north of LUD3 constructed as part of DA16/0176 which has been acquired by Sydney Metro to facilitate construction of the Western Sydney Airport rail link and will be decommissioned as part of the rail works. The interim signalised intersection will ensure continued and uninterrupted access to a Sydney Water Corporation Integrated Water Recycling Hub and provide access to future Sydney Science Park development proposals.

Initial consultation with TfNSW has concluded with the issue of In Principal Agreement (IPA) from TfNSW for the installation of signals on Day 1 of the interim signalised intersection operation and the proposed design does not significantly deviate from the concept design that the IPA was based (refer **Appendix B**).

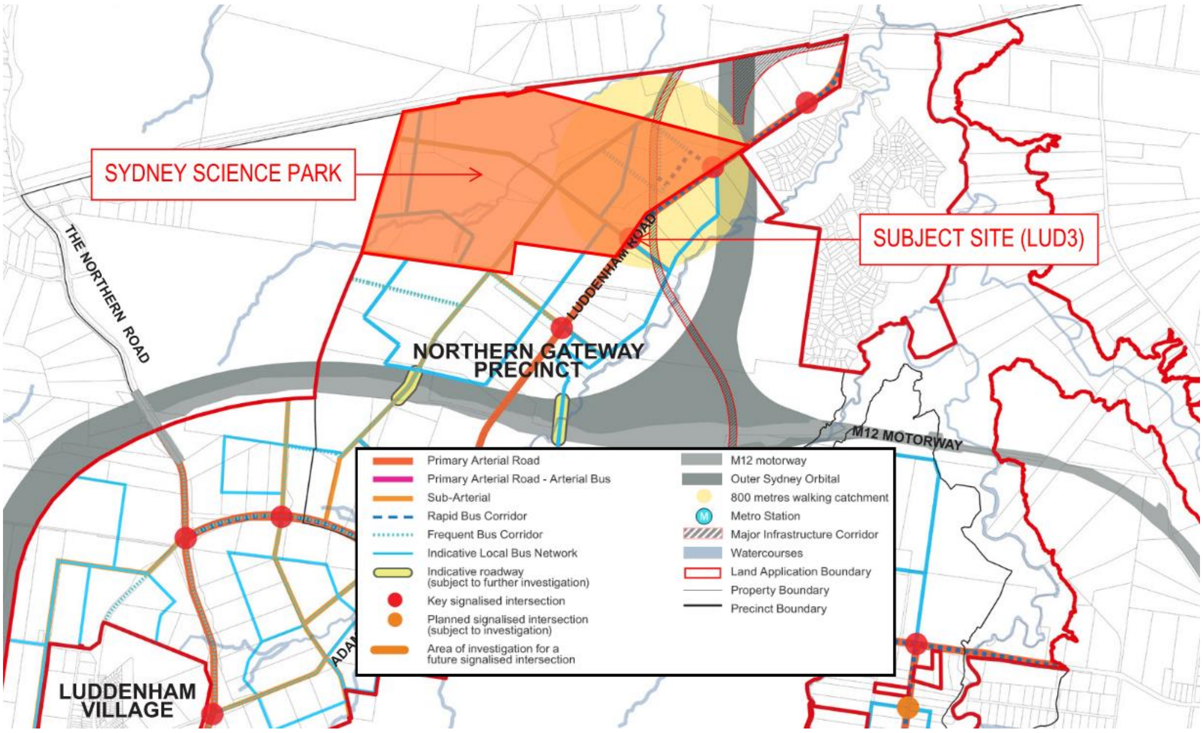



***Figure 2 – Subject Site Location***

*Western Aerotropolis Precinct Plan Figure 8: Transport Network, March 2022*

# 4 Soil and Water Management Plan

This section has been prepared to detail the proposed concept erosion and sediment control strategy and demonstrate general conformance with Part 2.5.5 Erosion and Sediment Control of the Western Sydney Aerotropolis Development Control Plan 2022.

DCP Objectives:

- O1. Protect the health of Wianamatta-South Creek and its tributaries from construction and building runoff and meet the performance criteria for ambient water quality objectives.
- O2. Encourage vegetation retention, protect vegetation during construction and operation, and facilitate prompt rehabilitation through revegetation strategies.
- O3. Minimise site disturbance during construction, reduce the amount of erosion, and stabilise construction works as quickly as possible following completion.

DCP Performance Outcomes:

- PO1. Development is to ensure 80% of all flows leaving the construction site achieves total suspended solids of 50mg/L or less and a pH of 6.5-8.5 during the construction and building phases until the site is stabilised and landscaped.

## 4.1 Construction Phasing

The interim signalised intersection is anticipated to be constructed in two key stages as follows and illustrated in **Figure 3**:

Phase 1 Construct northbound carriageway including Road 01 connection and carry out west verge electrical relocation. Traffic to remain on existing Luddenham Road carriageway.

Phase 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 and temporary retaining wall. Carry out telecommunications relocation. Install and commission traffic signals and install signage and linemarking.

This anticipated construction phasing will minimise traffic disturbance and traffic control measures while also separating the works into smaller areas of land disturbance enabling for more effective erosion and sediment control measures to be implemented as detailed in the following sections.

The proposed construction phasing is conceptual and subject to change as part of detailed design and coordination with the contractors preferred construction methodology.

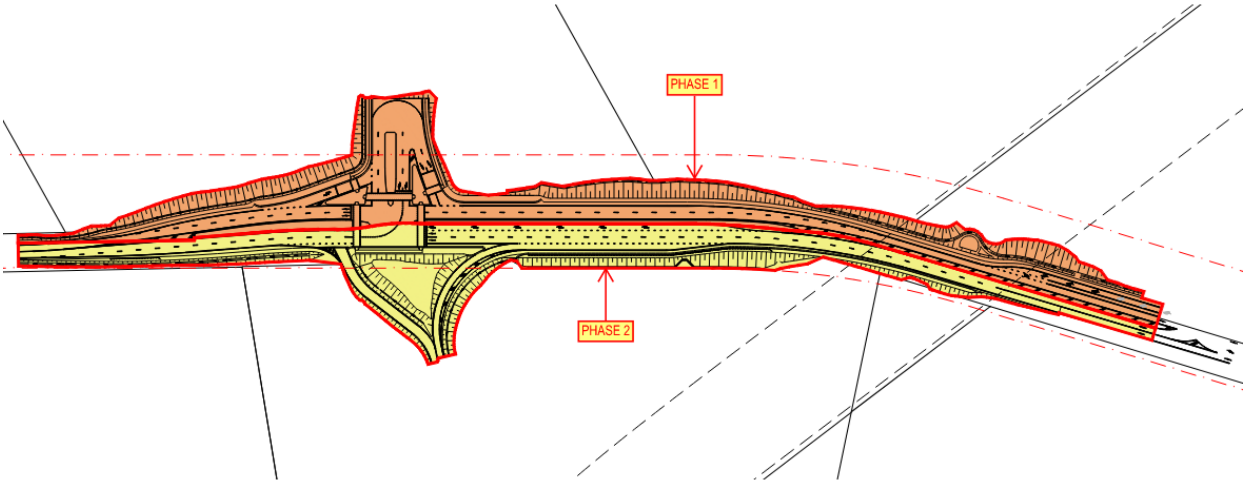



*Figure 3 – Construction Phasing*

*Construction phasing extents may change as part of detailed design and to align with the contractors preferred methodology.*

## 4.2 Erosion and Sediment Control Measures

The proposed erosion and sediment control measures are to conform generally with the Landcom Manual, "Managing Urban Stormwater Soil & Construction" 2004 (Blue Book) during all phases of construction and following completion of the works. Control measures are conceptually detailed on drawings 180001-01-DA-C03.01 to 180001-01-DA-C03.22 and include but are not limited to:

1. Installation of sediment fencing immediately downstream of disturbed areas including stockpiles to intercept stormwater runoff from the work area prior to entering waterways or stormwater inlets.
2. Inspection and maintenance of sediment fencing following rainfall.
3. Redirecting external undisturbed catchment runoff away from disturbed areas to minimise erosion potential by reducing runoff through the work area.
4. Construction of temporary sediment control basins to collect sediment laden stormwater runoff from the worksite.
5. Flocculation of sediment control basins to ensure settlement of dispersive soils within 5 days of rainfall.
6. Applying appropriate dust control measures such as spraying disturbed areas to keep damp but not saturated to minimise sediment mobilisation.
7. Applying hydroseed progressively to disturbed unpaved surfaces to minimise erosion until final landscaping can be applied.
8. Applying turf and vegetation cover immediately following completion of works for long term erosion control.

## 4.3 Calculations and Estimated Outcomes

A construction phase catchment analysis has been undertaken to determine achievement of the Objectives and Performance Outcomes adopting the proposed erosion and sediment control measures and is detailed below and summarised in **Table 1**.

***Table 1 – Erosion and Sediment Control Design Summary***

| Catchment ID | Catchment Area ($m^2$) | Estimated Annual Soil Loss[1] (t/year) | Estimated Soil Loss During Construction[2] ($m^3$) | Proposed Sediment Basin Storage Volume[3] ($m^3$) | Nominal Total Suspended Solids Concentration[4] (mg/L) |
|---|---|---|---|---|---|
| P1C1 | 4,700 | 47 | 5 | 5 | <50mg/L |
| P1C2 | 6,300 | 55 | 6 | 6 | <50mg/L |
| P1C3 | 3,800 | 32 | 4 | 4 | <50mg/L |
| P2C2 | 4,800 | 29 | 5 | 5 | <50mg/L |
| P2C3 | 6,500 | 57 | 9 | 9 | <50mg/L |
| P2C1 | 2,000 | Catchment is less than 2,500$m^2$ and is to conform with The Blue Book controls[5] | | | |
| P2C4 | 2,300 | Catchment is less than 2,500$m^2$ and is to conform with The Blue Book controls[5] | | | |

**Explanatory Note 1**
Estimated annual soil loss has been calculated adopting the Revised Universal Soil Loss Equation (RUSLE) which is an international industry standard equation for estimating average annual soil loss per unit area. The coefficients to appropriately apply this equation have been adopted from The Blue Book which provides the necessary data for the local catchment. The values calculated represent average soil loss over a 12-month period and is not reflective of total soil loss for a particular construction activity.

**Explanatory Note 2**
The interim signalised intersection is proposed to be constructed over a 6-month period with an assumed commencement in June 2024. Phase 1 is estimated to be undertaken over 3 months and Phase 2 is estimated to be undertaken in the remaining 3 months. Based on this and adopting monthly rainfall distributions from The Blue Book (refer **Figure 4**), the calculated annual soil loss has been adopted to inform estimated soil loss for the applicable construction duration and converted from tonnes to cubic meter units.

*Table 6.2 Percentage of average annual EI that normally occurs in the first and second half of each month for each Rainfall Zone (figure 4.9) (Rosewell and Turner, 1992)*

| Zone | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6 | 6 | 7 | 8 | 8 | 8 | 6 | 5 | 5 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 |
| 2 | 10 | 9 | 9 | 8 | 7 | 5 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 4 | 5 | 6 | 7 | 8 |
| 3 | 6 | 8 | 9 | 9 | 10 | 7 | 7 | 4 | 2 | 2 | 2 | 2 | 2 | 1 | 0 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 6 | 6 |
| 4 | 6 | 6 | 8 | 8 | 8 | 5 | 5 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 5 | 5 | 5 | 6 |
| 5 | 2 | 3 | 7 | 13 | 13 | 10 | 11 | 6 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 3 | 3 | [illegible] | 3 | 2 | 2 | 2 |
| 6 | 11 | 10 | 10 | 9 | 6 | 5 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 4 | [illegible] | 5 | 5 | 8 | 7 |
| 7 | 9 | 9 | 7 | 8 | 4 | 5 | 3 | 3 | 2 | 3 | 2 | [illegible] | [illegible] | [illegible] | [illegible] | 2 | 2 | 3 | [illegible] | [illegible] | [illegible] | 6 | 7 | 7 |
| 8 | 7 | 8 | 7 | 8 | 5 | 6 | 4 | 3 | 2 | 2 | 2 | [illegible] | [illegible] | [illegible] | [illegible] | 2 | 2 | 2 | [illegible] | [illegible] | [illegible] | 6 | 7 | 7 |
| 9 | 8 | 9 | 8 | 7 | 6 | 5 | 3 | 3 | 2 | 2 | 1 | [illegible] | [illegible] | [illegible] | [illegible] | 2 | 3 | 3 | [illegible] | [illegible] | [illegible] | 6 | 6 | 6 |
| 10 | 7 | 6 | 9 | 7 | 7 | 6 | 4 | 4 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 6 | 5 | 6 |
| 11 | 10 | 11 | 11 | 9 | 10 | 5 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 5 | 6 | 6 | 6 | 6 |
| 12 | 10 | 9 | 8 | 7 | 5 | 4 | 4 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 4 | 3 | 4 | 4 | 6 | 7 | 9 |

PHASE 1
14%

PHASE 2
21%

***Figure 4 – Adopted Rainfall Distribution***

*Source: The Blue Book.*

**Explanatory Note 3**

Proposed sediment basin storage volumes are proposed to match the estimated construction soil loss volumes to effectively capture and hold all estimated sediment based on average weather conditions. This design rationale exceeds the Performance Outcome to treat only 80% of flows during construction and provides some contingency for above average weather conditions and small isolated sub catchments that may bypass the sediment control basins. Sediment control basin settlement zone volumes have been calculated based on 5-day 80$^{th}$ percentile rainfall depths from The Blue Book which is appropriate given the estimated duration of works is 6 months or less and the works are not located directly adjacent a highly sensitive waterway.

**Explanatory Note 4**

As the sediment control basin storage volumes are proposed to match the average soil loss for the construction duration, the concentration of sediment laden water leaving the construction site is estimated to be effectively zero on average for catchments greater than 2,500m$^2$. This assessment assumes all suspended solids from captured runoff is to be removed by the contractor prior to pump out which is unlikely, and it is expected that the contractor will pump out captured water only where testing indicates the total suspended solids concentration is less than or equal to 50mg/L and pH levels are between 6.5-8.5.

**Explanatory Note 5**

Sediment control basins are not proposed for catchments P2C1 and P2C4 due to site constraints and only sediment control fencing and site stabilisation techniques are proposed. Section 6.3.2(d) of the Blue Book advises that sediment basins may not be required for small disturbance areas (<2,500m$^2$) provided the estimated annual soil loss volumes are low (<150m$^3$/year). Annual soil loss volumes for catchments P2C1 (2,000m$^2$) and P2C4 (2,300m$^2$) are anticipated to be less than 12m$^3$/year which is below the 150m$^3$/year threshold which can be adequately managed with erosion and sediment control techniques other than sediment control basins.

## 4.4 Installation and Maintenance

The estimated performance of the proposed erosion and sediment control measures assumes proper installation and effective and regular maintenance of the controls. Details for each of the proposed control measures in addition to an indicative maintenance schedule is provided on drawing 180001-01-DA-C03.22 to guide the contractor on minimum standards to be implemented during the construction phase.

## 4.5 Concurrent Transport for NSW Works

As indicated by aerial imagery on drawing 180001-01-DA-C01.41, Transport for NSW have commenced construction of the Sydney Metro – Western Sydney Airport rail line. Due to this, the nature of site conditions on Lot 24 are likely to vary at construction commencement of LUD3 and during construction. Management of construction stormwater runoff is to be coordinated with Transport for NSW at the time of construction and formalised through preparation of a Construction, Environment Management Plan.

# 5 Earthworks

This section has been prepared to detail the proposed earthworks and retaining wall strategy and demonstrate general conformance with Part 2.18 Earthworks and Retaining Walls of the Western Sydney Aerotropolis Development Control Plan 2022.

DCP Objectives:

- None.

DCP Performance Outcomes:

- PO1. To ensure site planning considers the stability of land, its topography, geology and soils.
- PO2. To ensure that earthworks and retaining wall construction is suitably designed and landscaped to ameliorate its visual presentation to and from the public domain and adjacent properties.
- PO3. To encourage reuse of fill material from within the Aerotropolis Precinct.

## 5.1 Cut and Fill Operations

As part of the proposed works, bulk earthworks on the site will generally consist of cut and fill operations to establish the proposed road formation and batter slopes up to 1V in 4H.

Approximate cut to fill earthworks operations for the works subject to this development application are summarised in **Table 2**.

*Table 2 – Estimated Cut and Fill Volumes*

| Earthworks | Volume ($m^3$) |
|---|---|
| **Cut** | -16,150 |
| **Fill** | +10,450 |
| **Balance** | -5,700 (export) |

The cut and fill earthworks volumes provided are concept only and are subject to change pending final coordination and detailed design. Cut and fill volumes were estimated based on the following assumptions:

- Allowance made for 150mm topsoil stripping.
- Allowance made for 500mm removal of existing pavement.
- Allowance made for 800mm proposed pavement boxing.
- Allowance made for 100mm topsoil replacement across landscape areas.
- No allowance for earthworks bulking factors.
- No allowance for soil generated from utility service and stormwater drainage trenching.

Excess material suitable for reuse is to be stockpiled on the Sydney Science Park site and covered for future use. Excess material not suitable for reuse is to be disposed of offsite at an appropriate disposal facility.

All unpaved disturbed surfaces are to be landscaped in accordance with the landscape architect's plans.

# 6 Geometric Design

## 6.1 Design Parameters

The interim signalised intersection has been generally designed in accordance with Austroads Guide to Road Design and TfNSW Supplements to the Austroads Guide to Road Design. A summary of design parameters is provided in **Table 3** and detailed in **Appendix C**.

*Table 3 – Interim Signalised Intersection Design Parameters*

| Design Element | Design Parameter |
|---|---|
| Luddenham Road (Major Road) | |
| Operating Speed | 80km/hr |
| Design Speed | 90km/hr |
| Reaction Time | 1.5 seconds[1] |
| Observation Time | 3.0 seconds |
| Design Vehicle | 20.0m ARV |
| Check Vehicle | 26.0m B-Double |
| Approach Sight Distance (ASD)[2] | 126m (cars) – to a 0m object height |
| Stopping Sight Distance (SSD) | 126m (cars) – to a 0.2m object height |
| Safe Intersection Sight Distance (SISD) | 201m (cars) |
| Road 01 (Minor Road) | |
| Operating Speed | 60km/hr |
| Design Speed | 70km/hr |
| Reaction Time | 1.5 seconds |
| Observation Time | 3.0 seconds |
| Approach Sight Distance (ASD) | 83m (cars) – to a 0m object height |
| Stopping Sight Distance (SSD) | 83m (cars) – to a 0.2m object height |

1. *Reaction time based on alert driving conditions due to presence of traffic signals. Additionally, TfNSW Supplement to Austroads Guide to Road Design nominates a 1.5 second reaction time for road speeds up to 90km/hr.*

2. *ASD cannot be achieved for the Major Road hence SSD has been adopted as per Section 3.2.1 of Austroads Guide to Road Design Part 4A.*

## 6.2 Intersection Arrangement

The interim signalised intersection arrangement is depicted in **Figure 5** and incorporates the following elements:

- Dual lane approaches and departures.
- 150m long single right turn lane from Luddenham Road to Road 01.
- 55m long single left turn slip lane from Luddenham Road to Road 01.
- Dual right turn lanes from Road 01 to Luddenham Road.
- Dual left turn lanes from Road 01 to Luddenham Road.
- 100m long left turn deceleration lane on Luddenham Road on the south bound approach for private construction access (Sydney Metro).
- Left turn private construction exit on the south bound departure (Sydney Metro).

In addition, the proposed design has adopted minimum 3.5m wide travel and turn lanes, 1.0m to 2.0m wide shoulders (narrower shoulder adopted at transitions to existing Luddenham Road) and 0.0m to 2.0m wide berms for utilities such as lighting (berm tapers to edge of pavement at transitions to existing Luddenham Road, to match existing road formation).

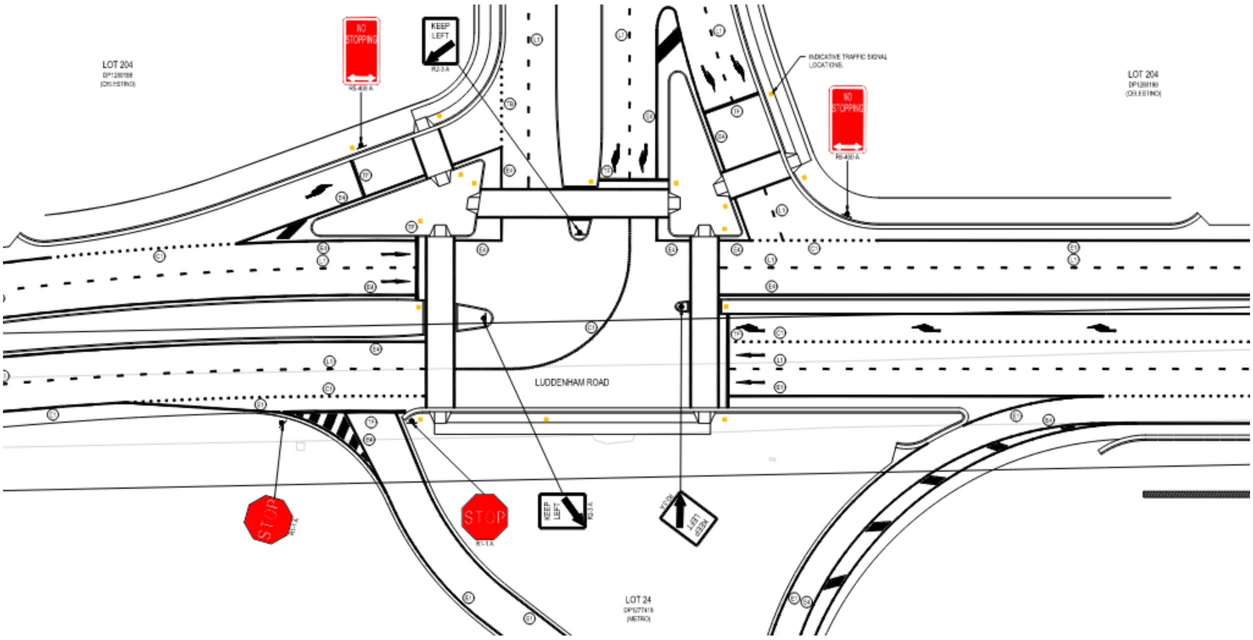



*Figure 5 – Intersection Layout*

## 6.3 Superelevation

An assessment of the proposed horizontal road geometry relative to the design speed of Luddenham Road indicates superelevation is necessary and recommended for safety at road bends and at the traffic signals junction respectively. The application of superelevation has been designed assuming a side friction factor of 0.15 (refer **Figure 6**). Adopting a superelevation of 4% on horizontal curves indicates a minimum horizontal curve radius of 336m is to be adopted. The minimum horizontal curve proposed along Luddenham Road (80km/hr Operating Speed) is 350m which is greater than the minimum required to achieve adequate side friction for both cars and trucks.

$$R = V^2 / [127*(e+f)]$$
$$R = 90^2 / [127*(0.04+0.15)]$$
$$R = 336m$$

**Table 7.5: Recommended side friction factors for cars and trucks**

| Operating speed (km/h) | *f* | | | |
|---|---|---|---|---|
| | Cars | | Trucks | |
| | Des max | Abs max | Des max | Abs max |
| 40 | 0.30 | 0.35 | 0.21 | – |
| 50 | 0.30 | 0.35 | 0.21 | 0.25 |
| 60 | 0.24 | 0.33 | 0.17 | 0.24 |
| 70 | 0.19 | 0.31 | 0.14 | 0.23 |
| 80 | 0.16 | 0.26 | 0.13 | 0.20 |
| 90 | 0.13 | 0.20 | 0.12 | 0.15 |
| 100 | 0.12 | 0.16 | 0.12 | 0.12 |
| 110 | 0.12 | 0.12 | 0.12 | 0.12 |
| 120 | 0.11 | 0.11 | 0.11 | 0.11 |
| 130 | 0.11 | 0.11 | 0.11 | – |

*Note: ARRB research into the stability of high centre of gravity articulated vehicles indicated that the least stable vehicles may roll over at side friction values as high as 0.35 (Mai & Sweatman 1984).*

*Figure 6 – Side Friction Values*

*Source: Austroads Guide to Road Design Part 3: Geometric Design.*

Single cross fall is proposed to be continued beyond the horizontal curve between approximate Luddenham Road Chainage 100 to Chainage 350 which improves operation of the intersection during green phases, improves intersection approach sightlines and is more consistent with the natural topography.

## 6.4 Sight Distances

Sight distance checks have been undertaken in accordance with Austroads Guide to Road Design Part 3: Geometric Design and Part 4A: Unsignalised and Signalised Intersections and have been demonstrated on drawings 180001-01-DA-C07.01 to 180001-01-DA-C07.06. A reaction time of 1.5 seconds has been adopted based on TfNSW Supplement to Austroads Guide to Road Design in calculating stopping distances.

## 6.5 Vertical Clearances

Vertical clearance to the Sydney Metro viaduct has been based on AS5100 which requires a minimum 5.4m clearance to arterial roads. Vertical clearances achieved are provided on drawings 180001-01-DA-C07.02 and 180001-01-DA-C07.04 and demonstrate that the minimum clearance can be achieved.

## 6.6 Future Luddenham Road Widening

The proposed interim signalised intersection design has adopted an alignment, typical road cross section and vertical geometry between approximate Luddenham Road Chainage 160 to Chainage 350 that has high potential to be retained as part of the future Luddenham Road widening works and does not preclude the construction of the future road widening.

The proposed alignment of this section of Luddenham Road has been designed to be parallel to the 60m wide road widening corridor with the carriageway pavement offset from the future east boundary consistent with the location of the future kerb and channel lip as per the Western Sydney Aerotropolis DCP typical section for a 60m wide road corridor.

The proposed vertical geometry for this section of Luddenham Road is generally fixed in both the interim and ultimate scenarios due to the sight distance requirements detailed in **Section 6.4** combined with the vertical clearance constraints highlighted in **Section 6.5**. The proposed vertical geometry for the interim signalised intersection (including superelevation and single cross fall for vehicle side friction compliance) between approximate Chainage 160 to Chainage 350 therefore has high potential to be adopted as part of the future Luddenham Road widening to minimise traffic disturbance and overall construction cost.

## 6.7 Turn Paths

The proposed design vehicle for the interim signalised intersection is the 20.0m Articulated Rigid Vehicle in accordance with AS2890.2 while the check vehicle adopted is the 26.0m B-Double in accordance with AS2890.2.

Turn paths have been generated using the AutoTURN software package and have adopted Austroads Guide to Road Design Part 4: Intersections and Crossings – General Section 5.6 recommendations.

Turn paths are provided on drawings 180001-01-DA-C25.01 to 180001-01-DA-C25.03.

## 6.8 Viaduct Column Horizontal Clearance

The interim horizontal clearance from the edge of proposed travel lanes to the viaduct columns is a minimum 6.7m. The natural ground levels surrounding the viaduct columns is to be maintained, positioning the base of the columns approximately 1m higher than proposed road levels with a 1 in 4 batter slope. Based on Austroads Guide to Road Design Part 6, adopting previous clear zone concepts, the clear zone in the immediate area is 6.5m. Based on this initial assessment, no vehicle barrier systems are proposed.

# 7 Stormwater Management

This section has been prepared to detail the proposed stormwater management strategy and demonstrate general conformance with the following subsections of the Western Sydney Aerotropolis Development Control Plan 2022:

- Part 2.3 Stormwater, Water Sensitive Urban Design and Integrated Water Management.
- Part 2.5.1 Flood Management.

Given the proposal only relates to construction of roads and associated works, the nature of the proposed development is categorised as public infrastructure and only limited provisions are applicable. These matters are addressed below in detail.

## 7.1 DCP Part 2.3 Stormwater Management

### 7.1.1 Part 2.3.1 Waterway Health and Riparian Corridors

The proposed interim signalised intersection forms part of the Cosgroves Creek catchment and is located at the top of one of its Strahler Order 1 tributaries. It is noted however that there is an inconsistency in the spatial data (Six Maps) and the existing topography from detail survey as depicted in **Figure 7**. There is a natural ridge line adjacent existing Luddenham Road which the spatial mapping has incorrectly identified a stream crossing over. In this respect the detailed survey prevails and the impact that the development (with implementation of the proposed construction and post construction controls) will have on existing waterways will be negligible.

The proposed interim signalised intersection is not located at or beyond a 15ha catchment threshold in a Strahler Order 1 tributary and therefore no riparian corridor restoration works are required.

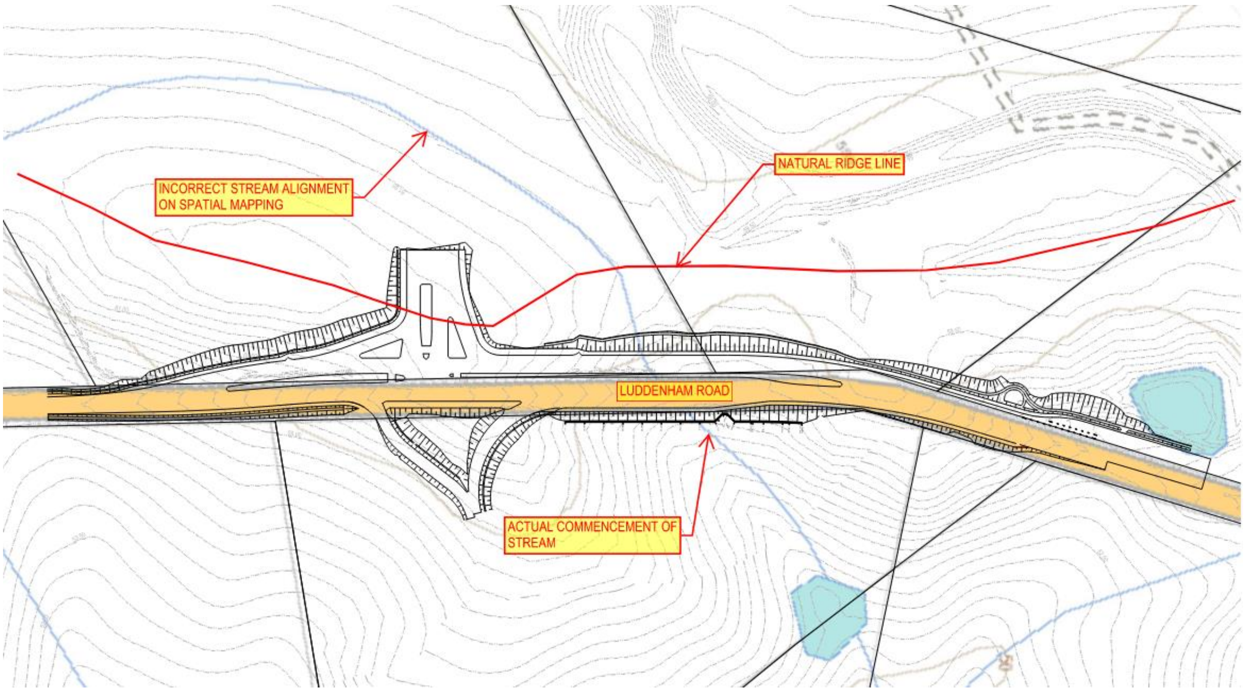



*Figure 7 – Strahler Order 1 Stream Alignment*

### 7.1.2 Part 2.3.2 Stormwater Management and WSUD

An assessment of the WSA DCP Part 2.3.2 Benchmark Solutions has identified that the interim signalised intersection development typology (Infrastructure) has not been considered and that the Benchmark Solutions have been calibrated based on assessment of Large Format Industrial (LFI), High Density Residential (HDR), and Low Density Residential (LDR) only in accordance with the Technical guidance for achieving Wianamatta South Creek stormwater management targets (DPE, 2022).

Given the nature of Infrastructure development, application of the current WSA DCP Part 2.3.2 controls is not appropriate and in the absence of guidance in the DCP or supporting technical documents for this development typology, alternative measures are proposed as detailed in the following sections.

#### *7.1.2.1 PO1 Stormwater Quality*

Due to spatial constraints in Infrastructure development, utilisation of residual existing grass lined swales and buffers will be relied upon to meet the intent of stormwater quality improvement in the interim. This strategy is proposed for the interim infrastructure scenario only and achievement of the WSA Part 2.3.2 Benchmark Solutions will be achieved as part of the ultimate regional stormwater management strategy or as part of future interim development where adjacent subdivision and/or lot development is proposed.

#### *7.1.2.2 PO2 Stormwater Flow Targets*

To assess stormwater flow impacts for Infrastructure development, The Penrith City Council DCP 2014 part C3 has been adopted as a guide and requires an assessment of pre-development and post-development peak stormwater flows to determine if the impact of development will have detrimental effects to the surrounding environment. Peak flows have been assessed using the DRAINS software package at the control points nominated in **Figure 8** and outcomes summarised in **Table 4**.

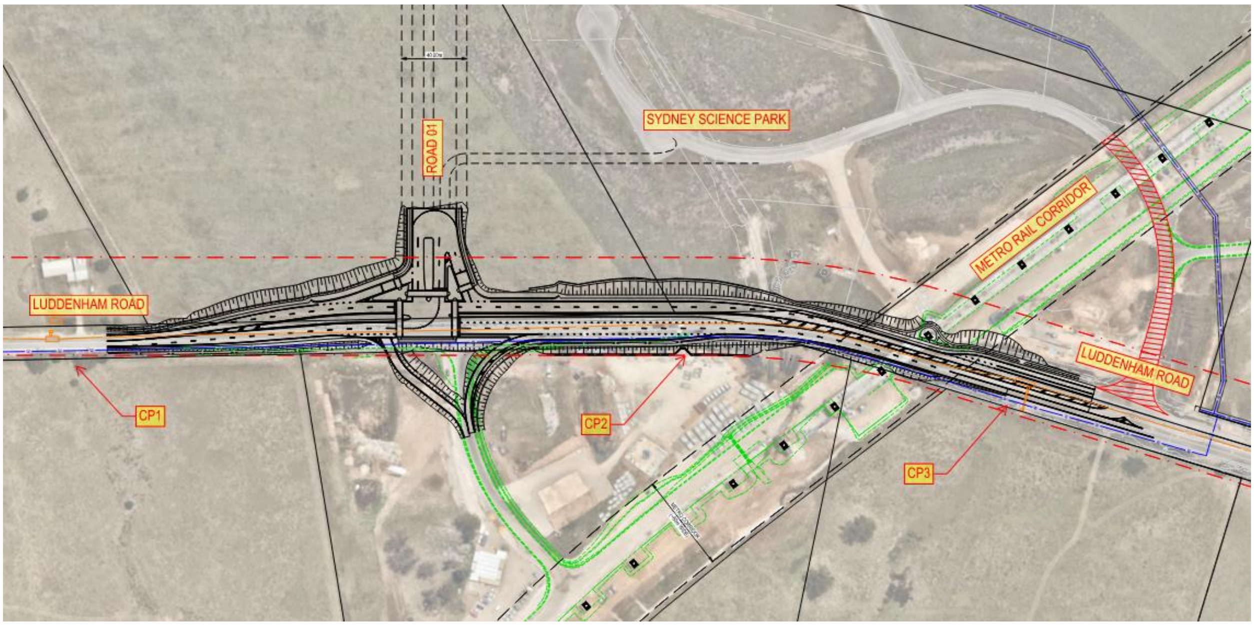



*Figure 8 – Peak Flow Control Points*

As indicated in **Table 4**, the effect of localised storages at inlet headwalls and pits in the post-development scenario contributes to generating negligible increases in peak flows at each of the control points. It is noted that the estimated impacts are temporary and do not affect lands currently used for residential or sensitive purposes, with the ultimate post development flows to be appropriately managed through regional stormwater infrastructure operated by Sydney Water Corporation adjacent Cosgroves Creek. Further, it is generally not feasible as part of road infrastructure development to provide attenuation infrastructure due to the narrow working corridor and there is limited flexibility in an interim scenario to alter the pit and pipe network to discharge to temporary detention basins without requiring these assets including road pavements and services to be reconstructed to the ultimate configuration in future.

The DRAINS model indicates that the capacity of pipe crossings (both existing and proposed) is not exceeded and that the proposed design generates reductions in the quantity of stormwater overtopping Luddenham Road at CP1 in the 1% AEP.

*Table 4 – Peak Flow Assessment*

| Control Point | 1% AEP Pre-Development Flow ($m^3/s$) | 1% AEP Post-Development Flow ($m^3/s$) | % Difference |
|---|---|---|---|
| CP1 | 0.93 | 0.95 | +2.5 |
| CP2 | 0.46 | 0.39 | -14.7 |
| CP3 | 0.95 | 1.07 | +12.3 |
| Total[1] | 2.13 | 2.34 | +9.9 |

1. *Total values differ to the sum of CP1 to CP3 due to differences in peak flow timing.*

#### 7.1.2.3 PO4 Streetscape Measures

The proposed development does not include regional stormwater infrastructure and does not preclude the achievement of PO1 or PO2 targets in the ultimate Luddenham Road design (i.e. landscaping and stormwater management in accordance with the WSA DCP can be provided as part of future ultimate LUD3 works). Existing grass lined swales and buffers will be relied upon in the interim to address PO1 and PO2.

#### 7.1.2.4 PO7 Safe Overland Flow Paths

The proposed stormwater management system has been modelled in the DRAINS software package and all stormwater flows within the carriageway and roadside swales are contained in the 1% AEP to safe depth and depth x velocity product. During larger storm events or where excessive blockage occurs, overtopping of the roadside swales will occur which mimics the pre-development condition.

## 7.2 DCP Part 2.5.1 Flood Management

The proposed interim signalised intersection is not located within or adjacent existing floodway or flood storage area and as demonstrated in Section 7.1.2.2 will have minimal impact on local peak flows and negligible impact overall on Cosgroves Creek flood behaviour. **Figure 9** shows the location of the proposed development relative to existing 1% AEP flood extents.

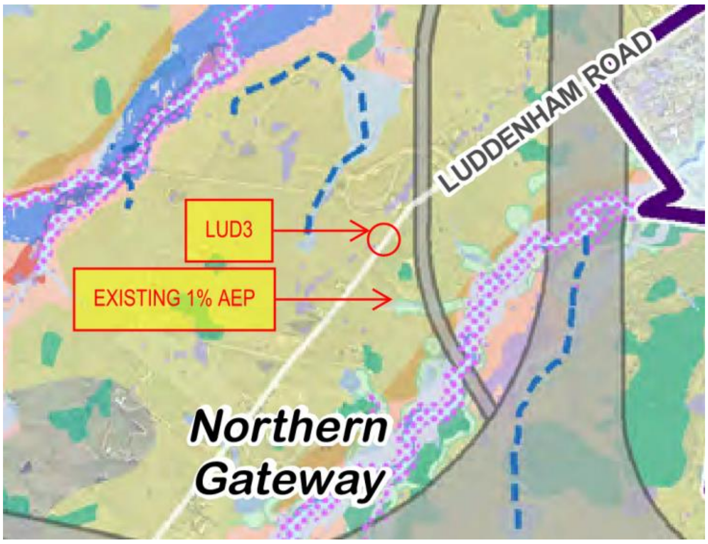



***Figure 9 – Existing 1% AEP Flood Extent Underlay***

*Source: Western Sydney Aerotropolis (Initial Precincts) Stormwater and Water Cycle Management Study, prepared by Sydney Water Corporation, December 2021 Figure 3-1.*

# 8 Pavements

Preliminary pavement profiles indicating anticipated pavement designs have been provided in the Enspire drawing package including a pavement layout to indicate the pavement design intent. Final pavement design details are to be provided by a Geotechnical Engineer as part of detail design taking into consideration the pavement extents nominated.

The concept pavement design consists of:

1. F1. Flexible pavement profile generally in accordance with a TfNSW pavement design for arterial roads for sections of the LUD3 intersection that have potential to be adopted as part of the ultimate Luddenham Road widening (approximate Luddenham Road Chainage 160 to Chainage 350 as per **Section 6.6** discussion).

2. F2. Flexible pavement profile generally in accordance with Austroads Guide to Pavement Technology and Penrith City Council specifications for transitions between pavement type F1 and existing Luddenham Road (i.e. have no potential to be adopted as part of the ultimate Luddenham Road widening).

3. Concrete medians.

4. Concrete footpaths.

5. Flexible pavement profile generally in accordance with Austroads Guide to Pavement Technology for the temporary Sydney Metro construction access.

All pavements are proposed to be constructed in accordance with Penrith City Council construction specifications.

# 9 Retaining Walls

Through negotiations with Transport for NSW with respect to impacts on existing Lot 24 and Lot 26, in principle support of the proposed design is predicated on impacts other than the immediate construction entry and exit works being wholly contained within the future Luddenham Road widening corridor. To achieve this outcome, a retaining wall is proposed between approximate Luddenham Road chainage CH270 to CH395 with an indicative elevation provided on drawing 180001-01-DA-C15.01. The wall is likely to be of masonry construction due to the height and surcharge loading anticipated which is to be refined as part of detail design.

# 10 Utilities

This section has been prepared to detail the proposed concept utilities adjustment strategy and demonstrate general conformance with Part 2.11 Services and Utilities of the Western Sydney Aerotropolis Development Control Plan 2022.

DCP Objectives:

- O1. Ensure the construction of utility services/infrastructure provision occurs in a logical and staged manner, and in sequence with development.
- O2. Encourage innovative and sustainable utility and servicing across the Aerotropolis to promote effective and efficient delivery of services. Ensure utilities designs and locations consider space for alternative future services.
- O3. Design and provide utility infrastructure to integrate with and not negatively impact use of the public realm, liveability, and the environment.
- O4. Infrastructure (new and existing) is protected from the impacts of urban development.

DCP Performance Outcomes:

- PO3. Infrastructure is adequately protected from development.
- PO4. Shared utility trenches combine multiple utilities within a compact area of the street verge, and futureproof service location within road cross-sections.

## 10.1 Utility Adjustments

The concept design proposes adjustments to existing overhead and underground electrical assets and underground telecommunications. The relocations are proposed to position these utilities outside the new pavement extents and with appropriate vertical cover to suit the new road levels. The relocation works are anticipated to be temporary until the construction of the ultimate Luddenham Road configuration and hence no shared utility trenches are proposed. Not withstanding this, the proposed adjustments complies with the objectives in that provision occur in a logical and staged manner to account for the future widening of Luddenham Road.

