



Denman Road pavement rehabilitation and culvert extension

Minor Works Review of
environmental factors

Transport for NSW | February 2023

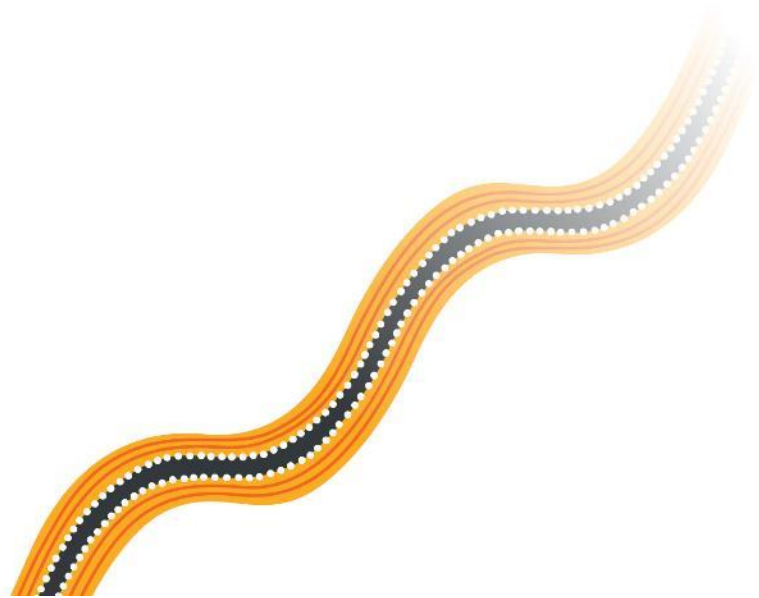
Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which the Denman Road pavement rehabilitation and culvert extension is proposed.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.



Denman Road pavement rehabilitation and culvert extension


Review of environmental factors

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Document controls

Approval and authorisation

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Signed:	
Dated:	2.2.2023

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1. Introduction

The purpose of the Minor Works review of environmental factors (REF) is to describe the proposal, to document the likely impacts of the proposal on the environment, to detail mitigation measures to be implemented and to determine whether or not the proposal can proceed. For the purposes of this work Transport for NSW (Transport) is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The description of the proposed works and assessment of associated environmental impacts has been undertaken in the context of section 171 of the Environmental Planning and Assessment Regulation 2021, Guidelines for Division 5.1 Assessments (DPE, 2022), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act) and the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so the REF helps to fulfil the requirements of section 5.5 of the EP&A Act including that Transport examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The potential for the proposal to significantly impact a matter of national environmental significance, including nationally listed threatened biodiversity matters, or the environment of Commonwealth land. Where a significant impact is considered likely on nationally listed biodiversity matters, either the proposal must be reconsidered or a Project REF must be prepared.

2. The proposal

2.1 Description

2.1.1 Proposal location

Location details	
Title	Denman Road pavement rehabilitation and culvert widening
File number	P.0071712
Road name and number	Denman Road (Main Road 209)
Closest cross road(s):	Racecourse Road, Thomas Mitchell Drive
Chainage of works:	Segment 209030 Chainage 2140 - 2762
Local government area:	Muswellbrook
Transport for NSW region:	North Region

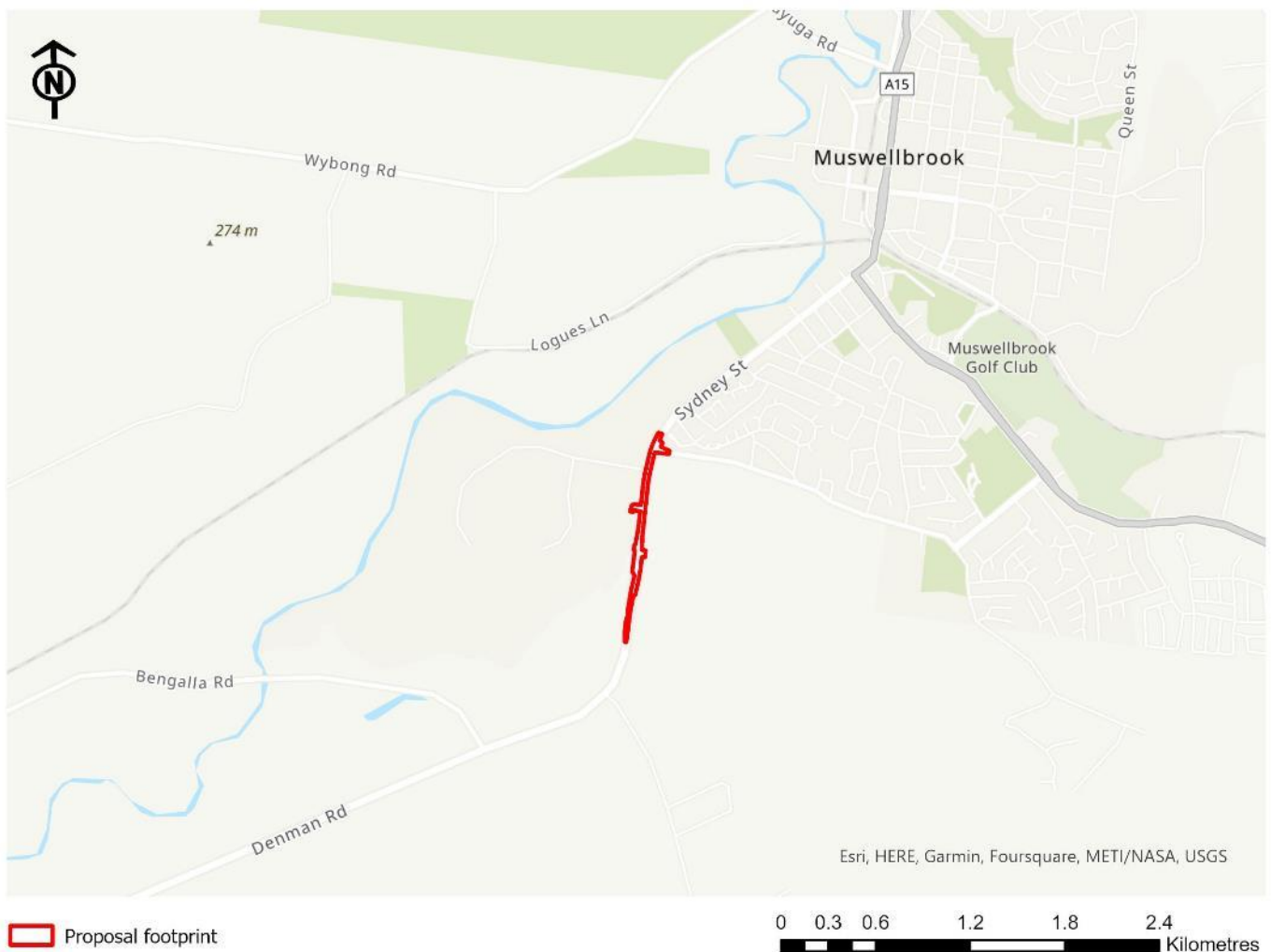


Figure 2-1: Location of the proposal

2.1.2 Description of proposed work

Transport proposes to carry out pavement rehabilitation and extend a culvert on Denman Road between Racecourse Road and Thomas Mitchell Drive, Muswellbrook (the proposal). The proposal is shown in Figure 2-2, a culvert perspective view is provided in Figure 2-3 and typical road cross sections are provided in Figure 2-4 and Figure 2-5.

Key features of the proposal include:

- Pavement rehabilitation over a length of about 610 metres, including
 - Construction of new road shoulders between 1.5 to 3 metres wide with heavy duty asphaltic pavement. Shown as pavement Type 1 on the typical cross sections.
 - Milling sections of existing pavement and constructing new heavy duty asphaltic pavement (primarily for the 3.5 metre wide travel lanes). Shown as pavement Type 2 on the typical cross sections.
 - Construction of new full depth pavement sections (on the western shoulder, south of the Ramrod Creek culvert). Shown as pavement Type 3 on the typical cross sections
- Removal of up to eleven trees within the proposal area
- Construction of new grassed road verges and batters to suit new road profile
- Extension of existing Ramrod Creek three cell reinforced concrete box culvert on upstream and downstream sides, including reshaping of culvert inlet/outlet and the provision of scour protection (rock rip rap 3-6 metres beyond the end of the apron slab both upstream and downstream)
- Works at the culvert inlet to avoid impacts on a Council water main:
 - Installation of one metre tall gabion basket wall to make a vertical drop onto the edge of the new concrete apron at the northern end of culvert inlet
 - Placement of a rock mattress abutting the gabion basket wall and the concrete apron
 - Placement of loose rock rip rap (approximately 250mm to 300mm) as scour protection to tie into the existing creek levels.
- Repairs at the existing Ramrod Creek culvert including repair of concrete spalls and application of a protective coating
- Placement of organic mesh and suitable planting to stabilise the banks of Ramrod Creek near the proposed culvert works
- Removal of existing width marker signage at the Ramrod Creek box culvert
- Provision of new cyclist friendly barriers and new asphaltic pavement on top of the Ramrod Creek box culvert
- Provision of guardrail on the approach/departure sides of the Ramrod Creek culvert
- Construction of new section of SA kerb on the eastern side of the Racecourse Road intersection
- Reinstatement of pavement speed limit markings near Racecourse Road
- Reforming of driveway accesses along the length of works
- Temporary access tracks from the road to the upstream and downstream culvert work areas (comprising geofabric with a layer of recycled asphalt pavement on top)
- Temporary construction compounds, stockpiles and over-size over-mass (OSOM) vehicle pullover bays.
- Replanting of amenity trees along road verges of Denman Road and Sydney Street transferring the required contribution into the Transport Conservation Fund.

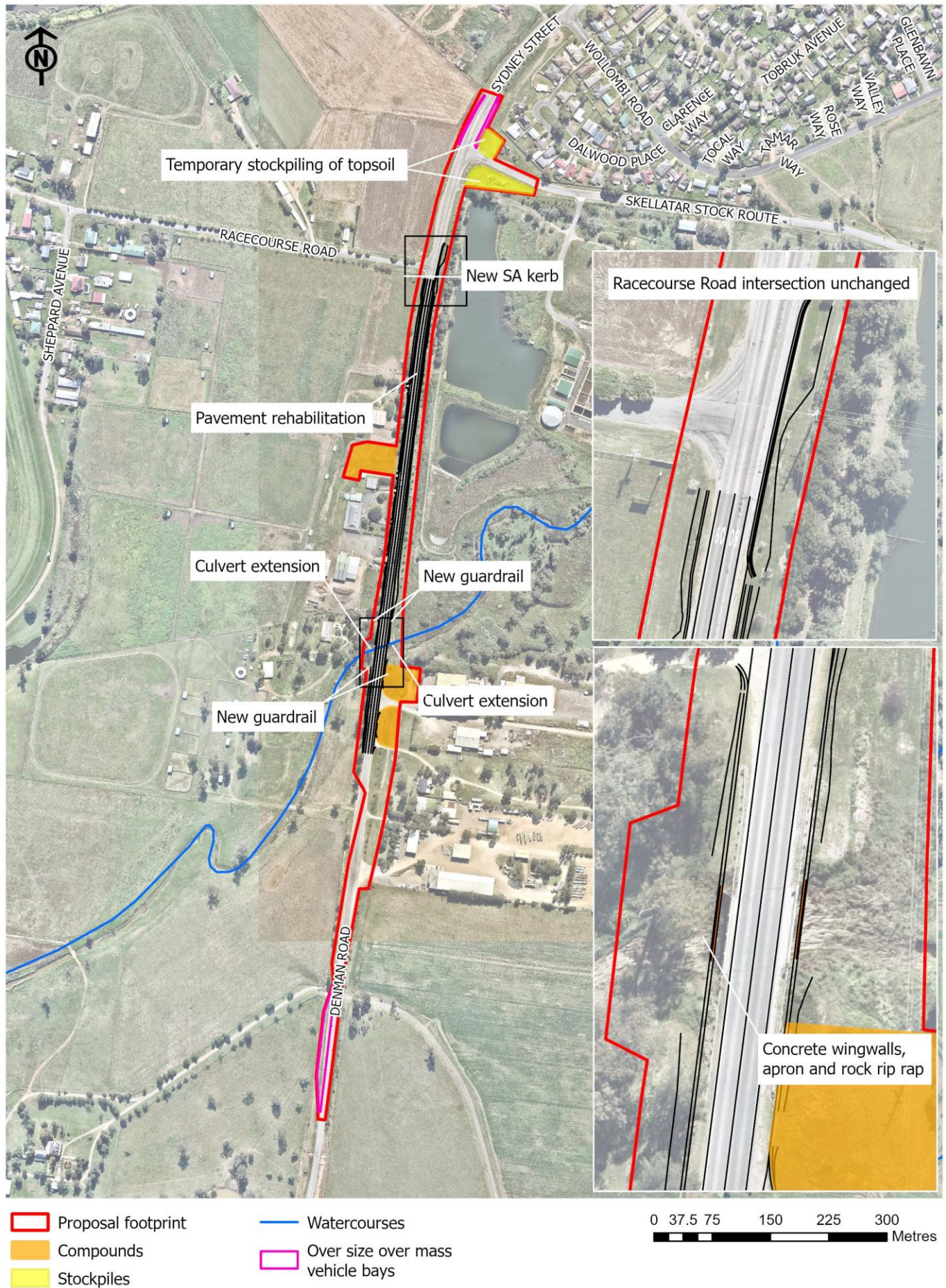


Figure 2-2: The proposal

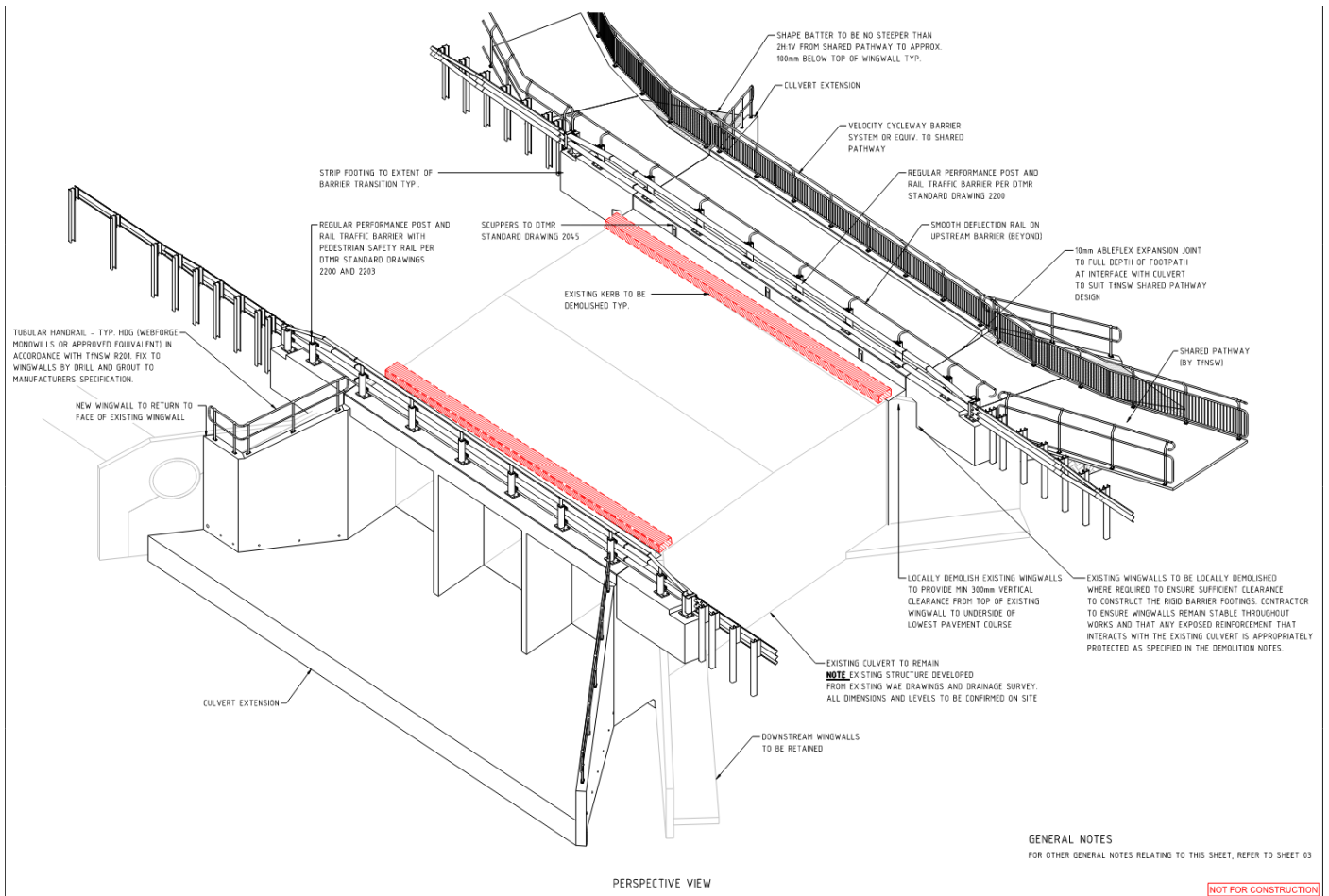


Figure 2-3: Perspective view – Ramrod Creek culvert

- Establish laydown areas for OSOM vehicles north of the Skellatar Stock Route intersection and at the southern end of the proposal area, including construction of new pavements and line marking adjustments where required.
- Remove trees that cannot be retained (up to eleven trees) and where possible salvage hollows from trees (removed from private land).
- Install kerbing (at specified locations)
- Driveway adjustments to suit new road formation
- Carry out the following for the downstream culvert extension, then the upstream culvert extension:
 - Establish temporary access track to culvert adjacent to the culvert wingwalls on upstream and downstream sides of the culvert (within proposal area)
 - Carry out any necessary clearing (within proposal area)
 - Establish temporary concrete washout area
 - Establish coffer dam for works area (diverting stream flows around works area and adjusting progressively). The coffer dam would be constructed from steel sheet piles and sand bags, while stream flows would either be pumped over the coffer dam or gravity fed to the other side using a storm water pipe inserted in an earth / sand bags dam adjacent to the sheet piles.
 - Northern culvert cell – subgrades replacement, remove existing barrier, kerb and part of wing wall, establish formwork, then progressively cast in situ extended apron slab, wing wall, culvert walls and crown slab
 - Southern culvert cell – subgrades replacement, remove existing barrier, kerb and part of wing wall, establish formwork, then progressively cast in situ extended apron slab, wing wall, culvert walls and crown slab
 - Central culvert cell – establish formwork then pour apron slab infill and crown slab extension
 - Backfill to wing walls and carry out earthworks on culvert approaches
 - Reshaping of culvert inlet/outlet and the provision of scour protection.
- Install guardrails (at specified locations) and remove redundant signage at culvert
- Carry out pavement widening, and rehabilitation works:
 - Northbound – carry out earthworks for widened pavement, place intermediate asphaltic concrete layer then carry out verge works
 - Southbound – carry out earthworks for widened pavement, place intermediate asphaltic concrete layer then carry out verge works
 - Placement of asphaltic concrete pavement wearing course
 - Line marking
- Seeding of reformed road verges and batters and planting to stabilise the disturbed banks of Ramrod Creek near the proposed culvert works.
- Site clean-up and demobilisation.



Figure 2-6: Site photographs

Plant and equipment

The proposal would require the use of a range of plant and equipment including:

- 13.5 tonne excavator (with attachments)
- Concrete truck
- Milling machine
- Asphalt paver
- Pumps for flow transfer and dewatering of coffer dam
- Rollers
- Kerb extruder
- Flatbed trucks
- Trailer mounted vegetation chipper
- Chainsaws
- Utility vehicles
- Various hand tools

- Generators (including potential use of diesel generators with battery storage) for the site compounds
- Solar lighting towers
- Traffic control equipment.

Working hours and construction duration

Construction work would be carried out primarily during the following standard working hours:

- 7am to 6pm Monday to Fridays
- 8am to 1pm Saturdays
- No work Sundays or public holidays

However, to minimise disruption to traffic on Denman Road, some work would need to be carried out outside these hours (including pavement works requiring lane occupancy).

Work outside standard hours would occur during the following periods:

- Evening (OOHW period 1):
 - Monday to Sunday – 6pm to 10pm
- Night (OOHW period 2):
 - Monday to Sunday – 10pm to 7am
 - Saturdays – 10pm to 8am
 - Sundays – 6pm to 7am.

Indicatively it is expected that pavement works would require up to about ten night work shifts towards the end of the construction program. Night work shifts would not typically be followed by day work shifts, with the exception of some clean-up work within the site compounds.

2.1.3 Objectives of works

The objectives of the proposal are:

- Renew the road asset and improve ride quality for road users
- Provide road shoulders and barriers to meet current standards and improve safety
- Accommodate a potential future shared path on the eastern side of Denman Road (alignment to be determined by Muswellbrook Shire Council)
- Minimise impacts on the flooding regime
- Minimise environment and community impacts.

2.1.4 Ancillary facilities

Ancillary facilities		
Will the proposal require the use or installation of a compound site?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Two compounds would be established at the following locations within the construction area (refer also to Figure 2-2):		
<ul style="list-style-type: none"> • 240 Denman Road • Frontage of Monadelphous Engineering (271 Denman Road) and the road frontage outside 275 Denman Road. 		

<p>The compounds would include worker amenities and storage areas. Establishment of the compounds would involve placement of geofabric and then recycled asphalt pavement / gravel to form a hardstand area, and application of screen mesh to the northern and southern fences. A drainage pipe would be installed at the location of an existing east-west gully along the southern boundary to maintain existing flows. The hardstand would be removed at the completion of construction and the area would be reseeded / rehabilitated.</p>		
<p>Will the proposal require the use or installation of a stockpile site?</p> <p>Temporary stockpile sites are proposed on the north-east and south-east corner of the Denman Road / Skellatar Stock Route intersection. These stockpile sites would have areas of about 730 and 1550 square metres respectively, and their locations are shown in Figure 2-2. These sites would be used for the temporary stockpiling. They would be fenced, and no vegetation removal is required for their establishment (with existing plantings on the south-east corner of the intersection to be protected). Environmental controls for the stockpiles would include:</p> <ul style="list-style-type: none"> • Installation of sedimentation controls between stockpiles and any drainage lines or down-slope areas • Management to prevent weed growth • Trimming to a regular shape to facilitate measuring with a height not exceeding two metres and batter slopes not steeper than 2:1 • Stabilisation of batters to minimise erosion • Covers, or other erosion protection for stockpiles that in place for more than 20 days as well as any temporary stockpiles that are susceptible to wind or water erosion • No compaction to maintain soil quality (minimising anoxic conditions which affect soil microbes). 	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Are any other ancillary facilities required (eg temporary plants, parking areas, access tracks)?</p> <p>Temporary access tracks would be established from the road to the upstream and downstream culvert work areas (comprising geofabric with a layer of recycled asphalt pavement over the top). The access tracks would be wholly within the nominated construction area all material would be removed at the end of construction and the area rehabilitated.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

2.1.5 Proposed date of commencement

Works are planned to commence in early 2023.

2.1.6 Estimated length of construction period

Works are expected to take about seven months to complete.

2.2 Need and options

2.2.1 Options considered

There were two options considered for the proposal as a whole. Option 1 is to do nothing and Option 2 is to carry out the road rehabilitation as proposed.

Option 1: Do nothing

Advantages:

- No construction related impacts (including in stream works) on the surrounding environment, and no visual and noise disturbance or traffic disruption.

Disadvantages:

- Does not maintain the road asset or improve ride quality for road users
- Does not bring road shoulders and barriers to current standards or improve safety.

Option 2: Carry out the road rehabilitation works and culvert extension

Implement the road rehabilitation works as described in Section 2.1. This option is preferred because it addresses the proposal objectives, can be carried out with manageable environmental impacts during construction and would renew the road asset.

Advantages:

- Provision of improved ride quality and safety for road users

Disadvantages:

- Potential for minor and mostly short-term impacts to the surrounding environment, including soil disturbance, water quality impacts, vegetation removal, visual impacts, construction noise, and traffic disruption.

2.2.2 Justification for the proposal

The proposal is required to improve ride quality and safety for road users. While the proposal would have minor impacts during construction (including soil disturbance, vegetation removal, visual impacts, noise, traffic disruption and potential water quality impacts) it would deliver asset management and road user benefits over the longer term.

On balance, the benefits derived from proceeding with the proposal are considered to outweigh the impacts subject to the implementation of safeguards proposed in this report.

2.3 Statutory and planning framework

2.3.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

The State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the state, including for roads and road infrastructure facilities. Section 2.108 of the SEPP (Transport and Infrastructure) permits

development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is appropriately characterised as development for the purposes of a road or road infrastructure facilities, and is to be carried out by or on behalf of Transport, it can be assessed under Division 5.1 of the EP&A Act. Development consent from council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under State Environmental Planning Policy (Resilience and Hazards) 2021, State Environmental Planning Policy (State Significant Precincts) 2005 or State Environmental Planning Policy (Planning Systems) 2021.

2.3.2 Other relevant legislation and environmental planning instruments

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the NSW Environment Protection Authority (EPA). It provides an integrated system of licenses to set out protection of the environment policies and to adopt more innovative approaches to reduce pollution in the environment, having regard to the need to maintain ecologically sustainable development (ESD). Measures to address potential pollution as a result of the proposal have been prescribed in this Minor Works REF and are included in Sections 3.1 and 3.2.

The POEO Act requires an Environmental Protection Licence (EPL) for scheduled development work and the carrying out of scheduled activities. The proposal does not involve undertaking a scheduled activity and therefore an EPL would not be required.

Fisheries Management Act 1994

The *Fisheries Management Act 1994* aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations.

Section 199 of the *Fisheries Management Act 1994* provides that:

(1) A public authority (other than a local government authority) must, before it carries out or authorises the carrying out of dredging or reclamation work:

(a) give the Minister written notice of the proposed work, and

(b) consider any matters concerning the proposed work that are raised by the Minister within 21 days after the giving of the notice (or such other period as is agreed between the Minister and the public authority).

Section 219 of the *Fisheries Management Act 1994* includes a prohibition on the blocking of fish passage. A permit is required from Department of Primary Industries (DPI) if a proposal would permanently or temporarily block fish passage.

Notice under Section 199 and a permit under section 219 is typically only required in relation to mapped Key Fish Habitat. Ramrod Creek is identified as key fish habitat and consultation has occurred in relation to the proposal (refer to Section 2.4.3). DPI has advised that under s.219(5)(a) any work that is permitted under the *Fisheries Management Act 1994* turns off the requirement for a section 219 permit to block fish passage, and a permit is therefore not required for this proposal.

Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) is directed at maintaining a healthy, productive and resilient environment consistent with the principles of ecologically sustainable development (ESD). The BC

Act sets out the assessment framework for threatened species and ecological communities. Certain species of animals or plants are identified as endangered species, populations or communities or vulnerable species under the Act. Areas of land comprising the habitats of listed endangered species may also be declared critical habitat under the Act.

Activities that are likely to have a significant impact on listed threatened species, populations, endangered ecological communities or their habitats must be the subject of a species impact statement and require the concurrence of the Secretary of the Department of Planning and Environment. This is unless the activity is a project to which Division 5.2 of the EP&A Act applies.

Potential impacts on flora and fauna and threatened communities as a result of the proposal are discussed in Section 3.7 of this Minor Works REF.

Biosecurity Act 2015

The *Biosecurity Act 2015* manages biosecurity risks, including weeds of national significance and the risks of contagion of infectious human diseases. Section 22 of the *Biosecurity Act 2015* includes the general biosecurity duty as follows:

Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.

The potential impacts and relevant safeguards are discussed further in Section 3.7. Appropriate biosecurity controls would be put in place for the proposed works to minimise the risk of weed transfer.

Heritage Act 1977

The *Heritage Act 1977* provides for the conservation of buildings, work, relics and places that are of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance to the State.

An excavation permit is required to disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. A permit is also required to disturb or excavate any land on which the person has discovered or exposed a relic. Section 139(4) of the *Heritage Act 1977* makes provision for the issuing of an exception in certain prescribed circumstances. There are no listed heritage items within or near the proposal area (refer to Section **Error! Reference source not found.**). An excavation permit would not be required for the proposal.

National Parks and Wildlife Act 1979

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1979*.

The harming or desecrating of Aboriginal objects or places is an offence under section 86 of the *National Parks and Wildlife Act 1979*. Under section 90, an Aboriginal heritage impact permit may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

The potential impacts and relevant safeguards are discussed further in Section 3.5. No permits under the *National Parks and Wildlife Act 1979* are required for the proposal.

2.4 Community and agency consultation

2.4.1 SEPP (Transport and Infrastructure) consultation

Part 2.2 of the SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. This is detailed below:

Is consultation with Council required under sections 2.10 - 2.12 and 2.14 of SEPP (Transport and Infrastructure)?		
Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Are the works likely to generate traffic to an extent that will strain the capacity of the existing road system in a local government area?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water? Adjustments to water infrastructure would be completed by the Muswellbrook Shire Council and is limited to relocation of water meters inside adjacent properties where required and underboring for new water services road crossings.	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow? Those parts of the road reserve beyond the pavement are under the management of Muswellbrook Shire Council. Council has been consulted during the design development process. Transport formally notified Council of the proposal by letter dated 28 January 2022. A response was received from Council on 7 April 2022. The issues raised by Council and the Transport response to those issues are provided in Section 2.4.2.	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance? Those parts of the road reserve beyond the pavement are under the management of Muswellbrook Shire Council. Council has been consulted during the design development process. Transport formally notified Council of the proposal by letter dated 28 January 2022. A response was received from Council on 7 April 2022. The issues raised by Council and the Transport response to those issues are provided in Section 2.4.2.	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Is there a local heritage item (that is not also a state heritage item) or a heritage conservation area in the study area for the works? If yes, does a	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

Is consultation with Council required under sections 2.10 - 2.12 and 2.14 of SEPP (Transport and Infrastructure)?

heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential? There are two locally significant listed non-Aboriginal heritage items adjacent to the southern extent of the proposal area – I83 (Balmoral Homestead) and I82 (Yammanie). There would be no direct impacts on these items and indirect (visual) impacts would be minor.

Is the proposal within the coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?

Yes

No/NA

Note: a certified coastal zone management plan is taken to be a certified coastal management program.

Are the works located on flood liable land? If so, will the works change flooding patterns to more than a minor extent?

Yes

No

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled *Floodplain Development Manual: the management of flood liable land* published by the New South Wales Government.

The locality is low lying and flood affected. Hydraulic assessment conducted by Transport indicates that the proposal would reduce the flood level in the 50 and 100 year Annual Recurrence Interval (ARI) floods. Muswellbrook Council has been consulted as part of the development process and advised that the maximum allowable afflux is 100 millimetres based on the existing and draft Development Control Plans. The proposal meets this requirement.

Is consultation with a public authority (other than Council) required under sections 2.13, 2.15 and 2.16 of SEPP (Transport and Infrastructure)?

Are the works located on flood liable land? (to any extent) (SEPP (Transport and Infrastructure) s2.13)
If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance?

Yes

No/NA

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled *Floodplain Development Manual: the management of flood liable land* published by the New South Wales Government.

The locality is low lying and flood affected. While the proposal would reduce upstream flooding, Transport wrote to NSW State Emergency Service (SES) on 17 May 2022. A response was received on 3 June 2022. It was concluded that the proposal would have a minimal risk to NSW SES response operations.

Is consultation with a public authority (other than Council) required under sections 2.13, 2.15 and 2.16 of SEPP (Transport and Infrastructure)?

The SES has to be notified if there are likely to be significant delays in the operation of the roads affected by the proposal. Substantial delays are not expected and provision would be made for the passage of SES vehicles through the work site where required. Records of correspondence are provided in Appendix B.		
Are the works adjacent to a national park, nature reserve or other area reserved under the <i>National Parks and Wildlife Act 1974</i> , or on land acquired under that Act?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Are the works on land in a mine subsidence district within the meaning of the <i>Mine Subsidence Compensation Act 1961</i> ?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

2.4.2 Other agency and community consultation

Due to the limited scope and nature of the proposal (road rehabilitation), broad stakeholder consultation was not considered necessary during the design development of the proposal. A range of consultation and notification activities would, however, be required prior to, and throughout construction to communicate key potential impacts on the community including noise, traffic delays, proposed night works and impacts to property accesses. Planned consultation activities are described below.

Community consultation

Suitable signage would be installed to inform road users of changes in traffic conditions prior to and during implementation of the proposal. Variable message sign(s) would be used to communicate construction of the proposal to the travelling public (about two kilometres in advance of the worksite).

Stakeholder consultation is being carried out to ensure key stakeholders are informed of the work schedule, changed traffic conditions and road closures. Community notifications would be distributed to residents and businesses who may be impacted by noise and changed traffic conditions.

The resident at 240 Denman Road was consulted and requested installation of screen mesh to the site fence along the northern and southern boundary to reduce visual impact on tenants and neighbour. This has been included in the proposal (refer to Section 2.1.4).

Residents and businesses who will be impacted by changes to driveway accesses would be directly consulted via door knocking. There would be times where access to properties would be managed under traffic control.

Emergency services, bus operators and the freight network would be consulted about changed traffic conditions. Traffic alerts and variable message signs would be used to communicate changed traffic conditions.

Muswellbrook Shire Council

Transport formally notified Council of the proposal by letter dated 28 January 2022. A response was received from Council on 7 April 2022. The issues raised by Council and the Transport response to those issues are provided below in Table 2-1.