New lighting is anticipated to be required for safety and will be installed concurrently where possible with the relocations and positioned beyond the paved road shoulder.

Adjustments to existing 132kV underground electrical and DN450mm potable water main are not proposed however engagement with the relevant service authority may be necessary to facilitate temporary or permanent protection measures as part of the proposed works. These utilities are currently under construction and For Construction details of these utilities have been adopted in the design of the interim signalised intersection.

# 11 Conclusion

This Civil Engineering and Stormwater Management Report has been prepared to provide an understanding of the design assumptions, inputs and guide to the civil engineering and stormwater management techniques for the proposed interim signalised intersection (LUD3) as depicted in **Figure 1**.

General conformance with the relevant requirements of the Western Sydney Aerotropolis Development Control Plan 2022 has been demonstrated with respect to indicative location, the proposed erosion and sediment controls, earthworks strategy, geometric design, and utility adjustments.

The WSA DCP provides guidance for built form outcomes and does not consider the type of development proposed, being provision of public roads only. Given the proposal does not involve any built form elements, utilisation of residual existing grass lined swales and buffers will be relied upon to meet the intent of stormwater quality improvement on the basis that the WSA DCP Benchmark Solutions have not been calibrated for the subject development typology (Infrastructure) and as such, are deemed not appropriate to implement for this interim development. Notwithstanding, the proposed interim intersection development does not preclude the achievement of the WSA DCP controls as part of the wider future precinct development.

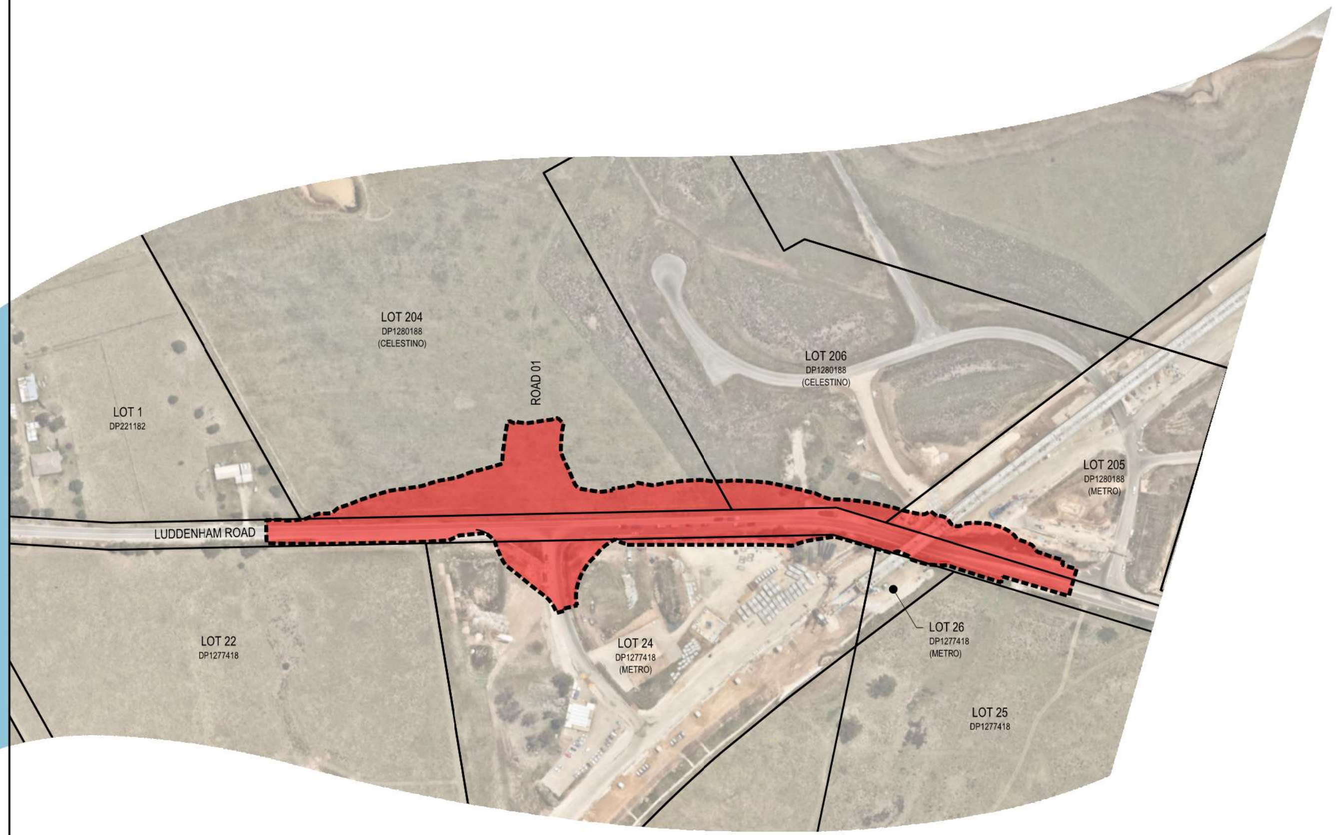
This report demonstrates that the road design requirements of the WSA DCP, PCC DCP, Austroads Guide to Road Design and TfNSW Supplements to Austroads Guide to Road Design can generally be achieved and that post development stormwater runoff can be safely managed. In addition, recommendations from site specific assessment reports such as Bushfire and Flora and Fauna can be accommodated.

# Appendix A Civil Design Drawings

Enspire Solutions

CELESTINO DEVELOPMENTS SSP PTY LTD

# SYDNEY SCIENCE PARK
# LUDDENHAM ROAD LUD3
## CIVIL ENGINEERING WORKS
### DEVELOPMENT APPLICATION




DRAWING SCHEDULE

| DRAWING NUMBER | DESCRIPTION |
|---|---|
| 180001-01-DA-C01.01 | COVER SHEET AND DRAWING SCHEDULE |
| 180001-01-DA-C01.21 | SPECIFICATION NOTES - SHEET 01 |
| 180001-01-DA-C01.22 | SPECIFICATION NOTES - SHEET 02 |
| 180001-01-DA-C01.41 | GENERAL ARRANGEMENT PLAN |
| 180001-01-DA-C02.01 | ESTABLISHMENT AND DEMOLITION PLAN - SHEET 01 |
| 180001-01-DA-C02.02 | ESTABLISHMENT AND DEMOLITION PLAN - SHEET 02 |
| 180001-01-DA-C03.01 | EROSION AND SEDIMENTATION CONTROL PLAN INDICATIVE CONSTRUCTION PHASE 01 - SHEET 01 |
| 180001-01-DA-C03.02 | EROSION AND SEDIMENTATION CONTROL PLAN INDICATIVE CONSTRUCTION PHASE 01 - SHEET 02 |
| 180001-01-DA-C03.03 | EROSION AND SEDIMENTATION CONTROL PLAN INDICATIVE CONSTRUCTION PHASE 02 - SHEET 01 |
| 180001-01-DA-C03.04 | EROSION AND SEDIMENTATION CONTROL PLAN INDICATIVE CONSTRUCTION PHASE 02 - SHEET 02 |
| 180001-01-DA-C03.21 | EROSION AND SEDIMENTATION CONTROL DETAILS - SHEET 01 |
| 180001-01-DA-C03.22 | EROSION AND SEDIMENTATION CONTROL DETAILS - SHEET 02 |
| 180001-01-DA-C04.01 | BULK EARTHWORKS CUT AND FILL PLAN |
| 180001-01-DA-C05.01 | SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 01 |
| 180001-01-DA-C05.02 | SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 02 |
| 180001-01-DA-C05.03 | SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 03 |
| 180001-01-DA-C05.04 | SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 04 |
| 180001-01-DA-C06.01 | ROAD TYPICAL CROSS SECTIONS - SHEET 01 |
| 180001-01-DA-C06.02 | ROAD TYPICAL CROSS SECTIONS - SHEET 02 |
| 180001-01-DA-C07.01 | ROAD LONGITUDINAL SECTIONS - SHEET 01 |
| 180001-01-DA-C07.02 | ROAD LONGITUDINAL SECTIONS - SHEET 02 |
| 180001-01-DA-C07.03 | ROAD LONGITUDINAL SECTIONS - SHEET 03 |
| 180001-01-DA-C07.04 | ROAD LONGITUDINAL SECTIONS - SHEET 04 |
| 180001-01-DA-C07.05 | ROAD LONGITUDINAL SECTIONS - SHEET 05 |
| 180001-01-DA-C07.06 | ROAD LONGITUDINAL SECTIONS - SHEET 06 |
| 180001-01-DA-C10.01 | PAVEMENT PLAN - SHEET 01 |
| 180001-01-DA-C10.02 | PAVEMENT PLAN - SHEET 02 |
| 180001-01-DA-C10.03 | PAVEMENT PLAN - SHEET 03 |
| 180001-01-DA-C10.04 | PAVEMENT PLAN - SHEET 04 |
| 180001-01-DA-C11.01 | SIGNAGE AND LINEMARKING PLAN - SHEET 01 |
| 180001-01-DA-C11.02 | SIGNAGE AND LINEMARKING PLAN - SHEET 02 |
| 180001-01-DA-C11.03 | SIGNAGE AND LINEMARKING PLAN - SHEET 03 |
| 180001-01-DA-C11.04 | SIGNAGE AND LINEMARKING PLAN - SHEET 04 |
| 180001-01-DA-C14.01 | SITEWORKS DETAILS |
| 180001-01-DA-C15.01 | RETAINING WALL ELEVATION |
| 180001-01-DA-C22.01 | STORMWATER CATCHMENT PLAN |
| 180001-01-DA-C25.01 | TURNING PATH PLAN - SHEET 01 |
| 180001-01-DA-C25.02 | TURNING PATH PLAN - SHEET 02 |
| 180001-01-DA-C25.03 | TURNING PATH PLAN - SHEET 03 |
| 180001-01-DA-C26.01 | SAFETY IN DESIGN REPORT |

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 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
CELESTINO

Scale
0 50 100 150 200m
SCALE 1:2000 @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

Scale: 1:2000
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-C01.01
Revision: 5

DATE PLOTTED: 19 December 2023 11:40 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C01.01-COVER SHEET AND DRAWING SCHEDULE.dwg

## SURVEY

1. ORIGIN OF SURVEY

   FILE: OVERALL DETAIL-GDA 2020.DWG
   DATE: 25/10/2021
   PROVIDED BY: PROUST AND GARDNER CONSULTING PTY LTD

   FILE: 23360-Entry Road Detail (C).DWG
   DATE: 01/03/2023
   PROVIDED BY: PROUST AND GARDNER CONSULTING PTY LTD
2. THE EXISTING SITE CONDITIONS SHOWN ON THE FOLLOWING DRAWINGS HAVE BEEN SUPPLIED BY REGISTERED SURVEYORS TO PROVIDE A BASIS FOR DESIGN. THE USE OF THIS SURVEY BASE DOES NOT GUARANTEE THE ACCURACY OR COMPLETENESS OF THE SURVEY BASE OR ITS SUITABILITY AS A BASIS FOR CONSTRUCTION DRAWINGS.
3. SHOULD DISCREPANCIES BE ENCOUNTERED DURING CONSTRUCTION BETWEEN THE SURVEY DATA AND ACTUAL FIELD DATA, CONTACT THE SUPERINTENDENT.
4. THE RELATIONSHIP OF IMPROVEMENTS TO BOUNDARIES ARE DIAGRAMMATIC ONLY. WHERE DISTANCES TO BOUNDARIES ARE CRITICAL THEY SHOULD BE CONFIRMED ON SITE PRIOR TO CONSTRUCTION BY FURTHER SURVEY.

## GENERAL

1. WORKS TO BE GENERALLY CONSTRUCTED IN ACCORDANCE WITH COUNCIL'S CONSTRUCTION SPECIFICATIONS.
2. TfNSW STANDARD DETAILS TO BE USED WHERE POSSIBLE.
3. UTILITY ADJUSTMENTS AT DEVELOPERS EXPENSE.
4. CONDUITS TO BE PLACED WHERE REQUIRED BY THE RELEVANT AUTHORITIES.

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## EROSION AND SEDIMENT CONTROL

### GENERAL INSTRUCTIONS

1. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE CONTROL OF EROSION AND SEDIMENTATION TO THE SATISFACTION OF COUNCIL, RELEVANT STATE GOVERNMENT AUTHORITY AND NSW EPA. THE EROSION AND SEDIMENTATION CONTROLS SHOWN ON THE DRAWINGS SHALL ONLY BE USED AS A GUIDE BY THE CONTRACTOR, AND SHALL REPRESENT THE MINIMUM REQUIREMENT ONLY.
2. THE CONTRACTOR SHALL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS DOCUMENTED OR AS OTHERWISE DIRECTED BY THE SUPERINTENDENT.
   ALL WORK SHALL BE GENERALLY CARRIED OUT IN ACCORDANCE WITH
   a. LOCAL AUTHORITY REQUIREMENTS
   b. EPA REQUIREMENTS
   c. NSW DEPARTMENT OF HOUSING MANUAL "MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION", 4th EDITION, MARCH 2004.
3. MAINTAIN THE EROSION CONTROL DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT AND THE LOCAL AUTHORITY.
4. WHEN STORMWATER PITS ARE CONSTRUCTED, PREVENT SITE RUNOFF ENTERING UNLESS SEDIMENT FENCES ARE ERECTED AROUND PITS.
5. CONTRACTOR IS TO ENSURE ALL EROSION & SEDIMENT CONTROL DEVICES ARE MAINTAINED IN GOOD WORKING ORDER AND OPERATE EFFECTIVELY. REPAIRS AND OR MAINTENANCE SHALL BE UNDERTAKEN AS REQUIRED, PARTICULARLY FOLLOWING STORM EVENTS.

### LAND DISTURBANCE

6. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE WILL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:
   a. INSTALL A SEDIMENT FENCE ALONG THE BOUNDARIES AS SHOWN ON PLAN. REFER DETAIL.
   b. CONSTRUCT STABILISED CONSTRUCTION ENTRANCE TO LOCATION AS DETERMINED BY SUPERINTENDENT/ENGINEER. REFER DETAIL.
   c. INSTALL SEDIMENT BASIN AS SHOWN ON PLAN, INSTALL SEDIMENT TRAPS AS SHOWN ON PLAN.
   d. UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. WHERE POSSIBLE, PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

### EROSION CONTROL

7. DURING WINDY WEATHER, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL.
8. FINAL SITE LANDSCAPING WILL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 20 WORKING DAYS FROM COMPLETION OF CONSTRUCTION ACTIVITIES.

### SEDIMENT CONTROL

9. STOCKPILES WILL NOT BE LOCATED WITHIN 2 METRES OF HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS. WHERE THEY ARE BETWEEN 2 AND 5 METRES FROM SUCH AREAS, SPECIAL SEDIMENT CONTROL MEASURES SHOULD BE TAKEN TO MINIMISE POSSIBLE POLLUTION TO DOWNSLOPE WATERS, E.G. THROUGH INSTALLATION OF SEDIMENT FENCING.
10. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) WILL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.
11. CONSTRUCTION WATER WILL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS THE WATER HAS BEEN TESTED AND MEETS THE REQUIREMENTS OF THE RELEVANT PLANNING CONTROLS.
12. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED.
13. ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER.
14. ANY EXISTING TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN WILL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:
   a. PROTECTING THEM WITH BARRIER FENCING OR SIMILAR MATERIALS INSTALLED OUTSIDE THE DRIP LINE
   b. ENSURING THAT NOTHING IS NAILED TO THEM
   c. PROHIBITING PAVING, GRADING, SEDIMENT WASH OR PLACING OF STOCKPILES WITHIN THE DRIP LINE EXCEPT UNDER THE FOLLOWING CONDITIONS.
   (I) ENCROACHMENT ONLY OCCURS ON ONE SIDE AND NO CLOSER TO THE TRUNK THAN EITHER 1.5 METRES OR HALF THE DISTANCE BETWEEN THE OUTER EDGE OF THE DRIP LINE AND THE TRUNK, WHICH EVER IS THE GREATER
   (II) A DRAINAGE SYSTEM THAT ALLOWS AIR AND WATER TO CIRCULATE THROUGH THE ROOT ZONE (E.G. A GRAVEL BED) IS PLACED UNDER ALL FILL LAYERS OF MORE THAN 300 MILLIMETRES DEPTH
   (III) CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY NOR TO COMPACT THE SOIL AROUND THEM.

## EXISTING SERVICES

1. ALL UTILITY SERVICES INDICATED ON THE DRAWINGS ORIGINATE FROM SUPPLIED DATA, THEREFORE THEIR ACCURACY AND COMPLETENESS IS NOT GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE AND CONFIRM THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY.
2. CARE TO BE TAKEN WHEN EXCAVATING NEAR EXISTING SERVICES. NO MECHANICAL EXCAVATIONS ARE TO BE UNDERTAKEN OVER ALL LIVE SERVICES. HAND EXCAVATION ONLY IN THESE AREAS.
3. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL EXISTING SERVICES THAT ARE TO BE RETAINED IN THE VICINITY OF THE PROPOSED WORKS. ANY AND ALL DAMAGE TO THESE SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT, AND AT NO EXTRA COST.
4. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR ADJUSTMENT (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS.
5. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE CAPPING OFF, EXCAVATION AND REMOVAL (IF REQUIRED) OF EXISTING SERVICES IN AREA AFFECTED BY WORKS UNLESS DIRECTED OTHERWISE ON THE DRAWINGS OR BY THE SUPERINTENDENT.
6. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES SERVICES TO ALL BUILDINGS NOT AFFECTED BY THE WORKS ARE NOT DISRUPTED.
7. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL GAIN APPROVAL OF THE PROGRAM FOR THE RELOCATION AND/OR CONSTRUCTION OF TEMPORARY SERVICES AND FOR ANY ASSOCIATED INTERRUPTION OF SUPPLY.
8. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES TO MAINTAIN EXISTING SUPPLY TO BUILDINGS REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.
9. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION A THOROUGH SEARCH OF ALL SERVICE AUTHORITIES SHOULD BE MADE TO DETERMINE THE POSSIBLE LOCATION OF ANY FURTHER UNDERGROUND SERVICES.
10. AUTHORITY PLANS GENERALLY SHOW ONLY THE PRESENCE OF CABLES AND PLANT AND DO NOT WARRANT OR GUARANTEE THAT SUCH PLANS ARE ACCURATE. DO NOT ASSUME DEPTH OR ALIGNMENT OF CABLES OR PLANT AS THESE VARY SIGNIFICANTLY. THE CONTRACTOR HAS A DUTY OF CARE WHEN EXCAVATING NEAR EXISTING SERVICES AND PLANT. BEFORE USING MACHINE EXCAVATORS SERVICES MUST FIRST BE PHYSICALLY EXPOSED BY SOFT DIG POTHOLING TO IDENTIFY IT'S LOCATION.
11. THE CONTRACTOR IS TO UNDERTAKE A BEFORE-YOU-DIG SEARCH PRIOR TO ANY EXCAVATION AND MAINTAIN A CURRENT SET ON-SITE DURING EXCAVATION WORKS.
12. THE LOCATIONS OF UNDERGROUND SERVICES SHOWN IN THIS SET OF DRAWINGS HAVE BEEN PLOTTED FROM SURVEY INFORMATION AND SERVICE AUTHORITY INFORMATION. THE SERVICE INFORMATION HAS BEEN PREPARED ONLY TO SHOW THE APPROXIMATE POSITIONS OF ANY KNOWN SERVICES AND MAY NOT BE AS CONSTRUCTED OR ACCURATE.ENSPIRE SOLUTIONS CAN NOT GUARANTEE THAT THE SERVICES INFORMATION SHOWN ON THESE DRAWINGS ACCURATELY INDICATES THE PRESENCE OR ABSENCE OF SERVICES OR THEIR LOCATION AND WILL ACCEPT NO LIABILITY FOR INACCURACIES IN THE SERVICES INFORMATION SHOWN FROM ANY CAUSE WHATSOEVER.
13. CONTRACTORS SHALL TAKE DUE CARE WHEN EXCAVATING ONSITE INCLUDING HAND EXCAVATION WHERE NECESSARY. CONTRACTORS ARE TO CONTACT THE RELEVANT SERVICE AUTHORITY PRIOR TO COMMENCEMENT OF EXCAVATION WORKS. CONTRACTORS ARE TO UNDERTAKE A SERVICES SEARCH, PRIOR TO COMMENCEMENT OF WORKS ON SITE. SEARCH RESULTS ARE TO BE KEPT ON SITE AT ALL TIMES.

## EARTHWORKS

1. AT THE COMMENCEMENT OF THE CUT AND FILLING OPERATIONS FOR BULK EARTHWORKS A GEOTECHNICAL ENGINEER IS TO VISIT THE SITE & CONFIRM THE SUITABILITY OF THE METHODOLOGY OF ACHIEVING THE REQUIRED BUILDING PLATFORMS AND COMPACTION REQUIREMENTS. SUBSEQUENTLY, THE HEAD CONTRACTOR IS TO CONFIRM, IN WRITING TO THE DESIGNING CIVIL & STRUCTURAL ENGINEERS, THAT THE METHODOLOGY APPROVED AT THE TIME OF THE GEOTECHNICAL ENGINEERS VISIT WAS MAINTAINED DURING ALL THE BULK EARTHWORKS PROCESS.
2. STRIP TOPSOIL, ORGANIC MATTER AND RUBBLE FROM CONSTRUCTION AREA TO EXPOSE NATURALLY OCCURRING MATERIAL AND STOCKPILE ON SITE AS DIRECTED BY THE SUPERINTENDENT.
3. WHERE FILLING, STRUCTURAL SLABS OR PAVEMENTS ARE REQUIRED, PROOF ROLL THE EXPOSED NATURAL SURFACE WITH A MINIMUM OF TEN PASSES OF A SMOOTH DRUM VIBRATING ROLLER (MINIMUM STATIC WEIGHT OF 10 TONNES) TO DETECT THEN REMOVE SOFT SPOTS (AREAS WITH MORE THAN 2mm MOVEMENT UNDER ROLLER) IN THE PRESENCE OF THE SUPERINTENDENT. THE CONTRACTOR IS TO ALLOW TO REMOVE AND REPLACE A PROVISIONAL QUANTITY OF UNSUITABLE SUBGRADE MATTER.
4. ALL SOFT, WET OR UNSUITABLE MATERIAL IS TO BE REMOVED AS DIRECTED BY THE SUPERINTENDENT AND REPLACED WITH APPROVED MATERIAL SATISFYING THE REQUIREMENTS LISTED BELOW.
5. EXCAVATED MATERIAL IS NOT TO BE USED AS STRUCTURAL FILL UNLESS APPROVED BY THE GEOTECHNICAL ENGINEER.
6. THE CONTRACTOR IS TO PROVIDE CERTIFICATES VERIFYING THE QUALITY OF IMPORTED MATERIAL FOR THE SUPERINTENDENTS APPROVAL.
7. ALL FILL MATERIAL SHALL BE PLACED IN MAXIMUM 200mm THICK LAYERS AND COMPACTED AT OPTIMUM MOISTURE CONTENT (+ OR - 2%) TO ACHIEVE A DRY DENSITY DETERMINED IN ACCORDANCE WITH AS1289 E3.1 OF NOT LESS THAN THE FOLLOWING STANDARD MINIMUM DRY DENSITY IN ACCORDANCE WITH AS1289 E5.1.1.1:

| LOCATION | COMPACTION REQUIREMENT |
|---|---|
| UNDER BUILDING SLABS | 100% SMDD |
| LANDSCAPED AREAS | 95% SMDD |
| ROADS & PAVED AREAS | 100% SMDD |

8. FOR NON COHESIVE MATERIAL, COMPACT TO NOT LESS THAN
   UNDER ROAD 80% DENSITY
   OTHER AREA 75% DENSITY
9. THE CONTRACTOR IS TO ALLOW FOR COMPACTION TESTING BY NATA REGISTERED LABORATORY FOR PLATFORMS AND FILL LAYERS IN ACCORDANCE WITH THE LATEST VERSION OF AS3798 - FOR TYPE 1 OPERATIONS (MINIMUM 3 TESTS PER LAYER).
10. FREQUENCY OF COMPACTION TESTING SHALL NOT BE LESS THAN:
   A. 1 TEST PER 200$m^3$ OF FILL PLACED PER 200mm LAYER OF FILL
   B. 3 TESTS PER VISIT
   C. 1 TEST PER 1000$m^2$ OF EXPOSED SUBGRADE
   D. TESTING SHALL BE "LEVEL 1" UNDERTAKEN IN ACCORDANCE WITH AS1398.
11. WHERE TEST RESULTS ARE BELOW THE SPECIFIED COMPACTION, RECOMPACT AND RETEST UNTIL SPECIFIED COMPACTION STANDARD IS ACHIEVED.
12. ALLOW FOR EXCAVATION IN ALL MATERIALS AS FOUND U.N.O. NO ADDITIONAL PAYMENTS WILL BE MADE FOR EXCAVATION IN WET OR HARD GROUND.
13. WHERE THERE IS INSUFFICIENT EXCAVATED MATERIAL SUITABLE FOR FILLING OR SUBGRADE REPLACEMENT, THE CONTRACTOR IS TO ALLOW TO IMPORT FILL. IMPORTED FILL SHALL COMPLY WITH THE FOLLOWING:
   A. MAXIMUM SIZE 50mm. PASSING 75 MICRON SIEVE (<25%).
   B. PLASTICITY INDEX BETWEEN 2-15% AND CBR>8.
   C. FREE FROM ORGANIC AND PERISHABLE MATTER.
14. REFER TO THE SITE SPECIFIC GEOTECHNICAL REPORT FOR GENERAL REQUIREMENTS ON SITE PREPARATION AND RE-USE OF EXISTING SITE MATERIAL AS ENGINEERED FILL.
15. THE CONTRACTOR SHALL PROGRAM THE EARTHWORKS OPERATION SO THAT THE WORKING AREAS ARE ADEQUATELY DRAINED DURING THE PERIOD OF CONSTRUCTION. THE SURFACE SHALL BE GRADED AND SEALED OFF TO REMOVE DEPRESSIONS, ROLLER MARKS AND SIMILAR WHICH WOULD ALLOW WATER TO POND AND PENETRATE THE UNDERLYING MATERIAL. ANY DAMAGE RESULTING FROM THE CONTRACTOR NOT OBSERVING THESE REQUIREMENTS SHALL BE RECTIFIED AT THEIR COST.
16. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE AND MAINTAIN THE INTEGRITY OF ALL SERVICES, CONDUITS AND PIPES DURING CONSTRUCTION, SPECIFICALLY DURING THE BACKFILLING AND COMPACTION PROCEDURE. ANY AND ALL DAMAGE TO NEW OR EXISTING SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR AT NO EXTRA COST.
17. PROTECT FINAL SURFACE WITH EITHER A TEMPORARY LOOSE SOIL LAYER OR A GRANULAR SUB-BASE LAYER TO PREVENT DRYING OUT PRIOR TO ON-GROUND SLAB CONSTRUCTION.

## SITEWORKS

1. ALL WORKS TO BE IN ACCORDANCE WITH LOCAL AUTHORITY REQUIREMENTS, SPECIFICATIONS AND AUSTRALIAN STANDARDS. CONFLICTS SHALL BE REFERRED TO THE SUPERINTENDENT FOR DIRECTION.
2. CONTRACTOR MUST VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY DISCREPANCIES TO BE REPORTED TO THE DESIGN ENGINEER.
3. THE CONTRACTOR IS TO DESIGN, OBTAIN APPROVALS AND CARRY OUT REQUIRED TEMPORARY TRAFFIC CONTROL PROCEDURES DURING CONSTRUCTION IN ACCORDANCE WITH RMS AND LOCAL AUTHORITY REGULATIONS AND REQUIREMENTS.
4. THE CONTRACTOR IS TO OBTAIN ALL AUTHORITY APPROVALS AS REQUIRED.
5. RESTORE ALL PAVED, COVERED, GRASSED AND LANDSCAPED AREAS TO THEIR ORIGINAL CONDITION ON COMPLETION OF WORKS.
6. ON COMPLETION OF ANY TRENCHING WORKS, ALL DISTURBED AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL, GRASSED AREAS AND ROAD PAVEMENTS.
7. THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR.
8. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO LODGMENT OF TENDER AND ON SITE WORKS. THE PRICE AS TENDERED SHALL BE INCLUSIVE OF ALL WORKS SHOWN ON THE TENDER PROJECT DRAWINGS. ADDITIONAL PAYMENTS FOR WORKS SHOWN ON THE TENDER PROJECT DRAWINGS WILL NOT BE APPROVED.
9. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE ENGINEERING PLANS AND SPECIFICATIONS, AND ANY OTHER WRITTEN INSTRUCTIONS THAT MAY BE ISSUED RELATING TO DEVELOPMENT OF THE SUBJECT SITE.
10. THESE PLANS SHALL BE READ IN CONJUNCTION WITH ALL APPROVED DRAWINGS AND SPECIFICATIONS PREPARED BY OTHER PROJECT CONSULTANTS.
11. DO NOT OBTAIN DIMENSIONS BY SCALING THE DRAWINGS. ALL DIMENSIONS ARE IN MILLIMETERS (mm) AND ALL LEVELS ARE IN METRES (m), UNO. ALL LEVELS ARE TO AUSTRALIAN HEIGHT DATUM (AHD).
12. IN CASE OF DOUBT OR DISCREPANCY REFER TO THE DESIGN ENGINEER AND SUPERINTENDENT FOR CLARIFICATION OR CONFIRMATION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. OTHERWISE THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COST OF REMEDIATION WORKS.
13. WHERE NEW WORKS ABUT EXISTING THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS OBTAINED.
14. THE CONTRACTOR SHALL COMPLY WITH ALL STATUTORY AND INDUSTRIAL REQUIREMENTS FOR PROVISION OF A SAFE WORKING ENVIRONMENT INCLUDING TRAFFIC CONTROL.
15. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES ACCESS TO ALL BUILDINGS ADJACENT THE WORKS IS NOT DISRUPTED.
16. WHERE NECESSARY THE CONTRACTOR SHALL PROVIDE SAFE PASSAGE OF VEHICLES AND/OR PEDESTRIANS THROUGH OR BY THE SITE.
17. WHERE NOTED ON THE DRAWINGS THAT WORKS ARE TO BE CARRIED BY OTHERS, (eg. ADJUSTMENT OF SERVICES), THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CO-ORDINATION OF THESE WORKS.
18. ALL VARIATIONS TO SPECIFIED PRODUCTS OR DESIGNS SHALL BE REFERRED TO THE DESIGN ENGINEER IN WRITING FOR APPROVAL.
19. ANY EXISTING TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN WILL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:
   A. PROTECTING THEM WITH BARRIER FENCING OR SIMILAR MATERIALS INSTALLED OUTSIDE THE DRIP LINE
   B. ENSURING THAT NOTHING IS NAILED TO THEM
   C. PROHIBITING PAVING, GRADING, SEDIMENT WASH OR PLACING OF STOCKPILES WITHIN THE DRIP LINE EXCEPT UNDER THE FOLLOWING CONDITIONS:
      C.a. ENCROACHMENT ONLY OCCURS ON ONE SIDE AND NO CLOSER TO THE TRUNK THAN EITHER 1.5 METRES OR HALF THE DISTANCE BETWEEN THE OUTER EDGE OF THE DRIP LINE AND THE TRUNK, WHICH EVER IS THE GREATER
      C.b. A DRAINAGE SYSTEM THAT ALLOWS AIR AND WATER TO CIRCULATE THROUGH THE ROOT ZONE (E.G. A GRAVEL BED) IS PLACED UNDER ALL FILL LAYERS OF MORE THAN 300 MILLIMETRES DEPTH
      C.c. CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY NOR TO COMPACT THE SOIL AROUND THEM.
20. EPA AND COUNCIL REQUIREMENTS MUST BE ADHERED TO REGARDING THE LEVEL OF NOISE AND WORKING HOURS, TO ENSURE THAT RESIDENTS AND OTHER APPLICABLE NEIGHBOURS TO THE SITE ARE NOT DISTURBED UNREASONABLY. THE GENERATION OF NOISE MUST BE MINIMISED.

## STORMWATER DRAINAGE NOTES

1. STORMWATER DESIGN CRITERIA:
   (A) ANNUAL EXCEEDANCE PROBABILITIES (AEP):
   5% (1 IN 20) MINOR (PIPED) NETWORK
   1% (1 IN 100) MAJOR (OVERLAND FLOW SYSTEM)

   (B) RAINFALL INTENSITIES:
   ARR 1987
   RAINFALL FROM BUREAU OF METEOROLOGY WEBSITE

   (C) HYDROLOGIC METHOD:
   DRAINS WITH ILSAX METHOD
2. PIPES 375 DIA. AND LARGER TO BE REINFORCED CONCRETE CLASS '2' APPROVED SPIGOT AND SOCKET WITH RUBBER RING JOINTS. U.N.O. ALL ROAD CROSSINGS ARE TO BE MINIMUM CLASS '4'.
3. PIPES 300 DIA AND LESS SHALL BE DWV GRADE (CLASS SN8) uPVC WITH SOLVENT WELDED JOINTS.
4. ALL PIPES ARE TO BE UNIFORMLY SUPPORTED ALONG THE LENGTH OF THE BARREL BY SUITABLE FILL MATERIAL. REFER TO BEDDING SUPPORT TYPE.
5. PIPES WITH SOCKETS SHALL BE LAID IN BEDDING WHERE SUITABLE RECESSES HAVE BEEN PROVIDED TO ENSURE PIPES DO NOT BEAR ON THEIR SOCKETS.
6. ALL STORMWATER DRAINAGE LINES UNDER PROPOSED BUILDING SLABS TO BE uPVC PRESSURE PIPE PN6. ENSURE ALL VERTICALS AND DOWNPIPES ARE uPVC PRESSURE PIPE, GRADE 6 FOR A MIN OF 3.0m IN HEIGHT.
7. PIPES TO BE INSTALLED TO TYPE HS2 SUPPORT IN ACCORDANCE WITH AS 3725 (2007) IN ALL CASES BACKFILL TRENCH WITH SAND TO 300mm ABOVE PIPE. WHERE PIPE IS UNDER PAVEMENTS BACKFILL REMAINDER OF TRENCH TO UNDERSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPACTED IN 150mm LAYERS TO MINIMUM 98% STANDARD MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 5.2.1. (OR A DENSITY INDEX OF NOT LESS THAN 75).
8. REFER TO AS/NRS 3725:2007 TABLE B1 FOR REQUIRED FILL DEPTHS ABOVE PIPE BARREL PRIOR TO USE OF COMPACTION MACHINERY OR TRAVERSING OF PIPES BY GENERAL SITE EQUIPMENT.
9. WHERE WORKING METHODS REQUIRE HIGHER CLASS PIPE, THE CONTRACTOR SHALL REFER TO AS 3725 (2007) TO DETERMINE THE APPROPRIATE PIPE CLASS. PROPOSED PIPE CLASS SHALL BE REVIEWED BY ENSPIRE SOLUTIONS PRIOR TO INSTALLATION.
10. ALL INTERNAL WORKS WITHIN PROPERTY BOUNDARIES ARE TO COMPLY WITH THE REQUIREMENTS OF AS/NZS 3500.3:2015.
11. ENLARGERS, CONNECTIONS AND JUNCTIONS TO BE PREFABRICATED FITTINGS WHERE PIPES ARE LESS THAN 300 DIA.
12. SUBSOIL DRAINAGE LINES SHALL BE INSTALLED BEHIND ALL KERBS EXCEPT WHERE STORMWATER DRAINAGE IS LOCATED ALONG THE KERBLINE.
13. A MINIMUM OF 3m OF SUBSOIL LINE SHALL BE LAID INTO UPSTREAM SIDE OF ALL DRAINAGE PITS.
14. FLUSHING POINTS SHALL BE INSTALLED TO TfNSW DETAIL, AND AT MAX 50m SPACING.
15. WHERE SUBSOIL DRAINS PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS, UNSLOTTED uPVC SEWER GRADE PIPE IS TO BE USED.
16. CARE IS TO BE TAKEN WITH LEVELS OF STORMWATER LINES. GRADES SHOWN ARE NOT TO BE REDUCED WITHOUT APPROVAL.
17. GRATES AND COVERS SHALL CONFORM TO AS 3996.
18. ALL BOX CULVERTS SHALL BE STRUCTURALLY DESIGNED BY THE MANUFACTURER AND DELIVERED TO SITE AS FIT FOR PURPOSE.
19. AT ALL TIMES DURING CONSTRUCTION OF STORMWATER PITS, ADEQUATE SAFETY PROCEDURES SHALL BE TAKEN TO ENSURE AGAINST THE POSSIBILITY OF PERSONNEL FALLING DOWN PITS.
20. ALL EXISTING STORMWATER DRAINAGE LINES AND PITS THAT ARE TO REMAIN ARE TO BE INSPECTED AND CLEANED. DURING THIS PROCESS ANY PART OF THE STORMWATER DRAINAGE SYSTEM THAT WARRANTS REPAIR SHALL BE REPORTED TO THE SUPERINTENDENT/ENGINEER FOR FURTHER DIRECTIONS.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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 |

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Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: SPECIFICATION NOTES

SHEET 01

Scale: NTS
Date: 23/12/2022
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Project Number/Drawing Number: 180001-01-DA-C01.21
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# KERBS

1. ALL KERBS, GUTTERS, DISH DRAINS AND CROSSINGS TO BE CONSTRUCTED ON 175mm GRANULAR BASECOURSE COMPACTED TO MINIMUM 95% MODIFIED DRY DENSITY (AS 1289 5.2.1).
2. EXPANSION JOINTS (E.J) TO BE FORMED FROM 10mm COMPRESSIBLE FOAM FILLER BOARD FOR THE FULL DEPTH OF THE SECTION AND CUT TO PROFILE. EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PITS, ON TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX 12m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE EXPANSION JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLABS.
3. WEAKENED PLANE JOINTS TO BE MIN 3mm WIDE AND LOCATED AT 3m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE WEAKENED PLANE JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLABS.
4. EXISTING ALLOTMENT DRAINAGE PIPES ARE TO BE BUILT INTO THE NEW KERB AND GUTTER WITH 100mm DIA HOLE OR IN ACCORDANCE WITH LOCAL AUTHORITY REQUIREMENTS.
5. IN THE REPLACEMENT OF KERB AND GUTTER :-
EXISTING ROAD PAVEMENT IS TO BE SAWCUT 600mm U.N.O FROM THE LIP OF GUTTER. UPON COMPLETION OF THE NEW KERB AND GUTTER NEW BASECOURSE AND SURFACE TO BE LAID 600mm WIDE U.N.O.

# PAVEMENTS

1. ALL PAVEMENT MATERIALS SHALL COMPLY WITH CURRENT RMS SPECIFICATIONS. PROVIDE MECHANICAL ANALYSIS FOR EACH BATCH OF PAVEMENT MATERIAL TO ENSURE CONFORMITY.
2. COMPACTION STANDARDS:
   A) BASE: 98% MODIFIED MAXIMUM DRY DENSITY
   B) SUBBASE: 95% MODIFIED MAXIMUM DRY DENSITY
3. THE CONTRACTOR SHALL CONFIRM THE DESIGN CBR WITH A MINIMUM OF 3 TESTS TAKEN AT SUBGRADE LEVEL. WHERE DISCREPANCY IS FOUND, CONTACT THE DESIGNING ENGINEER.
4. ALLOW FOR COMPACTION TESTING BY NATA REGISTERED LABORATORY FOR: BASE LAYER, SUBBASE LAYER, SUBGRADE IN ACCORDANCE WITH THE LATEST VERSION OF AS3798 FOR PAVEMENTS. ALLOW FOR AT LEAST TWO SUCCESSFUL COMPACTION TESTS IN EACH LAYER.
5. MATCH NEW PAVEMENT LAYERS NEATLY AND FLUSH WITH EXISTING WHERE REQUIRED.
6. KEY NEW BASE AND SUBBASE LAYERS INTO EXISTING WITH 150mm WIDE STEPS. ASPHALTIC CONCRETE WEARING COURSE IS TO EXTEND 150mm (MIN) PAST BASECOURSE INTERFACE.
7. TRENCHES THROUGH EXISTING ROAD AND CONCRETE PAVEMENTS SHALL BE SAWCUT TO FULL DEPTH OF CONCRETE AND A MIN 50mm IN BITUMINOUS PAVING.
8. ALL ASPHALTIC CONCRETE (AC) WORK TO BE PREPARED AND CARRIED OUT IN ACCORDANCE WITH GOOD ASPHALTIC PAVING PRACTICE AS DESCRIBED IN AS2734-1994 "ASPHALT (HOT-MIXED) PAVING - GUIDE TO GOOD PRACTICE" AND CURRENT RMS SPECIFICATIONS (R116).
9. WHERE NOMINATED, THE CONTRACTOR SHALL ALLOW FOR ALL COMPONENTS OF PROPRIETARY JOINTING SYSTEMS INCLUDING FIXING, TEMPLATES & PEGGING TO ENSURE THAT ALL DOWEL BARS REMAIN IN THE CORRECT ALIGNMENT AND POSITION.
10. ALL BASECOURSE MATERIAL SHALL BE IGNEOUS ROCK QUARRIED MATERIAL TO COMPLY WITH R.M.S. FORM 3051, COMPACTED TO MINIMUM 98% MODIFIED DENSITY IN ACCORDANCE WITH AS 1289 5.2.1 FREQUENCY OF COMPACTION TESTING SHALL NOT BE LESS THAN 1 TEST PER $50m^3$ OF BASECOURSE MATERIAL PLACED.
11. ALL SUB-BASE COURSE MATERIAL SHALL BE IGNEOUS ROCK QUARRIED MATERIAL TO COMPLY WITH R.M.S. FORM 3051, AND COMPACTED TO MINIMUM 95% MODIFIED DENSITY IN ACCORDANCE WITH A.S 1289 5.2.1 FREQUENCY OF COMPACTION TESTING SHALL NOT BE LESS THAN 1 TEST PER $50m^3$ OF SUB-BASE COURSE MATERIAL PLACED.
12. AS AN ALTERNATIVE TO THE USE OF IGNEOUS ROCK AS A SUB-BASE MATERIAL IN (9) A CERTIFIED RECYCLED CONCRETE MATERIAL COMPLYING WITH R.M.S. FORM 3051 WILL BE CONSIDERED. SUBJECT TO MATERIAL SAMPLES AND APPROPRIATE CERTIFICATIONS BEING PROVIDED TO THE SATISFACTION OF THE COUNCIL ENGINEER.
13. SHOULD THE CONTRACTOR WISH TO USE A RECYCLED PRODUCT THIS SHALL BE CLEARLY INDICATED IN THEIR TENDER AND THE PRICE DIFFERENCE BETWEEN AN IGNEOUS PRODUCT AND A RECYCLED PRODUCT SHALL BE CLEARLY INDICATED.