Table 2-1: Issues raised by Muswellbrook Shire Council and Transport responses

Issue	Response
The proposal presents an opportunity to provide an all-weather active transport crossing of Ramrod Creek. Council supports the option to accommodate a cycle lane in the widening of the road and extension of the culvert over Ramrod Creek as per the concept design.	Support noted
A flood impact and risk assessment is required when development will result in increases to the 1% Annual Exceedance Probability flood of more than 100 millimetres within 10 metres of the development.	A hydraulic assessment conducted by Transport indicates that the proposal would reduce the flood level in the 50 and 100 year Annual Recurrence Interval (ARI) floods.
Council does not support the removal of the existing London Plane trees on the western side of the road as these provide an important entry statement to the town of Muswellbrook.	The Aboricultural Impact Assessment (refer to Appendix E) concluded that while there would be a major encroachment of 12 trees (including eight of the subject <i>Platanus x acerifolia</i> trees (London Plane), these trees would not require removal. Up eleven other trees would need to be removed. Replacement plantings for these trees will be provided in consultation with Council and in accordance with the project landscaping plan. The required contribution will also be transferred to the Transport Conservation Fund.
Council requests that the details of the timing and duration of any proposed construction works will be communicated to Council, the adjoining residents, businesses and the general public.	Transport will issue a pre-work notification with key project information including construction activities, working times, duration of works and Transport contact for further information.
Council requests that a permanent additional sign to be erected at the creek displaying 'Ramrod Creek' with the purpose of Ramrod Creek being identifiable to the public.	Appropriate signage indicating Ramrod Creek has been included in the design.

Department of Primary Industries – Fisheries

Correspondence (email) regarding the proposal was sent to DPI on 21 April 2022. A response was received on 10 May 2022 and advised:

- The invert level of the culvert should be level with the natural creek bed to avoid blocking fish passage up/down stream
- The upper surface of the apron and rock riprap should also be level with the natural creek bed
- Erosion and sediment controls must be used throughout construction, in accordance with best practice
- Any pest species of fish, such as carp, should be euthanised (a Section 37 permit under the *Fisheries Management Act 1994* is required to do this).

The creek bed level is about 1000 millimetres higher than the proposed invert level. It is proposed to remove sediment builds up near the culvert to transition to the creek bed and improve hydraulic performance. On the upstream side of the culvert, a gabion wall and rock mattress is proposed for the transition from the culvert apron to the creek bed, to avoid impacts on a Council water main at that location (refer to Section 2.1.2). Safeguards have been proposed to ensure appropriate erosion/sediment control (Section 3.1) and management of any pest fish species (Section 3.7).

Further correspondence from DPI was received on 22 August 2022 indicating no objection to the proposal. Additional comments from DPI are considered below in Table 2-2.

Table 2-2: DPI issues and responses

Issue	Response
DPI understands that an ecologist has yet to report on the aquatic impacts of the work. DPI Fisheries requests that a copy of this report be forwarded to this office prior to works commencing. Any triggers for the <i>Fisheries Management Act 1994</i> may require further consultation.	The Biodiversity Assessment Report included in Appendix D addresses impacts on aquatic habitats. The report will be forwarded to DPI Fisheries prior to works commencing.
DPI understands that the Construction Environmental Management Plan (CEMP) has yet to be compiled for these works. DPI Fisheries requests that a copy of the CEMP be forwarded to this office prior to works commencing. Dewatering activities may require a Section 37 permit to allow the relocation of fish.	A copy of the CEMP will be provided to DPI prior to works commencing. The potential requirement for a permit under Section 37 of the <i>Fisheries Management Act 1994</i> is noted and acknowledged in Section 5.1 of this Minor Works REF.
As no marine vegetation is to be harmed in this proposal a section 205 permit under Part 7 of the <i>Fisheries Management Act 1994</i> is not required.	Noted.
Under s.219(5)(a) any work that is permitted under the <i>Fisheries Management Act 1994</i> turns off the requirement for a section 219 permit to block fish passage. So, a section 219 permit is not required for this project.	Noted.
Erosion and sediment mitigation devices are to be erected in a manner consistent with currently accepted Best Management Practice (i.e. Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004) to prevent the entry of sediment into the waterway	Refer to Section 3.1 and 3.2.

Issue	Response
<p>prior to any earthworks being undertaken. These are to be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal.</p>	
<p>Environmental safeguards are to be used during the works to ensure that there is no escape of turbid plumes into the adjacent aquatic environment.</p>	<p>Refer to Section 3.2.</p>
<p>Any material removed from the waterway that is to be temporarily deposited or stockpiled on land is to be located well away from the waterway and to be contained by appropriate sediment control devices.</p>	<p>Refer to Section 3.2, Safeguard W12.</p>
<p>DPI Fisheries (1800 043 536) and the Environment Protection Authority (131 555) is to be notified immediately if any fish kills occur in the vicinity of the works. In such cases, all works other than emergency response procedures are to cease until the issue is rectified and approval is given by DPI Fisheries and/or the Environment Protection authority for the works to proceed.</p>	<p>Any incidents will be managed and notified in accordance with the Transport for NSW Environmental Incident Procedure (Transport for NSW, 2021).</p>

3. Environmental assessment

This section provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environmental potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in the *Guidelines for Division 5.1 Assessments* (DPE, 2022) and section 171 of the Environmental Planning and Assessment Regulation 2021. The matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* are also considered in section 5. Site-specific safeguards are provided to ameliorate the identified potential impacts.

3.1 Soil

Description of existing environmental and potential impacts		
<p>Are there any known occurrences of salinity or acid sulfate soils in the area?</p> <p>Department of Planning and Environment acid sulfate soil risk mapping does not identify either of the proposal area as having a risk of acid sulfate soil occurrence. The site has an elevation of greater than 140 metres</p> <p>Reference to eSpade (hydrogeological landscapes data) indicates the proposal has a low overall salinity hazard.</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Does the proposal involve the disturbance of large areas (eg >2ha) for earthworks?</p> <p>The proposal would require earthworks associated excavation and fill placement for shoulder widening and culvert extension works. The area of disturbance would be a maximum of 2.8 hectares (although much of the area to be disturbed is existing road pavement). The whole proposal area would not be disturbed at any one time and progressive stabilisation of disturbed areas would occur.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Does the site have constraints for erosion and sedimentation controls such as steep gradients or narrow corridors?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Are there any sensitive receiving environments that are located in or nearby the likely proposal area or that would likely receive stormwater discharge from the proposal?</p> <p>Sensitive receiving environments include (but are not limited to) wetlands, state forests, national parks, nature reserves, rainforests, drinking water catchments).</p> <p>There are no wetlands, state forests, national parks, nature reserves, rainforests, drinking water catchments within or adjacent to the proposal area. The footprint does cross Ramrod Creek which flows to the Hunter River about 2.5 kilometres to the west.</p> <p>In the absence of appropriate controls, polluted stormwater would be released from the site into downstream waterways. The proposed safeguards in this section and Section 3.2 would address water quality risks during construction. Improvements to water quality are expected during operation as a result of improved culvert outlet treatments.</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

Description of existing environmental and potential impacts

<p>Is there any evidence within or nearby the likely footprint of potential contamination?</p> <p>A search (18 May 2022) of the NSW Environment Protection Authority (EPA) contaminated land record of notices for the Muswellbrook local government area returned no records near the proposal area. A search of the list of NSW contaminated sites notified to EPA (as of 11 May 2022) also returned no records near the proposal area.</p> <p>Current and former land use (road reserve, creek) at the proposal area does not indicate the potential for land contamination. If suspected contamination is identified during the construction of the proposal, the material would be managed in accordance with safeguards listed below and in section 5 of this MWREF.</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Is the likely proposal area in or nearby highly sloping landform?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Is the proposals likely to result in more than 2.5ha (area) of exposed soil?</p> <p>The area of disturbance would be a maximum of 2.8 hectares (although much of the area to be disturbed is existing road pavement). The whole proposal area would not be disturbed at any one time and progressive stabilisation of disturbed areas would occur. Safeguards have been proposed in this section, Section 3.2 and Section 3.4 to address water and air quality risks associated with exposed soils.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Safeguards

Safeguards to be implemented are:

E1	<p>Erosion and sediment control measures are to be implemented and maintained to:</p> <ul style="list-style-type: none"> • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets • Reduce water velocity and capture sediment on site • Minimise the amount of material transported from site to surrounding pavement surfaces • Divert clean water around the site <p>(in accordance with the Landcom/Department of Housing <i>Managing Urban Stormwater, Soils and Construction Guidelines</i> (the Blue Book)).</p>
E2	<p>Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.</p>
E3	<p>Erosion and sediment control measures are not to be removed until the work is complete and areas stabilised.</p>
E4	<p>A progressive erosion and sediment control plan is to be prepared for the works.</p>
E5	<p>Parking of vehicles and storage of plant/equipment is to occur only within the designated proposal area.</p>

E6	Existing ground cover vegetation will be retained to the greatest extent possible to minimise the area of exposed soils.
E7	If suspected contamination is identified all work would cease and the Transport for NSW Project Manager contacted immediately.
E8	Upslope and upstream diversions will be used to direct runoff away from the work sites to minimise the potential for surface flow to mobilise sediment.

3.2 Waterways and water quality

Description of existing environment and potential impacts

Is the proposal located within, adjacent to or near a waterway?

Yes

No

The proposal is adjacent to and includes works within Ramrod Creek, which flows to the Hunter River about 2.5 kilometres to the west. Ramrod Creek is ephemeral and conveys water only when it rains. Deposition of silt and vegetation growth upstream and downstream of the culvert (in the creek beyond the road corridor) has caused local ponding at the culvert even during dry times.

Culvert works would have duration of about sixteen weeks and would be staged as described in Section 2.1.2. A sheet pile coffer dam would be established for the works area (diverting or pumping any stream flows around works area and adjusting progressively).

Water management measures would be described in the CEMP (and associated environmental work method procedures for dewatering and in stream works) to ensure impacts to the downstream waterway are avoided. This would include controls for dewatering the work site and pumping water around the work zone, ensuring only clean water is discharged offsite.

A motorised pump may be required to pump water from upstream of the work site, to downstream of the work site (refer to section 2.1.2). If required, the pump would be positioned on the bank of Ramrod Creek. There would be a risk that fuel from the pump unit could spill into the Creek. To minimise the potential for spills, the pump would be double banded and an inspection of the pump would be undertaken prior to its use before each working shift. Outside of working shifts, the pump would be positioned outside of the high water mark and in the event of wet weather the pump would be relocated to higher ground within the proposal site.

Suitable controls would be implemented to prevent concrete or concrete wash water from entering the watercourse. For non-precast elements, most concrete would be contained within the formwork, with any excess to be removed at the end of each concrete pour. Concrete washout would occur in a portable container (within the work area at each concreting location) and wash water would be removed from site and disposed of in accordance with its waste classification.

It is worth mentioning a portion (approx. 800 sq.m of the 1900 sq.m) of the proposed site compound outside 271 Denman Rd is below the 5%AEP flood level (RL141.26).

In the absence of appropriate controls works within the watercourse have the potential to affect water quality. The proposed safeguards in this section and Section 3.1 would address water quality risks during construction.

Description of existing environment and potential impacts

Safeguards to protect the creek from erosion and sedimentation and minimise impacts from construction would be implemented in accordance with this MWREF and an approved CEMP.

Improvements to water quality are expected during operation as a result of improved culvert outlet treatments.

Is the location known to flood or be prone to water logging?

Yes

No

The proposal area would be in and adjacent to Ramrod Creek and would therefore be susceptible to flooding and water logging in rainfall and high stream flow events. The work to the north and south of the creek and the compound / stockpile sites would be on high ground and therefore less likely to be inundated.

During high rainfall or in the event of a flood there would be potential for the release of sediment and pollutants from the work area including fuel and other hydrocarbons causing a pollution event. Safeguards have been proposed to address water quality risks associated with flooding and high rainfall events.

All plant and equipment would be removed from the creek at the conclusion of each work shift. Restrictions on stockpiling material in low lying areas or areas known to have ponding water would be put in place to minimise the potential for transportation offsite.

The extended culvert has been designed to have a neutral effect on upstream flood levels. A hydraulic assessment conducted by Transport indicates that the proposal would reduce the flood level in the 50 and 100 year Annual Recurrence Interval (ARI) floods.

Is the proposal located within or immediately adjacent to the area managed by WaterNSW covered by chapter 8 of State Environmental Planning Policy (Biodiversity and Conservation) 2021?

Yes

No

Note: See map here: [Sydney drinking water catchment map](#).

Would the proposal be undertaken on a bridge or ferry?

Yes

No

The proposal includes works on a culvert described in Section 2.1.2.

Is the proposal likely to require the extraction of water from a local water course (not mains)?

Yes

No

Water may need to be pumped around work areas within the culvert but extraction of water from the watercourse is not required.

Water flow is to be maintained through the culvert at all times by diverting water around the work site and through a different culvert cell or through a temporary stormwater drainage pipe. As described in section 2.3.2, a permit from fisheries is not required.

Section 199 of the Fisheries Management Act specifies that a public authority must provide written notice to the Minister of any dredging or reclamation work. This was carried out as outlined in section 2.4.2 The proposed reshaping of the inlets and outlets would be consistent with dredging and reclamation work and therefore notice

Description of existing environment and potential impacts

to the Minister of the Department of Primary Industries would be required prior to commencing the work (refer section 5.1).

Safeguards

Safeguards to be implemented are:

W1	There is to be no release of dirty water into drainage lines and waterways.
W2	Water quality controls measures are to be used to prevent any materials (e.g. grout, sediment etc) entering drainage or waterways.
W3	Plant and equipment will be inspected regularly to ensure there are no leakages of fuel, oil and hydraulic fluid.
W4	All fuels, chemicals and liquids will be stored in an impervious bunded area within the compound site when not in use.
W5	If refuelling of plant and equipment is required on site it will take place on flat ground only using 20 litre drums within a bunded area large enough to contain 120 per cent of the container's contents.
W6	If an incident (e.g. spill) occurs, the Environmental Incident Procedure (Transport for NSW, 2021) is to be followed and the Transport for NSW Contract Manager and Environment Manager notified immediately.
W7	An emergency spill kit is to be kept on site and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances and include an absorbent boom suitable for deployment in the waterway. All staff are to be made aware of the location of the spill kit and trained in its use.
W8	Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls.
W9	Measures will be implemented to ensure that water pumped from the site is filtered (for sediments) prior to it re-entering the waterway at a suitable downstream location. This is to occur in accordance with an approved Environmental Work Method Procedure.
W10	Procedures will be developed for managing the worksite where there is a risk of flooding, including removal and storage of plant and equipment and securing of the site, and access arrangements.
W11	In the event a coffer dam is required, the motorised pump will be located on the bank of the creek and will be double bunded with the capacity to capture 120% of the potential spill volume. Before each shift the pump will be inspected to ensure it is in good working order and no defects are present.
W12	Any material removed from the waterway that is to be temporarily deposited or stockpiled on land is to be located well away from the waterway and to be contained by appropriate sediment control devices.
W13	Restrictions on storing fuel or stockpiling material in low lying areas or areas known to have ponding water would be put in place to minimise the potential for transportation offsite.
W14	All plant and equipment would be removed from the creek at the conclusion of each work shift

3.3 Noise and vibration

Description of existing environmental and potential impacts		
Are there any residential properties or other noise sensitive areas near the location of the proposal that may be affected by the work (ie church, school, hospital):		
<p>During construction?</p> <p>The nearest receivers to the proposal footprint are isolated residences on both sides of Denman Road at a distance of about 35 metres. Residences on Dalwood Place are located about 10 metres from the proposed stockpiling location near the intersection of Denman Road and Skellatar Stock Route. There is also a single residence adjacent to the proposed compound at 240 Denman Road. The potential impact of noise from the proposal on these receivers is discussed below.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>During operation?</p> <p>There would be no operational noise associated with the proposal. Refer to discussion below.</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Is the proposal going to be undertaken only during standard working hours?</p> <p>Standard working hours Monday-Friday: 7:00am to 6.00pm Saturday: 8.00am to 1.00pm Sunday and Public Holidays: no work</p> <p>To minimise disruption to traffic on Denman Road, some work would need to be carried out outside standard hours (including pavement works requiring lane occupancy, management of over-size-over-mass vehicles and water services adjustments). Work outside standard hours would occur during the following periods:</p> <ul style="list-style-type: none"> • Evening (OOHW period 1): <ul style="list-style-type: none"> – Monday to Sunday – 6pm to 10pm • Night (OOHW period 2): <ul style="list-style-type: none"> – Monday to Sunday – 10pm to 7am – Saturdays – 10pm to 8am – Sundays – 6pm to 7am. 	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Is any explosive blasting required for the proposal?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Would construction noise or vibration from the proposal affect sensitive receivers?</p> <p>Construction noise impacts have been considered in accordance with the <i>Construction Noise and Vibration Guideline</i> (Transport for NSW, 2022) and associated noise estimator tool (refer Appendix F). The 'distance-based scenario' worksheet was used with the 'bulk earthworks' scenario selected as representative of the noisiest day works and the 'profiling' scenario as scenario selected as representative of the noisiest night works. Calculations</p>	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Description of existing environmental and potential impacts

were also conducted for a compound operation scenario and for the proposed stockpiling locations.

Noise management levels (NMLs) were established for the proposal using the Rating Background Level (RBL) for the R2 representative environment defined in the noise estimator. This level best reflects nearby Denman Road traffic volumes and 80 kilometre per hour speed limit. The selected ground type used in the assessment was for 'undeveloped green fields, rural areas with isolated dwellings'. Noting the flat topography and limited number of structures, a direct line of sight between noise sources and receivers has been assumed. This is a conservative approach given that many of the receivers in the residential area to the north-east of the proposal area.

The following NMLs apply to the proposal:

Receiver	Period	RBL	NML LAeq(15min) dBA
Residential	Standard hours	45	55
	Day (OOHW)	45	50
	Evening (OOHW period 1)	40	45
	Night (OOHW period 2)	35	40

Key assessment results for the 'bulk earthworks' (day), 'profiling' (night) and 'compound operation' (day and night) scenarios are summarised in the tables below. An assessment has also been conducted for the proposed stockpile sites using a 13.5 tonne excavator as the noisiest plant. Impact distances are shown in **Error! Reference source not found.**, Figure 3-2, Figure 3-3 and Figure 3-5.

Noise impact (day) – bulk earthworks	Distance (m)	No. receivers*
Affected distance (>NML)	335	101
Noticeable (5-10 dBA > Background)	-	-
Clearly audible (10-20 dBA > Background)	-	-
Moderately intrusive (20-30 dBA > Background)	155	37
Highly intrusive (>30 dBA > Background)	60	13
Highly noise affected (> 75 dBA)	60	13

Noise impact (night) – profiling	Distance (m)	No. receivers*
Affected distance (>NML)	650	255
Noticeable (5-10 dBA > Background)	650	255
Clearly audible (10-20 dBA > Background)	450	162
Moderately intrusive (20-30 dBA > Background)	215	56
Highly intrusive (>30 dBA > Background)	95	21
Highly noise affected (> 75 dBA)	25	1
Sleep disturbance L _{Amax} 65 dB(A)	155	37

Noise impact (day) – compound operation	Distance (m)	No. receivers*
Affected distance (>NML)	170	4
Noticeable (5-10 dBA > Background)	-	-
Clearly audible (10-20 dBA > Background)	-	-
Moderately intrusive (20-30 dBA > Background)	65	-
Highly intrusive (>30 dBA > Background)	20	1

Description of existing environmental and potential impacts

Highly noise affected (> 75 dBA)	20	1
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Noise impact (night) – compound operation	Distance (m)	No. receivers*
Affected distance (>NML)	525	51
Noticeable (5-10 dBA > Background)	525	51
Clearly audible (10-20 dBA > Background)	360	4
Moderately intrusive (20-30 dBA > Background)	170	4
Highly intrusive (>30 dBA > Background)	65	1
Highly noise affected (> 75 dBA)	20	1
Sleep disturbance L _{Amax} 65 dB(A)	85	2

Noise impact (day) – stockpiling	Distance (m)	No. receivers*
Affected distance (>NML)	75	9
Noticeable (5-10 dBA > Background)	-	-
Clearly audible (10-20 dBA > Background)	-	-
Moderately intrusive (20-30 dBA > Background)	25	1
Highly intrusive (>30 dBA > Background)	15	1
Highly noise affected (> 75 dBA)	15	1

* Approximate based on aerial photography

The nominated stockpile sites near the Denman Road / Skellatar Stock Route intersection would involve periodic placement and removal of materials during standard hours and is not considered a major source of construction noise.

The nearest residences are predicted to be highly noise affected during the earthworks, profiling and stockpiling, while some residences exceed the sleep disturbance screening criteria for profiling and night time compound operation. Safeguards to minimise noise impacts are identified below, including carrying out the noisiest works before 11pm, considering alternatives to out-of-hours work, plant selection, work locations, placing noisy plant away from residences and screening to minimise impacts (e.g. placing site sheds to form a barrier between noise sources and receivers and potentially using noise curtains).

A notification distance of 335 metres is proposed for the proposal area for day works (bulk earthworks) and 450 metres is proposed for night works (profiling) as this is the affected distance for the worst-case scenario (i.e. the distance up to which noise management levels are likely to be exceeded). No separate notification distance is proposed for the compound sites and stockpiling site as these would be captured by this notification.

Would operation of the proposal alter the noise environment for sensitive receivers? This might include, but not be limited to, altering the line or level of an existing carriageway, changing traffic flow, adding extra lanes, increasing traffic volume, increasing the number of heavy vehicles, removing obstacles that provide shielding including changing the angle of view of the traffic, changing the type of pavement, increasing traffic speeds by more than 10km/hr or installing audio-tactile line markings.

Yes

No

Description of existing environmental and potential impacts

The operation of the proposal would not result in changes to the traffic mix or traffic speeds and traffic lanes would not move closer to noise sensitive receivers.

Would the proposal result in vibration being experienced by any surrounding properties or infrastructure during operation?

Yes

No

The major potential sources of construction vibration include vibrating rollers. Construction plant would be selected to ensure minimum safe working distances set by the Construction Noise and Vibration Guideline (Transport for NSW, 2022) are complied with where possible, both in relation to cosmetic damage and human response to vibration. This would mean 2-4 tonne vibratory rollers would be selected where possible and where needed to achieve the recommended minimum working distances. If minimum working distances cannot be complied with, additional measures including vibration monitoring would be implemented.

Recommended minimum working distances for relevant vibration intensive plant from sensitive receivers are provided in the table below.

Plant item	Rating / Description	Minimum working distance	
		Cosmetic damage	Human response
Vibratory roller	< 50 kN (Typically 1-2 tonnes)	5m	15-20m
	< 100 kN (Typically 2-4 tonnes)	6m	20m
	< 200 kN (Typically 4-6 tonnes)	12m	40m
	< 300 kN (Typically 7-13 tonnes)	15m	100m
	> 300 kN (Typically 13-18 tonnes)	20m	100m
	> 300 kN (> 18 tonnes)	25m	100m
Jackhammer	Hand held	1 m (nominal)	2m

It is also noted that horses may be stabled at properties on the western side of Denman Road. A review of aerial photography suggests that stables are located at setbacks typically greater than 150 metres, with most closer to the racecourse at distances greater than 300 metres. Given these distances and the relative short period of night works proposed, adverse impacts on the wellbeing of horses due to the proposal are unlikely.

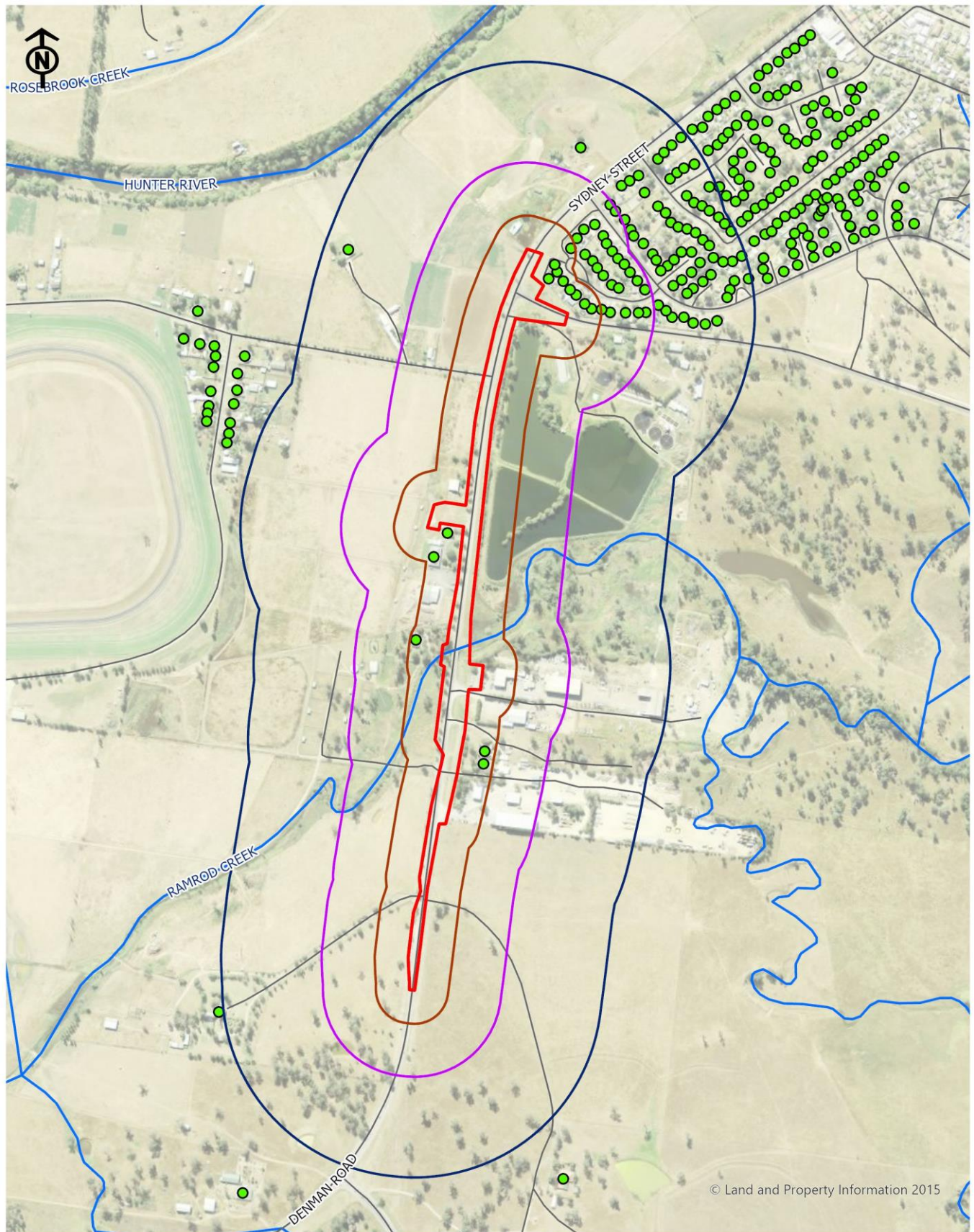


Figure 3-1: Construction noise predictions – bulk earthworks (day)

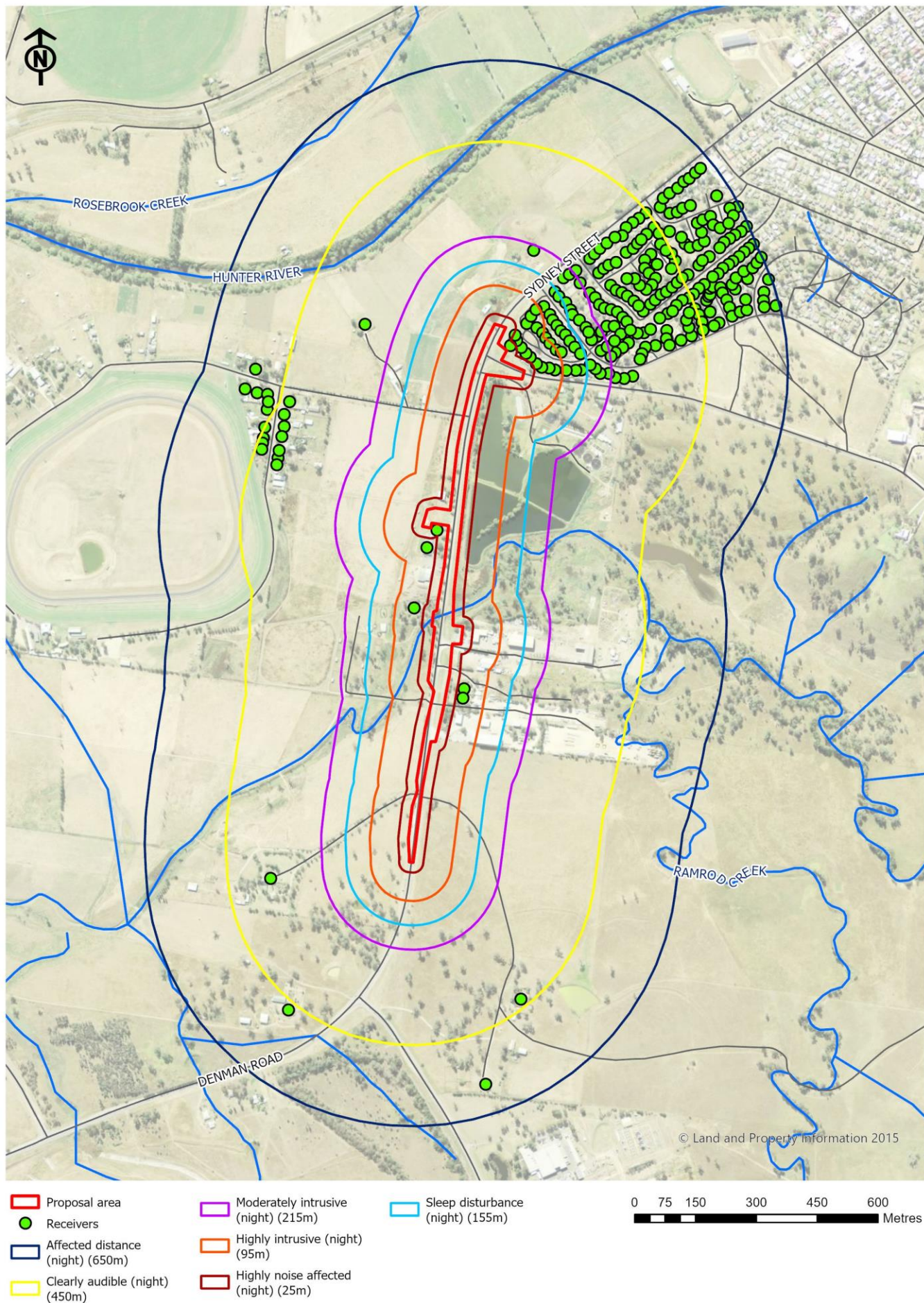


Figure 3-2: Construction noise predictions – profiling (night)

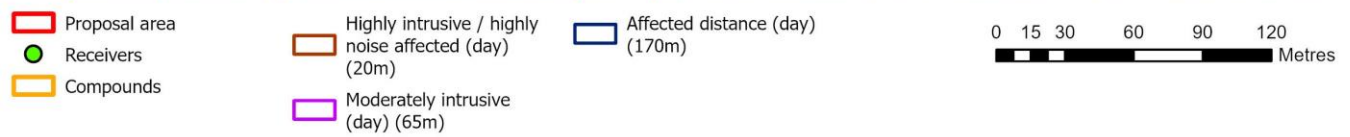
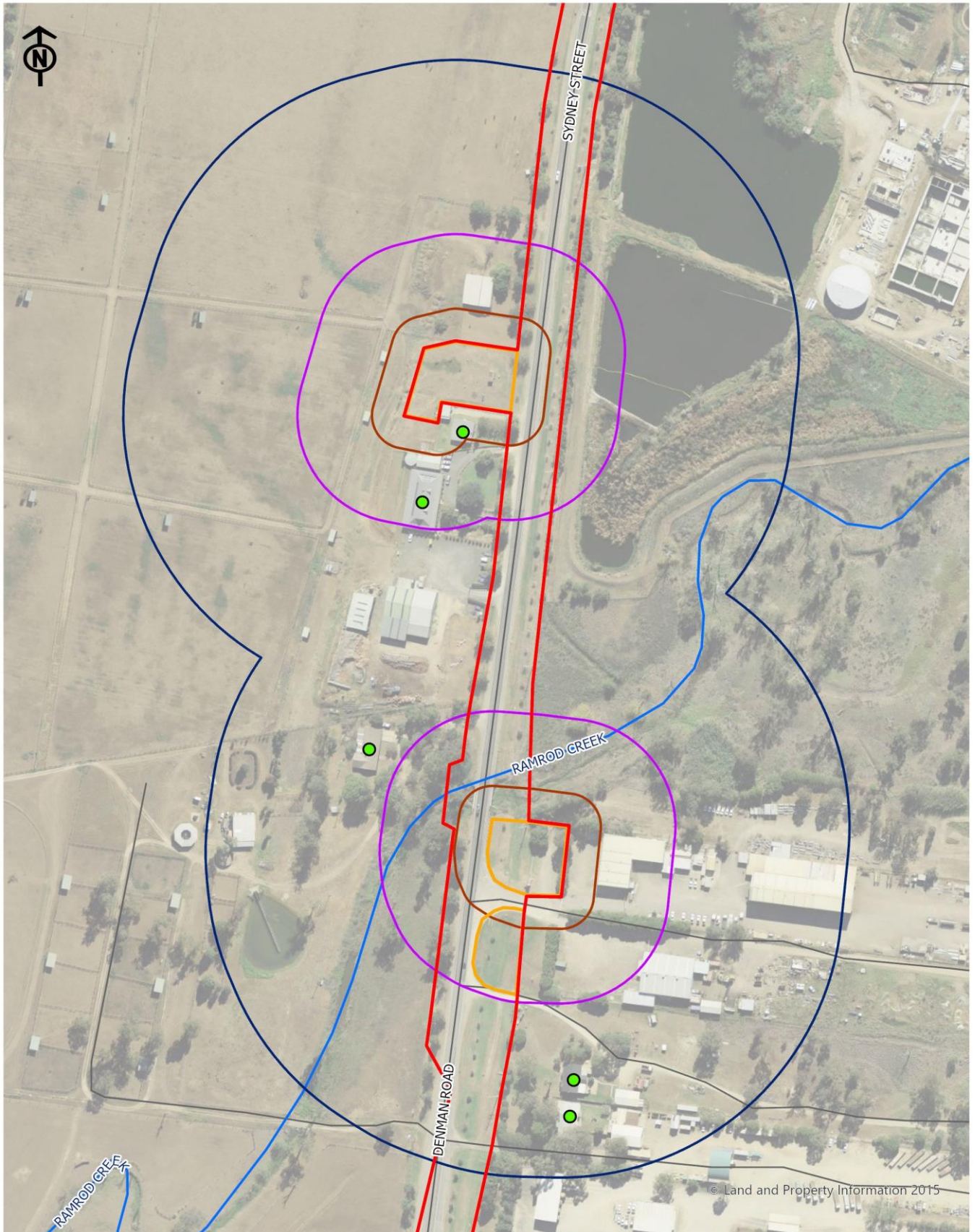