# CONCRETE

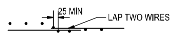
1. THIS SECTION REFERS TO CIVIL CONCRETE WORKS AND DOES NOT INCLUDE BUILDINGS OR BRIDGE STRUCTURES.
2. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
3. CONCRETE QUALITY;
ALL REQUIREMENTS OF THE CURRENT AS3600 CONCRETE SPECIFICATION DOCUMENT 1 SHALL APPLY TO THE FORMWORK, REINFORCEMENT AND CONCRETE UNLESS NOTED OTHERWISE.

| ELEMENT | AS 3600 F'c MPa AT 28 DAYS | SPECIFIED SLUMP | NOMINAL AGG. SIZE | MAX 56 DAY DRYING SHRINKAGE |
|---|---|---|---|---|
| KERBS AND PATHS | 25 | 60 | 20 | 650um |
| PITS AND VEHICULAR PAVEMENTS | 32 | 80 | 20 | 650um |
| FOOTINGS | 32 | 80 | 20 | 650um |
| CULVERT BASE SLAB | 40 | 80 | 20 | 650um |

4. CONCRETE PROPERTIES FOR SLABS AND BEAMS SHALL BE VARIED FROM NORMAL CLASS AS FOLLOWS:
   A. MINIMUM CEMENT CONTENT 250kg/m3
   B. MAXIMUM 56 DAY SHRINKAGE STRAIN = AS NOMINATED ABOVE
   C. PRIOR TO COMMENCEMENT CONCRETE SUPPLIER TO PROVIDE DRYING SHRINKAGE TEST RESULTS FROM PRODUCTION ASSESSMENT AS EVIDENCE THAT SPECIFIED DRYING SHRINKAGE LIMITS CAN BE ACHIEVED USING NORMAL MIX DESIGN.
5. CEMENT TYPE SHALL BE (ACSE SPECIFICATION) TYPE SL
6. PROJECT CONTROL TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1379.
7. NO ADMIXTURES SHALL BE USED IN CONCRETE UNLESS APPROVED IN WRITING BY THE DESIGN ENGINEER.
8. CLEAR CONCRETE COVERS SHALL BE (UNO):

| ENVIRONMENT | COVER |
|---|---|
| A. SURFACES OF MEMBERS CAST AGAINST, AND IN CONTACT WITH THE GROUND | 50mm |
| B. SURFACES OF MEMBERS CAST AGAINST, AND IN CONTACT WITH THE GROUND SEPARATED BY MEMBRANE | 40mm |
| C. SURFACES OF MEMBERS IN ABOVE GROUND EXTERIOR ENVIRONMENTS | 40mm |
| D. SURFACES OF MEMBERS IN INTERIOR ENVIRONMENTS | 20mm |

9. ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON MILD STEEL PLASTIC TIPPED CHAIRS, PLASTIC CHAIRS OR CONCRETE CHAIRS AT NOT GREATER THAN 1m CENTRES BOTH WAYS. BARS SHALL BE TIED AT ALTERNATE INTERSECTIONS.
10. THE FINISHED CONCRETE SHALL BE A DENSE HOMOGENEOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS.
11. FABRIC SHALL BE LAPPED IN ACCORDANCE WITH THE FOLLOWING DETAIL:




FOLLOWING THE FABRIC SYMBOL SL IS THE REFERENCE NUMBER FOR FABRIC TO AS 1304.

12. uPVC SHEET SHALL BE PLACED BELOW ALL CONCRETE PAVEMENTS.
13. ALL PENETRATIONS TO HAVE 2/N12 TRIMMER BARS TOP AND BOTTOM TO EACH FACE U.N.O. EXTEND TRIMMERS 700 BEYOND PENETRATION.
14. FORMWORK CLASS SHALL BE IN ACCORDANCE WITH AS380.
15. SURFACE FINISHES:

| ELEMENT | FORMWORK CLASS |
|---|---|
| STORMWATER PIT | OFF FORM |
| PAVEMENTS | MACHINE FLOAT/BROOM FINISHED |
| KERBS | STEEL FLOAT/TROWEL |

16. REINFORCEMENT SYMBOLS:
   N DENOTES GRADE 450 N BARS TO AS 1302 GRADE N
   R DENOTES 230 R HOT ROLLED PLAIN BARS TO AS 1302
   SL DENOTES HARD-DRAWN WIRE REINFORCING FABRIC TO AS 1304

NUMBER OF BARS IN A GROUP — BAR GRADE AND TYPE

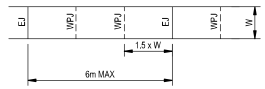
17 N 20 250

NOMINAL BAR SIZE IN mm — SPACING IN mm THE FIGURE

# PAVEMENT JOINTS

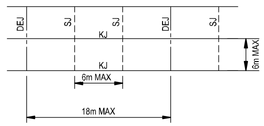
## PEDESTRIAN PAVEMENTS

1. ALL PEDESTRIAN PAVEMENTS ARE TO BE JOINTED AS FOLLOWS U.N.O ON THE DESIGN DRAWINGS.
2. EXPANSION JOINTS ARE TO BE LOCATED WHERE POSSIBLE AT TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX. 6.0m CENTRES.
3. WEAKENED PLANE JOINTS ARE TO BE LOCATED AT A MAX. SPACING OF 1.5 x WIDTH OF THE PAVEMENT.
4. WHERE POSSIBLE JOINTS SHOULD BE LOCATED TO MATCH KERBING AND OR ADJACENT PAVEMENT JOINTS.
5. TYPICAL PEDESTRIAN PAVEMENT JOINT DETAIL.




## VEHICULAR PAVEMENTS

6. ALL VEHICULAR PAVEMENTS TO BE JOINTED AS FOLLOWS U.N.O ON THE DESIGN DRAWINGS.
7. TIED KEYED CONSTRUCTION JOINTS SHOULD GENERALLY BE LOCATED LONGITUDINALLY AT A MAX OF 6.0m CENTRES
8. SAWN JOINTS SHOULD GENERALLY BE LOCATED LATERALLY AT A MAX OF 6.0m CENTRES WITH DOWELED EXPANSION JOINTS AT MAX 30.0m CENTRES
9. TYPICAL VEHICULAR PAVEMENT JOINT DETAIL.




10. PROVIDE 10mm EXPANSION FOAM BETWEEN NEW CONRETE WORKS AND EXISTING STRUCTURES.
11. LOCAL AUTHORITY REQUIREMENTS SHALL TAKE PRECEDENCE WITHIN THE PUBLIC ROAD RESERVE.
12. DOWELS TO BE PLACED ON PROPRIETARY CRADLES TO ENSURE CORRECT SPACING AND ALIGNMENT.

# SIGNAGE AND LINE MARKING

1. LINE MARKING AND PAINT SHALL BE IN ACCORDANCE WITH AS 2700 AND AS 2709 AND TfNSW SPECIFICATIONS.
2. ALL PAINT SHALL BE APPLIED BY MECHANICAL SPRAYER.
3. LINE MARKING SHALL BE SPOTTED OUT AND APPROVED PRIOR TO SPRAYING.
4. PAINT SHALL BE APPLIED AT A WET THICKNESS OF BETWEEN 0.35mm TO 0.40mm.
5. TRANSITION LINEMARKING TO SUIT EXISTING WHERE REQUIRED.ALL SIGNAGE TO BE INSTALLED IN ACCORDANCE WITH AUSTRALIAN STANDARDS.
6. REMOVE ALL REDUNDANT PAVEMENT MARKING AS REQUIRED.
7. PROVIDE RETRO-REFLECTORISED PAVEMENT MARKERS TO COUNCIL AND TfNSW. REQUIREMENTS.
8. ALL LINEMARKING TO BE WHITE IN COLOUR WITH THE EXCEPTION OF C2 AND C3 LINES ARE TO BE YELLOW.
9. ALL SIGNAGE TO BE IN ACCORDANCE WITH THE CURRENT VERSION OF THE TfNSW. REGULATORY SIGNS MANUAL.
10. RELOCATE OR REMOVE EXISTING SIGNS AS REQUIRED.
11. PROVIDE ADEQUATE APPROACH WARNING SIGNS DURING AND AFTER CONSTRUCTION.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
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Project
SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title
SPECIFICATION NOTES

SHEET 02

Scale: NTS
Date: 23/12/2022
Size: A1
Datum: MGA2020

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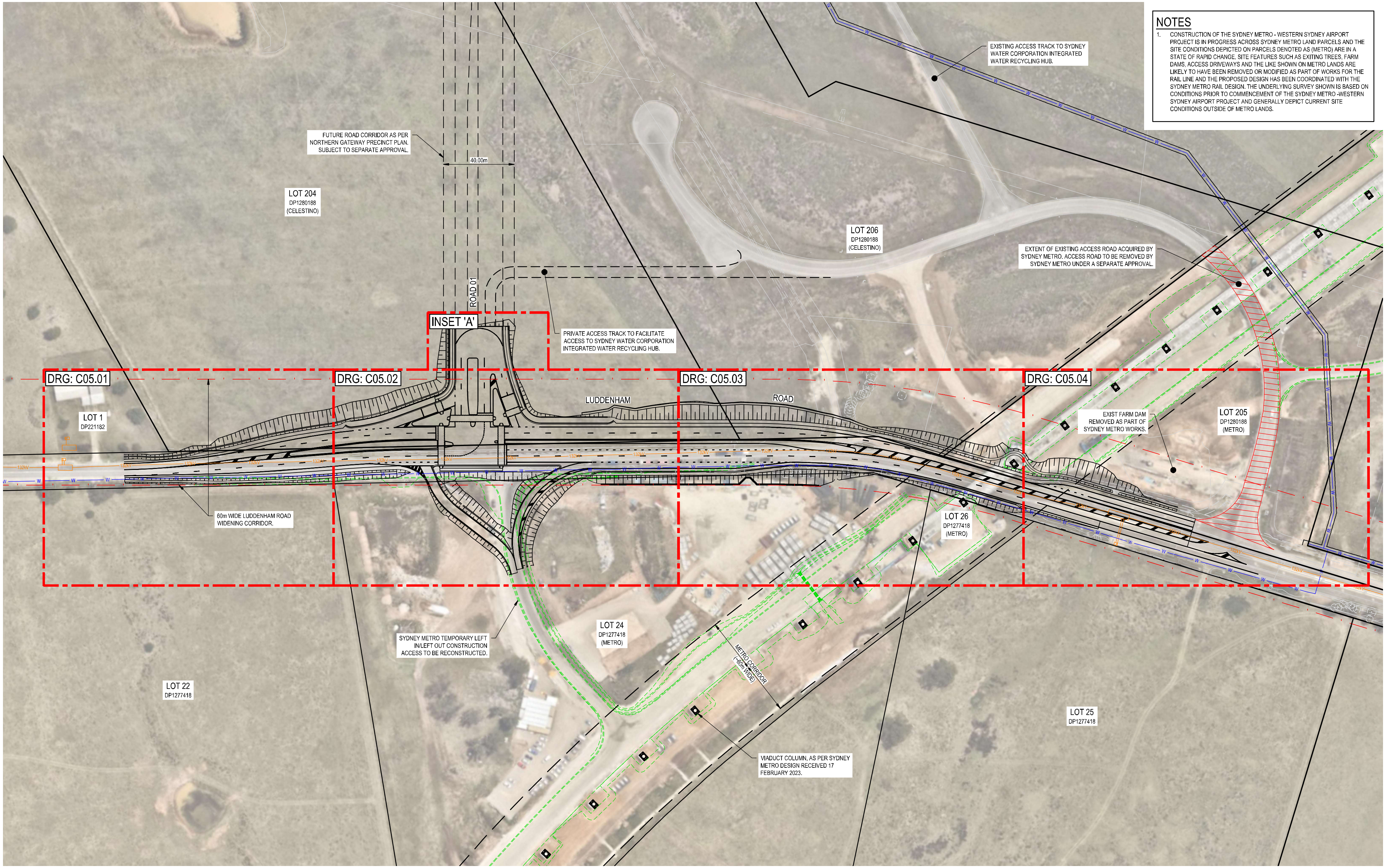
DATE PLOTTED: 19 December 2023 11:40 AM BY : SHAWN HOTONG
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DA\C01-DA\180001-01-DA-C01.21-C01.22-SPECIFICATIONS NOTES.dwg




## NOTES

1. CONSTRUCTION OF THE SYDNEY METRO - WESTERN SYDNEY AIRPORT PROJECT IS IN PROGRESS ACROSS SYDNEY METRO LAND PARCELS AND THE SITE CONDITIONS DEPICTED ON PARCELS DENOTED AS (METRO) ARE IN A STATE OF RAPID CHANGE. SITE FEATURES SUCH AS EXITING TREES, FARM DAMS, ACCESS DRIVEWAYS AND THE LIKE SHOWN ON METRO LANDS ARE LIKELY TO HAVE BEEN REMOVED OR MODIFIED AS PART OF WORKS FOR THE RAIL LINE AND THE PROPOSED DESIGN HAS BEEN COORDINATED WITH THE SYDNEY METRO RAIL DESIGN. THE UNDERLYING SURVEY SHOWN IS BASED ON CONDITIONS PRIOR TO COMMENCEMENT OF THE SYDNEY METRO -WESTERN SYDNEY AIRPORT PROJECT AND GENERALLY DEPICT CURRENT SITE CONDITIONS OUTSIDE OF METRO LANDS.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 6 | 19/12/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 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: CELESTINO

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

North

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

Revision: 6

DATE PLOTTED: 19 December 2023 11:13 AM BY : SHAWN HOTONG

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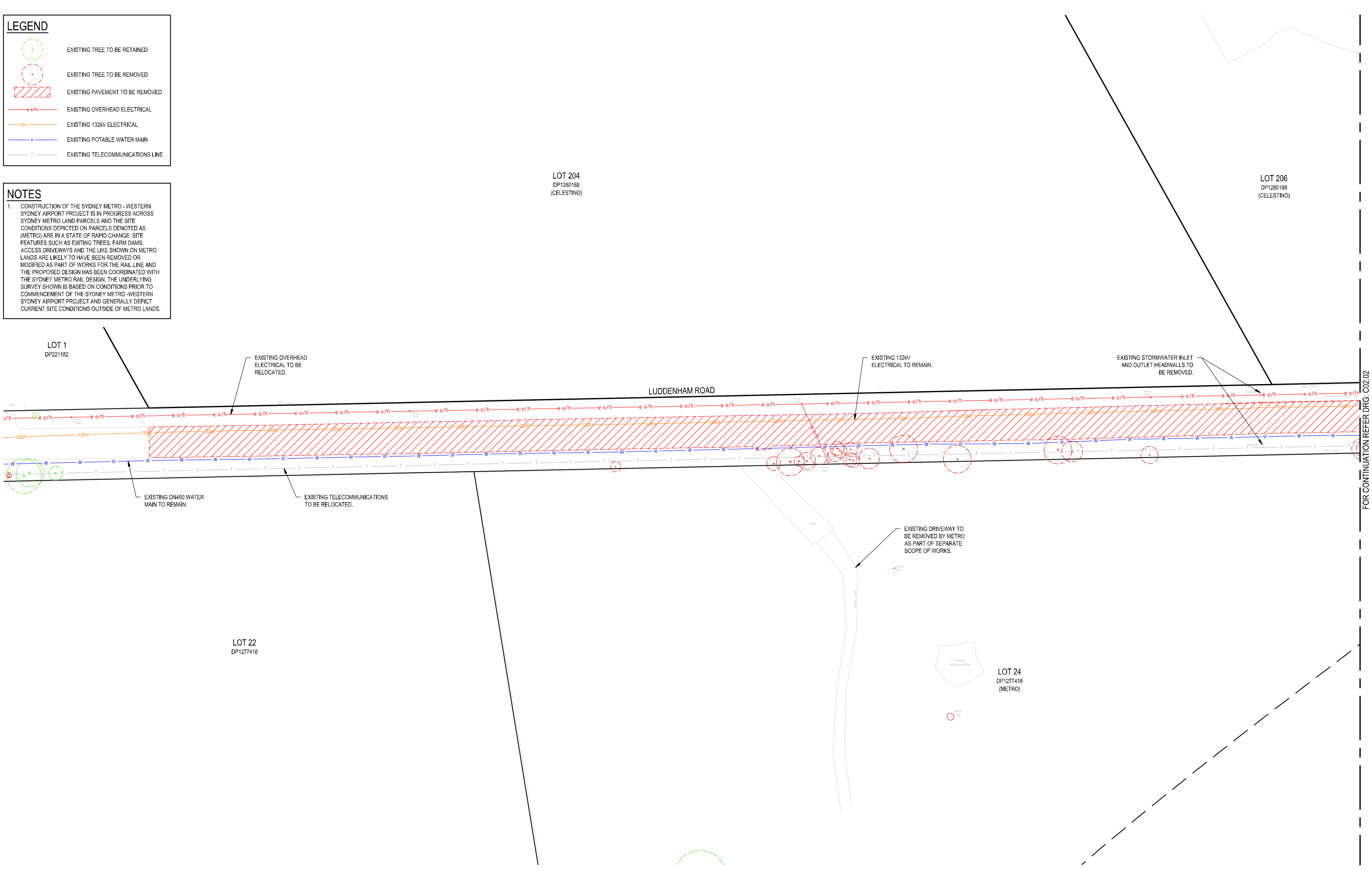


## LEGEND

- EXISTING TREE TO BE RETAINED
- EXISTING TREE TO BE REMOVED
- EXISTING PAVEMENT TO BE REMOVED
- EXISTING OVERHEAD ELECTRICAL
- EXISTING 132kV ELECTRICAL
- EXISTING POTABLE WATER MAIN
- EXISTING TELECOMMUNICATIONS LINE

## NOTES

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| 1 | 23/12/2022 | 70% PROGRESS ISSUE FOR REVIEW | CWH | JS | - | SH |

Client: CELESTINO

Scale: 0 10 20 30 40 50m SCALE 1:500 @A1

North



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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: ESTABLISHMENT AND DEMOLITION PLAN
SHEET 01

Scale: 1:500
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-C02.01

Revision: 6

DATE PLOTTED: 19 December 2023 11:14 AM BY : SHAWN HOTONG

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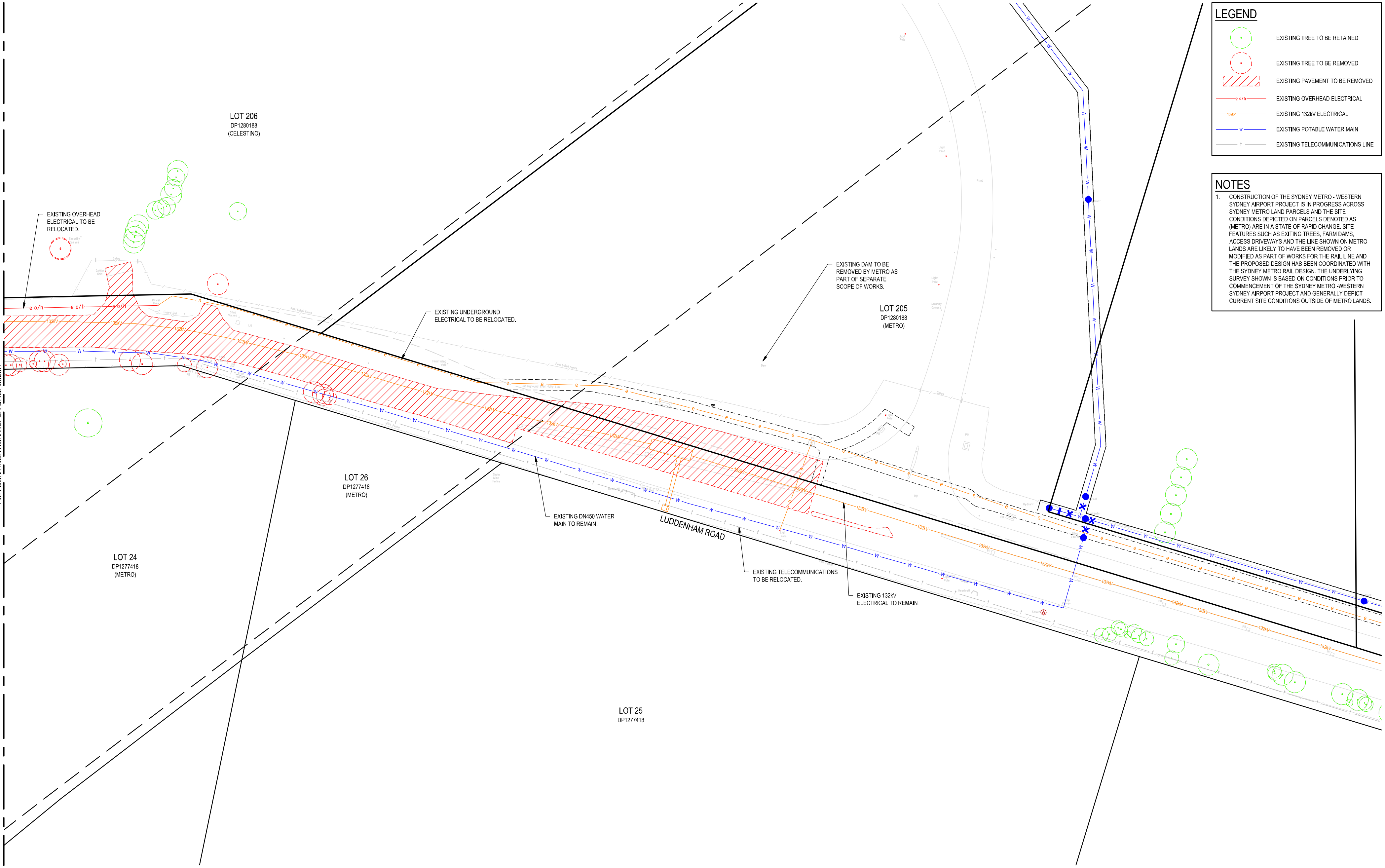


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- EXISTING TREE TO BE RETAINED
- EXISTING TREE TO BE REMOVED
- EXISTING PAVEMENT TO BE REMOVED
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- EXISTING 132kV ELECTRICAL
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## NOTES

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| 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

CELESTINO

Scale

0 10 20 30 40 50m

SCALE 1:500 @A1



North

enspire

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Phone: 02 9922 6135

Project
SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title
ESTABLISHMENT AND DEMOLITION PLAN

SHEET 02

Scale 1:500
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-C02.02

Revision
6

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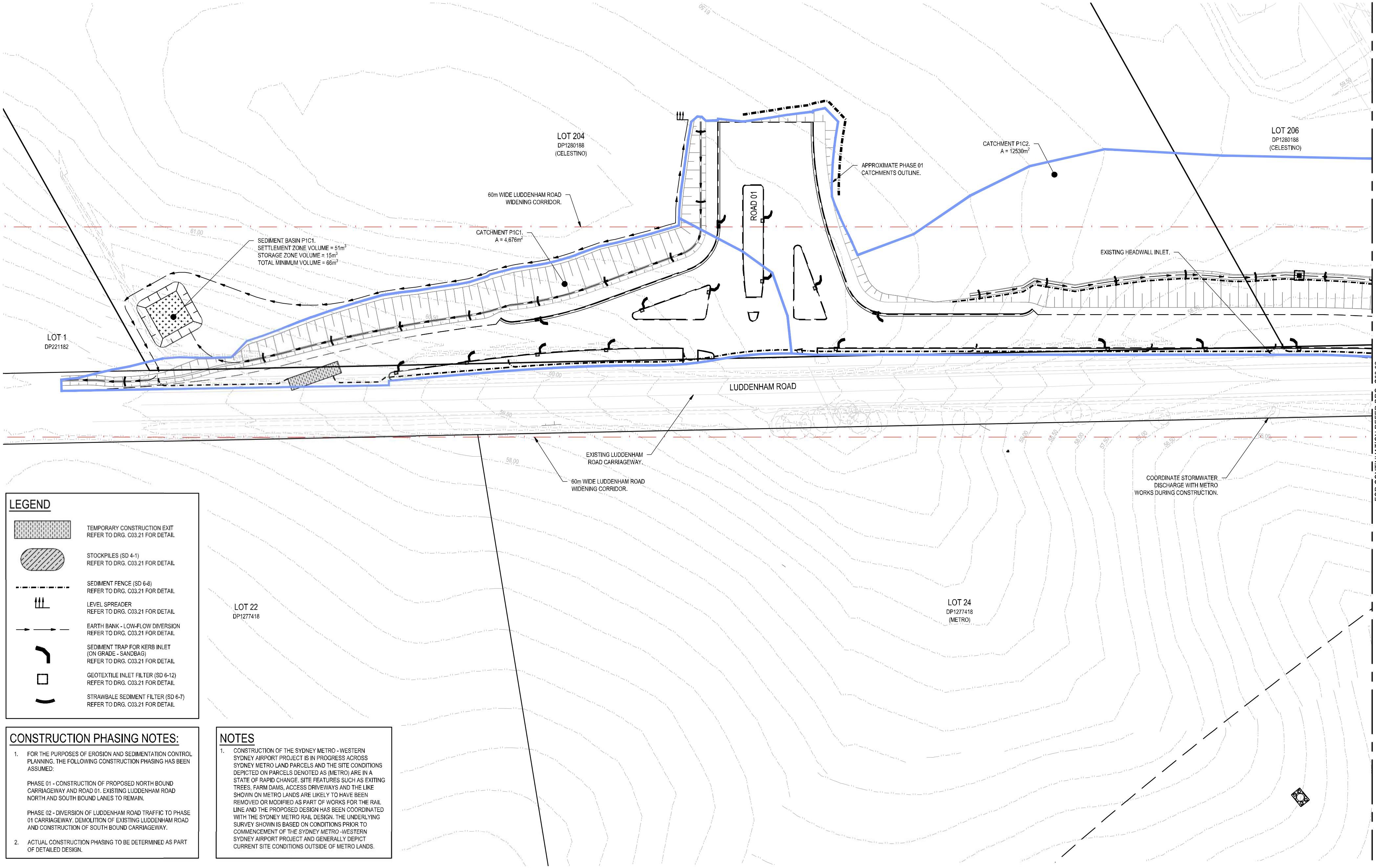


## LEGEND

- TEMPORARY CONSTRUCTION EXIT REFER TO DRG. C03.21 FOR DETAIL
- STOCKPILES (SD 4-1) REFER TO DRG. C03.21 FOR DETAIL
- SEDIMENT FENCE (SD 6-8) REFER TO DRG. C03.21 FOR DETAIL
- LEVEL SPREADER REFER TO DRG. C03.21 FOR DETAIL
- EARTH BANK - LOW-FLOW DIVERSION REFER TO DRG. C03.21 FOR DETAIL
- SEDIMENT TRAP FOR KERB INLET (ON GRADE - SANDBAG) REFER TO DRG. C03.21 FOR DETAIL
- GEOTEXTILE INLET FILTER (SD 6-12) REFER TO DRG. C03.21 FOR DETAIL
- STRAWBALE SEDIMENT FILTER (SD 6-7) REFER TO DRG. C03.21 FOR DETAIL

## CONSTRUCTION PHASING NOTES:

1. FOR THE PURPOSES OF EROSION AND SEDIMENTATION CONTROL PLANNING, THE FOLLOWING CONSTRUCTION PHASING HAS BEEN ASSUMED:

   PHASE 01 - CONSTRUCTION OF PROPOSED NORTH BOUND CARRIAGEWAY AND ROAD 01. EXISTING LUDDENHAM ROAD NORTH AND SOUTH BOUND LANES TO REMAIN.

   PHASE 02 - DIVERSION OF LUDDENHAM ROAD TRAFFIC TO PHASE 01 CARRIAGEWAY. DEMOLITION OF EXISTING LUDDENHAM ROAD AND CONSTRUCTION OF SOUTH BOUND CARRIAGEWAY.

2. ACTUAL CONSTRUCTION PHASING TO BE DETERMINED AS PART OF DETAILED DESIGN.

## NOTES

1. CONSTRUCTION OF THE SYDNEY METRO - WESTERN SYDNEY AIRPORT PROJECT IS IN PROGRESS ACROSS SYDNEY METRO LAND PARCELS AND THE SITE CONDITIONS DEPICTED ON PARCELS DENOTED AS (METRO) ARE IN A STATE OF RAPID CHANGE. SITE FEATURES SUCH AS EXITING TREES, FARM DAMS, ACCESS DRIVEWAYS AND THE LIKE SHOWN ON METRO LANDS ARE LIKELY TO HAVE BEEN REMOVED OR MODIFIED AS PART OF WORKS FOR THE RAIL LINE AND THE PROPOSED DESIGN HAS BEEN COORDINATED WITH THE SYDNEY METRO RAIL DESIGN. THE UNDERLYING SURVEY SHOWN IS BASED ON CONDITIONS PRIOR TO COMMENCEMENT OF THE SYDNEY METRO -WESTERN SYDNEY AIRPORT PROJECT AND GENERALLY DEPICT CURRENT SITE CONDITIONS OUTSIDE OF METRO LANDS.

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| 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: CELESTINO

Scale: 0 10 20 30 40 50m — SCALE 1:500 @A1

North



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ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

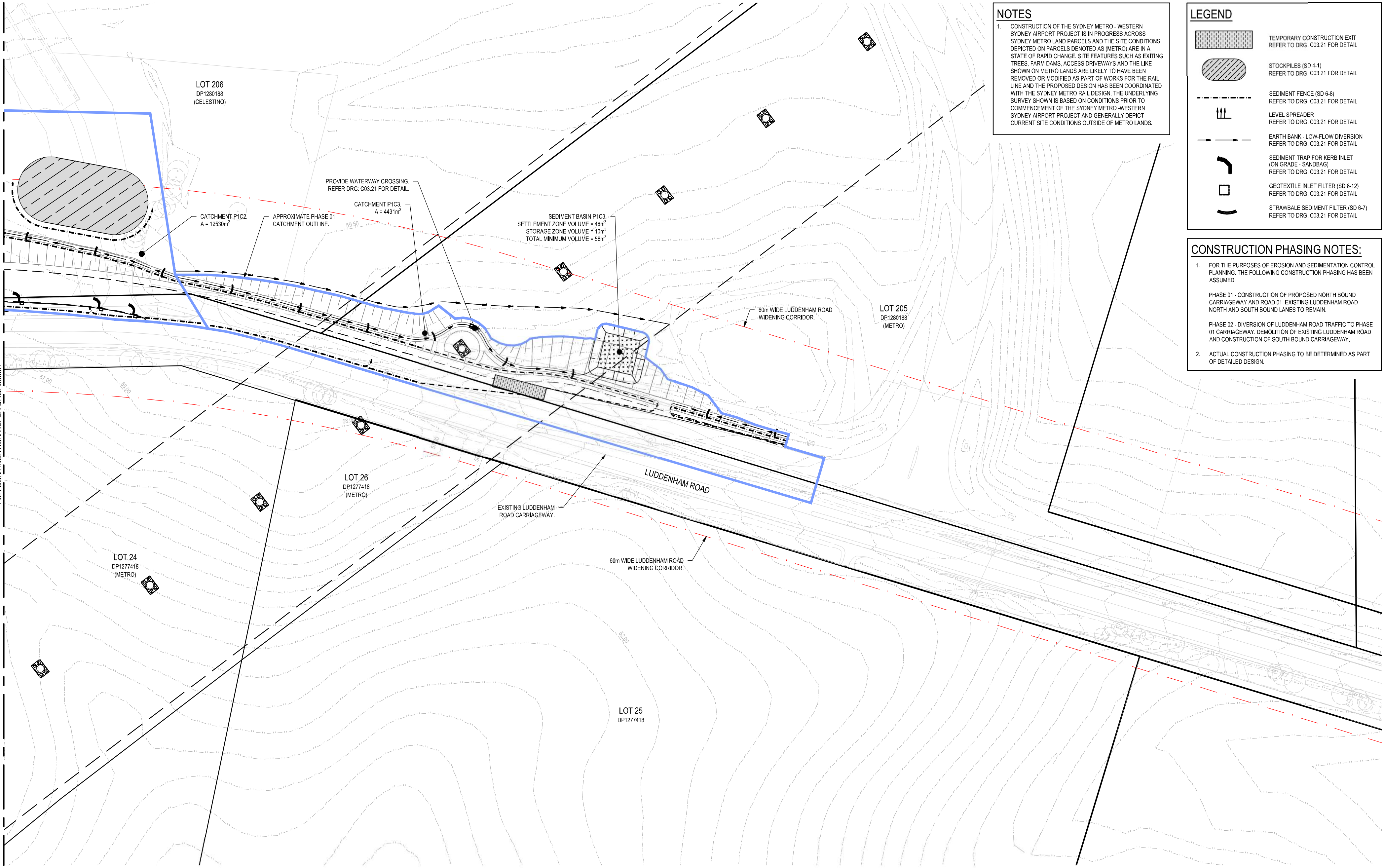
Title: EROSION AND SEDIMENTATION CONTROL PLAN
INDICATIVE CONSTRUCTION PHASE 01
SHEET 01

Scale: 1:500
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-C03.01
Revision: 6

DATE PLOTTED: 19 December 2023 11:14 AM BY : SHAWN HOTONG
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C03.01-C03.02-EROSION AND SEDIMENTATION CONTROL PLAN INDICATIVE CONSTRUCTION PHASE 01.dwg

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## LEGEND

- TEMPORARY CONSTRUCTION EXIT REFER TO DRG. C03.21 FOR DETAIL
- STOCKPILES (SD 4-1) REFER TO DRG. C03.21 FOR DETAIL
- SEDIMENT FENCE (SD 6-8) REFER TO DRG. C03.21 FOR DETAIL
- LEVEL SPREADER REFER TO DRG. C03.21 FOR DETAIL
- EARTH BANK - LOW-FLOW DIVERSION REFER TO DRG. C03.21 FOR DETAIL
- SEDIMENT TRAP FOR KERB INLET (ON GRADE - SANDBAG) REFER TO DRG. C03.21 FOR DETAIL
- GEOTEXTILE INLET FILTER (SD 6-12) REFER TO DRG. C03.21 FOR DETAIL
- STRAWBALE SEDIMENT FILTER (SD 6-7) REFER TO DRG. C03.21 FOR DETAIL

## CONSTRUCTION PHASING NOTES:

1. FOR THE PURPOSES OF EROSION AND SEDIMENTATION CONTROL PLANNING, THE FOLLOWING CONSTRUCTION PHASING HAS BEEN ASSUMED:

   PHASE 01 - CONSTRUCTION OF PROPOSED NORTH BOUND CARRIAGEWAY AND ROAD 01. EXISTING LUDDENHAM ROAD NORTH AND SOUTH BOUND LANES TO REMAIN.

   PHASE 02 - DIVERSION OF LUDDENHAM ROAD TRAFFIC TO PHASE 01 CARRIAGEWAY. DEMOLITION OF EXISTING LUDDENHAM ROAD AND CONSTRUCTION OF SOUTH BOUND CARRIAGEWAY.

2. ACTUAL CONSTRUCTION PHASING TO BE DETERMINED AS PART OF DETAILED DESIGN.

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Client: CELESTINO

Scale: 0 10 20 30 40 50m — SCALE 1:500 @A1

North



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Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: EROSION AND SEDIMENTATION CONTROL PLAN
INDICATIVE CONSTRUCTION PHASE 01
SHEET 02

Scale: 1:500
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
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Project Number/Drawing Number: 180001-01-DA-C03.02
Revision: 6

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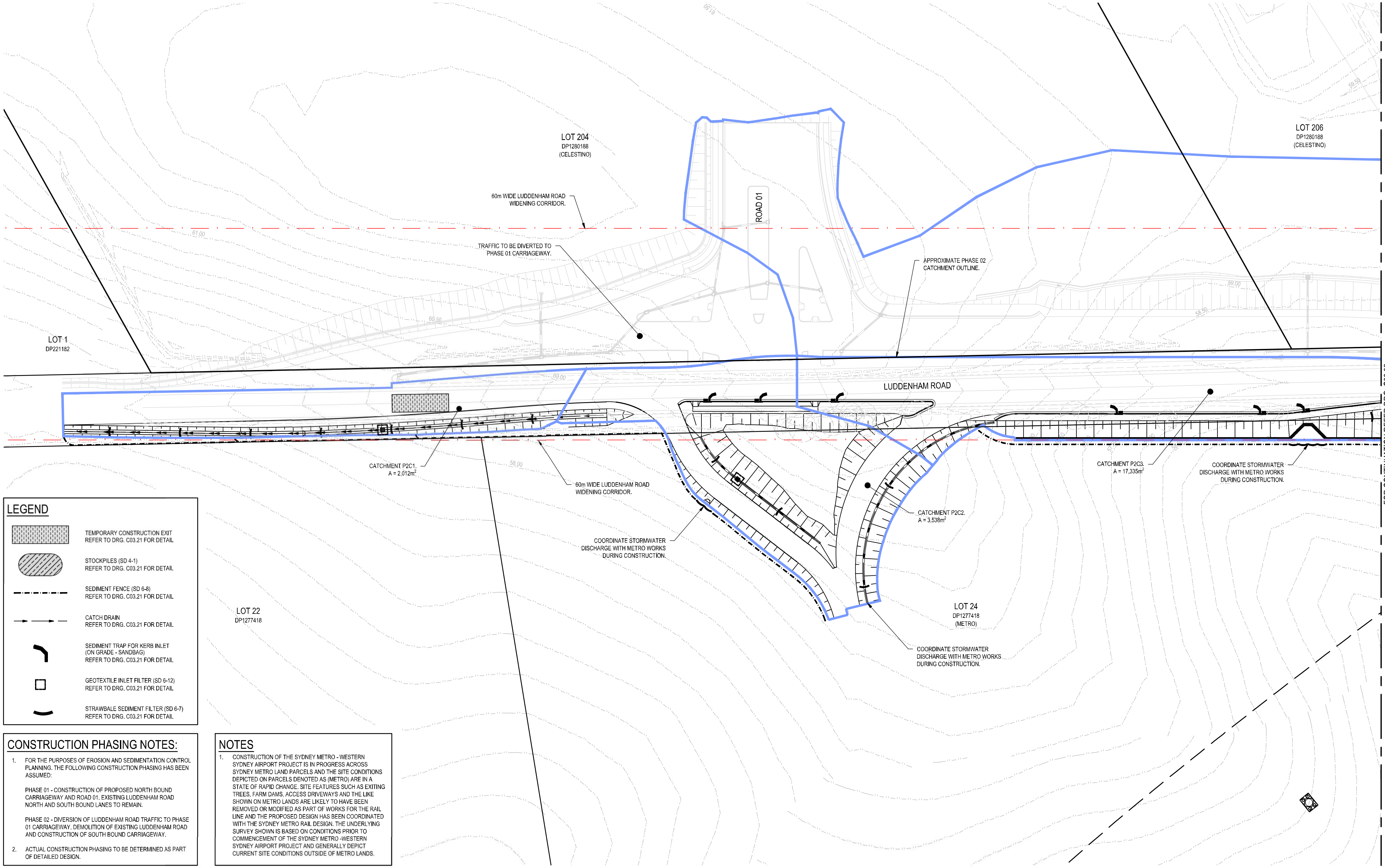


## LEGEND

| | |
|---|---|
| | TEMPORARY CONSTRUCTION EXIT REFER TO DRG. C03.21 FOR DETAIL |
| | STOCKPILES (SD 4-1) REFER TO DRG. C03.21 FOR DETAIL |
| | SEDIMENT FENCE (SD 6-8) REFER TO DRG. C03.21 FOR DETAIL |
| | CATCH DRAIN REFER TO DRG. C03.21 FOR DETAIL |
| | SEDIMENT TRAP FOR KERB INLET (ON GRADE - SANDBAG) REFER TO DRG. C03.21 FOR DETAIL |
| | GEOTEXTILE INLET FILTER (SD 6-12) REFER TO DRG. C03.21 FOR DETAIL |
| | STRAWBALE SEDIMENT FILTER (SD 6-7) REFER TO DRG. C03.21 FOR DETAIL |

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2. ACTUAL CONSTRUCTION PHASING TO BE DETERMINED AS PART OF DETAILED DESIGN.