Figure 3-3: Construction noise predictions – compound operation (day)

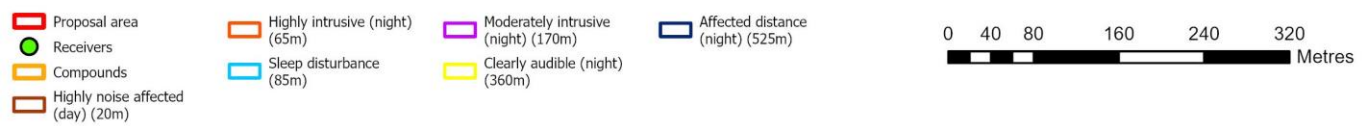
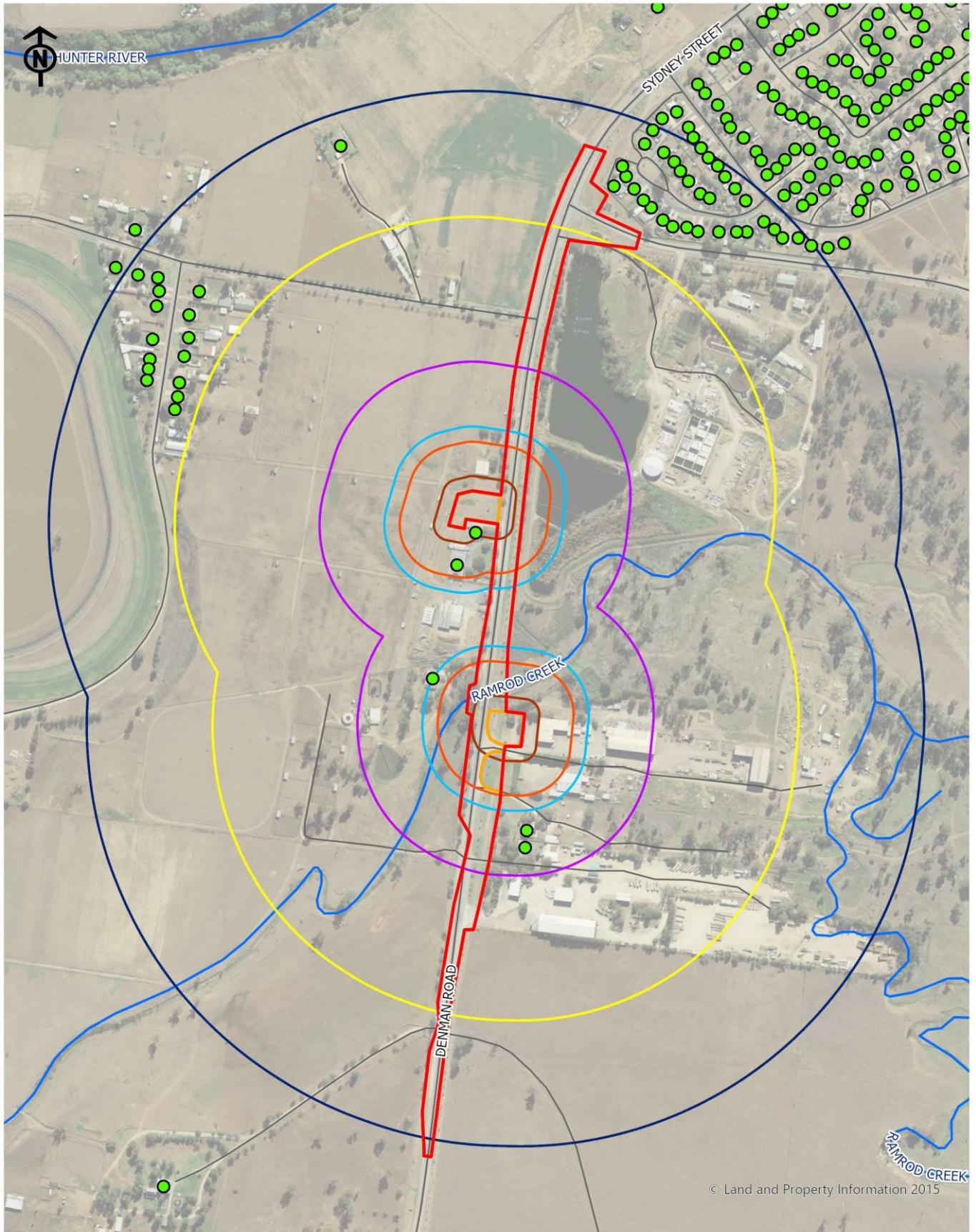


Figure 3-4: Construction noise predictions – compound operation (night)

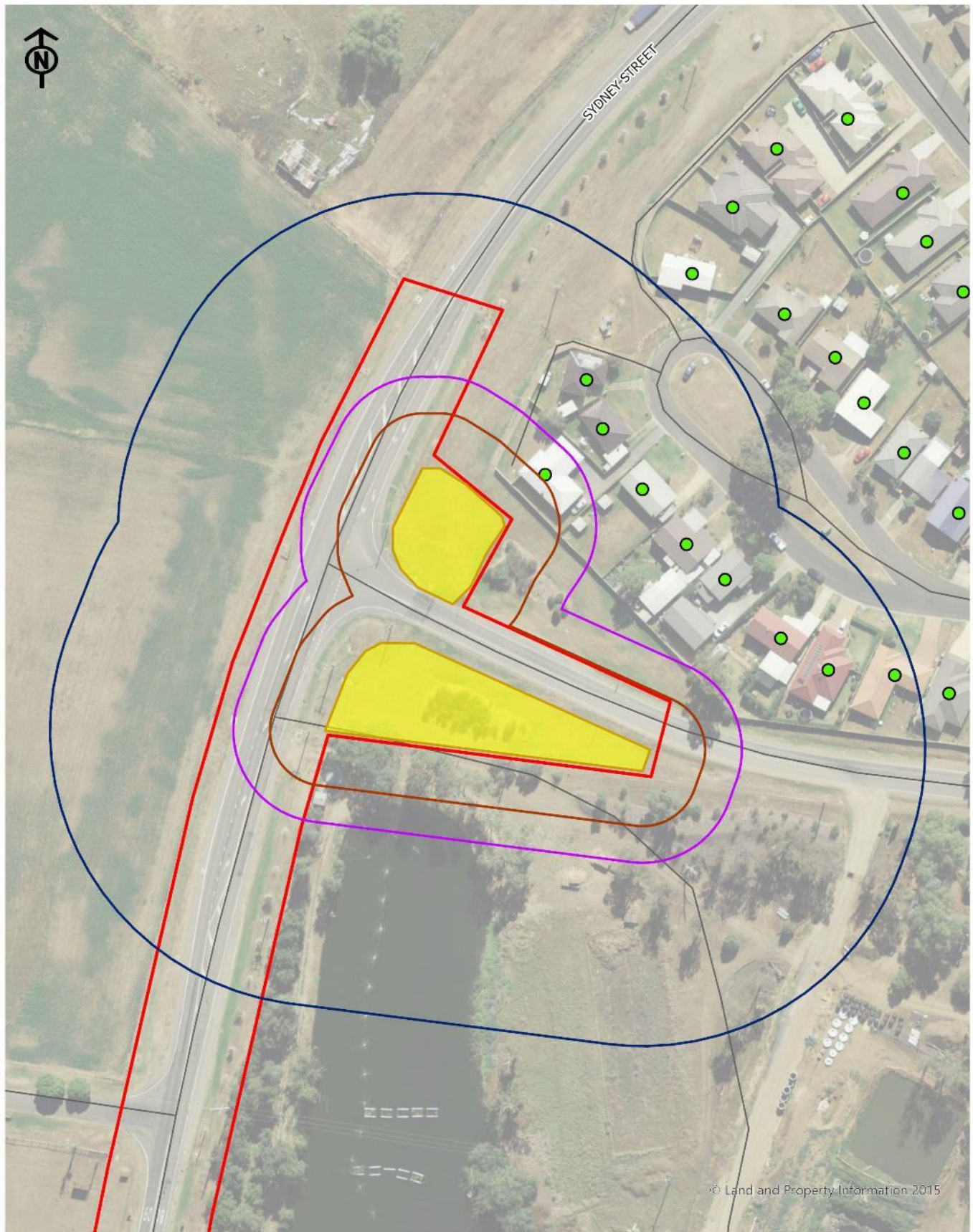


Figure 3-5: Construction noise predictions – stockpiling

Safeguards

Safeguards to be implemented are:

N1	<p>A noise and vibration management plan will be prepared and included in the project CEMP. The NVMP will generally follow the approach in the Interim Construction Noise Guideline (ICNG) (DECC, 2009) and the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016) and identify:</p> <ul style="list-style-type: none"> • all potential significant noise and vibration generating activities associated with the activity • feasible and reasonable mitigation measures to be implemented • a monitoring program to assess performance against relevant noise and vibration criteria and measures to be implemented in the event of non-compliance with noise and vibration criteria • a review process scheduling and assessing out-of-hours activities including consideration of alternatives to out-of-hours work, plant selection, work locations and screening to minimise impacts • arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures.
N2	<p>The standard mitigation measures prescribed in Appendix B of the Roads and Maritime <i>Construction Noise and Vibration Guideline</i> (Transport for NSW, 2022) will be implemented where relevant.</p>
N3	<p>Respite periods will be considered if nearby residents raise concerns about working hours and noise impacts when consulted during construction.</p>
N4	<p>A letterbox drop notification for residential receivers within 335 metres of day works and 450 metres of evening/night works will occur at least five business days prior to works starting. The extent of the notification will be confirmed with reference to the noise assessment and the specific types of activities proposed. The notification will detail work activities, dates and hours, impacts (including any changed traffic arrangements) and mitigation measures. It will also include a contact number for enquiries and complaints.</p>
N5	<p>Residences with a direct line of sight to the proposed works would be door knocked at least five business days prior to works starting. Residents would be provided with details of work activities, dates and hours, impacts (including any changed traffic arrangements), mitigation measures and a contact number for enquiries and complaints.</p>
N6	<p>The noisiest works will be scheduled to occur before 11pm where possible.</p>
N7	<p>Where vibration intensive plant such as vibratory rollers are used, vibration must be managed to minimise disturbance to building occupants and to avoid damage to buildings and other structures. This includes adhering to the recommended minimum working distances for vibration intensive plant identified in Section 6.1 of the <i>Construction Noise and Vibration Guideline</i> (Transport for NSW, 2022).</p>
N8	<p>The compound at 240 Denman Road will be organised and managed to minimise noise impacts on the adjacent residences. This would include placing noisy plant (e.g. generators) to the north of the site to maximise the distance to the residences and using site sheds as barriers where practicable. The use of noise curtains will be considered.</p>
N9	<p>The stockpile sites near the intersection of Denman Road and Skellatar Stock Route are not to be used outside standard construction hours.</p>

3.4 Air Quality

Description of existing environmental and potential impacts		
<p>Is the proposal likely to result in large areas (>2ha) of exposed soils?</p> <p>The proposal would require earthworks associated excavation and fill placement for shoulder widening and culvert extension works. The area of disturbance would be a maximum of 2.8 hectares (although much of the area to be disturbed is existing road pavement). The whole proposal area would not be disturbed at any one time and progressive stabilisation of disturbed areas would occur.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Are there any dust sensitive receivers located within the vicinity of the proposal during the construction period?</p> <p>Dust sensitive receivers near the proposal area include residential dwellings along the eastern and western sides of Denman Road and well as cyclists who may use Denman Road.</p> <p>Dust (or other airborne particulates) could be generated from a variety of activities including:</p> <ul style="list-style-type: none"> • Earthworks • Road sub-grade preparation • Transportation and handling of soils and materials • Line marking. <p>The total amount of dust would depend on the silt and moisture content in the soil, prevailing weather conditions and the types of activities being carried out. Depending on wind speed and direction, short-term impacts could be experienced at nearby sensitive receivers.</p> <p>Safeguards would be implemented to minimise potential air quality impacts to sensitive receivers during construction.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Is there likely to be an emission to air during construction?</p> <p>The proposal would not result in a material increase in air pollution. The proposal would result in minor exhaust emissions from equipment and vehicles. There would also be localised odour from asphaltting works. Given the scale of the proposal and implementation of appropriate controls, the potential for adverse air quality impacts on receivers and the general environment is considered minor.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Safeguards

Safeguards to be implemented are:

A1	Work will not be carried out during strong winds or in weather conditions where high level of dust or air borne particulates are likely.
A2	Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.

A3	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.
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3.5 Aboriginal heritage

Description of existing environmental and potential impacts		
<p>Would the proposal involve disturbance in any area that has not been subject to previous ground disturbances?</p> <p>The proposal area has been previously disturbed by road construction activities.</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Have online Aboriginal Heritage Information Management System (AHIMS) searches been completed?</p> <p>An AHIMS extensive search (17/5/22) was conducted for the locality around the proposal area (Lat, Long from: -32.3014, 150.8438 - Lat, Long to: -32.2652, 150.9056). The search returned 65 records, none of which are within the proposal area.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Is there potential for the proposal to impact on any items of Aboriginal heritage?</p> <p>The proposal would not affect known Aboriginal sites. The risk of encountering unregistered sites is considered low given the extent of previous disturbance at the site.</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Would the proposal involve the removal of mature native trees?</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Would the proposals impact on any features that may indicate any potential archaeological remains?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Is the proposal consistent with the requirements of the legacy Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI)?</p> <p>The Transport for NSW Stage 1 Aboriginal heritage due diligence assessment was completed by the Transport for NSW Aboriginal Community and Heritage Partner for Hunter Region on 2 September 2022. A copy of the assessment is provided at Appendix C. The assessment found that it is not necessary to proceed to Stage 2 of the PACHCI procedure and that the proposal may progress in accordance with this Minor Works REF, the environmental impact assessment process and all relevant approvals.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Safeguards

Safeguards to be implemented are:

AH1	If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the Transport for NSW Aboriginal cultural heritage officer and regional
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	environment manager contacted immediately. Steps in the Transport for NSW Unexpected Archaeological Finds Procedure must be followed.
AH2	If the scope of the proposal changes or the extent of the disturbance area changes then the Transport for NSW Aboriginal cultural heritage officer and regional environment manager should be contacted immediately.

3.6 Non-Aboriginal heritage

Description of existing environmental and potential impacts		
<p>Have online heritage database searches been completed?</p> <ul style="list-style-type: none"> • Transport (including legacy Roads and Maritime) section 170 register (searched as part of the State Heritage Inventory 18/5/2022) • NSW Heritage database (searched 18/5/2022) • Australian Heritage Database (searched 18/5/2022) • Local Environmental Plan(s) heritage items (searched as part of the State Heritage Inventory 18/5/2022) 	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Are there any items of non-Aboriginal heritage or heritage conservation areas listed on relevant heritage databases/registers that are located within the vicinity of the proposal?</p> <p>There are two locally significant listed non-Aboriginal heritage items adjacent to the southern extent of the proposal area – I83 (Balmoral Homestead) and I82 (Yammanie). There would be no direct impacts on these items (i.e. no encroachment of the heritage item curtilage) and indirect (visual / setting) impacts would be minor. The nearest works to these items is paving for a OSOM bay within the adjacent road reserve. There are no built structures within these heritage sites that are within the recommended minimum working distances for relevant vibration intensive plant (refer to Section 6.3).</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Are there any items of potential non-Aboriginal heritage significance which are not listed on relevant heritage databases/registers that are in the vicinity of the proposal?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Is the proposal likely to occur in or near features that indicate potential archaeological remains?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No



Figure 3-6: Heritage items near the proposal area

Safeguards

Safeguards to be implemented are:

H1	If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Standard Management Procedure: Unexpected Heritage Items (Roads and Maritime Services, 2015) must be followed. The Transport for NSW Environment Manager must be contacted immediately.
H2	The location of nearby heritage items and their status as no go areas would be covered in site inductions and pre-work toolbox talks.