## NOTES

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Client: CELESTINO

Scale: 0 10 20 30 40 50m SCALE 1:500 @A1

North



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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: EROSION AND SEDIMENTATION CONTROL PLAN INDICATIVE CONSTRUCTION PHASE 02 SHEET 01

Scale: 1:500 | Date: 6/04/2023 | Size: A1 | Datum: MGA2020

Status: FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C03.03 | Revision: 5

DATE PLOTTED: 19 December 2023 11:15 AM BY : SHAWN HOTONG
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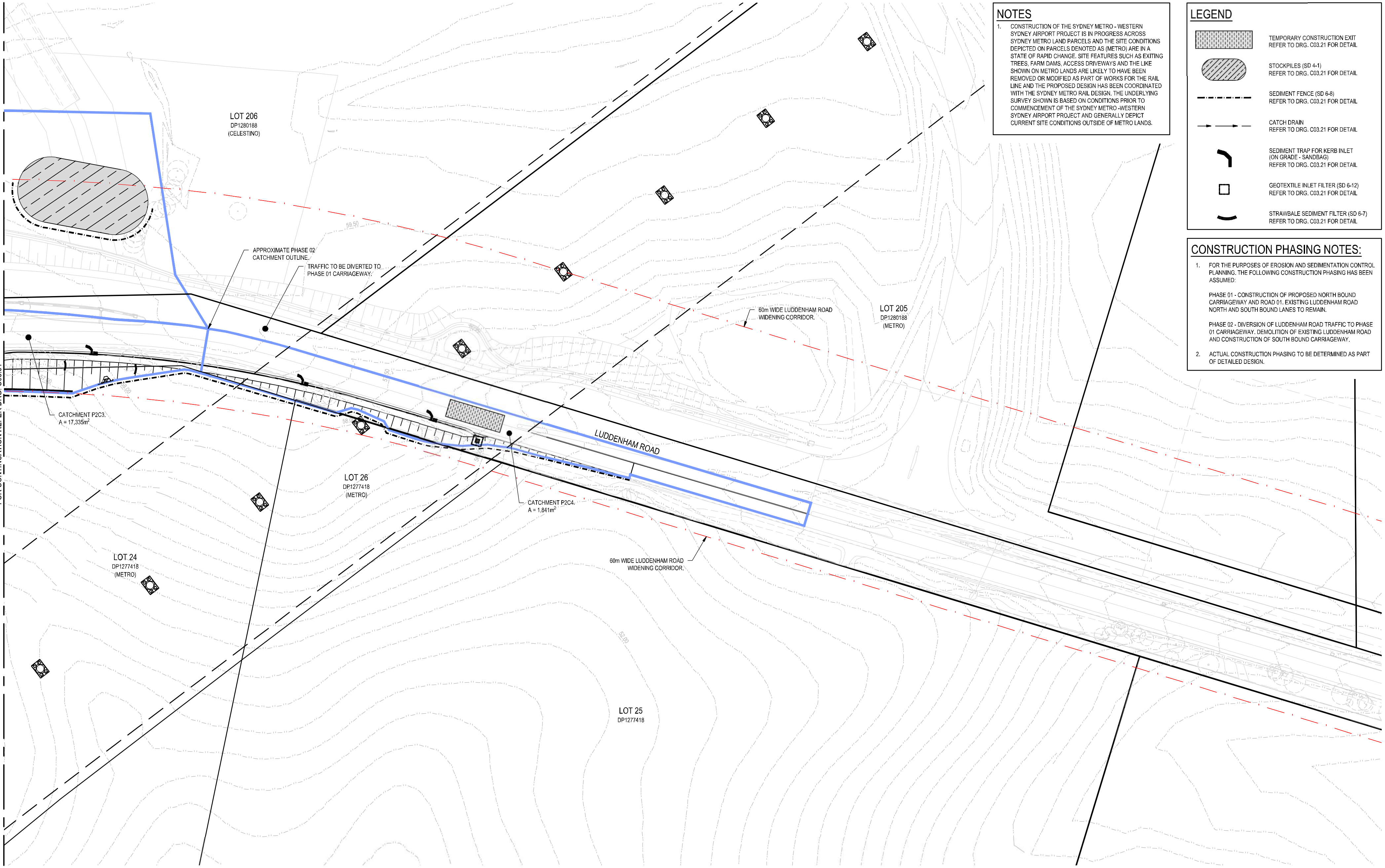


FOR CONTINUATION REFER DRG. C03.01

## NOTES

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## LEGEND

- TEMPORARY CONSTRUCTION EXIT REFER TO DRG. C03.21 FOR DETAIL
- STOCKPILES (SD 4-1) REFER TO DRG. C03.21 FOR DETAIL
- SEDIMENT FENCE (SD 6-8) REFER TO DRG. C03.21 FOR DETAIL
- CATCH DRAIN REFER TO DRG. C03.21 FOR DETAIL
- SEDIMENT TRAP FOR KERB INLET (ON GRADE - SANDBAG) REFER TO DRG. C03.21 FOR DETAIL
- GEOTEXTILE INLET FILTER (SD 6-12) REFER TO DRG. C03.21 FOR DETAIL
- STRAWBALE SEDIMENT FILTER (SD 6-7) REFER TO DRG. C03.21 FOR DETAIL

## CONSTRUCTION PHASING NOTES:

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   PHASE 02 - DIVERSION OF LUDDENHAM ROAD TRAFFIC TO PHASE 01 CARRIAGEWAY. DEMOLITION OF EXISTING LUDDENHAM ROAD AND CONSTRUCTION OF SOUTH BOUND CARRIAGEWAY.

2. ACTUAL CONSTRUCTION PHASING TO BE DETERMINED AS PART OF DETAILED DESIGN.

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Client: CELESTINO

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Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: EROSION AND SEDIMENTATION CONTROL PLAN
INDICATIVE CONSTRUCTION PHASE 02
SHEET 02

Scale: 1:500
Date: 6/04/2023
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
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Project Number/Drawing Number: 180001-01-DA-C03.04
Revision: 5

DATE PLOTTED: 19 December 2023 11:16 AM BY : SHAWN HOTONG

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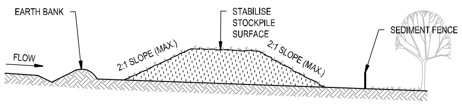
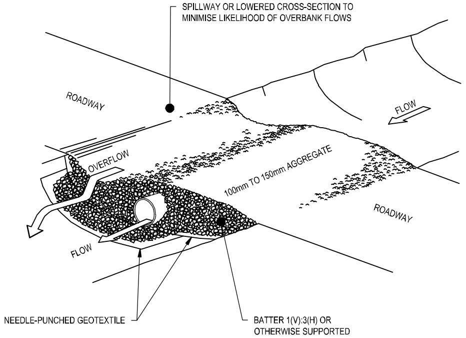


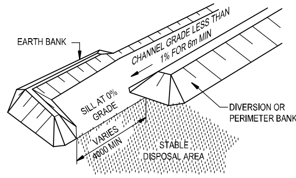

CONSTRUCTION NOTES
1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2m DOWNSLOPE.

## STOCKPILES (SD 4-1)



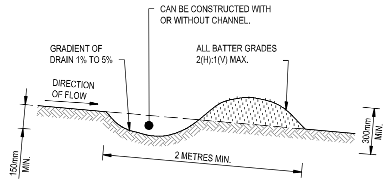

CONSTRUCTION NOTES
1. PROHIBIT ALL TRAFFIC UNTIL THE ACCESS WAY IS CONSTRUCTED.
2. STRIP ANY TOPSOIL AND PLACE A NEEDLE-PUNCHED TEXTILE OVER THE BASE OF THE CROSSING.
3. PLACE CLEAN, RIGID, NON POLLUTING AGGREGATE OR GRAVEL IN THE 100mm TO 150mm SIZE CLASS OVER THE FABRIC TO A MINIMUM DEPTH OF 200mm.
4. PROVIDE A 3m WIDE CARRIAGEWAY WITH SUFFICIENT LENGTH OF CULVERT PIPE TO ALLOW LESS THAN A 3(H): 1 (V) SLOPE ON SIDE BATTERS.
5. INSTALL A LOWER SECTION TO ACT AS AN EMERGENCY SPILLWAY IN GREATER THAN DESIGN STORM EVENTS.
6. ENSURE THAT CULVERT OUTLETS EXTEND BEYOND THE TOE OF FILL EMBANKMENTS.

## GRAVEL WATERWAY CROSSING (SD 5-1)




## LEVEL SPREADER

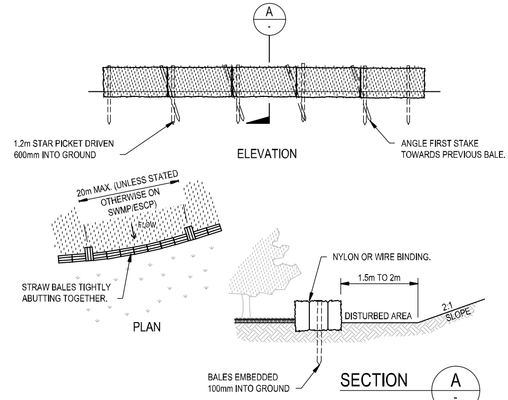
NOT TO SCALE




CONSTRUCTION NOTES
1. BUILD WITH GRADIENTS BETWEEN 1 AND 5 PERCENT.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V SHAPED.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION.

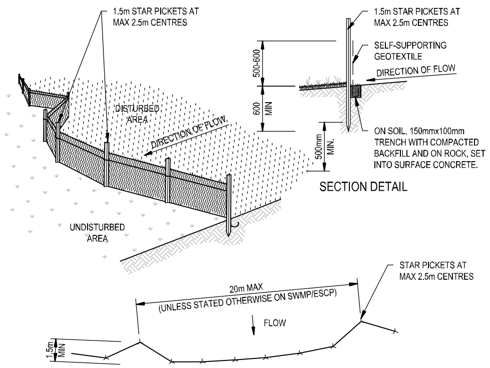
NOTE: ONLY TO BE USED AS TEMPORARY BANK WHERE MAXIMUM UPSLOPE LENGTH IS 80 METRES.

## EARTH BANK - LOW FLOW (SD 5-5)



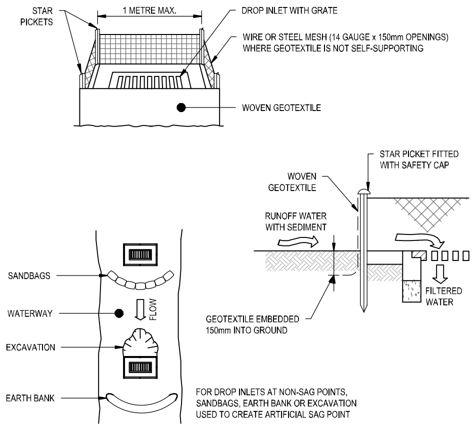

CONSTRUCTION NOTES
1. CONSTRUCT THE STRAW BALE FILTER AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE.
2. PLACE BALES LENGTHWISE IN A ROW WITH ENDS TIGHTLY ABUTTING. USE STRAW TO FILL ANY GAPS BETWEEN BALES. STRAWS ARE TO BE PLACED PARALLEL TO GROUND.
3. ENSURE THAT THE MAXIMUM HEIGHT OF THE FILTER IS ONE BALE.
4. EMBED EACH BALE IN THE GROUND 75mm TO 100mm AND ANCHOR WITH TWO 1.2 METRE STAR PICKETS OR STAKES. ANGLE THE FIRST STAR PICKET OR STAKE IN EACH BALE TOWARDS THE PREVIOUSLY LAID BALE. DRIVE THEM 600mm INTO THE GROUND AND, IF POSSIBLE, FLUSH WITH THE TOP OF THE BALES. WHERE STAR PICKETS ARE USED AND THEY PROTRUDE ABOVE THE BALES, ENSURE THEY ARE FITTED WITH SAFETY CAPS.
5. WHERE A STRAW BALE FILTER IS CONSTRUCTED DOWNSLOPE FROM A DISTURBED BATTER, ENSURE THE BALES ARE PLACED 1 TO 2 METRES DOWNSLOPE FROM THE TOE.
6. ESTABLISH A MAINTENANCE PROGRAM THAT ENSURES THE INTEGRITY OF THE BALES IS RETAINED - THEY COULD REQUIRE REPLACEMENT EACH TWO TO FOUR MONTHS.

## STRAW BALE FILTER (SD 6-7)



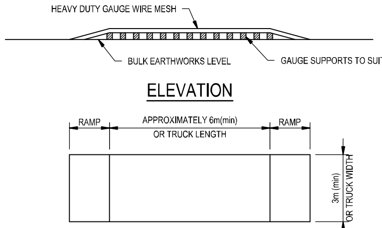

CONSTRUCTION NOTES
1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

## SEDIMENT FENCE (SD 6-8)



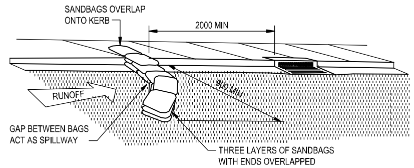

CONSTRUCTION NOTES
1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. FOLLOW STANDARD DRAWING 6-7 AND STANDARD DRAWING 6-8 FOR INSTALLATION PROCEDURES FOR THE STRAW BALES OR GEOFABRIC. REDUCE THE PICKET SPACING TO 1 METRE CENTRES.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILE UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

## GEOTEXTILE INLET FILTER (SD 6-12)



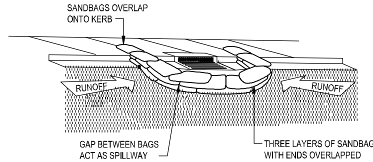

## TEMPORARY CONSTRUCTION EXIT (SHAKER PAD DETAIL)

THE EXIT SHALL BE MAINTAINED IN A CONDITION WHICH PREVENTS TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS OF WAY. THIS MAY REQUIRE REPAIR AND OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS OF WAY MUST BE REMOVED IMMEDIATELY.




## SEDIMENT TRAP FOR KERB INLET (ON GRADE - SANDBAG)

NOT TO SCALE




## SEDIMENT TRAP FOR KERB INLET (AT LOW POINT - SANDBAG)

NOT TO SCALE

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 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 |

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Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: EROSION AND SEDIMENTATION CONTROL DETAILS
SHEET 01

Scale: NTS
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-C03.21

Revision: 5

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C03.21-C03.22-EROSION AND SEDIMENTATION CONTROL DETAILS.dwg

DATE PLOTTED: 19 December 2023 11:40 AM BY : SHAWN HOTONG

## INDICATIVE MAINTENANCE SCHEDULE

| CONTROL ELEMENT | MAINTENANCE FREQUENCY | INSPECTION REQUIREMENTS |
|---|---|---|
| DIVERSION DRAINS | > MONTHLY AND/OR FOLLOWING A RAINFALL EVENT. | > CHECK STATE OF CHANNEL IS FREE DRAINING AND FREE OF DEBRIS OR BLOCKAGE. TRIM OVERGROWTH AND REMOVE BLOCKAGES WHERE REQUIRED.<br>> CHECK CHANNEL ALIGNMENT OR FORMATION HAS NOT BEEN ADVERSELY ALTERED. RECTIFY DEFECTS WITHIN 48 HOURS. |
| STRAW BALE FILTERS | > MONTHLY AND/OR FOLLOWING A RAINFALL EVENT. | > CHECK STRAW BALE FILTERS ARE TIGHTLY BOUND AND ANCHORED. RECTIFY DEFECTS WITHIN 48 HOURS.<br>> CHECK FOR EXCESS SEDIMENT BUILD UP AND REMOVE WHERE REQUIRED. |
| SEDIMENT FENCES | > MONTHLY AND/OR FOLLOWING A RAINFALL EVENT. | > CHECK SEDIMENT FENCES ARE APPROPRIATELY POSITIONED AND ANCHORED. RECTIFY DEFECTS WITHIN 48 HOURS.<br>> CHECK FOR EXCESS SEDIMENT BUILD UP AND REMOVE WHERE REQUIRED.<br>> CHECK FOR STANDING WATER AND DEWATER IN ACCORDANCE WITH SEDIMENT BASIN DEWATERING METHODOLOGY. ALTERNATIVELY TRANSFER SEDIMENT LADEN WATER TO SEDIMENT BASINS TO CONSOLIDATE TREATMENT ONLY WHERE SEDIMENT BASINS HAVE CAPACITY TO STORE TRANSFERRED WATER. |
| PIT INLET FILTERS | > MONTHLY AND/OR FOLLOWING A RAINFALL EVENT. | > CHECK PIT INLET FILTERS ARE CORRECTLY POSITIONED AND ANCHORED. RECTIFY DEFECTS WITHIN 48 HOURS.<br>> CHECK FOR EXCESS SEDIMENT BUILD UP AND REMOVE WHERE REQUIRED. |
| CONSTRUCTION EXITS | > WEEKLY AND/OR FOLLOWING A RAINFALL EVENT. | > CHECK CONSTRUCTION EXITS HAVE ADEQUATE SEDIMENT AND SOIL STORAGE. REMOVE EXCESS SEDIMENT AND SOILS.<br>> CHECK DIVERSION DRAIN TO NEAREST SEDIMENT CONTROL FENCE OR SEDIMENT CONTROL BASIN IS AVAILABLE AND UNIMPEDED.<br>> CONVERT TO WASH DOWN CONSTRUCTION EXIT WHERE EXCESSIVE SEDIMENT IS OBSERVED ON DEPARTURE AREAS. |
| SEDIMENT BASINS | > WEEKLY AND/OR FOLLOWING A RAINFALL EVENT. | > CHECK GENERAL STATE OF SEDIMENT BASINS ARE OPERATING AS PER DESIGN DRAWING (E.G. DEPTHS, OVERFLOW WEIRS, OVERFLOW DIRECTION). RECTIFY DEFECTS WITHIN 48 HOURS.<br>> ENSURE COMPLETE SETTLEMENT OF SEDIMENT WITHIN 5 DAYS OF RAINFALL. FLOCCULATE SEDIMENT LADEN WATER WHERE NECESSARY TO ENSURE SETTLEMENT WITHIN 5 DAYS OF RAINFALL.<br>> CHECK SEDIMENT STORAGE ZONE CAPACITY AND REMOVE ALL STORED SEDIMENT ONCE STORAGE IS EXCEEDED.<br>> DISPOSE OF SETTLEMENT ZONE WATER PRIOR TO NEXT FORECAST RAINFALL. TEST WATER PRIOR TO DISPOSAL AND DISPOSE ONLY WHERE TOTAL SUSPENDED SOLIDS IS EQUAL TO OR LESS THAN 50MG/L AND PH LEVELS BETWEEN 6.5-8.5. |

## 1. Erosion Hazard and Sediment Basins

**Site Name:** Sydney Science Park

**Site Location:** Penrith - Luddenham Road

**Precinct/Stage:** Interim Signalised Intersection (LUD3)

**Other Details:** Soil Type D assumed

| Site area | Sub-catchment or Name of Structure | | | | | | Notes |
|---|---|---|---|---|---|---|---|
| | P1C1 | P1C2 | P1C3 | | | | |
| Total catchment area (ha) | 0.47 | 1.25 | 0.44 | | | | |
| Disturbed catchment area (ha) | 0.47 | 0.63 | 0.44 | | | | |

**Soil analysis (enter sediment type if known, or laboratory particle size data)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sediment Type (C, F or D) if known: | D | D | D | | | | From Appendix C (if known) |
| % sand (fraction 0.02 to 2.00 mm) | | | | | | | Enter the percentage of each soil fraction. E.g. enter 10 for 10% |
| % silt (fraction 0.002 to 0.02 mm) | | | | | | | |
| % clay (fraction finer than 0.002 mm) | | | | | | | |
| Dispersion percentage | | | | | | | E.g. enter 10 for dispersion of 10% |
| % of whole soil dispersible | | | | | | | See Section 6.3.3(e). Auto-calculated |
| Soil Texture Group | D | D | D | | | | Automatic calculation from above |

**Rainfall data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Design rainfall depth (no of days) | 5 | 5 | 5 | | | | See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25. |
| Design rainfall depth (percentile) | 80 | 80 | 80 | | | | |
| x-day, y-percentile rainfall event (mm) | 21.8 | 21.8 | 21.8 | | | | |
| Rainfall R-factor (if known) | | | | | | | Only need to enter one or the other here |
| IFD: 2-year, 6-hour storm (if known) | 10.1 | 10.1 | 10.1 | | | | |

**RUSLE Factors**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rainfall erosivity (*R*-factor) | 2250 | 2250 | 2250 | | | | Auto-filled from above |
| Soil erodibility (*K*-factor) | 0.034 | 0.034 | 0.034 | | | | |
| Slope length (m) | 200 | 150 | 140 | | | | |
| Slope gradient (%) | 3 | 3 | 3 | | | | RUSLE LS factor calculated for a high rill/interrill ratio. |
| Length/gradient (*LS*-factor) | 1.01 | 0.88 | 0.85 | | | | |
| Erosion control practice (*P*-factor) | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | |
| Ground cover (*C*-factor) | 1 | 1 | 1 | 1 | 1 | 1 | |

**Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Storage (soil) zone design (no of months) | 3 | 3 | 3 | | | | Minimum is generally 2 months |
| Cv (Volumetric runoff coefficient) | 0.5 | 0.5 | 0.5 | | | | See Table F2, page F-4 in Appendix F |

**Calculations and Type D/F Sediment Basin Volumes**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Soil loss (t/ha/yr) | 100 | 87 | 84 | | | | |
| Soil Loss Class | 1 | 1 | 1 | | | | See Table 4.2, page 4-13 |
| Soil loss ($m^3$/ha/yr) | 77 | 67 | 65 | | | | Conversion to cubic metres |
| Sediment basin storage (soil) volume ($m^3$) | 9 | 11 | 7 | | | | See Sections 6.3.4(i) for calculations |
| Sediment basin settling (water) volume ($m^3$) | 51 | 136 | 48 | | | | See Sections 6.3.4(i) for calculations |
| Sediment basin total volume ($m^3$) | 60 | 147 | 55 | | | | |

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

## 1. Erosion Hazard and Sediment Basins

**Site Name:** Sydney Science Park

**Site Location:** Penrith - Luddenham Road

**Precinct/Stage:** Interim Signalised Intersection (LUD3)

**Other Details:** Soil Type D assumed

| Site area | Sub-catchment or Name of Structure | | | | | | Notes |
|---|---|---|---|---|---|---|---|
| | P2C1 | P2C2 | P2C3 | P2C4 | | | |
| Total catchment area (ha) | 0.2 | 0.48 | 1.9 | 0.23 | | | |
| Disturbed catchment area (ha) | 0.2 | 0.3 | 0.65 | 0.23 | | | |

**Soil analysis (enter sediment type if known, or laboratory particle size data)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sediment Type (C, F or D) if known: | D | D | D | D | | | From Appendix C (if known) |
| % sand (fraction 0.02 to 2.00 mm) | | | | | | | Enter the percentage of each soil fraction. E.g. enter 10 for 10% |
| % silt (fraction 0.002 to 0.02 mm) | | | | | | | |
| % clay (fraction finer than 0.002 mm) | | | | | | | |
| Dispersion percentage | | | | | | | E.g. enter 10 for dispersion of 10% |
| % of whole soil dispersible | | | | | | | See Section 6.3.3(e). Auto-calculated |
| Soil Texture Group | D | D | D | D | | | Automatic calculation from above |

**Rainfall data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Design rainfall depth (no of days) | | 5 | 5 | | | | See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25. |
| Design rainfall depth (percentile) | | 80 | 80 | | | | |
| x-day, y-percentile rainfall event (mm) | | 21.8 | 21.8 | | | | |
| Rainfall R-factor (if known) | | | | | | | Only need to enter one or the other here |
| IFD: 2-year, 6-hour storm (if known) | | 10.1 | 10.1 | | | | |

**RUSLE Factors**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rainfall erosivity (*R*-factor) | | 2250 | 2250 | | | | Auto-filled from above |
| Soil erodibility (*K*-factor) | 0.034 | 0.034 | 0.034 | 0.034 | | | |
| Slope length (m) | 150 | 70 | 150 | 120 | | | |
| Slope gradient (%) | 3 | 3 | 3 | 3 | | | RUSLE LS factor calculated for a high rill/interrill ratio. |
| Length/gradient (*LS*-factor) | 0.88 | 0.61 | 0.88 | 0.79 | | | |
| Erosion control practice (*P*-factor) | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | |
| Ground cover (*C*-factor) | 1 | 1 | 1 | 1 | 1 | 1 | |

**Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Storage (soil) zone design (no of months) | | 3 | 3 | | | | Minimum is generally 2 months |
| Cv (Volumetric runoff coefficient) | | 0.5 | 0.5 | | | | See Table F2, page F-4 in Appendix F |

**Calculations and Type D/F Sediment Basin Volumes**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Soil loss (t/ha/yr) | | 61 | 87 | | | | |
| Soil Loss Class | | 1 | 1 | | | | See Table 4.2, page 4-13 |
| Soil loss ($m^3$/ha/yr) | | 47 | 67 | | | | Conversion to cubic metres |
| Sediment basin storage (soil) volume ($m^3$) | | 4 | 11 | | | | See Sections 6.3.4(i) for calculations |
| Sediment basin settling (water) volume ($m^3$) | | 52 | 207 | | | | See Sections 6.3.4(i) for calculations |
| Sediment basin total volume ($m^3$) | | 56 | 218 | | | | |

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 3 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 2 | 27/04/2023 | ISSUED FOR DEVELOPMENT APPLICATION | GJI | JS | - | SH |
| 1 | 6/04/2023 | 90% PROGRESS ISSUE FOR REVIEW | CWH | JS | - | SH |

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Project
SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title
EROSION AND SEDIMENTATION CONTROL DETAILS
SHEET 02

Scale NTS
Date 6/04/2023
Size A1
Datum MGA2020

Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number
180001-01-DA-C03.22

Revision
3

DATE PLOTTED: 19 December 2023 11:40 AM BY : SHAWN HOTONG

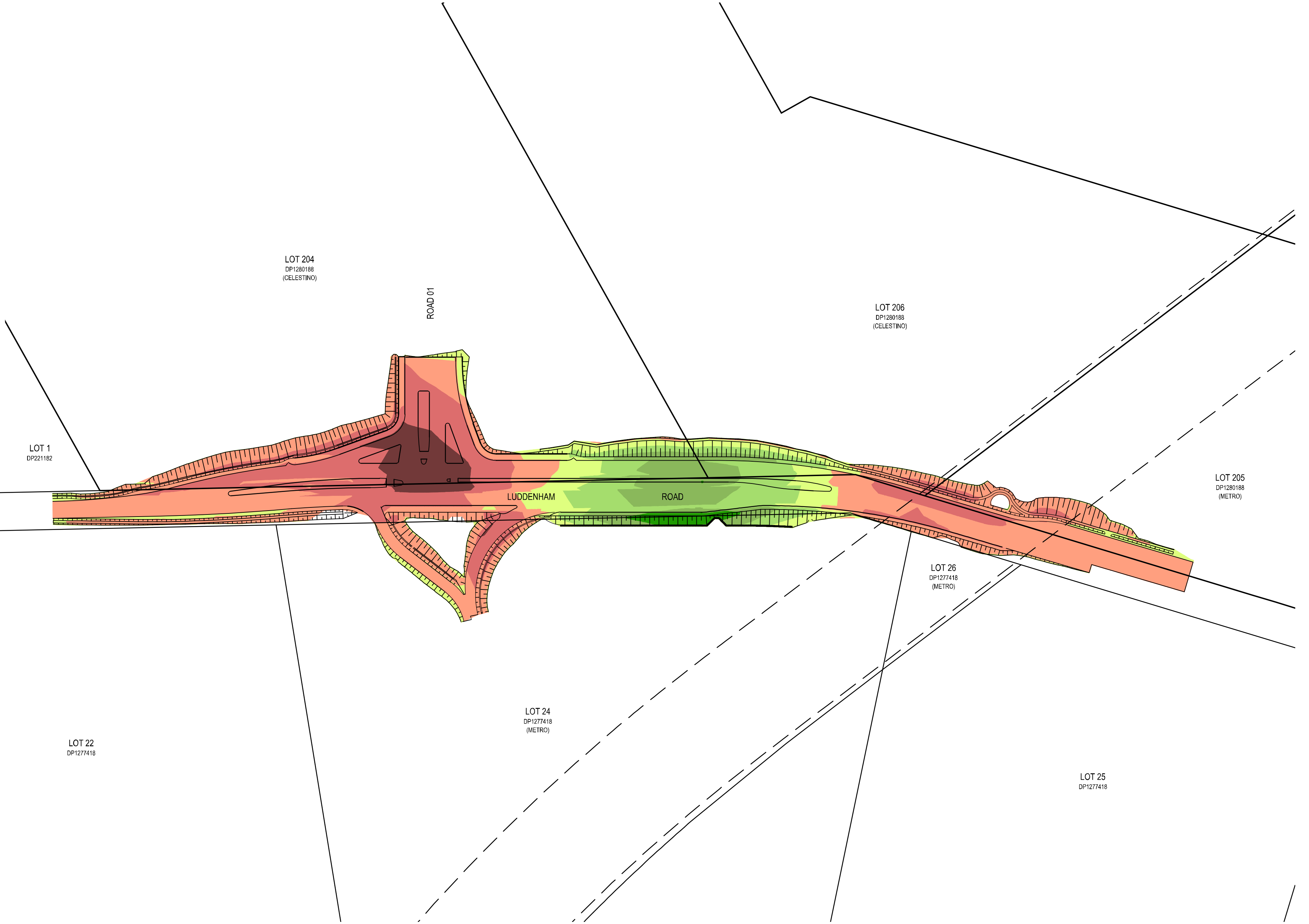
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C03.21-C03.22-EROSION AND SEDIMENTATION CONTROL DETAILS.dwg

## LEGEND

| | |
|---|---|
| (dark brown) | 2.0m TO 3.0m CUT |
| (red) | 1.0m TO 2.0m CUT |
| (salmon) | 0.0m TO 1.0m CUT |
| (pale yellow-green) | 0.0m TO 1.0m FILL |
| (light green) | 1.0m TO 2.0m FILL |
| (mid green) | 2.0m TO 3.0m FILL |
| (dark green) | 3.0m TO 4.0m FILL |

## NOTES:

1. REFER SPECIFICATION NOTES FOR GENERAL EARTHWORKS REQUIREMENTS.
2. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL/RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
3. NO ALLOWANCE HAS BEEN MADE FOR DETAILED EARTHWORKS. ie SERVICE TRENCHING, DETAILED EXCAVATION AND THE LIKE.
4. APPROXIMATE VOLUMES AS FOLLOWS;
   - 3.1 CUT -16,134 cu.m
   - 3.2 FILL +10,451 cu.m
   - 3.3 BALANCE 5,683 cu.m EXPORT




| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 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: CELESTINO

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

North: N



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Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: BULK EARTHWORKS CUT AND FILL PLAN

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

Status: FOR INFORMATION ONLY
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Revision: 5

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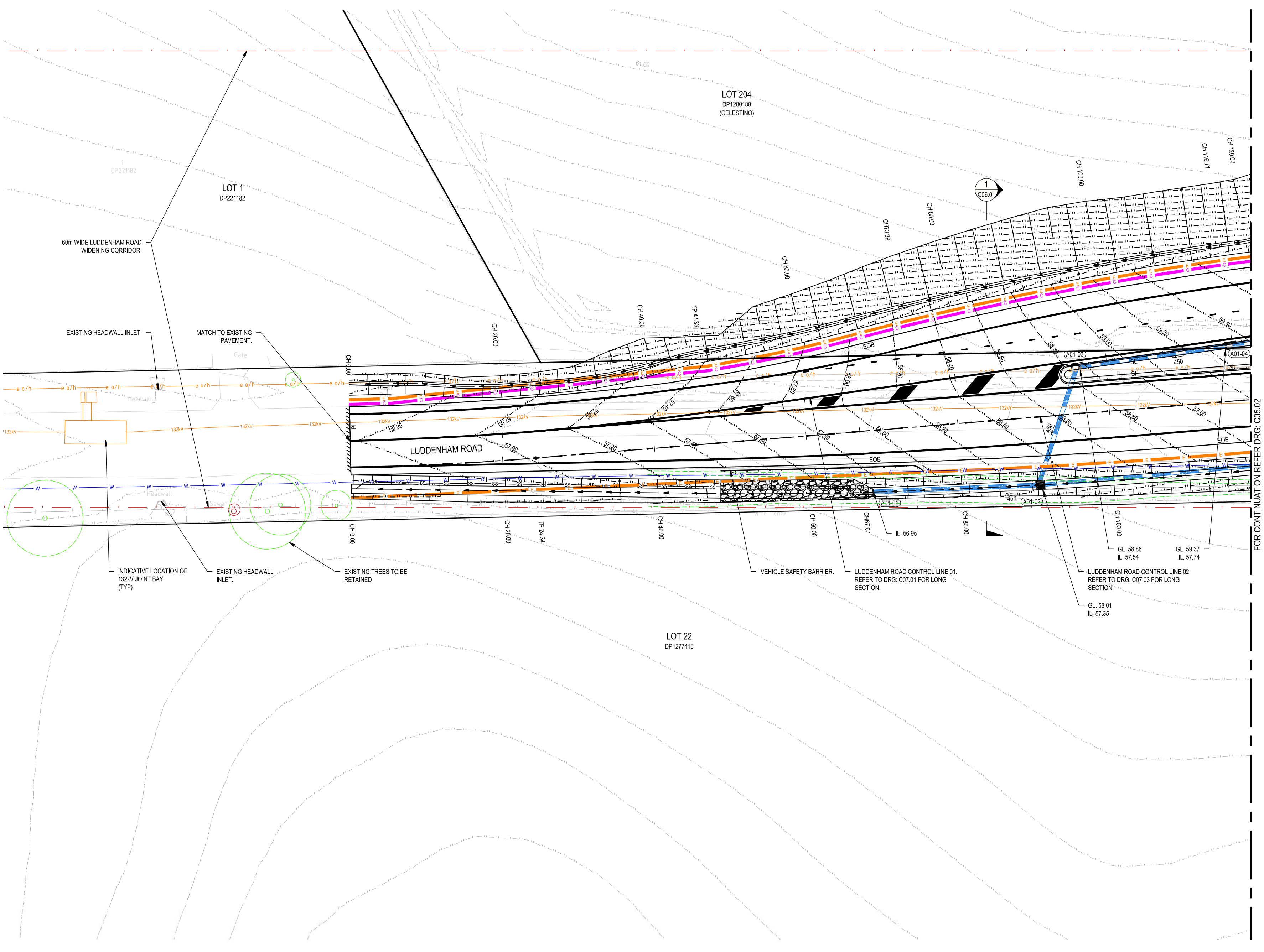
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C04.01-BULK EARTHWORKS CUT AND FILL PLAN.dwg

## LEGEND

| | |
|---|---|
| | PROPERTY BOUNDARY |
| 100.00 | CONTOUR |
| | BATTER 1IN 4 U.N.O |
| SA | BARRIER KERB AND CHANNEL REFER TfNSW STANDARD DRG: R0300-01 FOR DETAIL |
| SE | RAISED MEDIAN KERB WITH DRAINAGE REFER TfNSW STANDARD DRG: R0300-01 FOR DETAIL |
| SF | RAISED MEDIAN KERB REFER TfNSW STANDARD DRG: R0300-01 FOR DETAIL |
| PI | PAVEMENT INTERFACE |
| EOB | EDGE OF BITUMEN |
| RW01 | RETAINING WALL REFER DRG: C15.01 FOR ELEVATION |
| ● F 100.00 | FINISHED LEVEL |
| ● GL 100.00 | GRATE LEVEL |
| ● IL 100.00 | INVERT LEVEL |
| | GRASS LINED SWALE REFER DRG: C14.01 FOR DETAIL |
| | SCOUR PROTECTION |
| 375 | PIPE SIZE STORMWATER DRAINAGE LINE FLOW DIRECTION |
| A01/01 | STORMWATER LINE/PIT NUMBER |
| | KERB INLET PIT |
| | SURFACE INLET PIT/JUNCTION PIT |
| | HEADWALL |
| E | INDICATIVE INTERIM ELECTRICAL REFER NOTE 4 |
| C | INDICATIVE INTERIM TELECOMMUNICATIONS REFER NOTE 4 |




## NOTES:

1. CONSTRUCTION OF THE SYDNEY METRO - WESTERN SYDNEY AIRPORT PROJECT IS IN PROGRESS ACROSS SYDNEY METRO LAND PARCELS AND THE SITE CONDITIONS DEPICTED ON PARCELS DENOTED AS (METRO) ARE IN A STATE OF RAPID CHANGE. SITE FEATURES SUCH AS EXITING TREES, FARM DAMS, ACCESS DRIVEWAYS AND THE LIKE SHOWN ON METRO LANDS ARE LIKELY TO HAVE BEEN REMOVED OR MODIFIED AS PART OF WORKS FOR THE RAIL LINE AND THE PROPOSED DESIGN HAS BEEN COORDINATED WITH THE SYDNEY METRO RAIL DESIGN. THE UNDERLYING SURVEY SHOWN IS BASED ON CONDITIONS PRIOR TO COMMENCEMENT OF THE SYDNEY METRO -WESTERN SYDNEY AIRPORT PROJECT AND GENERALLY DEPICT CURRENT SITE CONDITIONS OUTSIDE OF METRO LANDS.
2. ALL INTERFACE BATTERS ARE TO BE STABILISED WITH SEEDED HYDROMULCH.
3. ALL VERGES TO BE STABILISED WITH TURF.
4. INDICATIVE INTERIM ELECTRICAL AND TELECOMMUNICATIONS ALLOCATIONS SHOWN ARE TO FACILITATE ADEQUATE SERVICING OF THE INTERIM SIGNALISED INTERSECTION AND DOES NOT REPRESENT ULTIMATE SERVICE ALLOCATIONS.(E.G. PROVISION OF STREET LIGHTING, UNDERGROUNDING OF EXISTING OVERHEAD, SERVICING INTERIM SIGNALS EQUIPMENT). ULTIMATE SERVICING IS TO BE PROVIDED AS PART OF PLANNED FUTURE LUDDENHAM ROAD WIDENING. INTERIM SERVICING SHOWN IS INDICATIVE ONLY AND SUBJECT TO CHANGE AS PART OF DETAIL DESIGN.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 7 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 6 | 19/12/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 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: CELESTINO

Scale: 0 5 10 15 20 25m SCALE 1:250 @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: SITEWORKS AND STORMWATER MANAGEMENT PLAN

SHEET 01

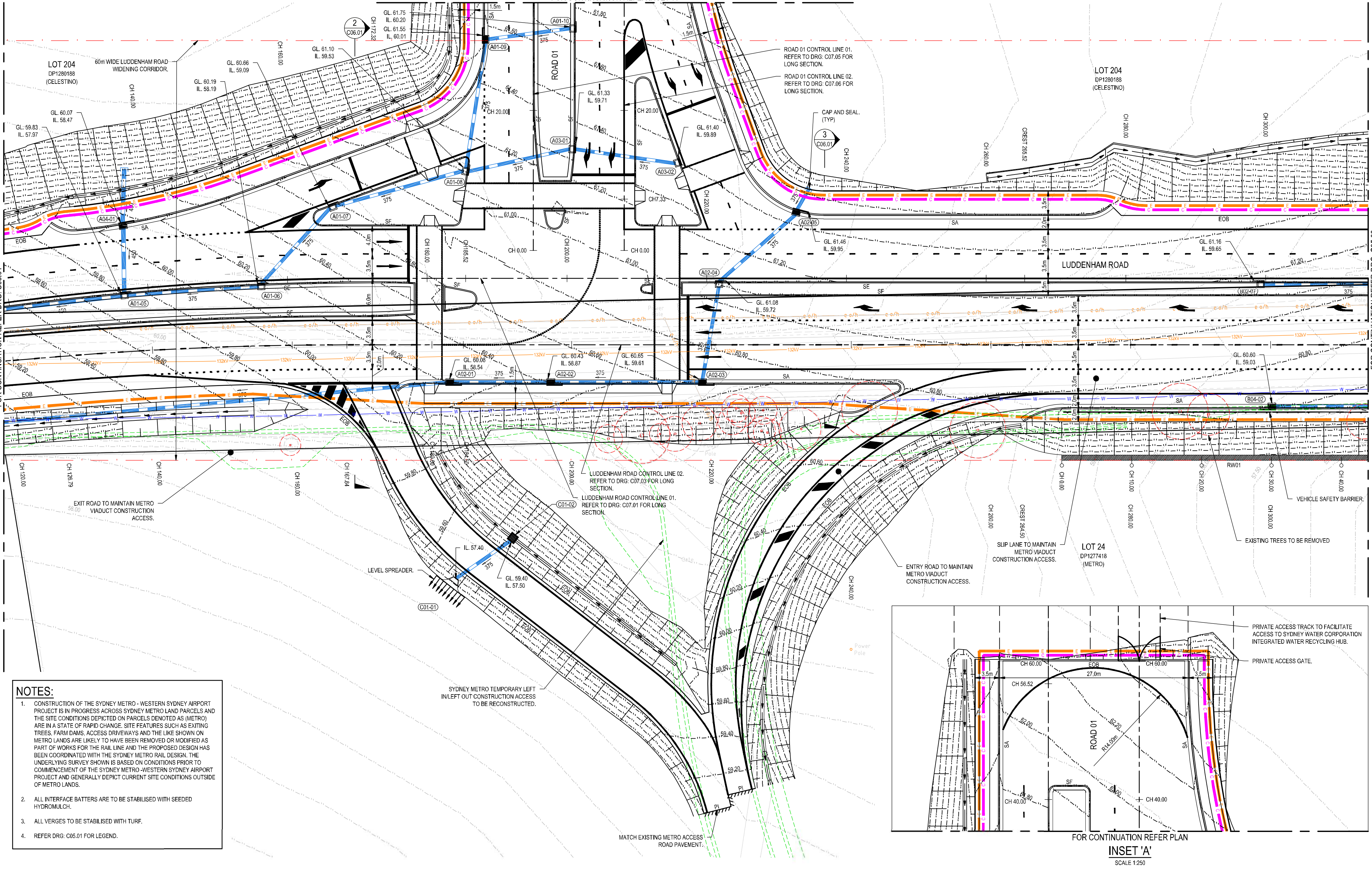
Scale: 1:250
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C05.01

Revision: 7

DATE PLOTTED: 2 April 2024 10:46 AM BY : SHAWN HOTONG
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C05.01-C05.04-SITEWORKS AND STORMWATER MANAGEMENT PLAN.dwg




## NOTES:

1. CONSTRUCTION OF THE SYDNEY METRO - WESTERN SYDNEY AIRPORT PROJECT IS IN PROGRESS ACROSS SYDNEY METRO LAND PARCELS AND THE SITE CONDITIONS DEPICTED ON PARCELS DENOTED AS (METRO) ARE IN A STATE OF RAPID CHANGE. SITE FEATURES SUCH AS EXITING TREES, FARM DAMS, ACCESS DRIVEWAYS AND THE LIKE SHOWN ON METRO LANDS ARE LIKELY TO HAVE BEEN REMOVED OR MODIFIED AS PART OF WORKS FOR THE RAIL LINE AND THE PROPOSED DESIGN HAS BEEN COORDINATED WITH THE SYDNEY METRO RAIL DESIGN. THE UNDERLYING SURVEY SHOWN IS BASED ON CONDITIONS PRIOR TO COMMENCEMENT OF THE SYDNEY METRO -WESTERN SYDNEY AIRPORT PROJECT AND GENERALLY DEPICT CURRENT SITE CONDITIONS OUTSIDE OF METRO LANDS.
2. ALL INTERFACE BATTERS ARE TO BE STABILISED WITH SEEDED HYDROMULCH.
3. ALL VERGES TO BE STABILISED WITH TURF.
4. REFER DRG: C05.01 FOR LEGEND.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 7 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 6 | 19/12/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 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: CELESTINO