3.7 Biodiversity

Description of existing environmental and potential impacts

Have relevant database searches been carried out?

Yes

No

Description of existing environmental and potential impacts

Database searches (Bionet Atlas and EPBC Act protected matters search) were carried out as part of this Minor Works REF on 19 May 2022. State Vegetation Type Map: Upper Hunter (v1.0. VIS_ID 4894) was also referred to (issued 1 July 2019).

Did the database searches identify any endangered ecological communities, threatened flora and/or threatened or protected fauna, or migratory species in or within the vicinity of the proposed works? Both Commonwealth and State listed matters must be considered.

The Biodiversity Assessment (Appendix D) found that the part of the proposal area near the culvert is highly disturbed and cleared, and is not considered to conform to any of the descriptions provided for those native vegetation communities or endangered ecological communities (EECs) recorded in the surrounding region.

The results of the Bionet Atlas search are provided in Appendix H, with the nearest records noted in the table below. All of the nearest records are for birds and primarily associated with the ponds at the adjacent Muswellbrook Wastewater treatment Plant.

Scientific and common name	Type of listing (BC Act or EPBC Act)	Distance from works	Potential Impacts
<i>Stictonetta naevosa</i> (Freckled Duck)	BC Act - V	Within and adjacent area	Not reliant on habitat at site
<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)	BC Act - V	~190m	Not reliant on habitat at site

During the site investigation for the Biodiversity Assessment a number of common-to-abundant occurring native birds were observed or heard calling near the area investigated, including species such as the Rainbow Lorikeet (*Trichoglossus haematodus*), Fairy Martins (*Petrochelidon ariel*) and Superb Fairy-wren (*Malurus cyaneus*). Amphibians heard calling throughout the upstream area, between 5-15 metres from the culvert's eastern entrance, included the Common Eastern Froglet (*Crinia signifera*) and Eastern Sign-bearing Froglet (*Crinia parinsignifera*).

None of the native species recorded are listed, or currently being considered for listing, under the EPBC Act, BC Act and/or FM Act.

Is the proposal likely to impact nationally listed threatened species, ecological communities or migratory species?

The proposal site does not contain habitat on which nationally listed threatened species would be reliant and there are no records for nationally listed threatened species within or adjacent to the proposal area. Vegetation

Yes

No

Yes

No

Description of existing environmental and potential impacts		
mapping does not indicate any which nationally listed threatened ecological communities at the site.		
<p>Would the proposal require the removal of any other vegetation?</p> <p>The proposal would affect groundcovers and up to eleven trees, six of which are mature.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Would the proposal affect any tree hollows or hollow logs?</p> <p>Two hollow-bearing trees (Yellow Box <i>Eucalyptus melliodora</i>; Western Red Box <i>Eucalyptus intertexta</i>) are within the proposal area require removal for the culvert extension, these being 10-15 metres tall, with numerous hollows (vertical/horizontal - 50-300 millimetres diameter) present on the trunks and limbs of the trees. Safeguards have been proposed to address potential impacts on hollow-dependent fauna which may be using these trees.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Are there any known areas of outstanding biodiversity value or areas mapped as 'littoral rainforest' or 'coastal wetland' under chapter 2 of State Environmental Planning Policy (Resilience and Hazards) 2021 (SEPP (Resilience and Hazards)) in or within the vicinity of the proposed work?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Would the proposal provide any additional barriers to the movement of wildlife?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Would the proposal disturb any natural waterways or aquatic habitat?</p> <p>Ramrod Creek is identified as key fish habitat and consultation with has occurred in relation to the proposal (refer to Section 2.4.3). During site inspections carp (which prefer still or slowly flowing waters at low altitudes, especially in areas where there is abundant aquatic vegetation) were the only fish species observed. Ramrod Creek has no Department of Primary Industries freshwater fish habitat rating, while the nearby Hunter River is identified as being in fair condition.</p> <p>Ramrod Creek is not identified by the Department of Primary Industries as being within the known distribution of any threatened fish species. The nearby Hunter River is within the know distribution of the Darling River Hardyhead (<i>Craterocephalus amniculus</i>) which is listed as threatened under the <i>Fisheries Management Act 1994</i>.</p> <p>Given the small area and nature of habitat to be affected, impacts on native (including threatened) fish would be minimal. Obstruction of fish passage would be temporary. Impacts on hydrology and water quality are discussed in Section 3.2.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Would the proposal disturb any crevices or other locations (such as on bridges and culverts) for potential bat habitat?</p> <p>The proposal would involve extension of an existing three cell cast in situ box culvert. The culvert does not contain any obvious joins and the size (cells are approximately 4 metres x 4 metres) and relatively short length of the culvert means it is exposed to substantial light. This makes it less likely habitat for microbats.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Description of existing environmental and potential impacts

A large 1650 mm diameter reinforced concrete drainage pipe currently discharges through the downstream wingwall. It is proposed to butt the new wingwall to the existing wingwall adjacent to the drainage pipe. Likely frequent inundation of this pipe and vegetation at the outlet makes this pipe less likely habitat for microbats.

In the event that microbats are identified, the Unexpected Threatened Species Find Procedure in Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) would be implemented.

Groundwater dependant ecosystems

A small part of the proposal site is mapped as low and high potential groundwater dependant ecosystem (refer to Figure 3-7).

The proposal requires only minor clearing of groundcovers in this area and would not substantially alter topography. Proposed excavation is limited in extent and depth (up to 0.5 metres for pavement works and up to 1.5 metre below the invert of the existing culvert) and not likely to result in substantial groundwater drawdown. Based on the small scale of development, the proposal is considered unlikely to substantially impact groundwater dependent ecosystems.Weeds

The proposal has the potential to spread weeds works and through the movement of vehicles and machinery into or out of the site. Safeguards have been proposed to address these potential impacts.

Of the introduced plant species recorded at the site, African Boxthorn (*Lycium ferocissimum*) is listed:

- As a Priority Weed in the Hunter region (which includes Muswellbrook LGA)
- Under Schedule 3 of the NSW Biosecurity Regulation 2017
- As a Weed of National Significance (Weeds Australia, 2022).

Invasion and spread of pathogens and disease

During construction, the proposal has the potential to cause both the spread of pathogens and disease. There is a risk of spreading fungus and diseases through the introduction and movement of soil. Standard hygiene management measures during construction are proposed to minimise this risk.

Fauna injury and mortality

Works could result in injury or death to fauna traversing the site. Species at risk include ground-dwelling species such as snakes, lizards, small mammals. Fish within Ramrod Creek could also be impacted. Safeguards have been proposed to address this risk.

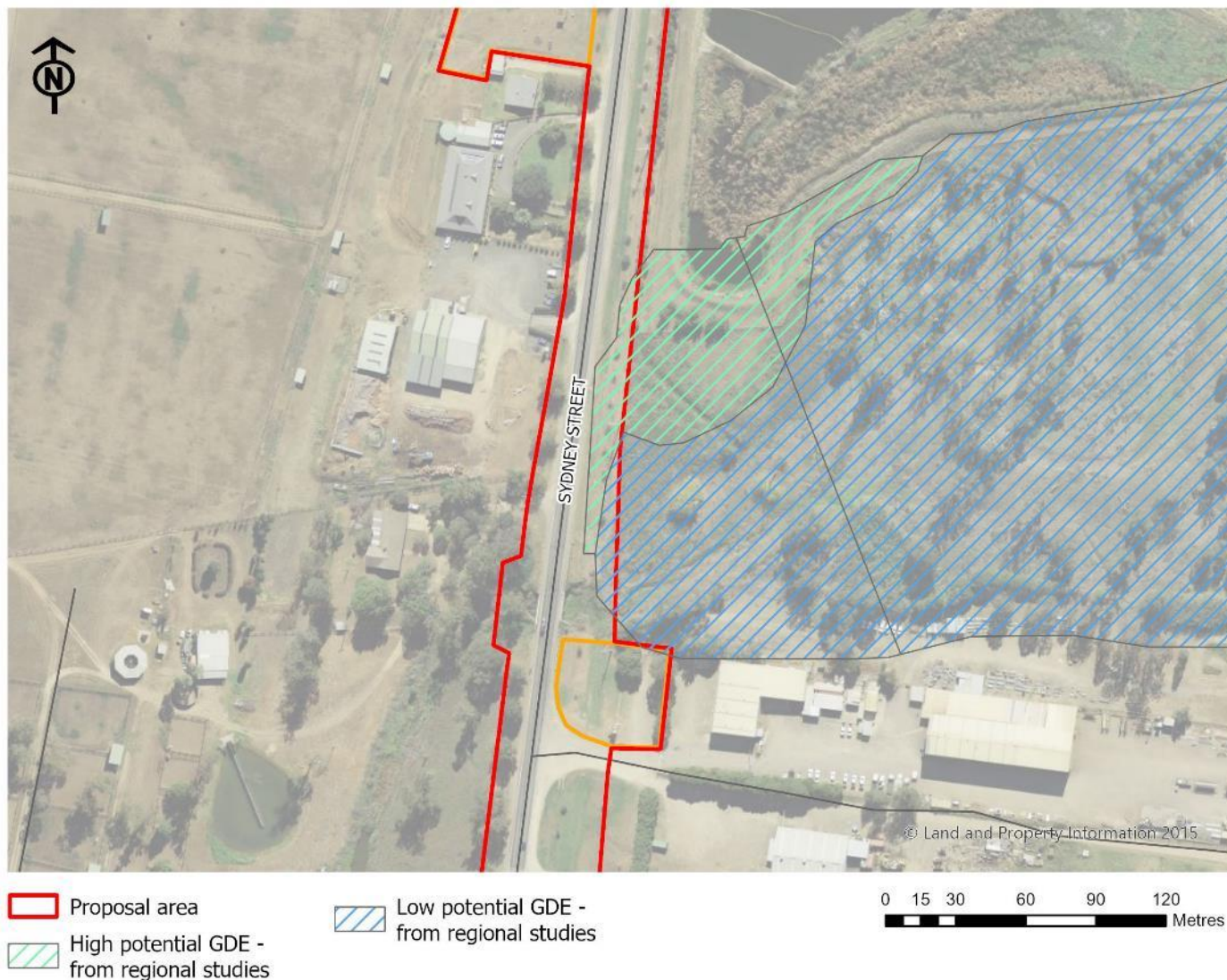


Figure 3-7: Groundwater dependent ecosystems

Safeguards

Safeguards to be implemented are:

F1	Exclusion zones will be established as per Guide 2: Biodiversity Guidelines Protecting and managing biodiversity on RTA projects (RTA, 2011).
F2	Fauna that may be present on site during works will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
F3	Inspections for the presence of any sheltering native species would be carried out under vehicles and machinery prior to their use.
F4	Weed species would be managed in accordance with Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) and the <i>Biosecurity Act 2015</i> (general duty to prevent, eliminate or minimise any biosecurity risk). This would include disposing of weeds and weed contaminated soil at an appropriate waste management facility.
F5	The existing culvert and drainage pipe will be inspected for any roosting microbats prior to disturbance. If bats are identified or suspected to be present, advice from a qualified ecologist will be sought.

F6	If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the Unexpected Threatened Species Find Procedure in Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
F7	The Best Practice Hygiene Protocols in Guide 7: Pathogen management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) will be implemented.
F8	Any pest species of fish within the work area, such as carp, will be euthanised (in accordance with a Section 37 permit under the <i>Fisheries Management Act 1994</i>).

3.8 Trees

Description of existing environmental and potential impacts

Does the proposal involve pruning, trimming or removal of any tree/s?

Yes

No

The Aboricultural Impact Assessment (refer to Appendix E) concluded that while there would be a major encroachment of the tree protection zone for 16 trees of the 88 trees assessed. This includes eight of the *Platanus x acerifolia* trees (London Plane), although these trees would not require removal. Up to eleven trees would require removal, these being:

- Tree 6 (*Eucalyptus melliodora*) – likely requires removal due to earthworks
- Tree 9 (*Casuarina glauca*) – likely requires removal due to earthworks
- Tree 10 (*Casuarina glauca*) – likely requires removal due to earthworks
- Tree 11 (*Casuarina glauca*) – likely requires removal due to earthworks
- Tree 12 (*Lagerstroemia indica*) – semi mature tree requires removal for the bridge works compound
- Tree 13 (*Casuarina glauca*) – likely requires removal due to earthworks
- Tree 14 (*Lagerstroemia indica*) – semi mature tree requires removal for the bridge works compound
- Tree 83 (*Eucalyptus melliodora*) – requires removal due to major encroachment of tree protection zone
- Tree 83 (*Eucalyptus melliodora*) – requires removal due to major encroachment of tree protection zone

Replacement plantings for these trees will be provided in consultation with Council and in accordance with the project landscaping plan. The required contribution to the Transport Conservation Fund will also be made.

Do the trees form part of a streetscape, an avenue or roadside planting?

Yes

No

The trees that would be removed (along with the larger London Plane trees) provide an important entry statement to the town of Muswellbrook. Retention of the London Plane trees and the proposed replanting within the road corridor would minimise streetscape impacts.

Have the trees been planted by a community group, Landcare group or by council or is the tree a memorial or part of a memorial group e.g. has a plaque?

Yes

No

Do the trees form part of a heritage listing or have other heritage value?

Yes

No

Safeguards

Safeguards to be implemented are:

TR1	<p>Works will occur consistent with the tree protection plan prepared as part of the Arboricultural Impact Assessment. This includes the following:</p> <ul style="list-style-type: none"> • Prior to demolition and/or site establishment, indicate clearly (with spray paint on trunks) trees marked for removal only • Tree protection (for trees that will be retained) will be installed prior to demolition and site establishment. This may include the mulching of areas within the tree protection zone. The project arborist will inspect and certify tree protection. • Scheduled inspection of trees by the project arborist will be undertaken every 8 weeks (2 months) during the construction period • Project arborist to supervise and document all works carried out within the tree protection zone of trees to be retained • Inspection of trees by project arborist after all major construction has ceased, following the removal of tree protection measures • Final inspection of trees by project arborist.
TR2	Replacement plantings for removed trees will be provided in consultation with Council and in accordance with the project landscaping plan.
TR3	Vehicles, plant or equipment would not be parked or stored within the tree protection zone, if parking or storage is required additional mitigation measures would be implemented to minimise the impact to the vegetation.

3.9 Traffic and transport

Description of existing environmental and potential impacts		
<p>Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during construction?</p> <p>No detours are needed for the proposal.</p> <p>The proposal would involve short-term lane closures (and associated traffic switches) and reduced speed limits, resulting in some disruptions and delays to traffic flow. There would also be short delays associated with the manoeuvring of over size over mass vehicles at the site. Any lane closures would need to be the subject of a Road Occupancy Licence.</p> <p>The formation of driveway crossovers would likely mean short term disruption to access for the subject properties. Driveway works would occur in consultation with affected owners / occupiers.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Is the proposal likely to affect any other transport nodes or transport infrastructure (e.g. bus stops, bus routes) in the surrounding area? Or result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

By providing for an all-weather active transport crossing of Ramrod Creek, the proposal supports the potential future provision (by others) of shared path along the eastern side of Denman Road.

Safeguards

Safeguards to be implemented are:

TT1	During construction traffic and/or pedestrian movements would be managed in accordance with <i>Traffic control at work sites – Technical manual</i> (version 6.1, 2022) as necessary.
TT2	Adjustments to driveways will occur in consultation with property owners / occupiers.

3.10 Socio-economic

Description of existing environmental and potential impacts

<p>Is the proposal likely to impact on local business?</p> <p>Business along Denman Road adjacent to the proposal area include mining services, equipment hire and tree services. Potential impacts on these businesses would include short-term disruption to access and reduced business visibility during construction. Access to adjacent properties, including businesses, would be managed in consultation with property owners / occupiers. While the subject businesses are destination based and less likely to be reliant of passing trade, a safeguard has also been proposed to ensure business visibility is maintained.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Is the proposal likely to require any property acquisition?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Is the proposal likely to alter any access for properties (either temporarily or permanently)?</p> <p>The formation of driveway crossovers would likely mean short term disruption to access for the subject properties. Driveway works would occur in consultation with affected owners / occupiers.</p> <p>No permanent changes to access are proposed.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Is the proposal likely to alter any on-street parking arrangements (either temporarily or permanently)?</p> <p>There are no signposted restrictions on parking on the Denman Road verges. These areas would be unavailable for vehicles to pull over at times during construction, however it is noted that there appears to be negligible parking demand at this location, with adequate provision for parking on adjacent properties.</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Is the proposal likely to change pedestrian movements or pedestrian access (either temporarily or permanently)?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

Description of existing environmental and potential impacts		
The proposal does accommodate a potential future shared path on the eastern side of Denman Road (alignment to be determined by Muswellbrook Shire Council).		
Is the proposal likely to impact on any items or places of social value to the community (either temporarily or permanently)?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Is the proposal likely to reduce or change visibility of any businesses, farms, tourist attractions or the like (either temporarily or permanently)?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
A safeguard has also been proposed to ensure business visibility is maintained.		