Scale: 0 5 10 15 20 25m SCALE 1:250 @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: SITEWORKS AND STORMWATER MANAGEMENT PLAN
SHEET 02

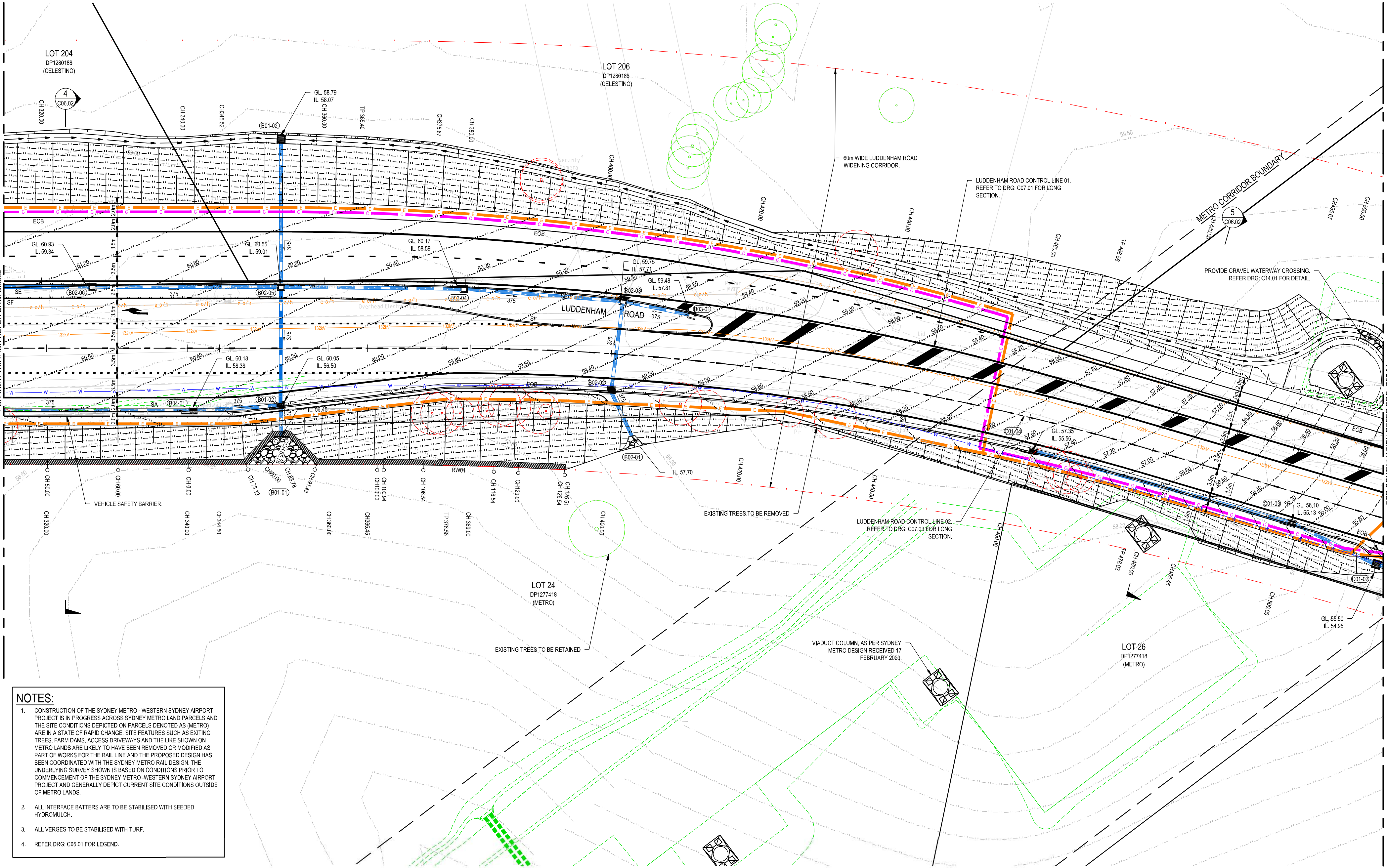
Scale: 1:250
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C05.02
Revision: 7

DATE PLOTTED: 2 April 2024 10:46 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C05.01-C05.04-SITEWORKS AND STORMWATER MANAGEMENT PLAN.dwg




## NOTES:

1. CONSTRUCTION OF THE SYDNEY METRO - WESTERN SYDNEY AIRPORT PROJECT IS IN PROGRESS ACROSS SYDNEY METRO LAND PARCELS AND THE SITE CONDITIONS DEPICTED ON PARCELS DENOTED AS (METRO) ARE IN A STATE OF RAPID CHANGE. SITE FEATURES SUCH AS EXITING TREES, FARM DAMS, ACCESS DRIVEWAYS AND THE LIKE SHOWN ON METRO LANDS ARE LIKELY TO HAVE BEEN REMOVED OR MODIFIED AS PART OF WORKS FOR THE RAIL LINE AND THE PROPOSED DESIGN HAS BEEN COORDINATED WITH THE SYDNEY METRO RAIL DESIGN. THE UNDERLYING SURVEY SHOWN IS BASED ON CONDITIONS PRIOR TO COMMENCEMENT OF THE SYDNEY METRO -WESTERN SYDNEY AIRPORT PROJECT AND GENERALLY DEPICT CURRENT SITE CONDITIONS OUTSIDE OF METRO LANDS.
2. ALL INTERFACE BATTERS ARE TO BE STABILISED WITH SEEDED HYDROMULCH.
3. ALL VERGES TO BE STABILISED WITH TURF.
4. REFER DRG: C05.01 FOR LEGEND.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 7 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 6 | 19/12/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 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: CELESTINO

Scale: 0 5 10 15 20 25m SCALE 1:250 @A1

North



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Enspire Solutions Pty Ltd
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ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

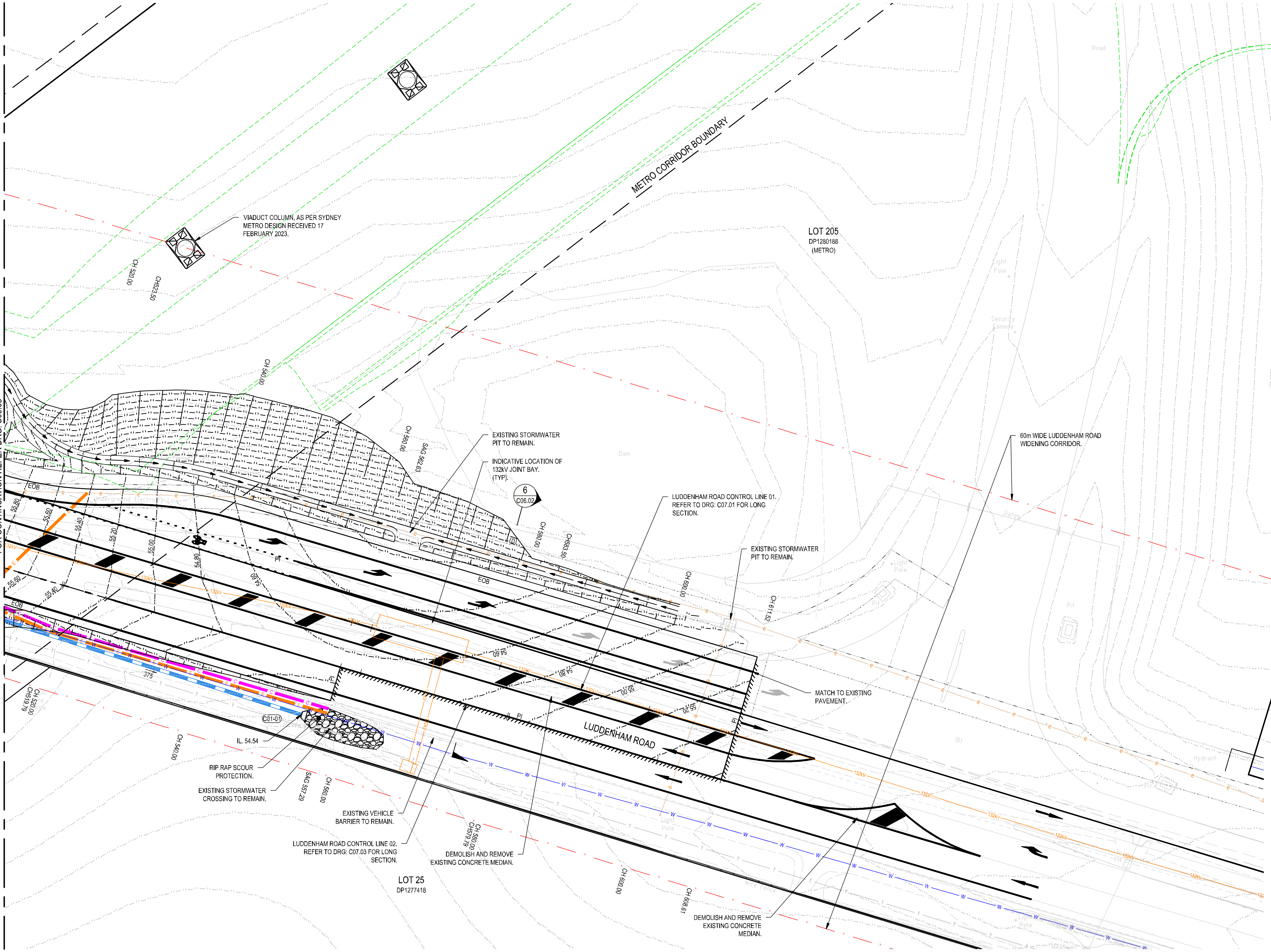
Title: SITEWORKS AND STORMWATER MANAGEMENT PLAN
SHEET 03

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-C05.03
Revision: 7

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C05.01-C05.04-SITEWORKS AND STORMWATER MANAGEMENT PLAN.dwg
DATE PLOTTED: 2 April 2024 10:46 AM BY : SHAWN HOTONG




## NOTES:

1. CONSTRUCTION OF THE SYDNEY METRO - WESTERN SYDNEY AIRPORT PROJECT IS IN PROGRESS ACROSS SYDNEY METRO LAND PARCELS AND THE SITE CONDITIONS DEPICTED ON PARCELS DENOTED AS (METRO) ARE IN A STATE OF RAPID CHANGE. SITE FEATURES SUCH AS EXITING TREES, FARM DAMS, ACCESS DRIVEWAYS AND THE LIKE SHOWN ON METRO LANDS ARE LIKELY TO HAVE BEEN REMOVED OR MODIFIED AS PART OF WORKS FOR THE RAIL LINE AND THE PROPOSED DESIGN HAS BEEN COORDINATED WITH THE SYDNEY METRO RAIL DESIGN. THE UNDERLYING SURVEY SHOWN IS BASED ON CONDITIONS PRIOR TO COMMENCEMENT OF THE SYDNEY METRO -WESTERN SYDNEY AIRPORT PROJECT AND GENERALLY DEPICT CURRENT SITE CONDITIONS OUTSIDE OF METRO LANDS.
2. ALL INTERFACE BATTERS ARE TO BE STABILISED WITH SEEDED HYDROMULCH.
3. ALL VERGES TO BE STABILISED WITH TURF.
4. REFER DRG: C05.01 FOR LEGEND.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 7 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 6 | 19/12/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 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: CELESTINO

Scale: 0 5 10 15 20 25m SCALE 1:250 @A1

North

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ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: SITEWORKS AND STORMWATER MANAGEMENT PLAN
SHEET 04

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

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

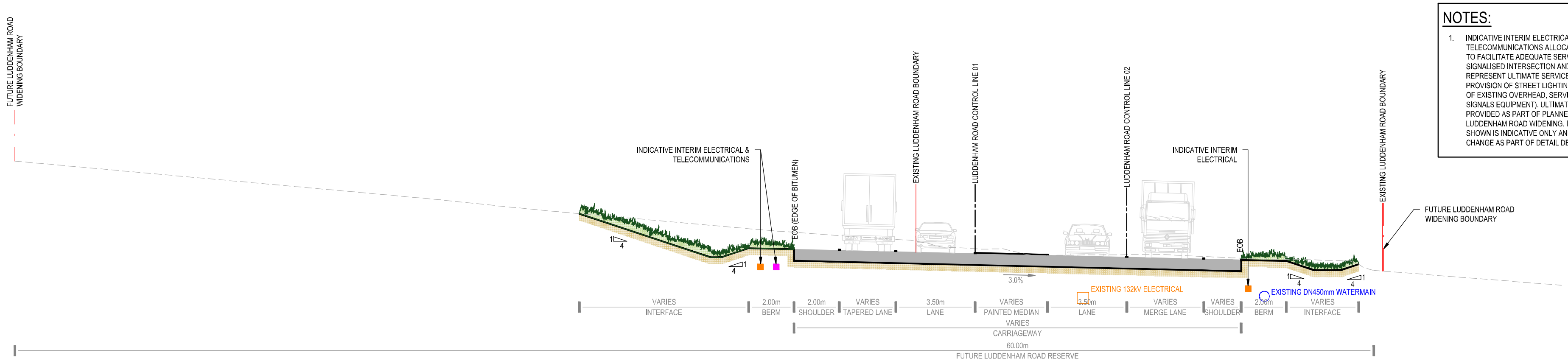
Project Number/Drawing Number: 180001-01-DA-C05.04
Revision: 7

DATE PLOTTED: 2 April 2024 10:46 AM BY : SHAWN HOTONG

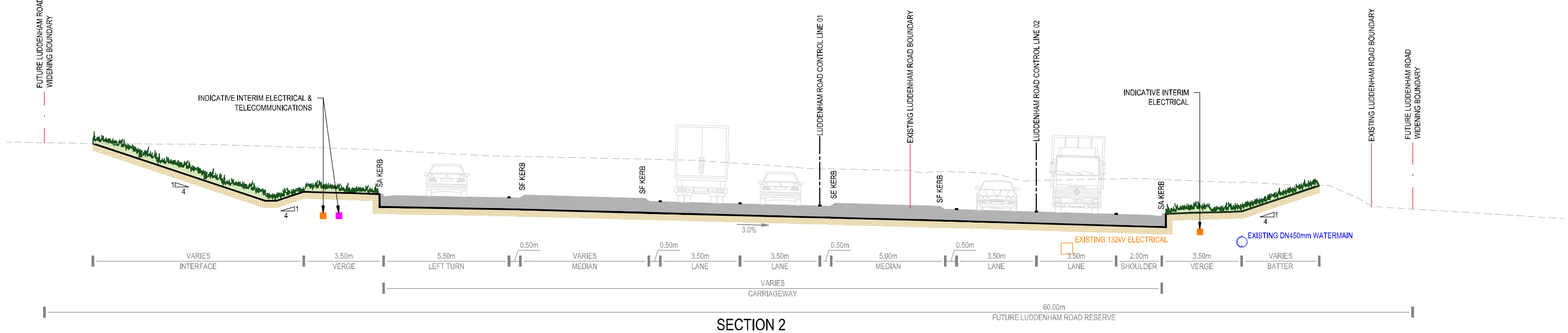
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C05.01-C05.04-SITEWORKS AND STORMWATER MANAGEMENT PLAN.dwg

## NOTES:

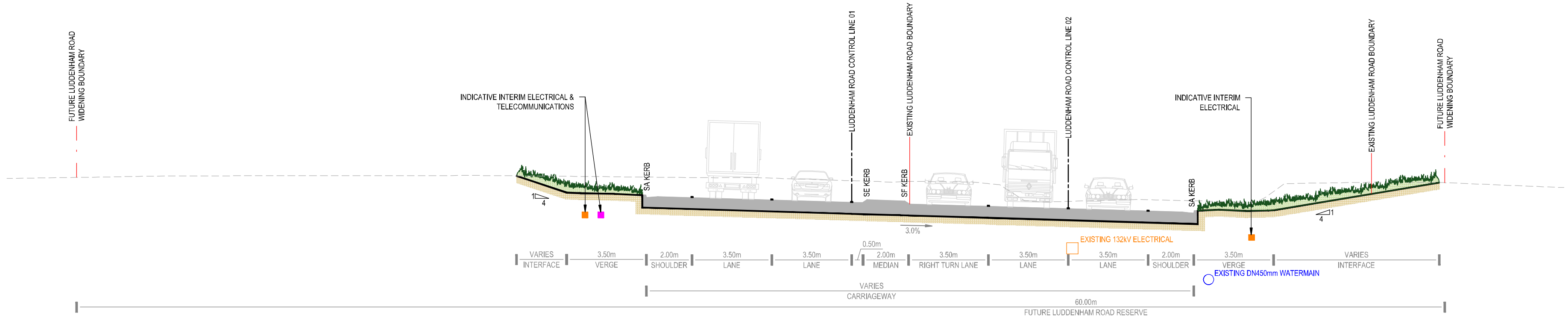
1. INDICATIVE INTERIM ELECTRICAL AND TELECOMMUNICATIONS ALLOCATIONS SHOWN ARE TO FACILITATE ADEQUATE SERVICING OF THE INTERIM SIGNALISED INTERSECTION AND DOES NOT REPRESENT ULTIMATE SERVICE ALLOCATIONS.(E.G. PROVISION OF STREET LIGHTING, UNDERGROUNDING OF EXISTING OVERHEAD, SERVICING INTERIM SIGNALS EQUIPMENT). ULTIMATE SERVICING IS TO BE PROVIDED AS PART OF PLANNED FUTURE LUDDENHAM ROAD WIDENING. INTERIM SERVICING SHOWN IS INDICATIVE ONLY AND SUBJECT TO CHANGE AS PART OF DETAIL DESIGN.




## SECTION 1
SCALE 1:100




## SECTION 2
SCALE 1:100




## SECTION 3
SCALE 1:100

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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: CELESTINO

Scale: 0 1 2 4 6 8 10m — SCALE 1:100 @A1

North

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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: ROAD TYPICAL CROSS SECTIONS
SHEET 01

Scale: 1:100
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

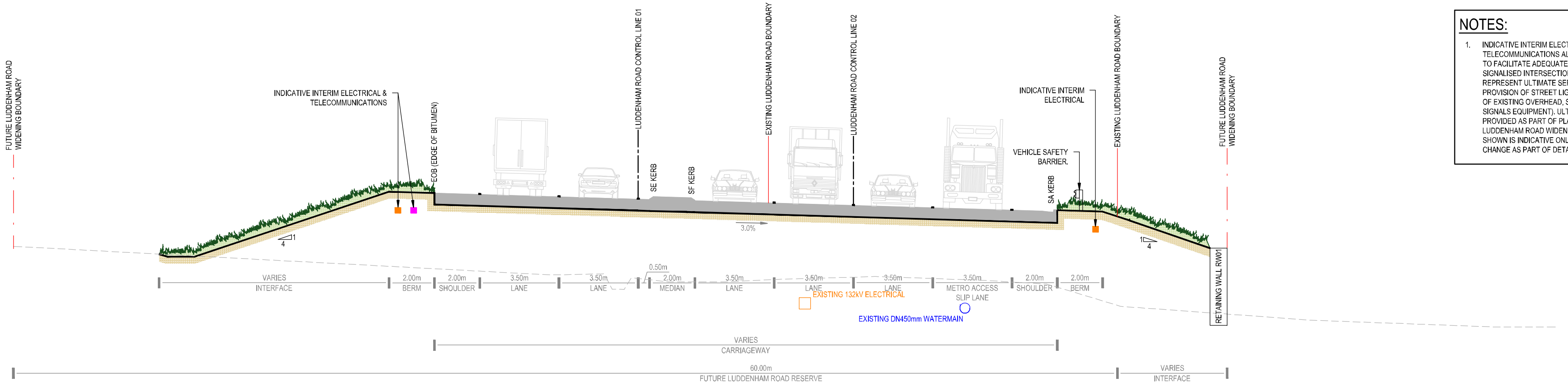
Project Number/Drawing Number: 180001-01-DA-C06.01
Revision: 5

DATE PLOTTED: 2 April 2024 10:34 AM BY : SHAWN HOTONG

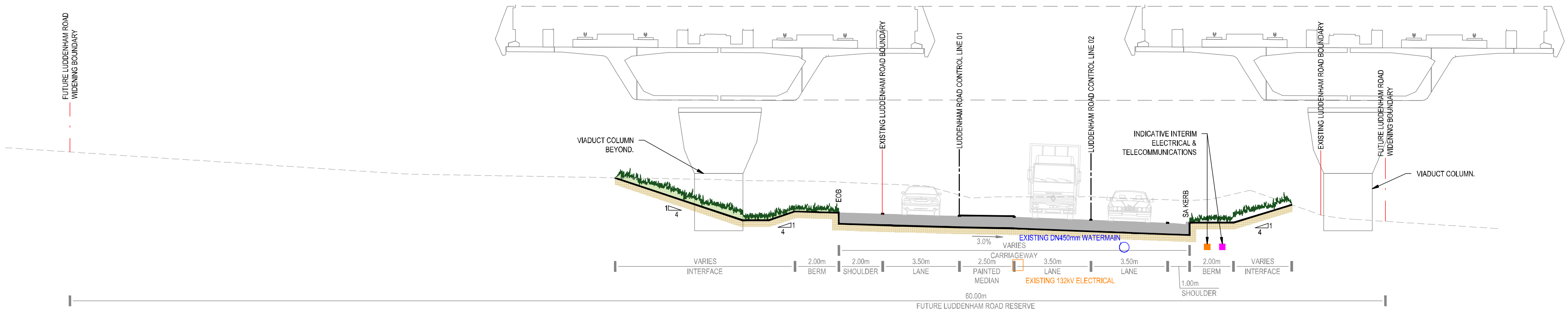
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C06.01-C06.02-ROAD TYPICAL CROSS SECTIONS.dwg

## NOTES:

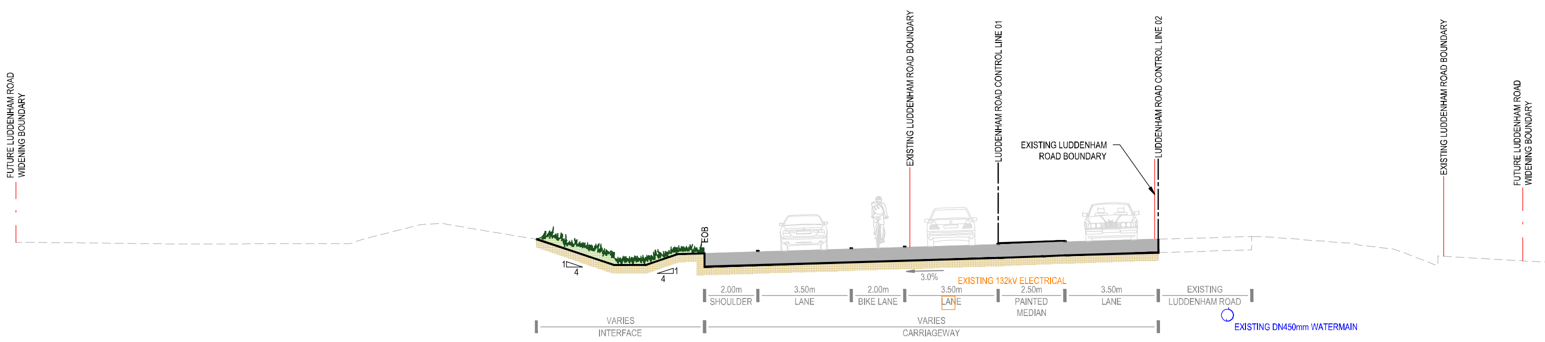
1. INDICATIVE INTERIM ELECTRICAL AND TELECOMMUNICATIONS ALLOCATIONS SHOWN ARE TO FACILITATE ADEQUATE SERVICING OF THE INTERIM SIGNALISED INTERSECTION AND DOES NOT REPRESENT ULTIMATE SERVICE ALLOCATIONS.(E.G. PROVISION OF STREET LIGHTING, UNDERGROUNDING OF EXISTING OVERHEAD, SERVICING INTERIM SIGNALS EQUIPMENT). ULTIMATE SERVICING IS TO BE PROVIDED AS PART OF PLANNED FUTURE LUDDENHAM ROAD WIDENING. INTERIM SERVICING SHOWN IS INDICATIVE ONLY AND SUBJECT TO CHANGE AS PART OF DETAIL DESIGN.




SECTION 4
SCALE 1:100




SECTION 5
SCALE 1:100




SECTION 6
SCALE 1:100

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 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
CELESTINO

Scale
0 1 2 4 6 8 10m
SCALE 1:100 @A1

North



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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
ROAD TYPICAL CROSS SECTIONS
SHEET 02

Scale 1:100
Date 23/12/2022
Size A1
Datum MGA2020

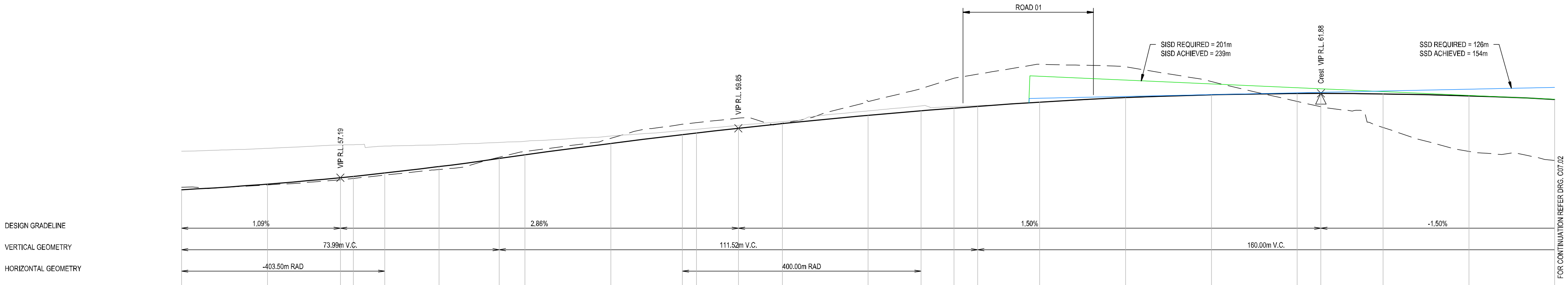
Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number
180001-01-DA-C06.02

Revision
5

DATE PLOTTED: 2 April 2024 10:34 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C06.01-C06.02-ROAD TYPICAL CROSS SECTIONS.dwg




DATUM RL 50.0

| CHAINAGE | FINISHED SURFACE | ULTIMATE SURFACE | EXISTING SURFACE |
|---|---|---|---|
| 0.00 | 56.79 | 58.59 | 56.91 |
| 20.00 | 57.05 | 58.72 | 57.02 |
| 37.00 | 57.36 | 58.89 | 57.26 |
| 40.00 | 57.42 | 58.90 | 57.32 |
| 47.33 | 57.57 | 58.83 | 57.48 |
| 60.00 | 57.87 | 58.89 | 57.74 |
| 73.99 | 58.25 | 58.99 | 58.31 |
| 80.00 | 58.42 | 59.05 | 58.58 |
| 100.00 | 58.95 | 59.29 | 59.20 |
| 116.71 | 59.36 | 59.56 | 59.84 |
| 120.00 | 59.44 | 59.61 | 59.92 |
| 129.75 | 59.66 | 59.79 | 60.13 |
| 140.00 | 59.87 | 59.97 | 59.90 |
| 160.00 | 60.26 | 60.47 | 60.91 |
| 172.32 | 60.47 | 60.70 | 61.50 |
| 180.00 | 60.60 | 60.67 | 61.99 |
| 185.52 | 60.68 | 60.71 | 62.18 |
| 200.00 | 60.88 | 60.87 | 62.63 |
| 220.00 | 61.09 | 61.08 | 62.53 |
| 240.00 | 61.22 | 61.21 | 61.83 |
| 260.00 | 61.28 | 61.26 | 60.91 |
| 265.52 | 61.28 | 61.27 | 60.66 |
| 280.00 | 61.26 | 61.25 | 59.70 |
| 300.00 | 61.17 | 61.16 | 58.58 |
| 320.00 | 61.00 | 60.99 | 58.16 |

## CONTROL LINE 01 LONGITUDINAL SECTION

SCALE 1:500 HORI
SCALE 1:100 VERT

## NOTES

1. REFER CONTROL LINE 02 FOR EXISTING UTILITY PROJECTIONS.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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: CELESTINO

Scale
H: 0 10 20 30 40 50m
V: 0 2 4 6 8 10m
SCALE: H:1:500 V:1:100 @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: ROAD LONGITUDINAL SECTIONS
SHEET 01

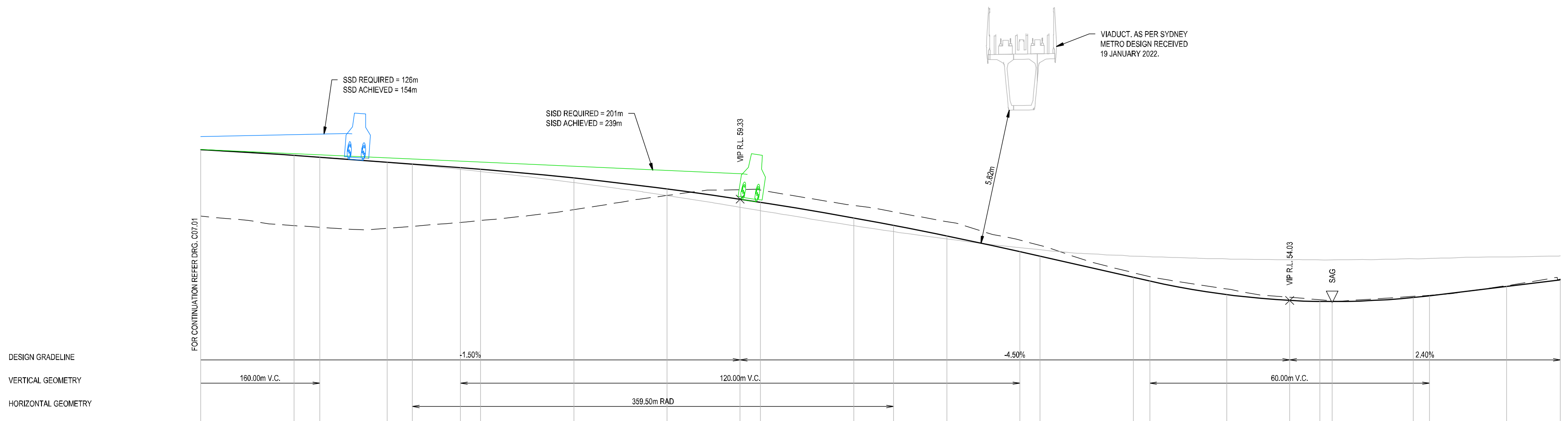
Scale: AS SHOWN
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C07.01
Revision: 4

DATE PLOTTED: 19 December 2023 11:41 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C07.01-C07.06-ROAD LONGITUDINAL SECTION.dwg




| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FINISHED SURFACE | 61.00 | 60.76 | 60.68 | 60.47 | 60.38 | 60.23 | 60.16 | 59.79 | 59.32 | 58.88 | 58.75 | 58.08 | 57.76 | 57.30 |
| ULTIMATE SURFACE | 60.99 | 60.76 | 60.68 | 60.46 | 60.36 | 60.16 | 60.07 | 59.60 | 59.04 | 58.54 | 58.39 | 57.75 | 57.49 | 57.18 |
| EXISTING SURFACE | 58.16 | 57.75 | 57.68 | 57.64 | 57.72 | 57.88 | 57.97 | 58.43 | 59.04 | 59.29 | 59.28 | 58.62 | 58.35 | 57.92 |
| CHAINAGE | 320.00 | 340.00 | 345.52 | 360.00 | 365.40 | 375.67 | 380.00 | 400.00 | 420.00 | 435.67 | 440.00 | 460.00 | 468.56 | 480.00 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FINISHED SURFACE | 56.63 | 56.43 | 55.53 | 55.38 | 54.79 | 54.55 | 54.50 | 54.50 | 54.67 | 54.75 | 55.14 | 55.42 |
| ULTIMATE SURFACE | 56.81 | 56.72 | 56.45 | 56.42 | 56.32 | 56.29 | 56.29 | 56.29 | 56.33 | 56.35 | 56.41 | 56.45 |
| EXISTING SURFACE | 57.13 | 56.90 | 55.73 | 55.56 | 55.04 | 54.68 | 54.57 | 54.52 | 54.72 | 54.77 | 55.18 | 55.46 |
| CHAINAGE | 495.67 | 500.00 | 520.00 | 523.50 | 540.00 | 553.50 | 560.00 | 562.63 | 580.00 | 583.50 | 600.00 | 611.52 |

## CONTROL LINE 01 LONGITUDINAL SECTION

SCALE 1:500 HORI
SCALE 1:100 VERT

NOTES
1. REFER CONTROL LINE 02 FOR EXISTING UTILITY PROJECTIONS.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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
CELESTINO

Scale
H: 0 10 20 30 40 50m
V: 0 2 4 6 8 10m
SCALE: H:1:500 V:1:100 @A1

North



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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
ROAD LONGITUDINAL SECTIONS
SHEET 02

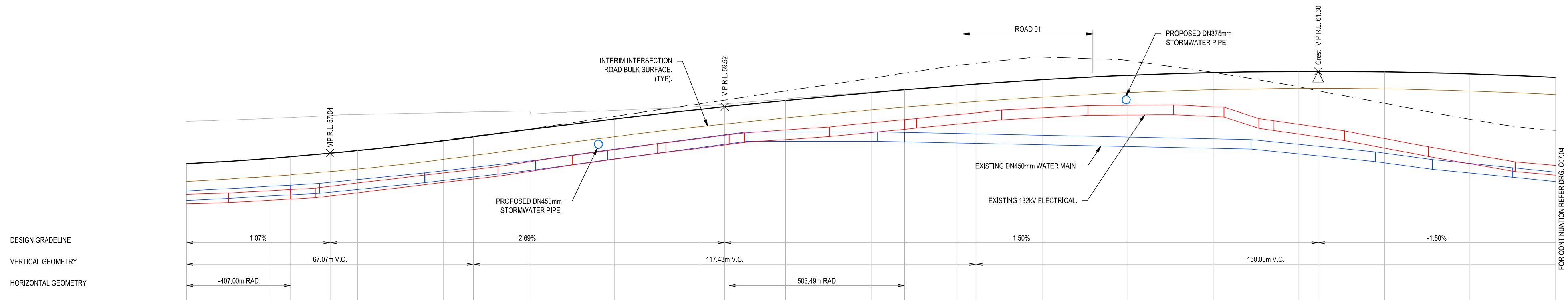
Scale: AS SHOWN
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C07.02
Revision: 4

DATE PLOTTED: 19 December 2023 11:41 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C07.01-C07.06-ROAD LONGITUDINAL SECTION.dwg




| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FINISHED SURFACE | 56.68 | 56.95 | 57.02 | 57.18 | 57.31 | 57.76 | 57.94 | 58.28 | 58.78 | 59.23 | 59.35 | 59.37 | 59.64 | 60.01 | 60.14 | 60.34 | 60.40 | 60.61 | 60.82 | 60.95 | 61.00 | 61.00 | 60.98 | 60.89 | 60.72 |
| ULTIMATE SURFACE | 58.67 | 58.81 | 58.85 | 58.95 | 58.99 | 59.08 | 59.10 | 59.15 | 59.18 | 59.37 | 59.47 | 59.49 | 59.72 | 60.04 | 60.16 | 60.34 | 60.40 | 60.61 | 60.80 | 60.93 | 60.98 | 60.98 | 60.96 | 60.87 | 60.70 |
| EXISTING SURFACE | 56.68 | 56.95 | 57.02 | 57.18 | 57.29 | 57.78 | 57.98 | 58.31 | 58.90 | 59.48 | 59.66 | 59.69 | 60.09 | 60.68 | 60.92 | 61.28 | 61.38 | 61.67 | 61.51 | 60.95 | 60.28 | 60.09 | 59.51 | 58.77 | 58.25 |
| CHAINAGE | 0.00 | 20.00 | 24.34 | 33.54 | 40.00 | 60.00 | 67.07 | 80.00 | 100.00 | 120.00 | 125.79 | 126.79 | 140.00 | 160.00 | 167.84 | 180.00 | 184.50 | 200.00 | 220.00 | 240.00 | 260.00 | 264.50 | 280.00 | 300.00 | 320.00 |

## CONTROL LINE 02 LONGITUDINAL SECTION

SCALE 1:500 HORI
SCALE 1:100 VERT

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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
CELESTINO

Scale
H: 0 10 20 30 40 50m
V: 0 2 4 6 8 10m
SCALE: H:1:500 V:1:100 @A1

North



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ABN: 71 624 801 690
Phone: 02 9922 6135

Project
SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

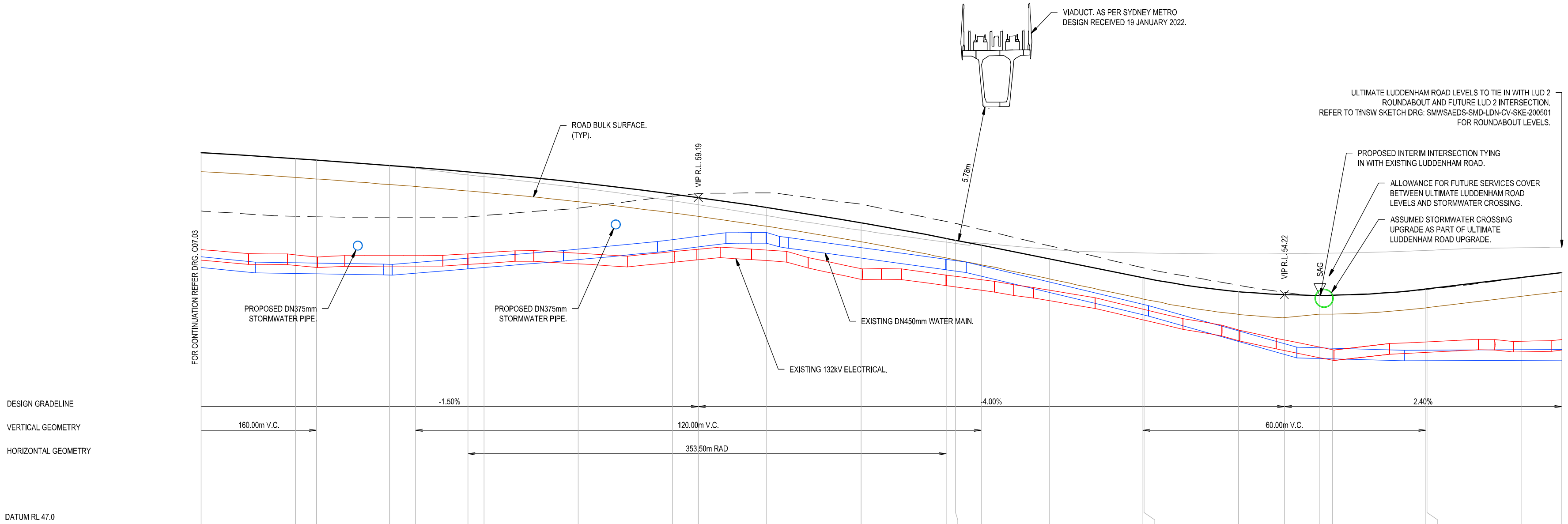
Title
ROAD LONGITUDINAL SECTIONS
SHEET 03

Scale: AS SHOWN
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-C07.03
Revision: 4

DATE PLOTTED: 19 December 2023 11:41 AM BY : SHAWN HOTONG
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C07.01-C07.06-ROAD LONGITUDINAL SECTION.dwg




| CHAINAGE | 320.00 | 340.00 | 344.50 | 360.00 | 365.45 | 376.58 | 380.00 | 400.00 | 420.00 | 425.45 | 440.00 | 460.00 | 478.02 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FINISHED SURFACE | 60.72 | 60.47 | 60.40 | 60.17 | 60.09 | 59.91 | 59.85 | 59.45 | 58.96 | 58.81 | 58.39 | 57.74 | 57.08 |
| ULTIMATE SURFACE | 60.70 | 60.47 | 60.40 | 60.16 | 60.05 | 59.77 | 59.70 | 59.24 | 58.88 | 58.51 | 58.05 | 57.43 | 56.92 |
| EXISTING SURFACE | 58.25 | 58.02 | 58.00 | 57.98 | 57.99 | 57.99 | 58.05 | 58.37 | 58.87 | 58.99 | 59.01 | 58.53 | 57.80 |

| CHAINAGE | 480.00 | 485.45 | 500.00 | 519.79 | 520.00 | 540.00 | 549.79 | 557.29 | 560.00 | 579.79 | 580.00 | 600.00 | 608.61 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FINISHED SURFACE | 57.00 | 56.79 | 56.21 | 55.42 | 55.41 | 54.83 | 54.70 | 54.67 | 54.67 | 54.94 | 54.94 | 55.42 | 55.63 |
| ULTIMATE SURFACE | 56.87 | 56.88 | 56.62 | 56.47 | 56.47 | 56.42 | 56.43 | 56.45 | 56.46 | 56.57 | 56.58 | 56.68 | 56.72 |
| EXISTING SURFACE | 57.72 | 57.46 | 56.77 | 55.84 | 55.83 | 55.09 | 54.80 | 54.66 | 54.66 | 54.92 | 54.92 | 55.41 | 55.63 |

## CONTROL LINE 02 LONGITUDINAL SECTION

SCALE 1:500 HORI
SCALE 1:100 VERT

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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: CELESTINO

Scale
H: 0 10 20 30 40 50m
V: 0 2 4 6 8 10m
SCALE: H:1:500 V:1:100 @A1

North



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Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: ROAD LONGITUDINAL SECTIONS