Safeguards

Safeguards to be implemented are:

S1	All complaints received during the work are to be recorded on a complaints register and attended to promptly.
S2	Construction activities (including the temporary parking of plant) will be managed to minimise impacts on the visibility of adjacent businesses.

3.11 Landscape character and visual amenity

Description of existing environmental and potential impacts		
Is the proposed work over or near an important physical or cultural element or landscape? (e.g. heritage items and areas, distinctive or historic built form, National Parks, conservation areas, scenic highways etc)?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
The proposal is not near any distinctive or historic built form, National Parks, conservation areas, scenic highways. Indirect impacts on heritage items to the immediate south of the proposal area are discussed in Section 3.6.		
The proposal involves rehabilitation and improvements to an existing rural road and would therefore be consistent with the existing landscape character.		
The trees that would be removed (along with the larger London Plane trees) provide an important entry statement to the town of Muswellbrook. Retention of the London Plane trees and the proposed replanting within the road corridor would minimise streetscape impacts.		
Would the proposal obstruct or intrude upon the character or views of a valued landscape or urban area. For example, locally significant topography, a rural landscape or a park, a river, lake or the ocean or a historic or distinctive townscape or landmark?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
The proposal area includes good quality views over a rural landscape. The proposal does not include any high or bulky elements that would obscure these views. Visual impacts would be largely confined to the construction stage and would relate to the visibility of disturbed areas and construction plant.		

Description of existing environmental and potential impacts		
<p>Would the proposal require the removal of mature trees or stands of vegetation, either native or introduced?</p> <p>The trees that would be removed (along with the larger London Plane trees provide an important entry statement to the town of Muswellbrook. Retention of the London Plane trees and the proposed replanting within the road corridor would minimise streetscape impacts.</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p>Would the proposal result in large areas of shotcrete visible from the road or adjacent properties?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Would the proposal involve new noise walls or visible changes to existing noise walls?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Would the proposal involve the removal or reuse of large areas of road corridor, landscape, either verges or medians?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Would the proposal involve substantial changes to the appearance of a bridge (including piers, girders, abutments and parapets) that are visible from the road or residential areas?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>If involving lighting, would the proposal create unwanted light spillage on residential properties at night (in construction or operation)?</p> <p>Lighting would be required for the proposed night work. Lighting would be directed at the work area and there would be limited potential for impacts on residential properties setbacks.</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
<p>Would any new structures or features to be constructed result in overshadowing to adjoining properties or areas?</p>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

Safeguards

Safeguards to be implemented are:

V1	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.
V2	All construction related material and equipment will be removed from the proposal area at the completion of work and disturbed areas restored.
V3	Construction site lighting will be oriented to minimise the risk of light spill impacts on any nearby residences.

3.12 Waste

Description of existing environmental and potential impacts		
<p>Is the proposal likely to generate >200 tonnes of waste material (contaminated and /or non-contaminated material)?</p> <p>The proposal would result in some waste. It is anticipated that the proposal would result in the generation of the following waste streams:</p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Description of existing environmental and potential impacts

<ul style="list-style-type: none"> General waste Mulched vegetation (from the trees to be removed) Concrete waste Milled asphalt pavement Spoil trenching activities. <p>Waste would be classified and either reused (where permitted) or disposed of at an appropriately licenced facility.</p>		
Is the proposal likely to require a licence from EPA?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Is the proposal likely to require the removal of asbestos?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

Safeguards

Safeguards to be implemented are:

M1	<p>Resource management hierarchy principles are to be followed:</p> <ul style="list-style-type: none"> Avoid unnecessary resource consumption as a priority Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) Disposal is undertaken as a last resort <p>(in accordance with the <i>Waste Avoidance & Resource Recovery Act 2001</i>).</p>
M2	<p>Waste material is to be reused in accordance with any waste exemptions or disposed of legally in accordance with its waste classification.</p>
M3	<p>There is to be no disposal or re-use of construction waste on to other land.</p>

4. Consideration of State and Commonwealth environmental factors

4.1 Environmental Planning and Assessment Regulation 2021 checklist

The following factors, listed in both the *Guidelines for Division 5.1 Assessments* (DPE, 2022) and section 171(2) of the Environmental Planning and Assessment Regulation 2021, have been considered to assess the likely impacts of the proposal on the natural and built environment. This consideration is required to comply with sections 5.5 and 5.7 of the EP&A Act.

Environmental factor	Impact
<p>(a) Any environmental impact on a community?</p> <p>The proposal would have a minor and short-term impact on community attributable to construction noise, lane closures and delays and construction related visual impacts. Safeguards have been proposed to address identified potential impacts.</p> <p>Over the long-term, the community would benefit from an improved standard of road.</p>	<p>Negative (minor and short-term)</p> <p>Positive (long-term)</p>
<p>(b) Any transformation of a locality?</p> <p>The proposal would result in some transformation of the locality in the short-term due to visual impacts associated with construction works. Over the longer term the proposal is unlikely to be noticeable in the broader rural landscape.</p>	<p>Negative (minor and short-term)</p>
<p>(c) Any environmental impact on the ecosystems of a locality?</p> <p>The proposal would have limited impact on ecosystems. Impacts on threatened species, communities and/or their habitats are discussed in Section 3.7.</p>	<p>Negative (minor and short-term)</p>
<p>(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p> <p>The proposal would result in a minor and short-term reduction in the aesthetic value of the locality as a result of construction related activities.</p>	<p>Negative (minor and short-term)</p>
<p>(e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</p> <p>The proposal would not affect any known Aboriginal sites. Indirect impacts on nearby listed non-Aboriginal heritage items would be negligible. The proposal area is disturbed and is likely to have low archaeological potential.</p>	<p>Nil</p>
<p>(f) Any impact on habitat of any protected animals (within the meaning of the <i>Biodiversity Conservation Act 2016</i>)?</p> <p>The proposal would result in the removal of some sheltering and foraging resources for bats, small mammals, birds and insects. The proposed safeguards are considered adequate to minimise impacts on protected animals.</p>	<p>Negative (minor and short-term)</p>

Environmental factor	Impact
<p>(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</p> <p>The proposal would not endanger any species of animal, plant or other form of life.</p>	Nil
<p>(h) Any long-term effects on the environment?</p> <p>Over the longer term the proposal would improve ride quality for road users.</p>	Positive (long-term)
<p>(i) Any degradation of the quality of the environment?</p> <p>There would be potential for minor, short-term impacts on the quality of the environment including amenity (air quality and noise), visual and potential water quality impacts. Safeguards have been proposed to address the potential impacts.</p>	Negative (minor short-term)
<p>(j) Any risk to the safety of the environment?</p> <p>The proposal would not result in a risk to the safety of the environment.</p>	Nil
<p>(k) Any reduction in the range of beneficial uses of the environment?</p> <p>The proposal would not reduce the range of beneficial uses of the environment.</p>	Nil
<p>(l) Any pollution of the environment?</p> <p>Minor, short-term risks to water quality would be present in the event of a spill or release of material from the work site during construction. Safeguards have been proposed to address the risk of pollution.</p>	Negative (minor short-term and long-term)
<p>(m) Any environmental problems associated with the disposal of waste?</p> <p>The proposal would result in some waste as noted in Section 3.12. Waste generated would be transported from the proposal area, tracked and disposed of legally.</p>	Nil
<p>(n) Any increased demands on resources, natural or otherwise which are, or are likely to become, in short supply?</p> <p>The proposal would not increase demand for resources which are, likely to become, in short supply.</p>	Nil
<p>(o) Any cumulative environmental effect with other existing or likely future activities?</p> <p>Noting the relatively limited scale of the proposal and the absence of other nearby projects, no cumulative environmental effects as a result of existing or likely future activities have been identified.</p>	Nil
<p>(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?</p> <p>The proposal would not influence coastal processes and/or coastal hazards.</p>	Nil
<p>(q) Any impact on applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1?</p> <p>The nominated regional strategic plan is the Hunter Regional Plan 2036. As the proposal for rehabilitation of an existing road, it does not directly align</p>	Positive (short-term and long-term)

Environmental factor	Impact
<p>(but is not inconsistent with) with many of the directions in the Hunter Regional Plan. The proposal is however consistent with Direction 26: Deliver infrastructure to support growth and communities.</p> <p>The Muswellbrook Shire Council Local Strategic Planning Statement 2020 – 2040 (Muswellbrook LSPS) identifies the key outcomes Council aims to achieve when developing policies and making land use decisions, and in advocating to other levels of government regarding decisions that involve the Shire. The proposal supports the following planning priorities identified in the Muswellbrook LSPS:</p> <ul style="list-style-type: none"> • Planning Priority 7: Industrial land is developed in an orderly manner, which meets future needs, and is provided with appropriate infrastructure – the proposal would provide improved road transport infrastructure that would benefit adjacent and nearby industrial and rural lands. • Planning Priority 12: Urban development is focused in areas with existing infrastructure and new infrastructure and services required for urban growth is appropriately funded – proposal would provide improved road transport infrastructure that would nearby urban, industrial and rural development. 	
<p>(r) Any impact on other relevant environmental factors?</p> <p>In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to Chapter 3 of this assessment.</p>	Nil

4.2 Matters of National Environmental Significance checklist

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance are required to be considered to:

- Assist in determining whether the proposal should be referred to the Australian Government Department of Agriculture, Water and the Environment
- For nationally listed threatened species, ecological communities and migratory species, whether the impacts are significant and should be assessed via a Project REF.

Factor	Impact
<p>(a) Any impact on a World Heritage property?</p> <p>The proposal would not impact on World Heritage property given the nature of the proposal and lack of proximity.</p>	Nil
<p>(b) Any impact on a National Heritage place?</p> <p>The proposal would not impact on a National Heritage place given the nature of the proposal and lack of proximity.</p>	Nil
<p>(c) Any impact on a wetland of international importance (often called ‘Ramsar’ wetlands)?</p> <p>The proposal is within the catchment of the Hunter Estuary Wetlands which is a Ramsar wetland. The small scale of the proposal in the context of the</p>	Nil

Factor	Impact
broader catchment, the distance to the wetlands and the proposed water quality safeguards mean that impacts on Ramsar wetlands are unlikely.	
<p>(d) Any impact on nationally threatened species, ecological communities or migratory species?</p> <p>A number of Commonwealth listed threatened species have the potential to occur in the local area. The nature, scale and location of the proposal are such that impacts on these species or their habitats are not expected. Indirect impacts are also not expected.</p>	Not significant
<p>(e) Any impact on a Commonwealth marine area?</p> <p>There would be no environmental impact on a Commonwealth marine area.</p>	Nil
<p>(f) Does the proposal involve a nuclear action (including uranium mining)?</p> <p>The proposal does not involve a nuclear action.</p>	Nil
<p>Additionally, any impact (direct or indirect) on the environment of Commonwealth land?</p>	Nil

5. Summary of safeguards and environmental management measures

This section provides a summary of the site specific environmental safeguards and management measures identified in described in chapters 3 and 4 of this REF. These safeguards will be implemented to reduce potential environmental impacts throughout construction and operation. A framework for managing the potential impacts is provided with reference to environmental management plans and relevant Transport QA specifications. Any potential licence and/or approval requirements required prior to construction are also listed

Table 5-1: Summary of site-specific safeguards for proposed work

Safeguards for the proposed work		
Soil	E1	Erosion and sediment control measures are to be implemented and maintained to: <ul style="list-style-type: none"> Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets Reduce water velocity and capture sediment on site Minimise the amount of material transported from site to surrounding pavement surfaces Divert clean water around the site (in accordance with the Landcom/Department of Housing <i>Managing Urban Stormwater, Soils and Construction Guidelines</i> (the Blue Book)).
	E2	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.
	E3	Erosion and sediment control measures are not to be removed until the work is complete and areas stabilised.
	E4	A progressive erosion and sediment control plan is to be prepared for the works.
	E5	Parking of vehicles and storage of plant/equipment is to occur only within the designated proposal area.
	E6	Existing ground cover vegetation will be retained to the greatest extent possible to minimise the area of exposed soils.
	E7	If suspected contamination is identified all work would cease and the Transport for NSW Project Manager contacted immediately.
	E8	Upslope and upstream diversions will be used to direct runoff away from the work sites to minimise the potential for surface flow to mobilise sediment.
Waterways and water quality	W1	There is to be no release of dirty water into drainage lines and waterways.
	W2	Water quality controls measures are to be used to prevent any materials (eg grout, sediment etc) entering drainage or waterways.
	W3	Plant and equipment will be inspected regularly to ensure there are no leakages of fuel, oil and hydraulic fluid.

Safeguards for the proposed work

	W4	All fuels, chemicals and liquids will be stored in an impervious bunded area within the compound site when not in use.
	W5	If refuelling of plant and equipment is required on site it will take place on flat ground only using 20 litre drums within a bunded area large enough to contain 120 per cent of the container's contents.
	W6	If an incident (eg spill) occurs, the Environmental Incident Procedure (Transport for NSW, 2021) is to be followed and the Transport for NSW Contract Manager and Environment Manager notified immediately.
	W7	An emergency spill kit is to be kept on site and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances and include an absorbent boom suitable for deployment in the waterway. All staff are to be made aware of the location of the spill kit and trained in its use.
	W8	Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls.
	W9	Measures will be implemented to ensure that water pumped from the site is filtered (for sediments) prior to it re-entering the waterway at a suitable downstream location. This is to occur in accordance with an approved Environmental Work Method Procedure.
	W10	Procedures will be developed for managing the worksite where there is a risk of flooding, including removal and storage of plant and equipment and securing of the site, and access arrangements.
	W11	In the event a coffer dam is required, the motorised pump will be located on the bank of the creek and will be double bunded with the capacity to capture 120% of the potential spill volume. Before each shift the pump will be inspected to ensure it is in good working order and no defects are present.
	W12	Any material removed from the waterway that is to be temporarily deposited or stockpiled on land is to be located well away from the waterway and to be contained by appropriate sediment control devices.
	W13	Restrictions on stockpiling material in low lying areas or areas known to have ponding water would be put in place to minimise the potential for transportation offsite.
	W14	All plant and equipment would be removed from the creek at the conclusion of each work shift
Noise and vibration	N1	<p>A noise and vibration management plan will be prepared and included in the project CEMP. The NVMP will generally follow the approach in the Interim Construction Noise Guideline (ICNG) (DECC, 2009) and the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016) and identify:</p> <ul style="list-style-type: none"> all potential significant noise and vibration generating activities associated with the activity

Safeguards for the proposed work

		<ul style="list-style-type: none"> feasible and reasonable mitigation measures to be implemented a monitoring program to assess performance against relevant noise and vibration criteria and measures to be implemented in the event of non-compliance with noise and vibration criteria a review process scheduling and assessing out-of-hours activities including consideration of alternatives to out-of-hours work, plant selection, work locations and screening to minimise impacts arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures.
	N2	The standard mitigation measures prescribed in Appendix B of the <i>Roads and Maritime Construction Noise and Vibration Guideline</i> (Roads and Maritime Services, 2016) will be implemented where relevant.
	N3	Respite periods will be considered if nearby residents raise concerns about working hours and noise impacts when consulted during construction.
	N4	A letterbox drop notification for residential receivers within 335 metres of day works and 450 metres of evening/night works will occur at least five business days prior to works starting. The extent of the notification will be confirmed with reference to the noise assessment and the specific types of activities proposed. The notification will detail work activities, dates and hours, impacts (including any changed traffic arrangements) and mitigation measures. It will also include a contact number for enquiries and complaints.
	N5	Residences with a direct line of sight to the proposed works would be door knocked at least five business days prior to works starting. Residents would be provided with details of work activities, dates and hours, impacts (including any changed traffic arrangements), mitigation measures and a contact number for enquiries and complaints.
	N6	The noisiest works will be scheduled to occur before 11pm where possible.
	N7	Where vibration intensive plant such as vibratory rollers are used, vibration must be managed to minimise disturbance to building occupants and to avoid damage to buildings and other structures. This includes adhering to the recommended minimum working distances for vibration intensive plant identified in Section 6.1 of the <i>Construction Noise and Vibration Guideline</i> (Transport for NSW, 2022).
	N8	The compound at 240 Denman Road will be organised and managed to minimise noise impacts on the adjacent residences. This would include placing noisy plant (e.g. generators) to the north of the site to maximise the distance to the residences and using site sheds as barriers where practicable. The use of noise curtains will be considered.
	N9	The stockpile sites near the intersection of Denman Road and Skellatar Stock Route are not to be used outside standard construction hours.
Air quality	A1	Work will not be carried out during strong winds or in weather conditions where high level of dust or air borne particulates are likely.