SHEET 04

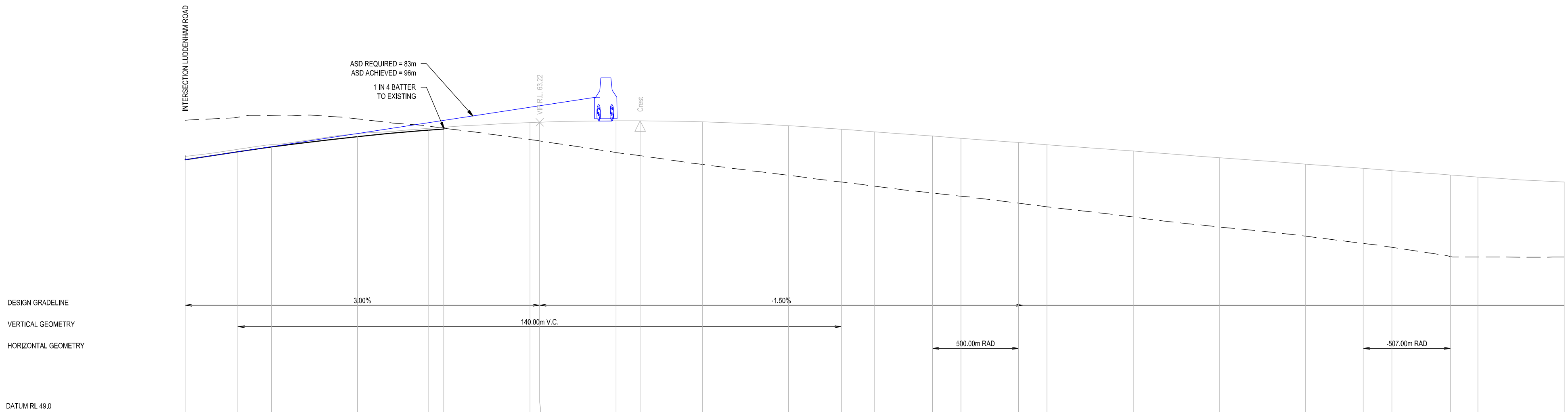
Scale: AS SHOWN
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C07.04
Revision: 4

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C07.01-C07.06-ROAD LONGITUDINAL SECTION.dwg

DATE PLOTTED: 19 December 2023 11:41 AM BY : SHAWN HOTONG




| CHAINAGE | FINISHED SURFACE | ULTIMATE SURFACE | EXISTING SURFACE |
|---|---|---|---|
| 0.00 | 60.75 | 60.91 | 62.58 |
| 12.25 | 61.12 | 61.24 | 62.73 |
| 20.00 | 61.34 | 61.45 | 62.80 |
| 40.00 | 61.83 | 61.96 | 62.64 |
| 56.52 | 62.13 | 62.21 | 62.31 |
| 60.00 | 62.18 | 62.26 | 62.22 |
| 80.00 | 62.41 | 62.47 | 61.69 |
| 82.25 | 62.43 | 62.49 | 61.63 |
| 100.00 | 62.51 | 62.56 | 61.09 |
| 105.58 | 62.52 | 62.56 | 60.94 |
| 120.00 | 62.48 | 62.51 | 60.53 |
| 140.00 | 62.33 | 62.34 | 60.03 |
| 152.25 | 62.17 | 62.17 | 59.72 |
| 160.00 | 62.05 | 62.05 | 59.52 |
| 173.43 | 61.85 | 61.85 | 59.20 |
| 180.00 | 61.75 | 61.75 | 59.06 |
| 193.41 | 61.55 | 61.55 | 58.73 |
| 200.00 | | 61.45 | 58.57 |
| 220.00 | | 61.15 | 58.09 |
| 240.00 | | 60.85 | 57.63 |
| 260.00 | | 60.55 | 57.20 |
| 273.36 | | 60.35 | 56.87 |
| 280.00 | | 60.25 | 56.69 |
| 293.63 | | 60.05 | 56.26 |
| 300.00 | | 59.95 | 56.25 |
| 320.00 | | 59.71 | 56.25 |

## ROAD 01 CONTROL LINE 01 LONGITUDINAL SECTION

SCALE 1:500 HORI
SCALE 1:100 VERT

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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
CELESTINO

Scale
H: 0 10 20 30 40 50m
V: 0 2 4 6 8 10m
SCALE: H:1:500 V:1:100 @A1

North



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Phone: 02 9922 6135

Project
SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title
ROAD LONGITUDINAL SECTIONS

SHEET 05

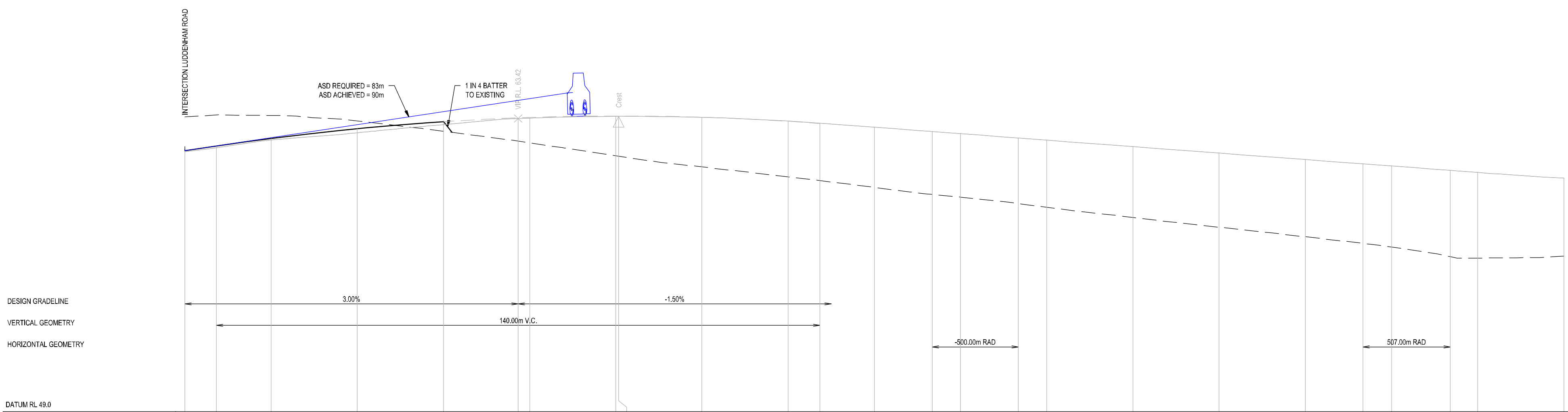
Scale: AS SHOWN
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C07.05
Revision: 4

DATE PLOTTED: 19 December 2023 11:41 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C07.01-C07.06-ROAD LONGITUDINAL SECTION.dwg




| CHAINAGE | FINISHED SURFACE | ULTIMATE SURFACE | EXISTING SURFACE |
|---|---|---|---|
| 0.00 | 61.10 | 61.06 | 62.67 |
| 7.33 | 61.32 | 61.24 | 62.76 |
| 20.00 | 61.67 | 61.60 | 62.74 |
| 40.00 | 62.13 | 61.94 | 62.49 |
| 60.00 | 62.45 | 62.31 | 62.01 |
| 77.33 | 62.63 | 62.60 | 61.55 |
| 80.00 | 62.65 | 62.62 | 61.47 |
| 100.00 | 62.72 | 62.70 | 60.87 |
| 100.67 | 62.72 | 62.70 | 60.85 |
| 120.00 | 62.66 | 62.65 | 60.35 |
| 140.00 | 62.47 | 62.48 | 59.89 |
| 147.33 | 62.37 | 62.38 | 59.72 |
| 160.00 | | 62.19 | 59.40 |
| 173.42 | | 61.99 | 59.08 |
| 180.00 | | 61.89 | 58.95 |
| 193.41 | | 61.69 | 58.65 |
| 200.00 | | 61.59 | 58.48 |
| 220.00 | | 61.29 | 58.01 |
| 240.00 | | 60.99 | 57.55 |
| 260.00 | | 60.69 | 57.11 |
| 273.36 | | 60.49 | 56.81 |
| 280.00 | | 60.39 | 56.63 |
| 293.63 | | 60.19 | 56.18 |
| 300.00 | | 60.09 | 56.12 |
| 320.00 | | 59.83 | 56.21 |

ROAD 01 CONTROL LINE 02 LONGITUDINAL SECTION

SCALE 1:500 HORI
SCALE 1:100 VERT

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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

CELESTINO

Scale

H: 0 10 20 30 40 50m
V: 0 2 4 6 8 10m
SCALE: H:1:500 V:1:100 @A1

North



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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
ROAD LONGITUDINAL SECTIONS

SHEET 06

Scale: AS SHOWN
Date: 23/12/2022
Size: A1
Datum: MGA2020

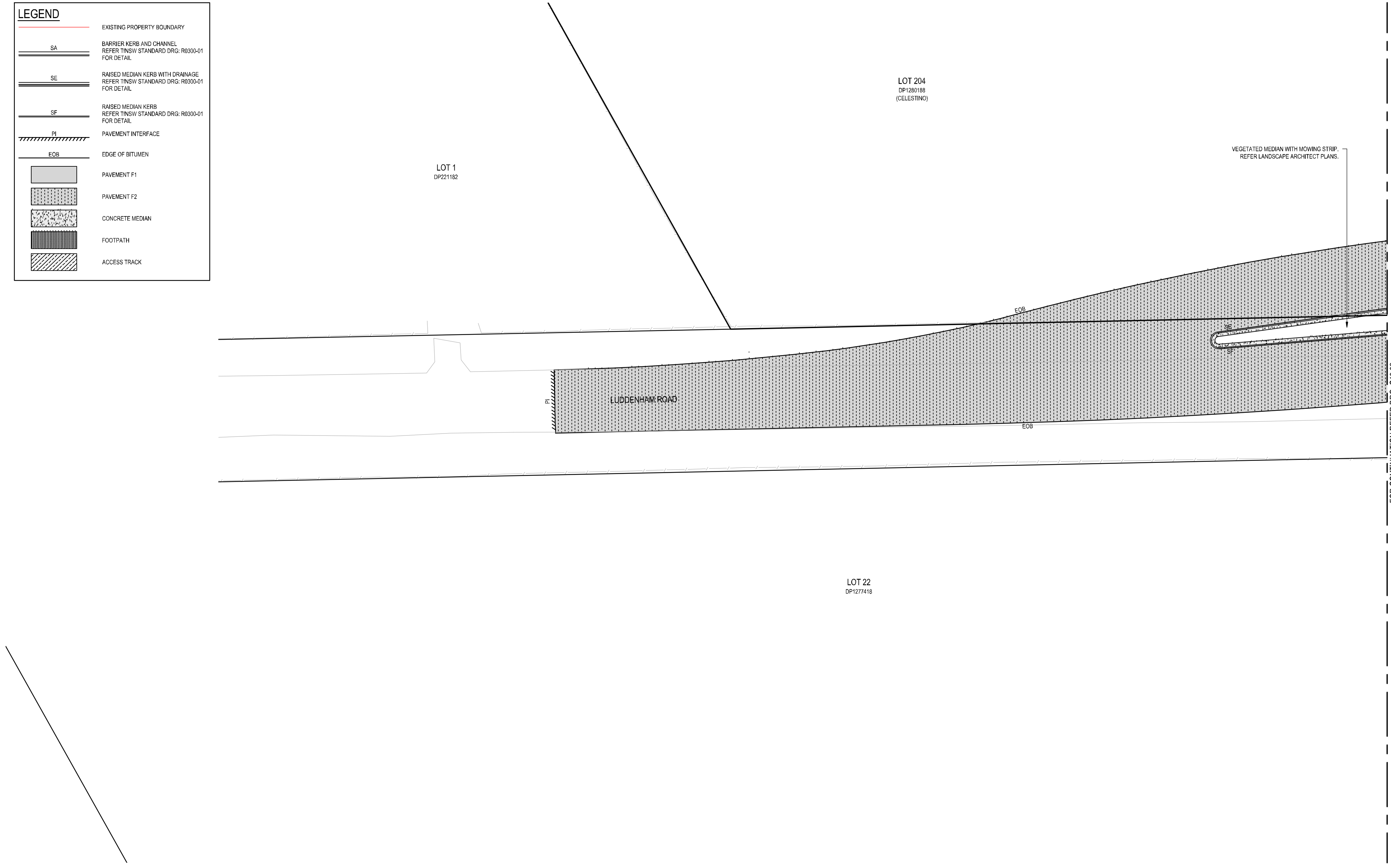
Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C07.06
Revision: 4

DATE PLOTTED: 19 December 2023 11:41 AM BY : SHAWN HOTONG
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C07.01-C07.06-ROAD LONGITUDINAL SECTION.dwg

## LEGEND

| | |
|---|---|
| | EXISTING PROPERTY BOUNDARY |
| SA | BARRIER KERB AND CHANNEL REFER TfNSW STANDARD DRG: R0300-01 FOR DETAIL |
| SE | RAISED MEDIAN KERB WITH DRAINAGE REFER TfNSW STANDARD DRG: R0300-01 FOR DETAIL |
| SF | RAISED MEDIAN KERB REFER TfNSW STANDARD DRG: R0300-01 FOR DETAIL |
| PI | PAVEMENT INTERFACE |
| EOB | EDGE OF BITUMEN |
| | PAVEMENT F1 |
| | PAVEMENT F2 |
| | CONCRETE MEDIAN |
| | FOOTPATH |
| | ACCESS TRACK |




FOR CONTINUATION REFER DRG: C10.02

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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: CELESTINO

Scale: 0 5 10 15 20 25m SCALE 1:250 @A1

North



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ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: PAVEMENT PLAN

SHEET 01

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

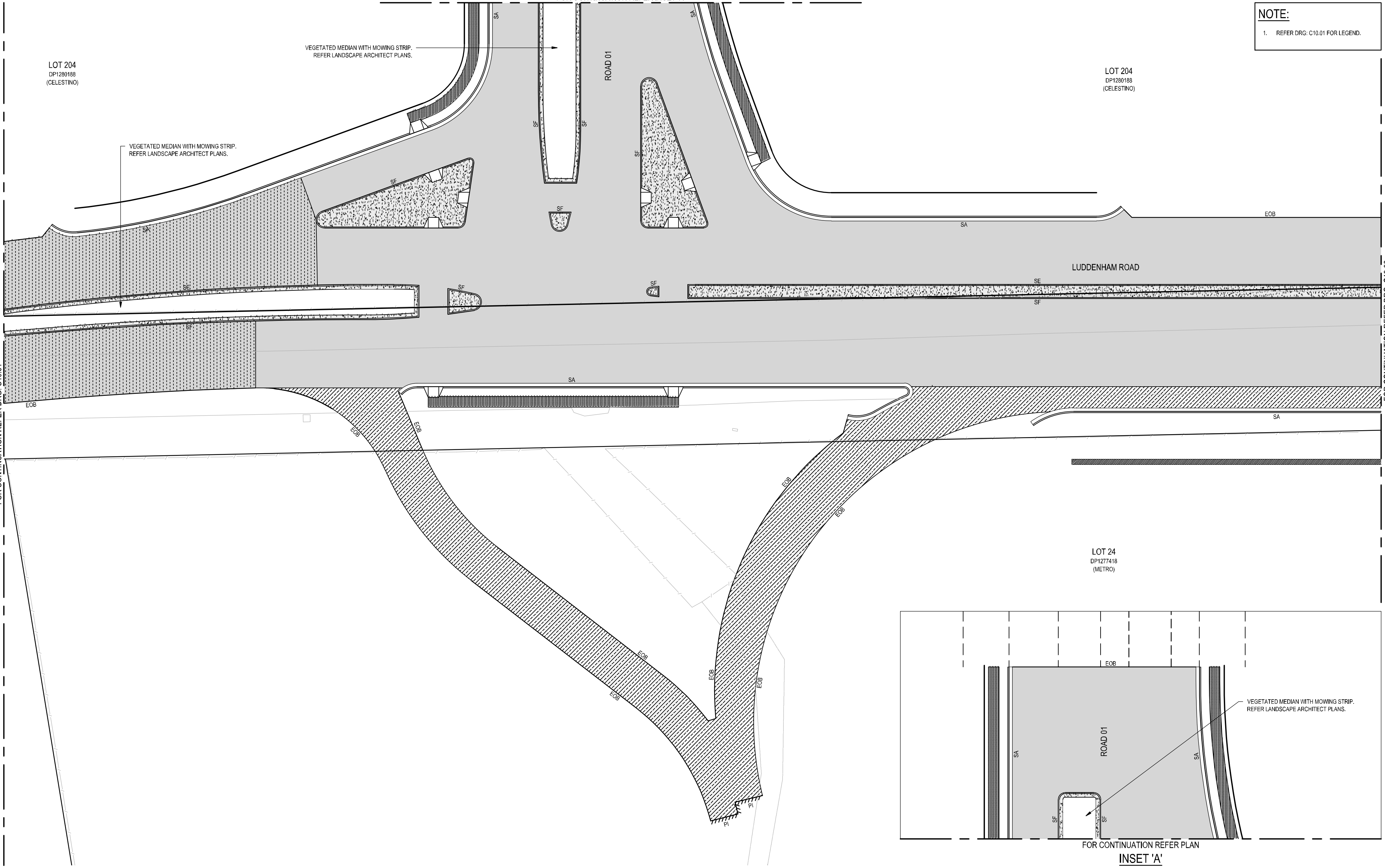
Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C10.01

Revision: 5

DATE PLOTTED: 2 April 2024 10:35 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C10.01-C10.04-PAVEMENT PLAN.dwg




| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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
CELESTINO

Scale
0 5 10 15 20 25m
SCALE 1:250 @A1



North

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ABN: 71 624 801 690
Phone: 02 9922 6135

Project
SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title
PAVEMENT PLAN

SHEET 02

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

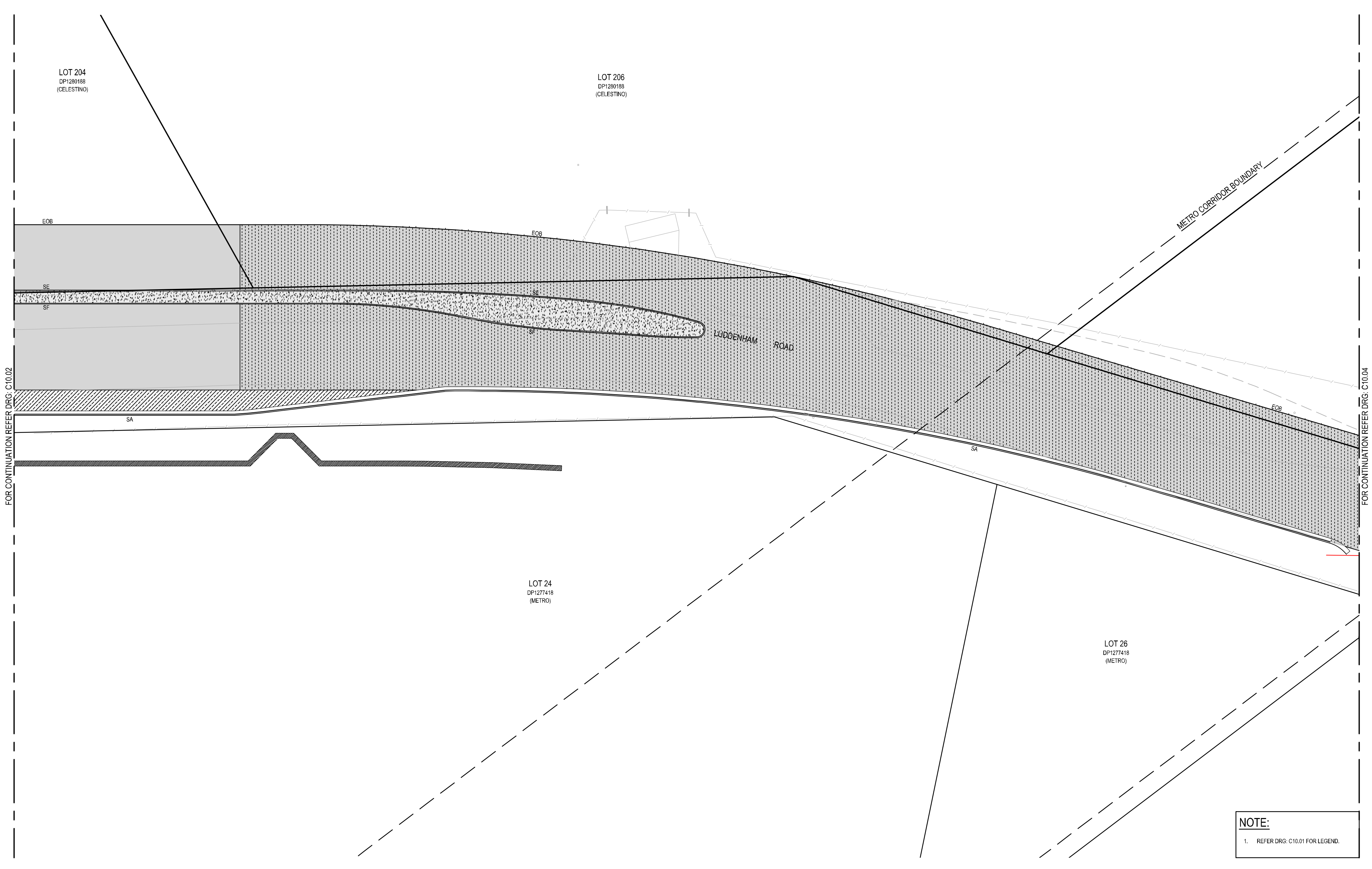
Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number
180001-01-DA-C10.02

Revision
5

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C10.01-C10.04-PAVEMENT PLAN.dwg

DATE PLOTTED: 2 April 2024 10:35 AM BY : SHAWN HOTONG




NOTE:

1. REFER DRG: C10.01 FOR LEGEND.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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

CELESTINO

Scale

0 5 10 15 20 25m

SCALE 1:250 @A1

North

N



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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
PAVEMENT PLAN

SHEET 03

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

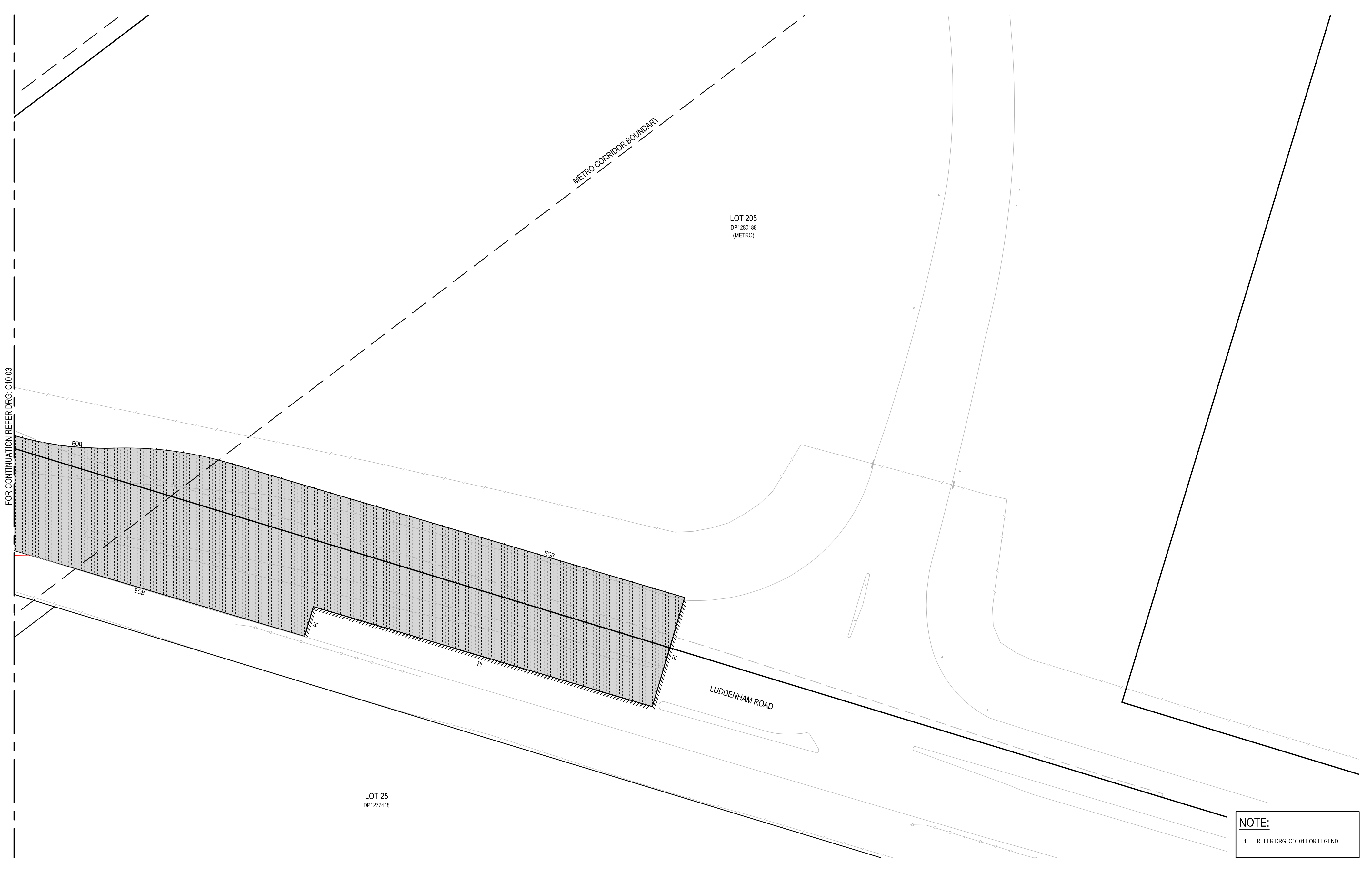
Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number
180001-01-DA-C10.03

Revision
5

DATE PLOTTED: 2 April 2024 10:35 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C10.01-C10.04-PAVEMENT PLAN.dwg




NOTE:

1. REFER DRG: C10.01 FOR LEGEND.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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: CELESTINO

Scale: 0 5 10 15 20 25m — SCALE 1:250 @A1

North: N

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ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: PAVEMENT PLAN
SHEET 04

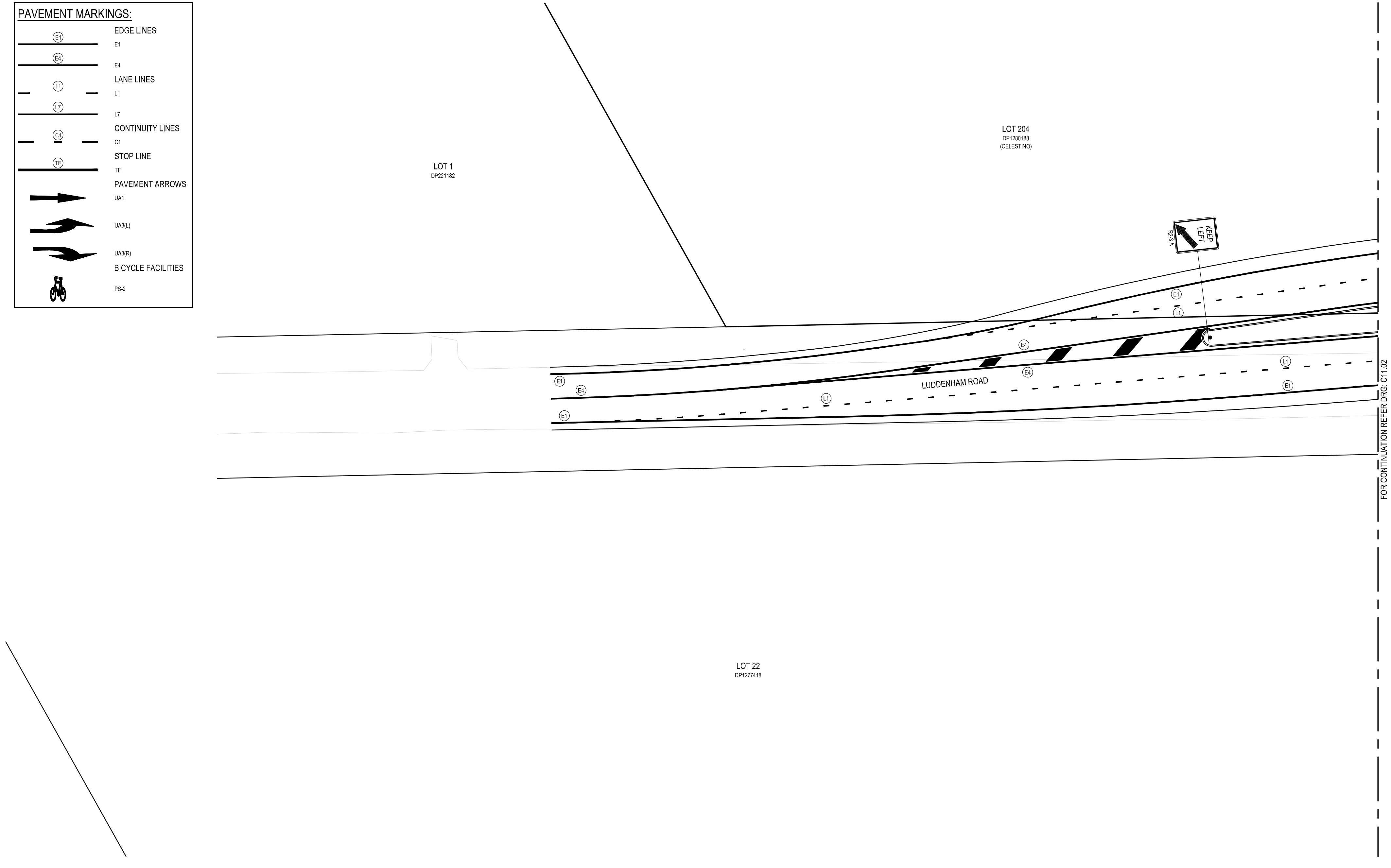
Scale: 1:250
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C10.04
Revision: 5

DATE PLOTTED: 2 April 2024 10:35 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C10.01-C10.04-PAVEMENT PLAN.dwg




| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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

CELESTINO

Scale

0 5 10 15 20 25m

SCALE 1:250 @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
SIGNAGE AND LINEMARKING PLAN
SHEET 01

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

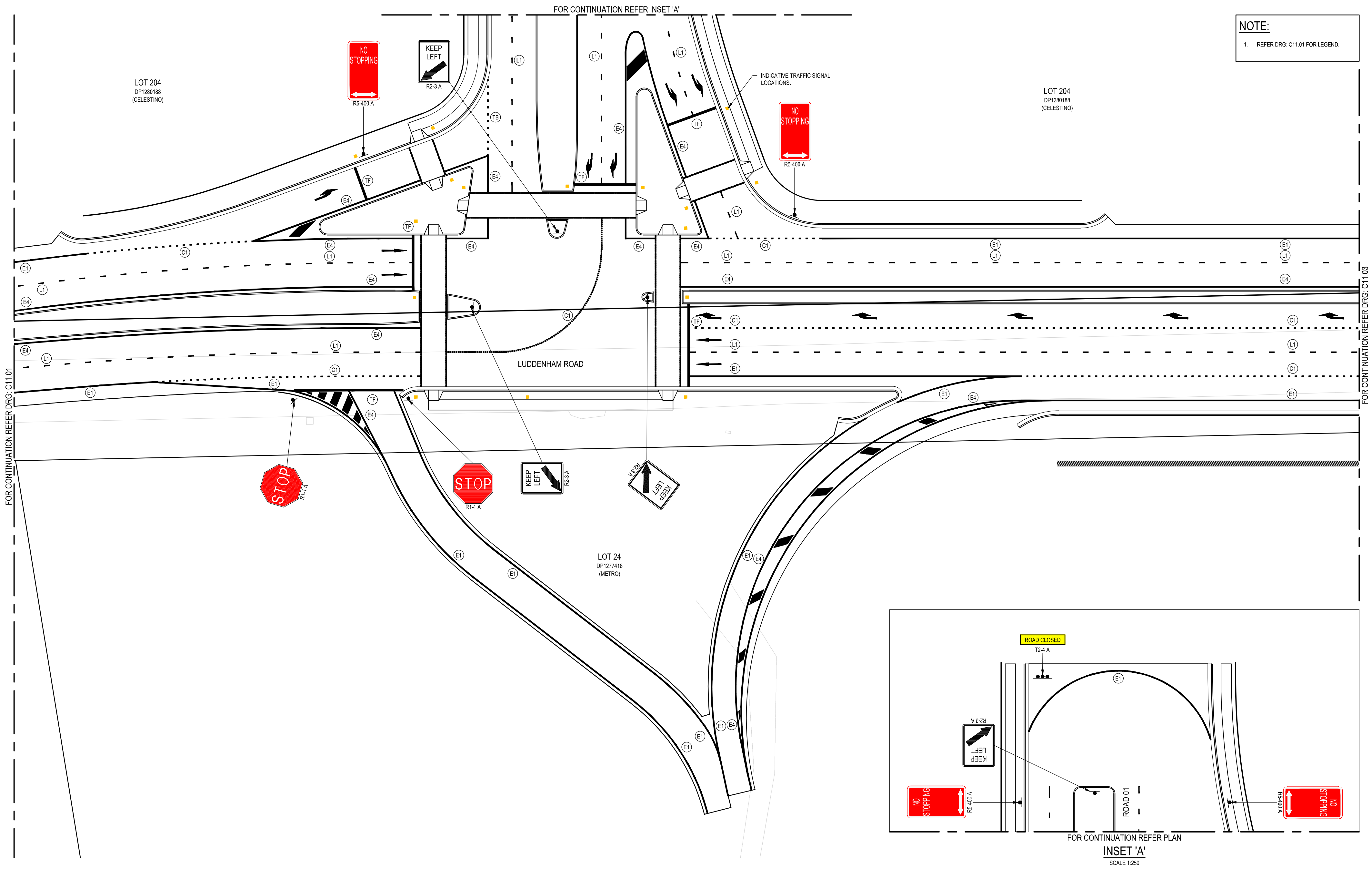
Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C11.01

Revision: 4

DATE PLOTTED: 19 December 2023 11:43 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C11.01-C11.04-SIGNAGE AND LINEMARKING PLAN.dwg




## NOTE:

1. REFER DRG: C11.01 FOR LEGEND.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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: CELESTINO

Scale: 0 5 10 15 20 25m SCALE 1:250 @A1

North



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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: SIGNAGE AND LINEMARKING PLAN
SHEET 02

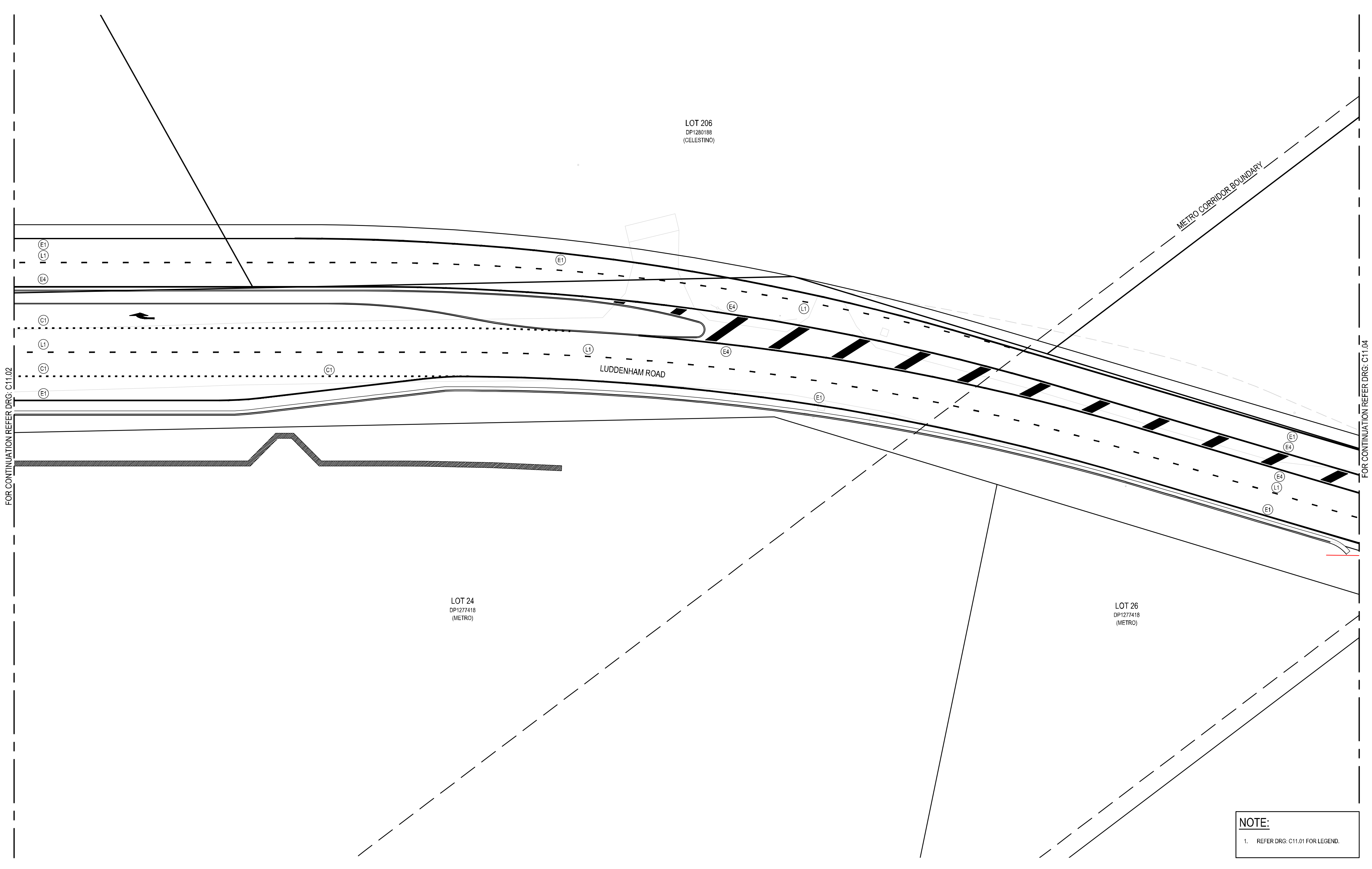
Scale: 1:250
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C11.02
Revision: 4

DATE PLOTTED: 19 December 2023 11:43 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C11.01-C11.04-SIGNAGE AND LINEMARKING PLAN.dwg




NOTE:

1. REFER DRG: C11.01 FOR LEGEND.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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: CELESTINO

Scale: 0 5 10 15 20 25m SCALE 1:250 @A1

North



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Enspire Solutions Pty Ltd
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ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: SIGNAGE AND LINEMARKING PLAN

SHEET 03

Scale: 1:250

Date: 23/12/2022

Size: A1

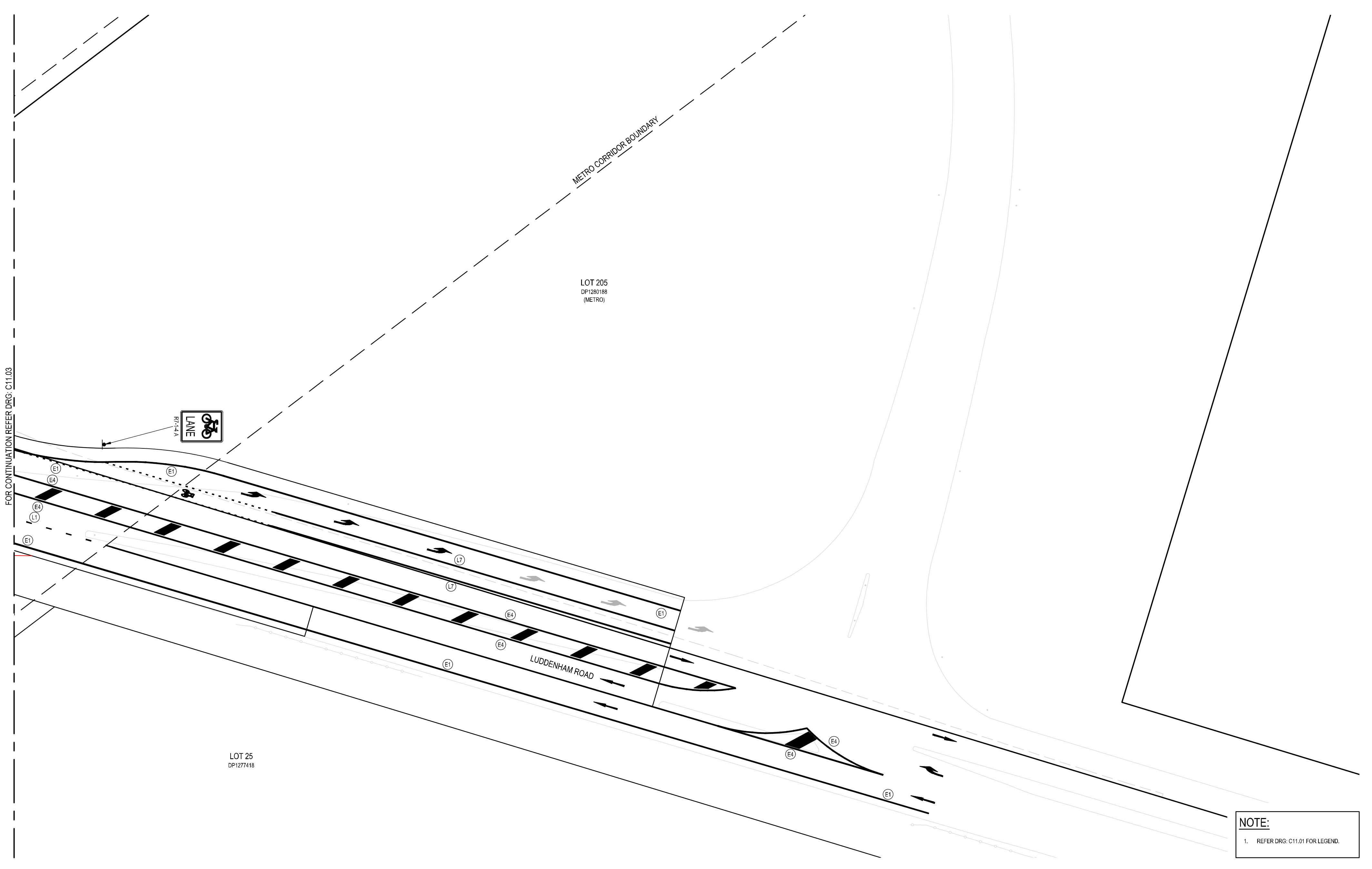
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C11.03

Revision: 4

DATE PLOTTED: 19 December 2023 11:43 AM BY : SHAWN HOTONG
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C11.01-C11.04-SIGNAGE AND LINEMARKING PLAN.dwg




FOR CONTINUATION REFER DRG: C11.03

NOTE:

1. REFER DRG: C11.01 FOR LEGEND.

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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: CELESTINO

Scale: 0 5 10 15 20 25m SCALE 1:250 @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

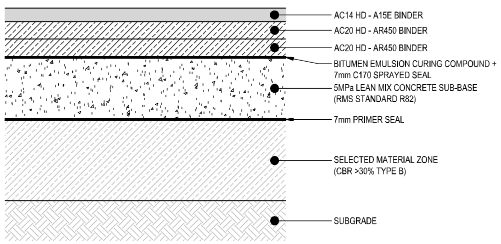
Title: SIGNAGE AND LINEMARKING PLAN
SHEET 04

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

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

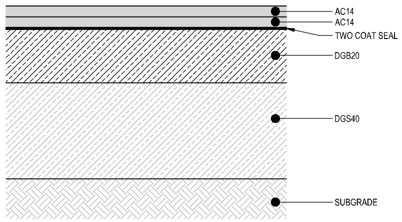
Project Number/Drawing Number: 180001-01-DA-C11.04
Revision: 4

DATE PLOTTED: 19 December 2023 11:43 AM BY : SHAWN HOTONG
CAD File: P:\180001 SSP D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C11.01-C11.04-SIGNAGE AND LINEMARKING PLAN.dwg



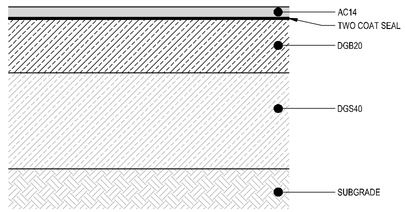

## ROAD PAVEMENT F1
SCALE 1:10

NOTE:
PAVEMENT PROFILE IS INDICATIVE AND TO BE DETERMINED BY GEOTECHNICAL ENGINEER AT DETAILED DESIGN



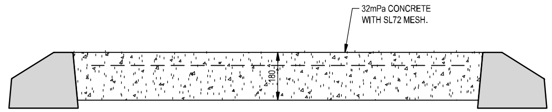

## ROAD PAVEMENT F2
SCALE 1:10

NOTE:
PAVEMENT PROFILE IS INDICATIVE AND TO BE DETERMINED BY GEOTECHNICAL ENGINEER AT DETAILED DESIGN

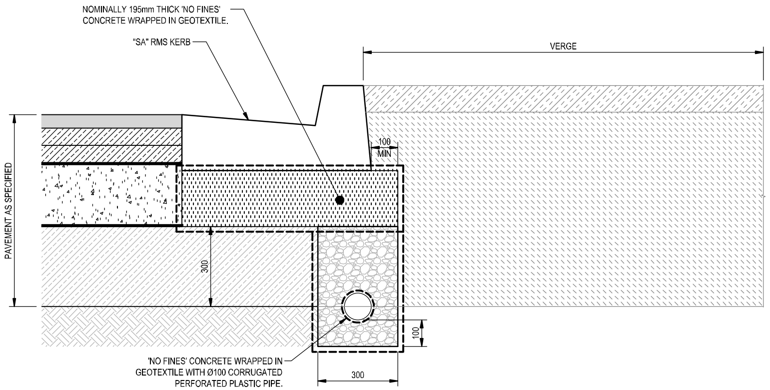



## ACCESS TRACK
SCALE 1:10

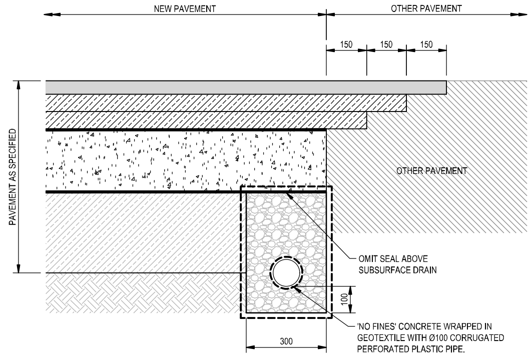
NOTE:
PAVEMENT PROFILE IS INDICATIVE AND TO BE DETERMINED BY GEOTECHNICAL ENGINEER AT DETAILED DESIGN



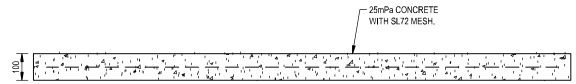

## CONCRETE MEDIAN
SCALE 1:10



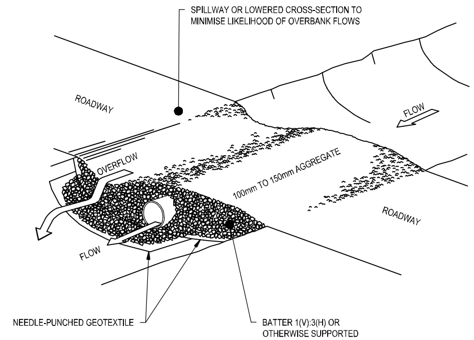

## VERGE WITH SA KERB
SCALE 1:10




## PAVEMENT INTERFACE (PI)
SCALE 1:10

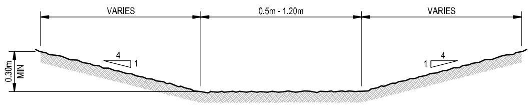



## CONCRETE FOOTPATH
SCALE 1:10




CONSTRUCTION NOTES
1. PROHIBIT ALL TRAFFIC UNTIL THE ACCESS WAY IS CONSTRUCTED.
2. STRIP ANY TOPSOIL AND PLACE A NEEDLE-PUNCHED TEXTILE OVER THE BASE OF THE CROSSING.
3. PLACE CLEAN, RIGID, NON POLLUTING AGGREGATE OR GRAVEL IN THE 100mm TO 150mm SIZE CLASS OVER THE FABRIC TO A MINIMUM DEPTH OF 200mm.
4. PROVIDE A 3m WIDE CARRIAGEWAY WITH SUFFICIENT LENGTH OF CULVERT PIPE TO ALLOW LESS THAN A 3(H): 1 (V) SLOPE ON SIDE BATTERS.
5. INSTALL A LOWER SECTION TO ACT AS AN EMERGENCY SPILLWAY IN GREATER THAN DESIGN STORM EVENTS.
6. ENSURE THAT CULVERT OUTLETS EXTEND BEYOND THE TOE OF FILL EMBANKMENTS.

## GRAVEL WATERWAY CROSSING (SD 5-1)




## GRASS LINED SWALE
SCALE 1:20

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 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
CELESTINO

Scale
SCALE 1:20 (0, 0.5, 1, 1.5, 2m) @A1
SCALE 1:50 (0, 1, 2, 3, 4, 5m) @A1

North



enspire

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Project
SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title
SITEWORKS DETAILS

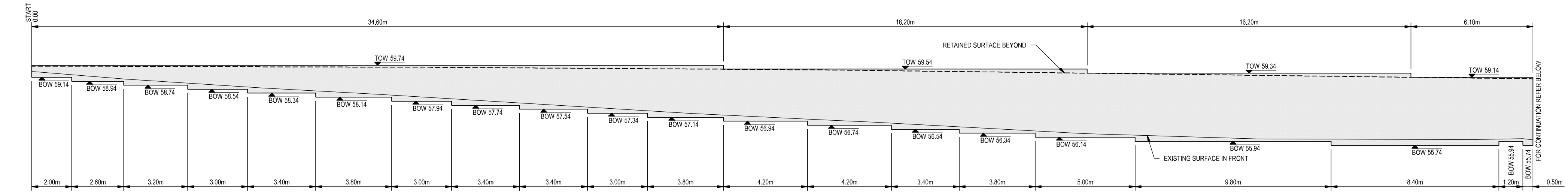
Scale: AS SHOWN
Date: 23/12/2022
Size: A1
Datum: MGA2020

Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C14.01
Revision: 5

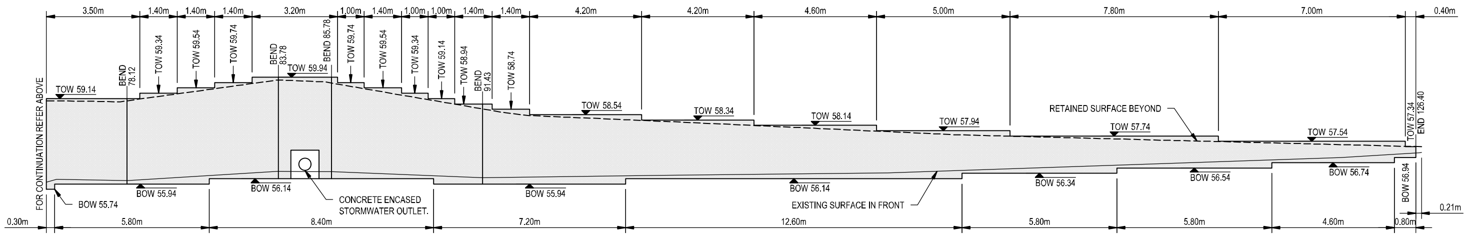
DATE PLOTTED: 19 December 2023 11:43 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C14.01-SITEWORKS DETAILS.dwg




## RETAINING WALL - RW01 ELEVATION

SCALE HORI 1:100
SCALE VERT 1:100




## RETAINING WALL - RW01 ELEVATION

SCALE HORI 1:100
SCALE VERT 1:100

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 1 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |

Client

CELESTINO

Scale

0 1 2 4 6 8 10m

SCALE 1:100 @A1

North



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Phone: 02 9922 6135

Project
SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title
RETAINING WALL ELEVATION

Scale: 1:100
Date: 24/11/2023
Size: A1
Datum: MGA2020

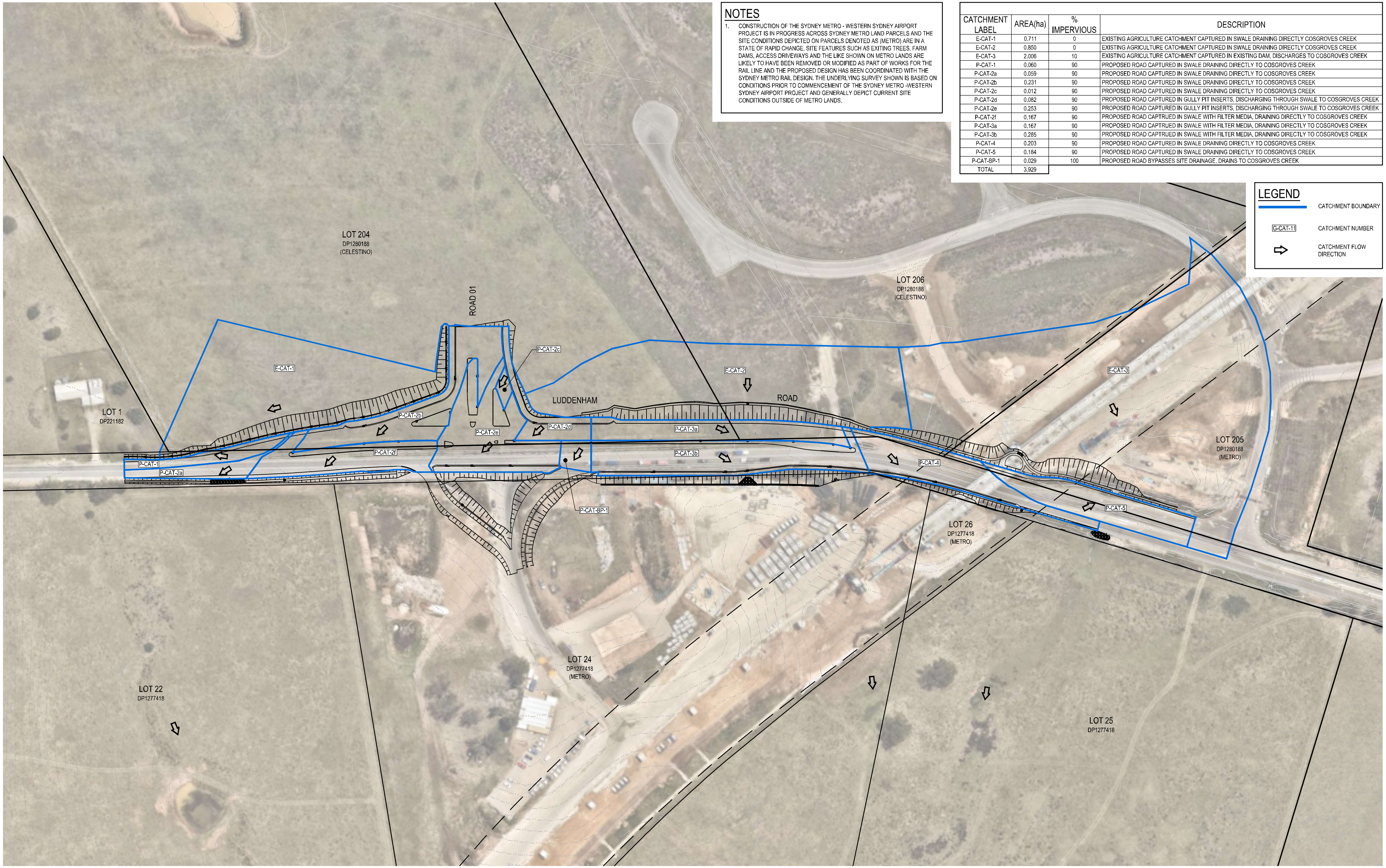
Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C15.01

Revision: 1

DATE PLOTTED: 19 December 2023 11:43 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C15.01-RETAINING WALL ELEVATION.dwg




## NOTES

1. CONSTRUCTION OF THE SYDNEY METRO - WESTERN SYDNEY AIRPORT PROJECT IS IN PROGRESS ACROSS SYDNEY METRO LAND PARCELS AND THE SITE CONDITIONS DEPICTED ON PARCELS DENOTED AS (METRO) ARE IN A STATE OF RAPID CHANGE. SITE FEATURES SUCH AS EXITING TREES, FARM DAMS, ACCESS DRIVEWAYS AND THE LIKE SHOWN ON METRO LANDS ARE LIKELY TO HAVE BEEN REMOVED OR MODIFIED AS PART OF WORKS FOR THE RAIL LINE AND THE PROPOSED DESIGN HAS BEEN COORDINATED WITH THE SYDNEY METRO RAIL DESIGN. THE UNDERLYING SURVEY SHOWN IS BASED ON CONDITIONS PRIOR TO COMMENCEMENT OF THE SYDNEY METRO -WESTERN SYDNEY AIRPORT PROJECT AND GENERALLY DEPICT CURRENT SITE CONDITIONS OUTSIDE OF METRO LANDS.

| CATCHMENT LABEL | AREA(ha) | % IMPERVIOUS | DESCRIPTION |
|---|---|---|---|
| E-CAT-1 | 0.711 | 0 | EXISTING AGRICULTURE CATCHMENT CAPTURED IN SWALE DRAINING DIRECTLY COSGROVES CREEK |
| E-CAT-2 | 0.850 | 0 | EXISTING AGRICULTURE CATCHMENT CAPTURED IN SWALE DRAINING DIRECTLY COSGROVES CREEK |
| E-CAT-3 | 2.006 | 10 | EXISTING AGRICULTURE CATCHMENT CAPTURED IN EXISTING DAM, DISCHARGES TO COSGROVES CREEK |
| P-CAT-1 | 0.060 | 90 | PROPOSED ROAD CAPTURED IN SWALE DRAINING DIRECTLY TO COSGROVES CREEK |
| P-CAT-2a | 0.059 | 90 | PROPOSED ROAD CAPTURED IN SWALE DRAINING DIRECTLY TO COSGROVES CREEK |
| P-CAT-2b | 0.231 | 90 | PROPOSED ROAD CAPTURED IN SWALE DRAINING DIRECTLY TO COSGROVES CREEK |
| P-CAT-2c | 0.012 | 90 | PROPOSED ROAD CAPTURED IN SWALE DRAINING DIRECTLY TO COSGROVES CREEK |
| P-CAT-2d | 0.082 | 90 | PROPOSED ROAD CAPTURED IN GULLY PIT INSERTS, DISCHARGING THROUGH SWALE TO COSGROVES CREEK |
| P-CAT-2e | 0.253 | 90 | PROPOSED ROAD CAPTURED IN GULLY PIT INSERTS, DISCHARGING THROUGH SWALE TO COSGROVES CREEK |
| P-CAT-2f | 0.167 | 90 | PROPOSED ROAD CAPTRUED IN SWALE WITH FILTER MEDIA, DRAINING DIRECTLY TO COSGROVES CREEK |
| P-CAT-3a | 0.167 | 90 | PROPOSED ROAD CAPTRUED IN SWALE WITH FILTER MEDIA, DRAINING DIRECTLY TO COSGROVES CREEK |
| P-CAT-3b | 0.285 | 90 | PROPOSED ROAD CAPTRUED IN SWALE WITH FILTER MEDIA, DRAINING DIRECTLY TO COSGROVES CREEK |
| P-CAT-4 | 0.203 | 90 | PROPOSED ROAD CAPTURED IN SWALE DRAINING DIRECTLY TO COSGROVES CREEK |
| P-CAT-5 | 0.184 | 90 | PROPOSED ROAD CAPTURED IN SWALE DRAINING DIRECTLY TO COSGROVES CREEK |
| P-CAT-BP-1 | 0.029 | 100 | PROPOSED ROAD BYPASSES SITE DRAINAGE, DRAINS TO COSGROVES CREEK |
| TOTAL | 3.929 | | |

## LEGEND

- CATCHMENT BOUNDARY
- C-CAT-11 CATCHMENT NUMBER
- CATCHMENT FLOW DIRECTION

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 6 | 19/12/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 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

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
STORMWATER CATCHMENT PLAN

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

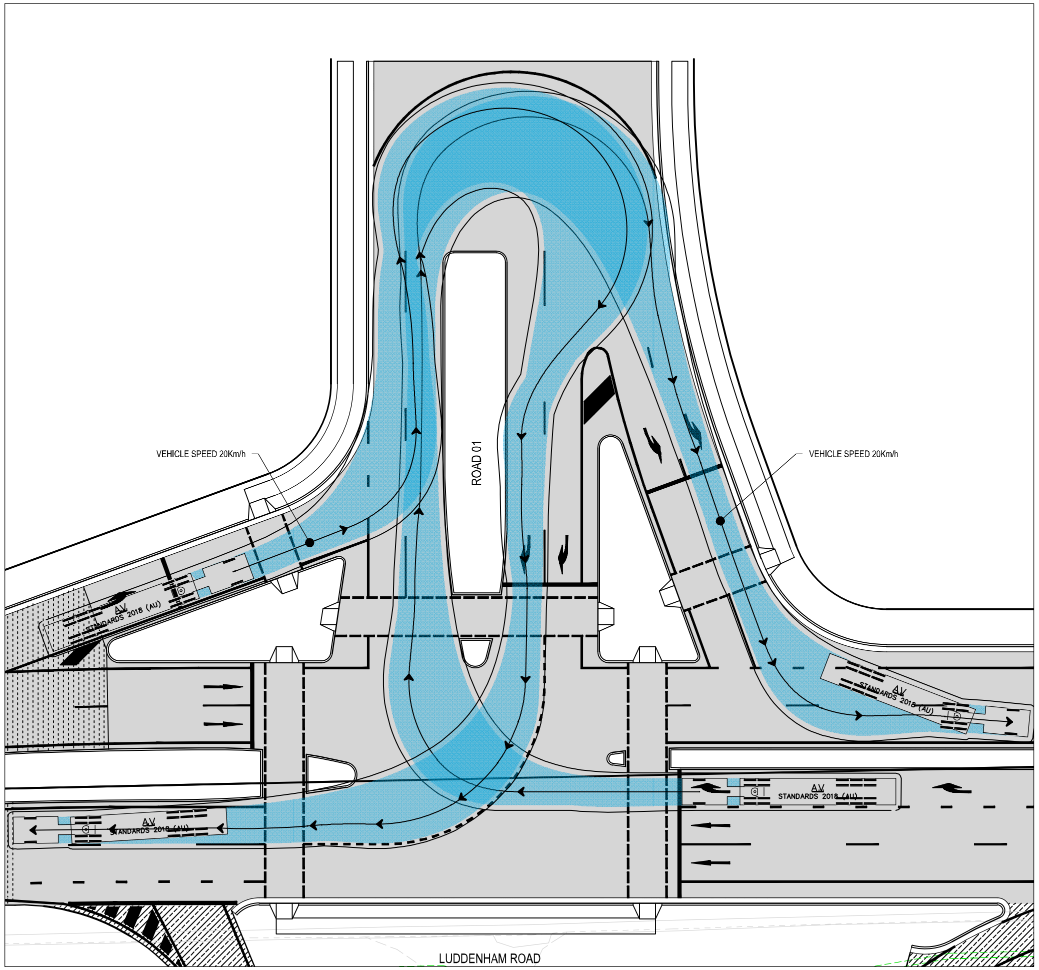
Status
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number
180001-01-DA-C22.01

Revision
6

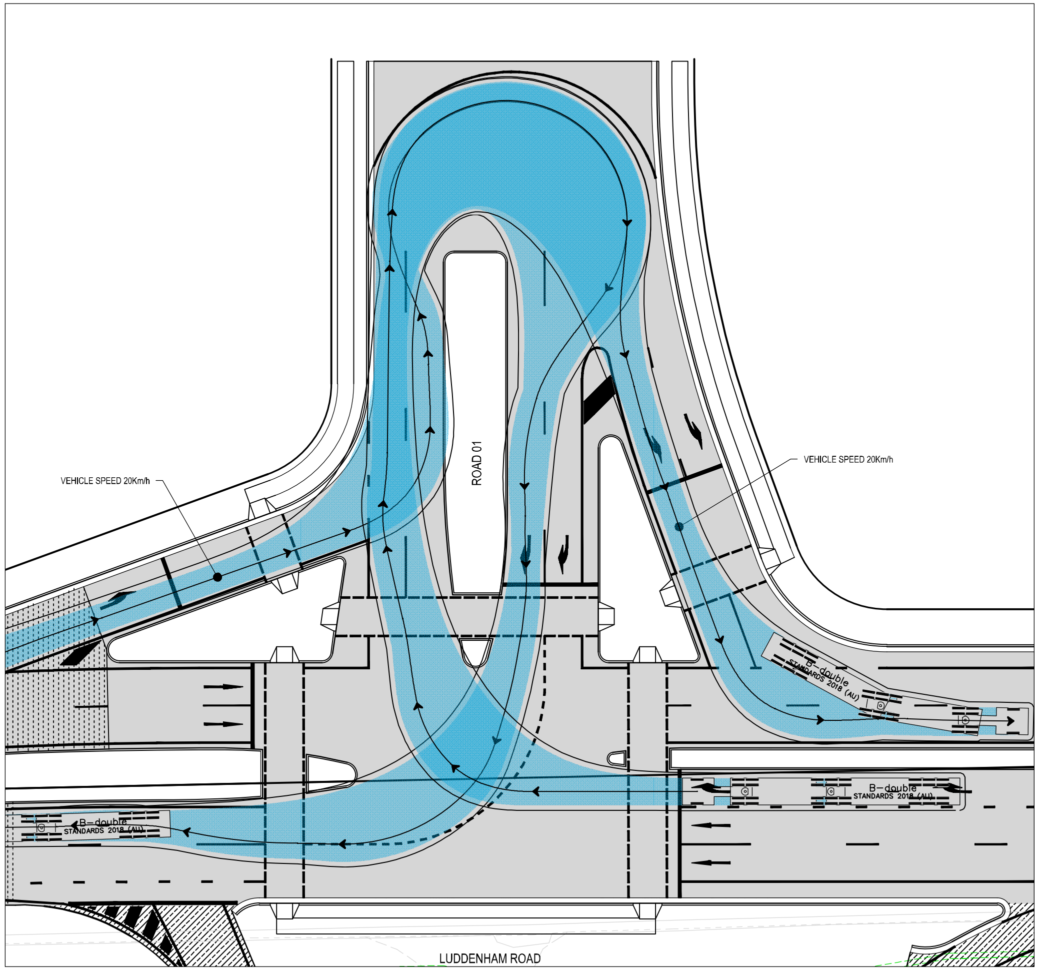
DATE PLOTTED: 19 December 2023 11:21 AM BY : SHAWN HOTONG

CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C22.01-STORMWATER CATCHMENT PLAN.dwg




LUDDENHAM ROAD & ROAD 01 INTERSECTION - ARTICULATED VEHICLE MOVEMENTS

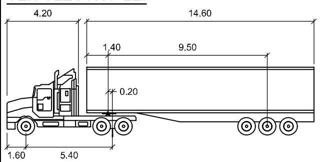
SCALE 1:250




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

SCALE 1:250

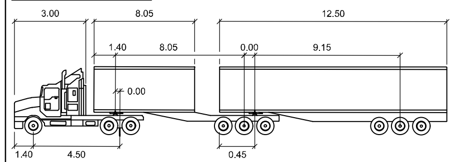
VEHICLE PROFILE:




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. |
|---|---|---|---|---|---|---|
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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: CELESTINO

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

North



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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

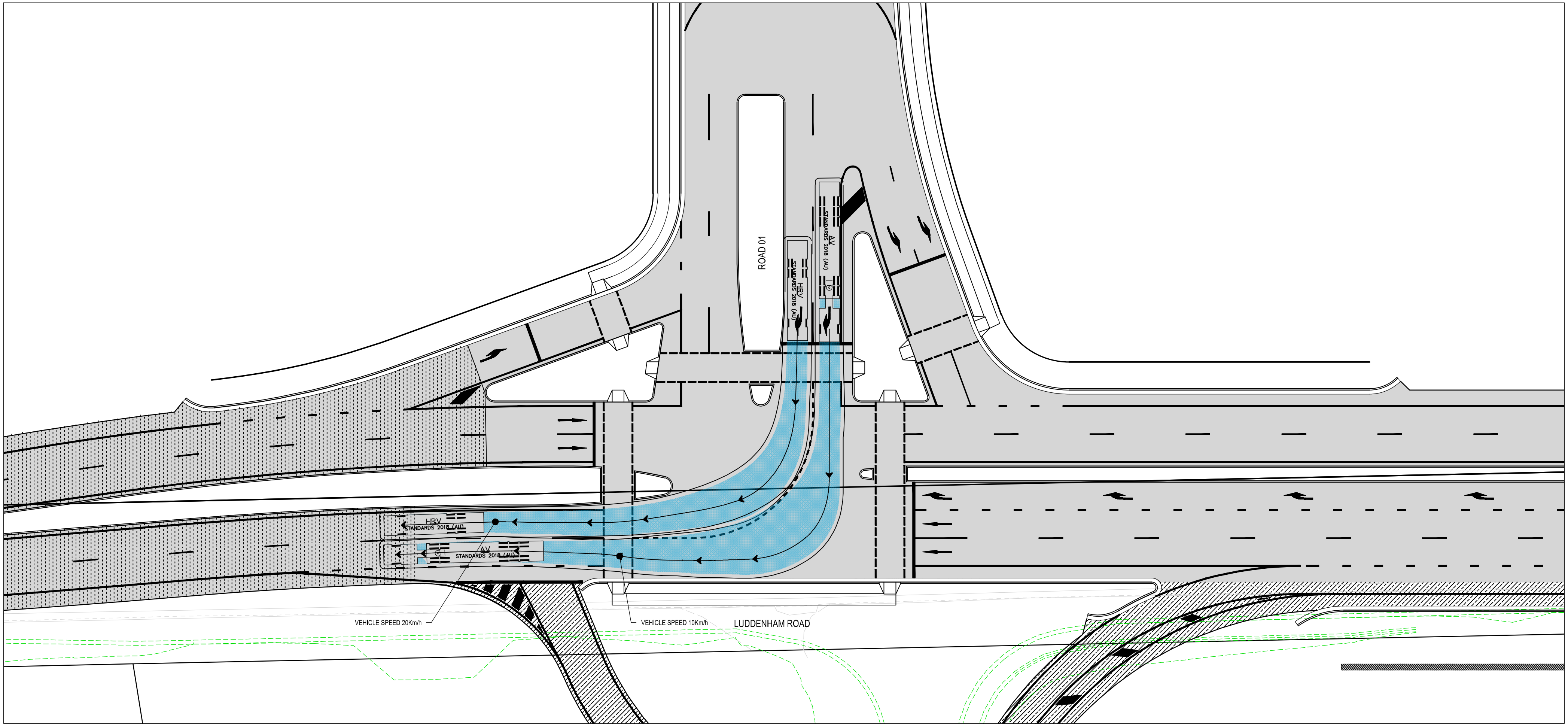
Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

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

Revision: 5

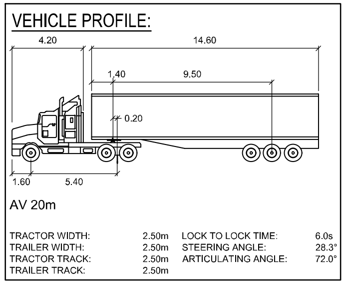
DATE PLOTTED: 19 December 2023 11:43 AM BY : SHAWN HOTONG

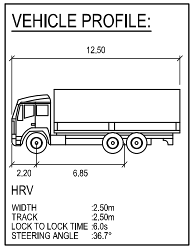
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DA\CC\01-DA\180001-01-DA-C25.01-C25.03-TURNING PATH PLAN.dwg




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

SCALE 1:250




| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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: CELESTINO

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

North



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ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: TURNING PATH PLAN

SHEET 02

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

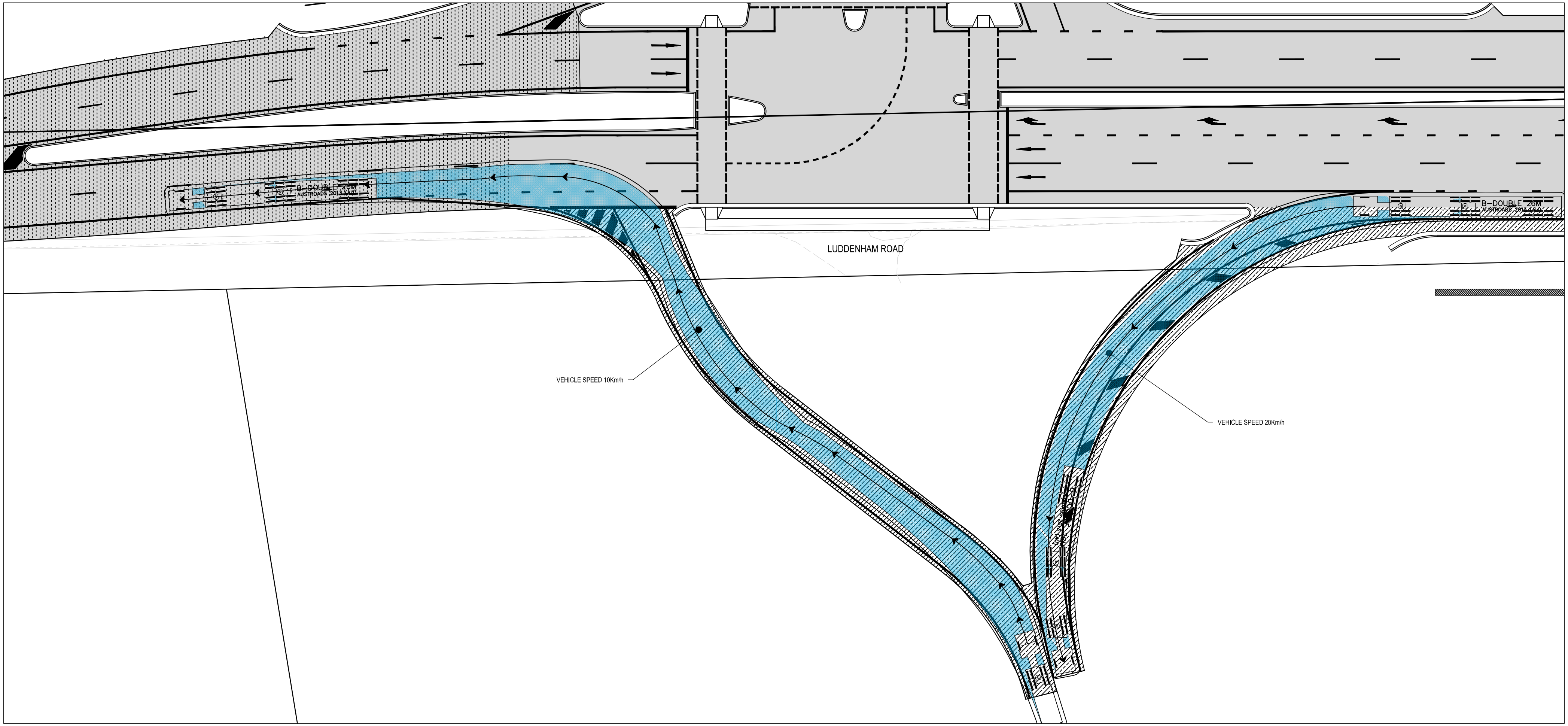
Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

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

Revision: 5

DATE PLOTTED: 19 December 2023 11:43 AM BY : SHAWN HOTONG

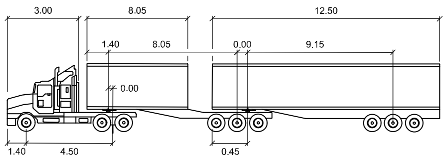
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C25.01-C25.03-TURNING PATH PLAN.dwg




## LUDDENHAM ROAD LOT 24 ACCESS DRIVEWAY - B-DOUBLE VEHICLE MOVEMENTS

SCALE 1:250

### 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. |
|---|---|---|---|---|---|---|
| 5 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | JS | - | SH |
| 3 | 8/05/2023 | ISSUED FOR DEVELOPMENT APPLICATION | CWH | JS | - | SH |
| 2 | 27/04/2023 | ISSUED FOR DEVELOPMENT APPLICATION | GJI | JS | - | SH |
| 1 | 6/04/2023 | 90% PROGRESS ISSUE FOR REVIEW | CWH | JS | - | SH |

Client: CELESTINO

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

North

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enspire
Enspire Solutions Pty Ltd
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ABN: 71 624 801 690
Phone: 02 9922 6135

Project: SYDNEY SCIENCE PARK
LUDDENHAM ROAD LUD3
CIVIL ENGINEERING WORKS

Title: TURNING PATH PLAN
SHEET 03

Scale: 1:250
Date: 6/04/2023
Size: A1
Datum: MGA2020

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

Project Number/Drawing Number: 180001-01-DA-C25.03
Revision: 5

DATE PLOTTED: 19 December 2023 11:43 AM BY : SHAWN HOTONG

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

# SAFETY IN DESIGN REPORT

## INTRODUCTION

ENSPIRE HAS BEEN APPOINTED BY CELESTINO DEVELOPMENT SSP TO PREPARE DESIGN DOCUMENTATION FOR ROADS AND STORMWATER PIT AND PIPE INFRASTRUCTURE FOR LUD3 INTERIM SIGNALISED INTERSECTION. THIS SAFETY IN DESIGN REPORT HAS BEEN DEVELOPED IN PARALLEL WITH THE DESIGN TO IDENTIFY POTENTIAL HAZARDS TO WORK HEALTH AND SAFETY AND DEVELOP RISK ASSESSMENT METHODS TO POTENTIALLY REDUCE THE LIKELIHOOD AND SEVERITY OF HAZARDS.

THIS SAFETY IN DESIGN REPORT HAS BEEN PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF THE WORK HEALTH AND SAFETY REGULATION 2017 AND THE WORK HEALTH AND SAFETY REGULATION PART 6.2 CLAUSE 295. UNDER THE WORK HEALTH AND SAFETY REGULATION DESIGNERS HAVE THE RESPONSIBILITY TO ENSURE THEIR DESIGN ELIMINATES OR MINIMISES RISKS TO HEALTH AND SAFETY AND GIVE ADEQUATE INFORMATION TO PEOPLE COMMISSIONING THE DESIGN AND UNDERTAKING CONSTRUCTION, OPERATION AND MAINTENANCE ACTIVITIES BASED ON THE DESIGN.

THIS REPORT SPECIFIES POTENTIAL HEALTH AND SAFETY RISKS AND HAZARDS ASSOCIATED WITH THE DESIGN ELEMENTS DOCUMENTED IN THIS DRAWING PACKAGE TO RELEVANT PERSONNEL DURING THE DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE, AND DEMOLITION AS WELL AS ULTIMATE DEMOLITION PROCESS AND ASSESSES THEIR LIKELIHOOD AND CONSEQUENCES. THIS REPORT PROPOSES ACTIONS AND STRATEGIES AGAINST RISKS IDENTIFIED TO ACHIEVE EFFECTIVE MITIGATION OF THE RISKS AND HAZARDS, AND ASSESSES RESIDUAL RISKS BASED ON CONTROL MEASURES BEING IMPLEMENTED. ANY SAFETY ISSUES UNRESOLVED THROUGH DESIGN ARE ALSO IDENTIFIED FOR THEIR APPROPRIATE MANAGEMENT.

THE INFORMATION CONTAINED IN THIS SAFETY IN DESIGN REPORT HAS BEEN PREPARED PRIOR TO THE COMMENCEMENT OF THE WORK ON SITE. IT DOES NOT TAKE ACCOUNT OF ANY MATTERS OR INFORMATION WHICH MAY COME TO LIGHT AFTER THAT TIME. WHEN A DESIGN IS ALTERED, AN ADDITIONAL REVIEW MUST BE CONDUCTED TO ENSURE NEW RISKS HAVE BEEN CAPTURED DUE TO MODIFICATION OF THE DESIGN. ADDITIONALLY, CLIENTS ARE REQUIRED TO INFORM ENSPIRE OF ANY EXISTING RISKS AND HAZARDS IN THE AREA WHERE CONSTRUCTION WILL TAKE PLACE.

THE RISKS IDENTIFIED IN THIS SAFETY IN DESIGN REPORT ARE PROJECT AND DESIGN SPECIFIC RISKS WHICH WOULD NOT BE EASILY RECOGNIZED BY A REASONABLY COMPETENT STAKEHOLDER. IT DOES NOT ADDRESS THE COMMON-PLACE HAZARDS OR HAZARDS WHERE KNOWN SOLUTIONS APPLY, AND WHICH ARE ASSOCIATED WITH CONSTRUCTION, OPERATION AND MAINTENANCE AND DEMOLITION GENERALLY. THESE COMMON-PLACE HAZARDS MUST BE CONTROLLED BY THE APPLICATION OF NORMAL GOOD MANAGEMENT PRACTICES.

THIS DESIGN REPORT ASSUMES THAT DURING CONSTRUCTION, OPERATION AND MAINTENANCE OF THE DEVELOPMENT, THE PRINCIPAL WILL ENGAGE EXPERIENCED AND COMPETENT PERSONNEL AS PART OF THE RESPECTIVE TENDER EVALUATION PROCESS. IT IS THE HEAD CONTRACTOR'S OBLIGATION TO PREPARE AND IMPLEMENT SITE SPECIFIC WORK HEALTH AND SAFETY MANAGEMENT PLANS TO MITIGATE COMMON RISKS ASSOCIATED WITH GENERAL CONSTRUCTION AND OPERATION ACTIVITIES IN ACCORDANCE WITH THE WORK HEALTH AND SAFETY REGULATION 2017.

## PROPOSED WORKS

THE SCOPE OF THE MAIN ACTIVITIES INVOLVED IN THESE WORKS ARE:

- DETAILED DESIGN OF ROADS AND STORMWATER INFRASTRUCTURE;
- CONSTRUCTION OF ROADS, STORMWATER INFRASTRUCTURE AND SERVICES;
- SITE VISITS AND INSPECTIONS;
- POST CONSTRUCTION OPERATION AND MAINTENANCE.
- FUTURE DEMOLITION

## INFORMATION TRANSFER

SAFETY IN DESIGN RELIES ON EFFECTIVE DOCUMENTATION AND COMMUNICATION BETWEEN EVERYONE INVOLVED IN THE LIFE CYCLE OF THE DESIGN ELEMENTS. IN ACCORDANCE WITH THE WORK HEALTH AND SAFETY REGULATION 2017, THE DESIGNER MUST PROVIDE A COPY OF THIS SAFETY IN DESIGN REPORT TO THE PRINCIPAL CONTRACTOR IN PARALLEL WITH THE COMPLETED DESIGN DOCUMENTATION AND ENSURE THAT THE FOLLOWING ACTIONS ARE UNDERTAKEN:

- ONSITE SAFETY INDUCTIONS, INCLUDING HAZARDS IDENTIFIED IN THIS REPORT, SHOULD BE CONDUCTED FOR ALL STAFF;
- SAFETY MANAGEMENT PLANS SHOULD BE PREPARED FOR THE HAZARDS IDENTIFIED IN THIS REPORT;
- THERE SHOULD BE NO VARIATION ON DESIGN REQUIREMENTS WITHOUT CONSULTATION WITH THE ORIGINAL DESIGNERS;
- ONSITE MANAGEMENT OF CONTRACTORS TO ENSURE THAT HAZARDS THAT ARISE THROUGH STARTING/COMPLETION OF JOBS DOES NOT OCCUR; AND
- THIS DESIGN MAY INTERFACE WITH OTHER PLANS AND ACCOUNT SHOULD BE TAKEN OF ANY INTERFACE ISSUES.

IT IS RECOMMENDED THAT THIS SAFETY IN DESIGN REPORT BE PASSED ONTO ANY PARTICIPANT IN THE PROJECT WHO MAY EXTEND THE DESIGN OR FURTHER DEVELOP THE DESIGN.

## SAFE DESIGN PROCESS

A SAFE DESIGN PROCESS SHOULD BE ENGAGED EARLY IN THE DEVELOPMENT OF THE DESIGN TO IDENTIFY ALL CONCEIVABLE RISKS AND HAZARDS THAT MAY AFFECT THE FUNDAMENTALS OF THE DESIGN AND AVOID UNNECESSARY REWORK. IT SHOULD BE IMPLEMENTED THROUGH A STRUCTURED APPROACH ACROSS EACH PHASE OF THE DESIGN PROCESS.

DELIVERY OF SAFE DESIGN FOR EACH DESIGN PHASE OF THE PROJECT HAS BEEN CARRIED OUT FOLLOWING THE STEPS BELOW:

- STEP 1: PRELIMINARY RISK IDENTIFICATION

  THE DESIGNER/DESIGN TEAM TO CONDUCT A PRELIMINARY ASSESSMENT AND IDENTIFY ANY POTENTIAL RISKS RELEVANT TO THE SCOPE OF DESIGN WORKS. WITH PROJECTS INVOLVING MULTIPLE DISCIPLINES, THE DESIGNER/DESIGN TEAM TO ATTEND SAFETY IN DESIGN WORKSHOP (IF APPROPRIATE) AND IDENTIFY RISKS IN CONSULTATION WITH OTHER KEY PROJECT STAKEHOLDERS.
- STEP 2: RISK ASSESSMENT AND MITIGATION

  THE DESIGNER/DESIGN TEAM TO ASSESS THE LIKELIHOOD AND SEVERITY OF EACH HAZARD AND DEVELOP CONTROLS AND MEASURES TO ELIMINATE OR MINIMISE THE CONSEQUENCES OF THE HAZARD.
- STEP 3: VERIFICATION

  ENSPIRE TO PERFORM INTERNAL VERIFICATION ON THE SAFE DESIGN RISK REGISTER PRIOR TO ISSUING TO THE CONTRACTOR AND CLIENT.
- STEP 4: REVIEW DESIGN

  THE DESIGNER/DESIGN TEAM TO IDENTIFY ANY ALTERATIONS IN DESIGN AND REVIEW AND UPDATE RISK REGISTER ACCORDINGLY.

## PROJECT REPRESENTATIVES

| ORGANISATION | PROJECT ROLE | MAIN CONTACT | CONTACT DETAILS |
|---|---|---|---|
| CELESTINO DEVELOPMENTS SSP | DEVELOPMENT PROPONENT | BRADLEY DEKRUIF | TEL:<br>02 9842 1259<br>EMAIL:<br>bradley.dekruif@celestino.net.au<br>ADDRESS:<br>642 GREAT WESTERN HIGHWAY, PENDLE HILL NSW 2145 |
| ENSPIRE SOLUTIONS | CIVIL DESIGN CONSULTANT | SHAWN HOTONG | TEL:<br>0424 629 155<br>EMAIL:<br>shawn.hotong@enspiresolutions.com.au<br>ADDRESS:<br>LEVEL 4, 153 WALKER STREET, NORTH SYDNEY NSW 2060 |
| TBC | PRINCIPAL CONTRACTOR | TBC | TBC |
| TBC | ASSET OPERATOR / MAINTENANCE | TBC | TBC |

## QUALITATIVE MEASURES OF LIKELIHOOD OR FREQUENCY

| LEVEL | MEASURE | CRITERIA |
|---|---|---|
| 1 | RARE | WOULD ONLY OCCUR IN HIGHLY EXCEPTIONAL CIRCUMSTANCES THAT ARE UNLIKELY TO EXIST IN ANY PHASE OF THE DEVELOPMENT'S LIFECYCLE PERIOD. EXTREMELY REMOTE CHANCE OF OCCURRENCE IN DEVELOPMENT'S LIFECYCLE PERIOD. 'ONCE IN A LIFETIME' EVENT. |
| 2 | UNLIKELY | NOT LIKELY TO OCCUR IN THE DEVELOPMENT'S LIFECYCLE PERIOD. A SMALL, BUT REMOTE CHANCE OF OCCURRENCE DUE TO CIRCUMSTANCES / SITUATIONS THAT COULD ARISE. |
| 3 | POSSIBLE | LIKELY TO OCCUR AT LEAST ONCE BUT NOT EXPECTED TO OCCUR MUCH MORE THAT THIS IN THE DEVELOPMENT'S LIFECYCLE PERIOD. |
| 4 | LIKELY | LIKELY TO OCCUR MORE THAN ONCE IN THE DEVELOPMENT'S LIFECYCLE PERIOD BUT NOT AN 'EVERYDAY' OCCURRENCE. PRECONDITIONS WILL ARISE AT TIMES THROUGHOUT THE PERIOD. |
| 5 | ALMOST CERTAIN | WILL OCCUR. CIRCUMSTANCES OR SITUATIONS ARE LIKELY TO ARISE OFTEN THROUGHOUT THE DEVELOPMENT'S LIFECYCLE PERIOD WHICH PROVIDES THE OPPORTUNITY FOR CRYSTALLISATION OF RISK. EXPECT FREQUENT, REGULAR OCCURRENCES. |

## QUALITATIVE MEASURES OF IMPACT - CONSEQUENCE SEVERITY

| LEVEL | MEASURE | CRITERIA |
|---|---|---|
| 1 | INSIGNIFICANT | NO INJURIES; NO ENVIRONMENTAL IMPACT. |
| 2 | MINOR | FIRST AID; ENVIRONMENTAL RELEASE IMMEDIATELY CONTAINED. |
| 3 | MODERATE | MEDICAL TREATMENT; ENVIRONMENTAL RELEASE NOT IMMEDIATELY CONTAINED WITH NO DETRIMENTAL EFFECTS. |
| 4 | MAJOR | LOST TIME AND/OR LONG-TERM INJURY/ILLNESS; ENVIRONMENTAL RELEASE NOT IMMEDIATELY CONTAINED WITH TOXIC EFFECTS. |
| 5 | CATASTROPHIC | FATALITY; RELEASE TO THE ENVIRONMENT WITH LONG TERM OR PERMANENT TOXIC EFFECTS. |

## MATRIX FOR DETERMINATION OF RISK LEVEL

| CONSEQUENCE | | | | | | | |
|---|---|---|---|---|---|---|---|
| | CATASTROPHIC | (5) | HIGH | VERY HIGH | VERY HIGH | VERY HIGH | VERY HIGH |
| | MAJOR | (4) | HIGH | HIGH | VERY HIGH | VERY HIGH | VERY HIGH |
| | MODERATE | (3) | MODERATE | MODERATE | HIGH | HIGH | VERY HIGH |
| | MINOR | (2) | LOW | LOW | MODERATE | HIGH | VERY HIGH |
| | INSIGNIFICANT | (1) | LOW | LOW | LOW | MODERATE | HIGH |
| | | | RARE (1) | UNLIKELY (2) | POSSIBLE (3) | LIKELY (4) | ALMOST CERTAINLY (5) |
| | | | LIKELIHOOD | | | | |

## SAFE DESIGN RISK REGISTER

| ITEM | ACTIVITY | HAZARD | STAGE | INITIAL RISK | | | DESIGN ACTION | RESIDUAL RISK | | | PERSON RESPONSIBLE FOR CONTROLS | STATUS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | LIKELIHOOD | CONSEQUENCE | RISK LEVEL | | LIKELIHOOD | CONSEQUENCE | RISK LEVEL | | |
| 1 | SEDIMENT BASIN OPERATION | FALLING INTO BASIN WHICH HOLDS WATER | CONSTRUCTION | 2 | 5 | VERY HIGH | - PROVIDE BATTER SLOPES SUITABLE FOR SAFE EGRESS.<br>- MAINTAIN WATER LEVELS IN BASIN.<br>- MINIMISE PERMANENT WATER DEPTH.<br>- FENCE SEDIMENT BASINS TO PREVENT ACCIDENTAL FALL. | 2 | 3 | MODERATE | CONTRACTOR | - |
| 2 | TREE REMOVAL | - FALL FROM HEIGHT<br>- CRUSH INJURY FROM FALLING TREE | CONSTRUCTION | 2 | 5 | VERY HIGH | - LIMIT NUMBER OF TREES TO BE REMOVED.<br>- CERTIFIED ARBORIST USING BEST PRACTICES RESPONSIBLE FOR TREE REMOVAL. | 2 | 3 | MODERATE | CONTRACTOR | - |
| 3 | PIPE TRENCHING | FALL INTO DEEP EXCAVATIONS | CONSTRUCTION | 2 | 5 | VERY HIGH | - APPLY APPROPRIATE BENCHING / SHORING TECHNIQUES.<br>- UNDERTAKE WORKS UNDER GEOTECHNICAL ENGINEER SUPERVISION.<br>- MANAGE ROAD SIDE TRAFFIC APPROPRIATELY. | 1 | 3 | MODERATE | CONTRACTOR | - |
| 4 | LOCALISED STEEP BATTERS | VEHICLE ROLL OVER | OPERATION | 3 | 5 | VERY HIGH | - PROVIDE VEHICLE BARRIER PROTECTION | 3 | 2 | MODERATE | DESIGNER | - |
| 5 | VIADUCT CROSSING | COLLISION WITH TALL VEHICLES / LOADS | OPERATION AND CONSTRUCTION | 3 | 5 | VERY HIGH | - DESIGN VERTICAL ROAD GEOMETRY WITH ADEQUATE VERTICAL CLEARANCE.<br>- CONTRACTOR TO ESTABLISH SAFE WORK METHODS WITHIN VIADUCT BUFFER. | 1 | 5 | HIGH | DESIGNER<br>CONTRACTOR | - |
| 6 | EXISTING LIVE UTILITIES | CONFLICT WITH EXISTING UTILITIES | CONSTRUCTION | 5 | 5 | VERY HIGH | - UNDERGROUND OVERHEAD ELECTRICAL.<br>- PHYSICALLY LOCATE EXISTING UTILITIES TO CONFIRM LOCATIONS.<br>- ADOPT SURVEY/WAE/FOR CONSTRUCTION DATA FOR INFRASTRUCTURE PLANNING PURPOSES (E.G. STORMWATER CROSSINGS).<br>- ADOPT SAFE WORKING METHODS AROUND EXISTING UTILITIES.<br>- APPLY TEMPORARY PROTECTION MEASURES DURING WORKS. | 3 | 3 | HIGH | DESIGNER<br>CONTRACTOR | - |
| 7 | VIADUCT COLUMN CLEAR ZONE | VEHICLE COLLISION WITH COLUMNS | OPERATION | 2 | 2 | LOW | - CURRENT DESIGN ADEQUATELY POSITIONS COLUMNS RELATIVE TO EDGE OF TRAVEL LANE, OUTSIDE CLEAR ZONE.<br>- PROPOSED ROADS ARE IN CUT, RESULTING IN THE COLUMN HAZARD BEING ELEVATED REDUCING COLLISION POTENTIAL. | 2 | 2 | LOW | DESIGNER | - |
| 8 | CONCURRENT ADJACENT WORKS | OVERLAPPING PRINCIPAL CONTRACTOR ZONES GENERATING CONSTRUCTION TRAFFIC HAZARD | CONSTRUCTION | 3 | 4 | VERY HIGH | - COORDINATE TRAFFIC CONTROLS AND VEHICLE ROUTES WITH ADJACENT WORKS SITE(S)<br>- CONSIDER ALTERNATIVE ACCESS ROUTES TO SEPARATE CONSTRUCTION TRAFFIC. | 1 | 3 | MODERATE | CONTRACTOR | - |

| REV. | DATE | DESCRIPTION | DRN. | DES. | VERIF. | APPD. |
|---|---|---|---|---|---|---|
| 5 | 2/04/2024 | AMENDED TO TFNSW & SMWSA COMMENTS | SHH | SHH | | SHH |
| 4 | 24/11/2023 | ISSUED FOR DEVELOPMENT APPLICATION | MDH | 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

CELESTINO

Scale

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
SAFETY IN DESIGN REPORT

Scale NTS
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-C26.01

Revision
5

DATE PLOTTED: 2 April 2024 12:55 PM BY : SHAWN HOTONG
CAD File: P:\180001 SSP\D-Civil\01-LUD3 Signals\Drawings\6-DACC\01-DA\180001-01-DA-C26.01-SAFETY IN DESIGN REPORT.dwg

# Appendix B TfNSW Signals In Principal Approval

TfNSW

**TRANSPORT**

NSW GOVERNMENT

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

| Project Details | | |
|---|---|---|
| **Program**<br>N/A | **Region**<br>Greater Sydney | **3 Cities**<br>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** | D. Ninham | **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.**

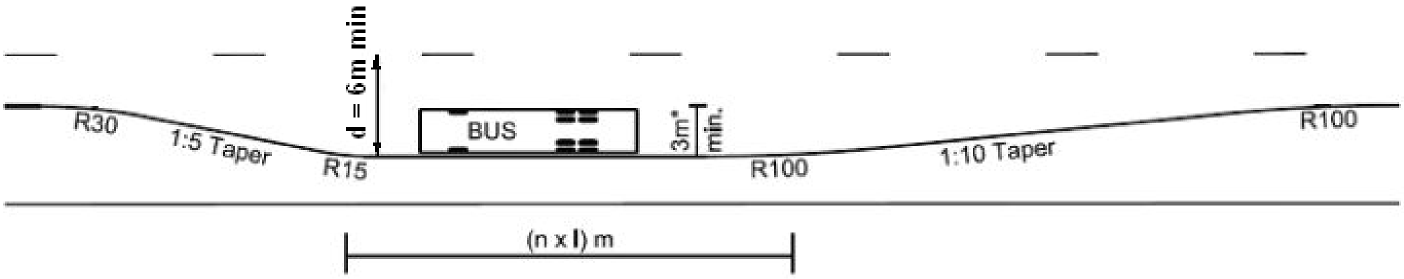
**In extenuating circumstances, such as where traffic volumes, land use or network changes have substantially altered the road environment, Roads and Maritime reserves the right to withdraw this Agreement in Principle.**

# Appendix C Geometric Design Details

Enspire Solutions

### 4.12.3 Bus stops - rural

The approved layout for rural indented bus bays is shown below:




* Width (including clearances) may need to be increased where large/wide buses are involved
n = number of buses using stop simultaneously
l = length of bus (including clearances if desired)
d = either centreline of road, designated centreline or first lane line

# 5 Sight distance

### 5.2.2 Driver reaction time

Roads and Maritime practice is to use the following driver reaction times:

**Table 5.2: Driver reaction times**

| Reaction Time (s) | Design Speed (km/h) |
|---|---|
| 2.5 | ≥ 110 |
| 2.0 | 100 |
| 1.5 | ≤ 90 |

Adopted reaction time

Note: Higher reaction times should be considered where local conditions warrant.

### 5.2.3 Longitudinal deceleration

Roads and Maritime uses a coefficient of deceleration of 0.36 for cars on sealed roads.

The tabled value of coefficient of deceleration for buses ensures passenger comfort when decelerating on the approach to a bus stop. This should be considered when designing bus specific facilities.

### 5.3.2 Truck stopping sight distance

Roads and Maritime does not use truck stopping sight distance as a normal design parameter. Truck stopping sight distance should be checked in approach to truck related facilities (such as inspection bays and weigh bridges), assuming the car / truck speed relationship shown in Table 3.5.

# 7 Horizontal alignment

### 7.5.1 Compound curves

In Roads and Maritime practice  the desirable ratio of the larger radius to the smaller radius should not exceed 1:0.75. However, in low speed designs, where compound curves with radii less than 1000m are unavoidable, the larger radius to the smaller should not exceed 1:0.5. For high speed design, the design speed criteria and not curve ratios should be satisfied.

### 7.6 Side friction and minimum curve size

Roads and Maritime uses the desirable maximum values of side friction for cars as the normal design parameter for side friction.

### 7.8 Curves with adverse crossfall

Roads and Maritime does not use the values shown in Table 7.12: Minimum radii with adverse crossfall for existing urban roads.

Absolute maximum value for trucks checked for safety in design.

### 7.9 Pavement widening on horizontal curves

Roads and Maritime accepts the application of independently widening lanes or widening evenly across all lanes. Existing and/or proposed traffic composition and lane usage should be considered.

## 8 Vertical alignment

### 8.6.7 Minimum length of vertical curves

Roads and Maritime does not use the values shown in Table 8.11: Minimum length vertical curves for reconstruction.

## A Extended design domain (EDD) for geometric road design

### A.5 Pavement widening

Where normal design domain values for lane widening on curves cannot be achieved, lane widening can be calculated using the following formula. The need for lane widening ceases when widening per lane is less than 0.2 metres.

$$W = \left(\sqrt{R^2 + A(2L + A)} - \sqrt{R^2 - \sum \mathrm{L_i}^2}\right) \mathrm{x} \left(1 - e^{\frac{-0.015 \,\mathrm{x}\, D \,\mathrm{x}\, R}{\sqrt{\sum \mathrm{Li^2}}}}\right) + W_V + C_l$$

Where:

| Design vehicle | ∑Li² | L | A | Wv |
|---|---|---|---|---|
| Passenger vehicle (5.2m) | 9.3025 | 3.05 | 0.95 | 1.94 |
| Service vehicle (8.8m) | 25 | 5 | 1.5 | 2.5 |
| Single unit truck / bus (12.5m) | 46.9225 | 6.85 | 2.2 | 2.5 |
| Long rigid bus (14.5m) | 70.56 | 8.4 | 2.6 | 2.5 |
| Articulated bus (19m) | 61.21 | 5.5 | 2.6 | 2.5 |
| Prime move and semi-trailer (19m) | 118.3 | 5.3 | 1.6 | 2.5 |
| Prime move and semi-trailer (25m) | 222.21 | 5.4 | 1.6 | 3.0 |
| B-double (25m) | 169.81 | 4 | 1 | 2.5 |
| B-double (26m) | 168.775 | 4.5 | 1.4 | 2.5 |
| A double (Type I) (36.2m) | 228.9 | 5.5 | 1.6 | 2.5 |
| B triple (35.4m) | 245.99 | 5 | 1.5 | 2.5 |
| A triple | 333.29 | 6 | 1.7 | 2.5 |

Note: The design vehicles listed in the table are those listed in Austroads Design Vehicles and Turning Path Templates (2013)

$W$ = Widened lane width (m)

$Wv$ = Width of vehicle

$R$ = Radius (m)

$e$ = Exponential mathematical constant "e"

$D$ = Degree of curvature (degrees)

$C_l$ = Lateral clearance (m)

$L$ = Wheelbase of single unit or prime mover (m)

$A$ = Front overhang of inner lane vehicle (m)

**Table 3.1: Approach sight distance (ASD) and corresponding minimum crest vertical curve size for sealed roads (S < L)**

| Design speed (km/h) | Based on approach sight distance for a car[1] $h_1 = 1.1$, $h_2 = 0$, $d = 0.36$[2] | | | | | |
|---|---|---|---|---|---|---|
| | $R_T = 1.5$ sec[3] | | $R_T = 2.0$ sec | | $R_T = 2.5$ sec | |
| | ASD (m) | *K* | ASD (m) | *K* | ASD (m) | *K* |
| 40 Road 01 | 34 | 5.3 | 40 | 7.2 | – | – |
| 50 | 48 | 10.5 | 55 | 13.8 | – | – |
| 60 | 64 | 18.8 | 73 | 24.0 | – | – |
| 70 | 83 | 31.1 | 92 | 38.9 | – | – |
| 80 | 103 | 48.5 | 114 | 59.5 | – | – |
| 90 | 126 | 72.3 | 139 | 87.3 | 151 | 104 |
| 100 | 151 | 104 | 165 | 124 | 179 | 146 |
| 110 | – | – | 193 | 171 | 209 | 198 |
| 120 Luddenham Road | – | – | 224 | 229 | 241 | 264 |
| 130 | – | – | 257 | 301 | 275 | 344 |
| Truck stopping capability provided by the minimum crest curve size[4] | $h_1 = 2.4$ m, $h_2 = 0$ m, $d = 0.22$ | | | | | |

1 *If the average grade over the braking length is not zero, calculate the approach sight distance (ASD) values using the correction factors in Table 3.4 (or use Equation 1) by applying the average grade over the braking length.*

2 *In constrained locations (typically lower volume roads, less important roads, mountainous roads, lower speed urban roads and tunnels), a coefficient of deceleration of 0.46 may be used. For any horizontal curve with a side friction factor greater than the desirable maximum value for cars (in constrained locations), use a coefficient of deceleration of 0.41. The resultant crest curve size can then be calculated using the relevant equations in AGRD Part 3 (Austroads 2016b).*

3 *A 1.5 sec reaction time is only to be used in constrained situations where drivers will be alert. Typical situations are given in Table 5.2 of AGRD Part 3. The general minimum reaction time is 2 sec.*

4 *This check case assumes the same combination of design speed and reaction time as those listed in the table, except that the 120 km/h and 130 km/h speeds are not used.*

*Notes:*
*K is the length of vertical curve in metres for a 1% grade change.*
*Main Roads Western Australia has adopted a desirable minimum reaction time of 2.5 sec and an absolute minimum reaction time of 2.0 sec. A reaction time of 1.5 sec is not to be used in Western Australia.*
*Combinations of design speed and reaction times not shown in this table are generally not used.*
*Refer to AGRD Part 3 to determine the ASD for trucks around horizontal curves.*

**Table 3.2: Safe intersection sight distance (SISD) and corresponding minimum crest vertical curve size for sealed roads (S < L)**

| Design speed (km/h) | Based on safe intersection sight distance for cars[1] $h_1$ = 1.1; $h_2$ = 1.25, $d$ = 0.36[2]; Observation time = 3 sec | | | | | |
|---|---|---|---|---|---|---|
| | $R_T$ = 1.5 sec[3] | | $R_T$ = 2.0 sec | | $R_T$ = 2.5 sec | |
| | SISD (m) | $K$ | SISD (m) | $K$ | SISD (m) | $K$ |
| 40 | 67 | 4.9 | 73 | 6 | – | – |
| 50 | 90 | 8.6 | 97 | 10 | – | – |
| 60 | 114 | 14 | 123 | 16 | – | – |
| 70 | 141 | 22 | 151 | 25 | – | – |
| 80 | 170 | 31 | 181 | 35 | – | – |
| 90 | 201 | 43 | 214 | 49 | 226 | 55 |
| 100 | 234 | 59 | 248 | 66 | 262 | 74 |
| 110 | – | – | 285 | 87 | 300 | 97 |
| 120 | – | – | 324 | 112 | 341 | 124 |
| 130 | – | – | 365 | 143 | 383 | 157 |

Luddenham Road

1 *If the average grade over the braking length is not zero, calculate the safe intersection sight distance (SISD) values using the correction factors in Table 3.4 (or use Equation 2) by applying the average grade over the braking length.*
2 *A coefficient of deceleration of greater than 0.36 is not provided in this table. The provision of SISD requires more conservative values than for other sight distance models (e.g. the stopping sight distance model allows values up to 0.46 in constrained situations). This is because there is a much higher likelihood of colliding with hazards at intersections (that is, other vehicles). Comparatively, there is a relatively low risk of hitting a small object on the road (the stopping sight distance model).*
3 *A 1.5 sec reaction time is only to be used in constrained situations where drivers will be alert. Typical situations are given in Table 4.2 of AGRD Part 3 (Austroads 2016b). The general minimum reaction time is 2 sec.*

*Notes:*
*K is the length of vertical curve for a 1% change in grade.*
*To determine SISD for trucks around horizontal curves, use Equation 2 with an observation time of 2.5 sec.*
*Main Roads Western Australia have adopted a desirable minimum reaction time of 2.5 sec and an absolute minimum reaction time of 2.0 sec. A reaction time of 1.5 sec is not to be used in Western Australia.*
*Combinations of design speed and reaction times not shown in this table are generally not used.*

**Table 3.3: Safe intersection sight distances check cases**

| | | |
|---|---|---|
| **Minimum SISD capability provided by the crest vertical curve size[1]** | Car at night[2] | $d$ = 0.46, $h_1$ = 0.65 m, $h_2$ = 1.25 m, observation time = 2.6 sec (car headlight to top of car)<br>$d$ = 0.46, $h_1$ = 1.1 m, $h_2$ = 0.8 m, observation time = 2.5 sec (car driver eye height to car taillight) |
| | Truck | $d$ = 0.24, $h_1$ = 2.4 m, $h_2$ = 1.25 m, observation time = 3.0 sec (truck driver height to top of car) |
| | Truck at night[2] | $d$ = 0.29, $h_1$ = 1.05 m, $h_2$ = 1.25 m, observation time = 1.8 sec (commercial vehicle headlight to top of car)<br>$d$ = 0.29, $h_1$ = 2.4 m, $h_2$ = 0.8 m, observation time = 3.0 sec (truck driver eye height to car taillight) |

1 *These check cases assume the same combination of design speed and reaction time as those listed in the table, except that the 120 km/h and 130 km/h speeds are not used for the truck cases.*
2 *Many of the sight distances corresponding to the minimum crest size are greater than the range of most headlights (that is, 120–150 m). In addition, tighter horizontal curvature will cause the light beam to shine off the pavement (assuming 3° lateral spread each way).*

*Note: Designers should also refer to AGRD Part 3 for further information on the vertical height parameters.*

**Table 5.5: Stopping sight distances for cars on sealed roads**

| Design speed (km/h) | Absolute minimum values Only for specific road types and situations(1) based on $d$ = 0.46(2),(3) | | | Desirable minimum values for all road types based on $d$ = 0.36 | | | Values for major highways and freeways in flat terrain(7) based on $d$ = 0.26 | |
|---|---|---|---|---|---|---|---|---|
| Road 01 | $R_T$ = 1.5 s(4) | $R_T$ = 2.0 s(4) | $R_T$ = 2.5 s | $R_T$ = 1.5 s(4) | $R_T$ = 2.0 s(4) | $R_T$ = 2.5 s | $R_T$ = 2.0 s | $R_T$ = 2.5 s |
| 40 | 30 | 36 | – | 34 | 40 | 45 | – | – |
| 50 | 42 | 49 | – | 48 | 55 | 62 | – | – |
| 60 | 56 | 64 | – | 64 | 73 | 81 | – | – |
| 70 | 71 | 81 | – | 83 | 92 | 102 | 113 | 123 |
| 80 | 88 | 99 | – | 103 | 114 | 126 | 141 | 152 |
| 90 | 107 | 119 | 132 | 126 | 139 | 151 | 173 | 185 |
| 100 | – | 141 | 155 | – | 165 | 179 | 207 | 221 |
| 110 | – | 165 | 180 | – | 193 | 209 | 244 | 260 |
| 120 | – | 190 | 207 | – | 224 | 241 | 285 | 301 |
| Luddenham Road 130 | – | 217 | 235 | – | 257 | 275 | 328 | 346 |
| **Corrections due to grade (5) (6)** | **–8** | **–6** | **–4** | **–2** | **2** | **4** | **6** | **8** |
| 40 | 5 | 3 | 2 | 1 | –1 | –2 | –2 | –3 |
| 50 | 8 | 5 | 3 | 2 | –1 | –3 | –4 | –5 |
| 60 | 11 | 8 | 5 | 2 | –2 | –4 | –6 | –7 |
| 70 | 15 | 11 | 7 | 3 | –3 | –5 | –8 | –10 |
| 80 | 20 | 14 | 9 | 4 | –4 | –7 | –10 | –13 |
| 90 | 25 | 18 | 11 | 5 | –5 | –9 | –13 | –16 |
| 100 | 31 | 22 | 14 | 6 | –6 | –11 | –16 | –20 |
| 110 | 38 | 26 | 17 | 8 | –7 | –13 | –19 | –24 |
| 120 | 45 | 31 | 20 | 9 | –8 | –16 | –22 | –29 |
| 130 | 53 | 37 | 23 | 11 | –10 | –18 | –26 | –34 |

1 *These values are only suitable for use in very constrained locations. Examples of this in Australia are:*
- *lower volume roads*
- *mountainous roads*
- *lower speed urban roads*
- *sighting over or around barriers.*

2 *On any horizontal curve with a side friction factor greater than the desirable maximum value, reduce the coefficient of deceleration by 0.05 and calculate the stopping distance according to Equation 1.*

3 *Where deceleration values greater than 0.36 are used, minimum seal widths for supplementary manoeuvre capability should be provided. For two-lane, two-way roads, a desirable minimum width of 12 m and a minimum of 9 m is applicable. This is especially important on horizontal curves with a side friction demand greater than the desirable maximum in Table 7.5.*

4 *Reaction times of 1.5 s cannot be used in Western Australia. A 1.5 s reaction time is only to be used in constrained situations where drivers will be alert. Typical situations are given in Table 5.2. The general minimum reaction time is 2.0 s.*

5 *If the roadway is on a grade, designers shall adjust stopping sight distance values by applying these grade corrections derived with d = 0.36. Downhill grades are shown as negative, with uphill listed as positive. The grade adopted is determined using the average grade over the braking length. Grade correction for d = 0.46 should be calculated separately using Equation 1. Generally, grade corrections are not necessary when using d = 0.26 because the deceleration value is conservative and because steep grades are not usually applied to roadways utilising d = 0.26.*

6 *Corrected stopping sight distances should be rounded conservatively to the nearest 5 m.*

7 *Green shaded area of Table 5.5 should only be used with the written approval of the relevant road agency when project objectives are being established.*

*Note: Combinations of design speed and reaction times not shown in this table are generally not used. Either the resulting stopping distances are similar to other combinations of the parameters for the design speed, or they fall outside the realistic design speed for the road.*

## 7.6 Side Friction and Minimum Curve Size

A vehicle travelling around a circular horizontal curve requires a radial force that tends to effect the change in direction and consequent centripetal acceleration. This force is provided by side friction between the tyres and the road surface. If there is insufficient force provided by side friction, the vehicle will tend to slide tangentially to the road alignment.

The side friction factor (*f*) is a measure of the frictional force between the pavement and the vehicle tyre. Based on the review of side friction factor values used by Australian and international agencies, the desirable and absolute values of *f* recommended for design are shown in Table 7.5.

The value of the side friction factor depends on the type and condition of the road surface, driver behaviour and the type and condition of the tyres. Therefore, it is variable.

The desirable maximum values should be used on intermediate and high speed roads with uniform traffic flow, on which drivers are not tolerant of discomfort. Where possible, these values should be adopted to allow vehicles to maintain their lateral position within a traffic lane and to be able to comfortably change lanes if necessary. Figure 7.7 to Figure 7.9 provide the relationship between speed, radius and superelevation using the desirable maximum values of side friction, for both urban and rural roads.

On low speed roads with non-uniform traffic flow, which are typical in urban areas or mountainous terrain, drivers are more tolerant of discomfort. This permits the absolute maximum values of side friction to be safely used in the design of horizontal curves, although the designer should endeavour to adopt desirable maximum values where possible. The minimum radii curves listed in Table 7.6 are suitable in constrained urban areas but their use in rural areas will result in a poor alignment and associated road safety issues.

**Table 7.5: Recommended side friction factors for cars and trucks**

| Operating speed (km/h) | *f* | | | |
|---|---|---|---|---|
| | Cars | | Trucks | |
| | Des max | Abs max | Des max | Abs max |
| 40 | 0.30 | 0.35 | 0.21 | – |
| 50 | 0.30 | 0.35 | 0.21 | 0.25 |
| 60 | 0.24 | 0.33 | 0.17 | 0.24 |
| 70 | 0.19 | 0.31 | 0.14 | 0.23 |
| 80 | 0.16 | 0.26 | 0.13 | 0.20 |
| 90 | 0.13 | 0.20 | 0.12 | 0.15 |
| 100 | 0.12 | 0.16 | 0.12 | 0.12 |
| 110 | 0.12 | 0.12 | 0.12 | 0.12 |
| 120 | 0.11 | 0.11 | 0.11 | 0.11 |
| 130 | 0.11 | 0.11 | 0.11 | – |

0.15 Assumed for Luddenham Road

*Note: ARRB research into the stability of high centre of gravity articulated vehicles indicated that the least stable vehicles may roll over at side friction values as high as 0.35 (Mai & Sweatman 1984).*

[see Commentary 16]

### 7.6.1 Minimum Radius Values

The minimum radius of a horizontal curve for a given operating speed can be determined from Equation 5. Using the values for $f_{max}$ from Table 7.5, the approximate minimum radii for various vehicle speeds for typical values of $e_{max}$ are as shown in Table 7.6.

## 13.7 Vertical clearance at structures

The minimum vertical clearance to superstructure components of bridges and other structures shall be as given in Table 13.7, unless specified otherwise or agreed by the relevant authority.

**TABLE 13.7**

**MINIMUM VERTICAL CLEARANCE**

| Location | Clearance<br>m |
|---|---|
| Above urban and rural freeways | 5.4 |
| Above main and arterial roads | 5.4 |
| Above other roads | 4.6 (see Note 3) |
| Above high clearance routes | 5.9 |
| Above very high clearance routes (with no alternative) | 6.5 |
| Beneath pedestrian and cyclist path bridges | - At least 0.2 greater than adjacent bridges, but not less than 5.4<br>- 5.5 where there are no adjacent bridges<br>- 6.0 on designated high clearance routes<br>- Over navigable waterways at least 0.2 greater than the nearest road or rail bridges upstream or downstream |
| Beneath major overhead sign structures | - 5.4 above any moving traffic lane to the lowest edge of the sign, supporting structure or lighting mounted below the sign<br>- 5.9 for high clearance routes<br>- 6.0 where future lighting is considered |
| Above pedestrian paths | 2.4 |
| Above cyclist paths and shared paths | 2.7 |
| Above rail | See Clause 13.8 |
| Above light rail | 5.3 to be confirmed with the relevant authority |
| Above or below aerial electricity cables<br>500 kV<br>220 kV | <br>17.0<br>14.5 |
| Above waterways | See Clause 11.1 and Clause 13.3 |

Minimum vertical clearance to viaduct

NOTES:

1 The vertical clearances given in this Table include an allowance of 100 mm for the combined effect of settlement and road resurfacing. Where these effects may be greater than 100 mm, additional vertical clearance shall be provided, as appropriate.

2 Vertical bridge clearances shall be designed in accordance with AS 1742.2.

3 Provided there is a 5.4 m clearance on an alternative route approved by the relevant authority.

## 13.8 Bridges over rail

Vertical and horizontal clearances for bridges over rail shall be as required by the rail authority and shall be considered together with the requirements of Clause 15.

## 13.9 Superelevation and crossfall on road bridges

At each abutment, the geometry of the bridge pavement shall match that of the road approaches. Where stage construction is envisaged, consideration shall be given to the final structural arrangement. The superelevation and widening of the deck surface of a bridge on a horizontal curve shall be as required by the relevant authority.

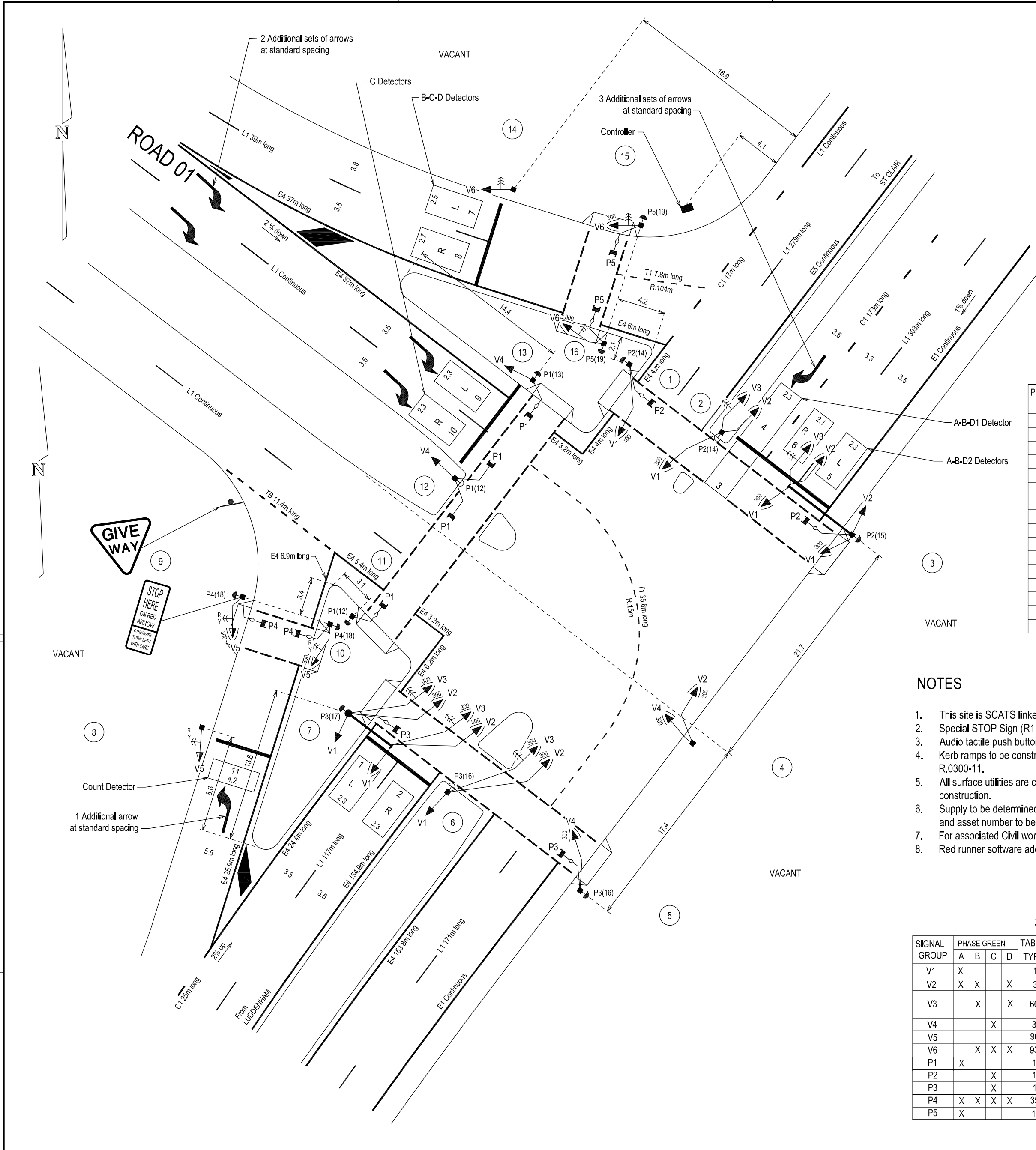
# Appendix D Preliminary Signals Plan

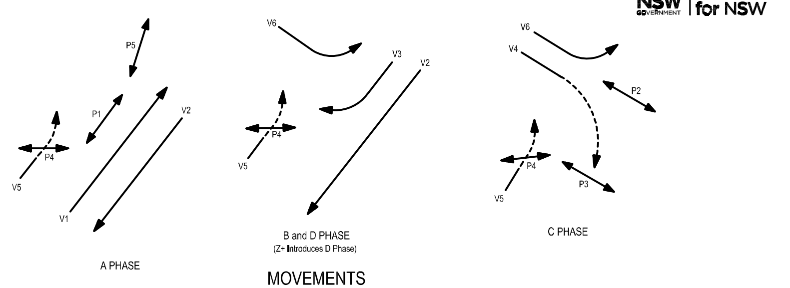
Road Delay Solutions

# TCS 0000

DATE IN SERVICE : 00/00/0000

Transport for NSW




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.

## 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 | $\overline{B}.\overline{D}$ | $\overline{B(NEXT)}.\overline{D(NEXT)}$ | $\overline{A(NEXT)}.\overline{D(NEXT)}$ | $\overline{A(NEXT)}.\overline{B(NEXT)}$ |
| B-C-D | FN | C(PR) | B(E1) | | C(E1) |
| | SG/PS | $\overline{C}$ | B | | C |
| | DS | — | $\overline{B-C-D(PR)}.\overline{C(NEXT)}.\overline{D(NEXT)}$ | | — |
| cont. B-C-D | FN | D(E1) | | | |
| | SG/PS | D | | | |
| | DS | $\overline{B-C-D(PR)}.\overline{C(NEXT)}.\overline{D(NEXT)}$ | | | |
| 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 | — | $\overline{B}.\overline{C}.\overline{D}$ | | |
| P2 P.B. | FN | C(PB) | A(L) | | |
| | SG/PS | $\overline{P2(WALK)}$ | $\overline{C.P2(WALK)}$ | | |
| | DS | — | $\overline{A}.\overline{B}.\overline{D}$ | | |
| P3 P.B. | FN | C(PB) | A(L) | | |
| | SG/PS | $\overline{P2(WALK)}$ | $\overline{C.P2(WALK)}$ | | |
| | DS | — | $\overline{A}.\overline{B}.\overline{D}$ | | |
| P5 P.B. | FN | C(PB) | A(L) | | |
| | SG/PS | $\overline{P5(WALK)}$ | $\overline{C.P5(WALK)}$ | | |
| | DS | — | $\overline{A}.\overline{B}.\overline{D}$ | | |

## 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<br>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 |

A ORIGINAL ISSUE

| PUBLIC UTILITY LEGEND | |
|---|---|
| HYDRANT | |
| STOP VALVE | |
| GAS VALVE | |
| SEWER MANHOLE | |
| COMMS PIT | |
| ELECT LIGHT POLE | |
| POWER POLE | |
| STAY POLE | |
| TELEPHONE BOX | |
| COMMS PILLAR | |

| REFERENCE PLANS | |
|---|---|
| SYMBOLS/ABRVS | VD0003-6 |
| STD POSN CMPT | VD0001-5 |
| INSTL STOP DET | VC0005-17 |
| VEH GROUP OP | TS-TNI-019 |
| DET LOGIC OP | TS-TNI-020 |
| PED MVT OP | TS-TNI-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

TFNSW RECOMMENDATION
ROAD DESIGN ENGINEERING
NAME
POSITION
DATE
NETWORK OPERATIONS
NAME
POSITION
DATE

TFNSW ACCEPTANCE
ACCEPTED
NAME
POSITION
DATE
ACCEPTED BY
SECTION

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 (1:200)
ISSUE A
FILE SF2000/0000000
SUPERSEDES SHEET ISSUE -
REG No. DS2000/000000
TCS No. 0000
SHEET 1