Safeguards for the proposed work

	A2	Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.
	A3	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.
Aboriginal Heritage	AH1	If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the Transport for NSW Aboriginal cultural heritage officer and regional environment manager contacted immediately. Steps in the Transport for NSW Unexpected Archaeological Finds Procedure must be followed.
	AH2	If the scope of the proposal changes or the extent of the disturbance area changes then the Transport for NSW Aboriginal cultural heritage officer and regional environment manager should be contacted immediately.
Non-Aboriginal Heritage	H1	If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Standard Management Procedure: Unexpected Heritage Items (Roads and Maritime Services, 2015) must be followed. The Transport for NSW Environment Manager must be contacted immediately.
	H2	The location of nearby heritage items and their status as no go areas would be covered in site inductions and pre-work toolbox talks.
Biodiversity	F1	Exclusion zones will be established as per Guide 2: Biodiversity Guidelines Protecting and managing biodiversity on RTA projects (RTA, 2011).
	F2	Fauna that may be present on site during works will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
	F3	Inspections for the presence of any sheltering native species would be carried out under vehicles and machinery prior to their use.
	F4	Weed species would be managed in accordance with Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) and the Biosecurity Act 2015 (general duty to prevent, eliminate or minimise any biosecurity risk). This would include disposing of weeds and weed contaminated soil at an appropriate waste management facility.
	F5	The existing culvert and drainage pipe will be inspected for any roosting microbats prior to disturbance. If bats are identified or suspected to be present, advice from a qualified ecologist will be sought.
	F6	If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the Unexpected Threatened Species Find Procedure in Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
	F7	The Best Practice Hygiene Protocols in Guide 7: Pathogen management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) will be implemented.

Safeguards for the proposed work

	F8	Any pest species of fish within the work area, such as carp, will be euthanised (in accordance with a Section 37 permit under the <i>Fisheries Management Act 1994</i>).
Trees	TR1	<p>Works will occur consistent with the tree protection plan prepared as part of the Arboricultural Impact Assessment. This includes the following:</p> <ul style="list-style-type: none"> • Prior to demolition and/or site establishment, indicate clearly (with spray paint on trunks) trees marked for removal only • Tree protection (for trees that will be retained) will be installed prior to demolition and site establishment. This may include the mulching of areas within the tree protection zone. The project arborist will inspect and certify tree protection. • Scheduled inspection of trees by the project arborist will be undertaken every 8 weeks (2 months) during the construction period • Project arborist to supervise and document all works carried out within the tree protection zone of trees to be retained • Inspection of trees by project arborist after all major construction has ceased, following the removal of tree protection measures • Final inspection of trees by project arborist.
	TR2	Replacement plantings for removed trees will be provided in consultation with Council and in accordance with the landscaping plan. And transferring contribution into the Conservation fund..
	TR3	Vehicles, plant or equipment would not be parked or stored within the tree protection zone, if parking or storage is required additional mitigation measures would be implemented to minimise the impact to the vegetation.
Traffic and transport	TT1	During construction traffic and/or pedestrian movements would be managed in accordance with <i>Traffic control at work sites – Technical manual</i> (version 6.1, 2022) as necessary.
	TT2	Adjustments to driveways will occur in consultation with property owners / occupiers.
Socio-economic	S1	All complaints received during the work are to be recorded on a complaints register and attended to promptly.
	S2	Construction activities (including the temporary parking of plant) will be managed to minimise impacts on the visibility of adjacent businesses.
Landscape character and visual amenity	V1	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.
	V2	All construction related material and equipment will be removed from the proposal area at the completion of work and disturbed areas restored.
	V3	Construction site lighting will be oriented to minimise the risk of light spill impacts on any nearby residences.
Waste	M1	<p>Resource management hierarchy principles are to be followed:</p> <ul style="list-style-type: none"> • Avoid unnecessary resource consumption as a priority

Safeguards for the proposed work

		<ul style="list-style-type: none"> Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) Disposal is undertaken as a last resort (in accordance with the <i>Waste Avoidance & Resource Recovery Act 2001</i>).
	M2	Waste material is to be reused in accordance with any waste exemptions or disposed of legally in accordance with its waste classification.
	M3	There is to be no disposal or re-use of construction waste on to other land.

5.1 Licensing and approvals

List of licences and/or approvals required for the proposal:

Table 5-2: Summary of licensing and approval required.

Instrument	Requirement	Timing
<i>Fisheries Management Act 1994 (s199)</i>	Notification to the Minister for Primary Industries prior to any dredging or reclamation works.	Notification has occurred (see Section 2.4.2)
<i>Fisheries Management Act 1994 (s37)</i>	Required for relocation of fish or euthanising pest species of fish, such as carp, as advised by the Department of Primary Industries – Fisheries.	Prior to the start of activity
<i>Roads Act 1993</i>	Road occupancy licence	Prior to the start of activity

5.2 Other requirements

Requirement		
Environmental management plan sent to SMES for review.	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
BAR and CEMP to be sent to DPI prior to works commencing.	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

6. Certification, review and decision

6.1 Certification

This minor works REF provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.

Prepared by:



Stuart Hill
Environmental Consultant
Hills Environmental
1 February 2023

6.2 Environment staff review

The Minor Works REF has been reviewed and considered against the requirements of sections 5.5 and 5.7 of the EP&A Act.

In considering the proposal this assessment has examined and taken into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity as addressed in the Minor Works REF and associated information. This assessment is considered to be in accordance with the factors required to be considered under section 171 of the Environmental Planning and Assessment Regulation 2021.

The proposal described in the Minor Works REF will have some environmental impacts which can be ameliorated satisfactorily. Having regard to the safeguard and management measures proposed, this assessment has considered that these impacts are unlikely to be significant and therefore an approval for the proposal does not need to be sought under Division 5.2 of the EP&A Act.

The assessment has considered the potential impacts of the activity on areas of outstanding value and on threatened species, ecological communities or their habitats for both terrestrial and aquatic species as defined by the *Biodiversity Conservation Act 2016* and the *Fisheries Management Act 1994*.

The proposal described in the Minor Works REF will not affect areas of outstanding value. The activity described in the Minor Works REF will not significantly affect threatened species ecological communities or their habitats. Therefore, a species impact statement is not required.

The assessment has also addressed the potential impacts on the activity on matters of national environmental significance and any impacts on the environment of Commonwealth land and concluded that there will be no significant impacts. Therefore there is no need for a referral to be made to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Minor Works REF is considered to meet all relevant requirements.

6.3 Environment staff recommendation

It is recommended that the proposal to carry out pavement rehabilitation and a culvert extension on Denman Road at Muswellbrook as described in this Minor Works REF proceed subject to the implementation of all safeguards identified in the Minor Works REF and compliance with all other relevant statutory approvals, licences, permits and authorisations.

The Minor Works REF has examined and taken into account to the fullest extent possible all matters likely to affect the environment by reason of the activity and established that the activity is not likely to significantly affect the environment or threatened species, ecological communities or their habitats.

The Minor Works REF has concluded that there will be no significant impacts on matters of national environmental significance or any impacts on the environment of Commonwealth land.

The Minor Works REF determination will remain current for five years until February 2028 at which time it shall lapse if works have not been physically commenced.

Recommended by:



Name: Mark Riddell

Position: A/ Environment and Sustainability Manager

Date: 20/02/2023

Noted by:

Name:

Position:

Date:

6.4 Determination

In accordance with the above recommendation and sections 5.5 and 5.7 of the EP&A Act, I determine that Transport for NSW may:

- proceed with the activity



Name: David Pattison

Position: Senior Manager Project Services North

Date: 24 February 2023

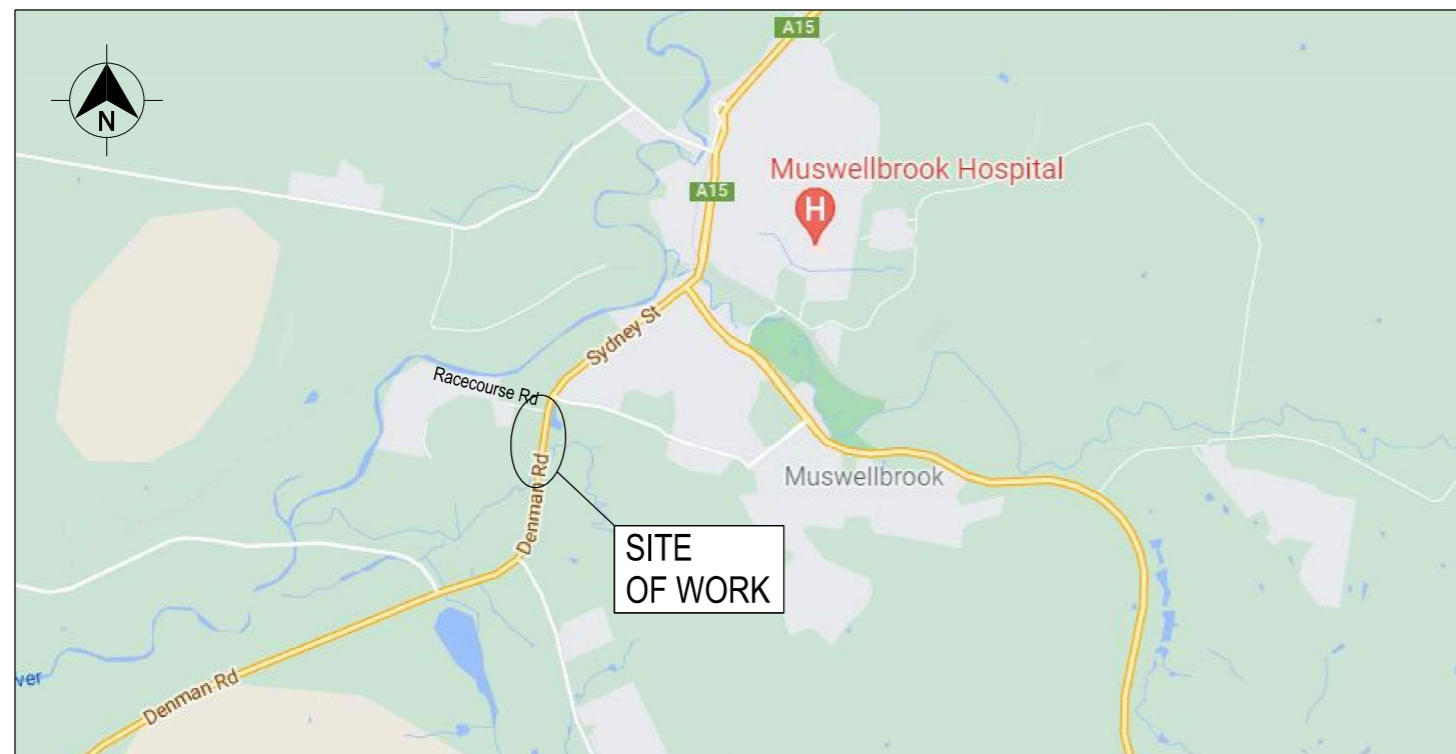
Appendix A

Design drawings

MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD

PAVEMENT REHABILITATION SEGMENT 209030

ROAD DESIGN DETAIL DESIGN PART 1



LOCALITY PLAN

MAP DATA ©2021 GOOGLE

PART INDEX

PART NUMBER	CODE	NAME
PART 1	GE	GENERAL
	RD	ROAD ALIGNMENT AND DETAIL
	RC	ROAD CROSS SECTIONS
	RF	ROADSIDE FURNITURE AND LINEMARKING
	MS	SURVEY INFRASTRUCTURE
PART 2	MS	GROUND CONTOURS - INFORMATION ONLY
	IS	ISOPACHYTE - INFORMATION ONLY
	MS	OSOM LAYDOWN LOCATIONS - INFORMATION ONLY

ACCEPTED FOR CONSTRUCTION

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DRAWING FILE LOCATION / NAME		LINEAR REFERENCING START: 0209, 0020, A1, 00.379 FINISH: 0209, 0020, A1, 01.011		PLOT DATE / TIME 08/12/2022 9:56:27 AM	PLOT BY cburns3	CLIENT 	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030	A3
PREPARED BY TRANSPORT FOR NSW ROAD DESIGN - HUNTER TECHNICAL SERVICES - NORTH INFRASTRUCTURE AND PLACE TfNSW	DESIGNED	REVIEWED	VERIFIED	TFNSW PROJECT MANAGER NAME L. HUANG	TITLE PROJECT ENGINEER	PREPARED FOR ASSET PROGRAMS NORTH REGIONAL AND OUTER METROPOLITAN TfNSW	RMS PROJECT No. P.0071712.02.001.003	DESIGN PROJECT No. SF2021/191953
TITLE ROAD DESIGNER	TITLE LEAD ROAD DESIGNER	TITLE ROAD DESIGN MANAGER		VALIDATION AND ACCEPTANCE OF THESE DRAWINGS AND THE DESIGN SHOWN THEREON IS TO BE CARRIED OUT UNDER SEPARATE PROCESS		RMS REGISTRATION No. DS2021 / 000702	ISSUE STATUS ISSUED FOR CONSTRUCTION	EDMS No. XXXXXXXXXX
							SHEET No. GE-0001	PART 1
							ISSUE B	

SHEET INDEX - 1 OF 2

SHEET NUMBER	SHEET DESCRIPTION	ISSUE					
		A	B	C	D	E	F
GE	GENERAL						
GE-0001	COVER SHEET	9/12/2022	8/02/2023				
GE-0002	SHEET INDEX - 1 OF 2	9/12/2022	8/02/2023				
GE-0003	SHEET INDEX - 2 OF 2	9/12/2022	8/02/2023				
GE-0004	SURVEY FEATURE LEGEND - 1 OF 2	9/12/2022					
GE-0005	SURVEY FEATURE LEGEND - 2 OF 2	9/12/2022					
GE-0006	GENERAL OVERVIEW PLAN	9/12/2022					
RD	ROAD ALIGNMENT AND DETAIL						
RD-0001	TYPICAL SECTIONS - SHEET 1	9/12/2022					
RD-0002	TYPICAL SECTIONS - SHEET 2	9/12/2022	8/02/2023				
RD-0003	PAVEMENT DETAILS	9/12/2022	8/02/2023				
RD-0011	ALIGNMENT PLAN - MR209 DENMAN ROAD - MC00 - CH.2140 TO CH.2205	9/12/2022					
RD-0012	ALIGNMENT PLAN - MR209 DENMAN ROAD - MC00 - CH.2205 TO CH.2330	9/12/2022					
RD-0013	ALIGNMENT PLAN - MR209 DENMAN ROAD - MC00 - CH.2330 TO CH.2455	9/12/2022					
RD-0014	ALIGNMENT PLAN - MR209 DENMAN ROAD - MC00 - CH.2455 TO CH.2580	9/12/2022					
RD-0015	ALIGNMENT PLAN - MR209 DENMAN ROAD - MC00 - CH.2580 TO CH.2705	9/12/2022					
RD-0016	ALIGNMENT PLAN - MR209 DENMAN ROAD - MC00 - CH.2705 TO CH.2762	9/12/2022					
RD-0017	ALIGNMENT PLAN - MR209 DENMAN ROAD - MCA1 AND MCA2	9/12/2022					
RD-0018	ALIGNMENT PLAN - MR209 DENMAN ROAD - MCA3 AND MCA4	9/12/2022					
RD-0019	ALIGNMENT PLAN - MR209 DENMAN ROAD - MCA5 AND MCA6	9/12/2022					
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RD-0021	ALIGNMENT SCHEDULES - 1 OF 2	9/12/2022					
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RD-0031	DETAIL PLAN - MR209 DENMAN ROAD - MC00 - CH.2140 TO CH.2205	9/12/2022					
RD-0032	DETAIL PLAN - MR209 DENMAN ROAD - MC00 - CH.2205 TO CH.2330	9/12/2022					
RD-0033	DETAIL PLAN - MR209 DENMAN ROAD - MC00 - CH.2330 TO CH.2455	9/12/2022					
RD-0034	DETAIL PLAN - MR209 DENMAN ROAD - MC00 - CH.2455 TO CH.2580	9/12/2022	8/02/2023				
RD-0035	DETAIL PLAN - MR209 DENMAN ROAD - MC00 - CH.2580 TO CH.2705	9/12/2022	8/02/2023				
RD-0036	DETAIL PLAN - MR209 DENMAN ROAD - MC00 - CH.2705 TO CH.2762	9/12/2022					
RD-0037	CULVERT PLAN	9/12/2022	8/02/2023				
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RC-0002	CROSS SECTION - MR209 DENMAN ROAD - MC00 - CH.2220 TO CH.2280	9/12/2022					
RC-0003	CROSS SECTION - MR209 DENMAN ROAD - MC00 - CH.2300 TO CH.2360	9/12/2022					
RC-0004	CROSS SECTION - MR209 DENMAN ROAD - MC00 - CH.2380 TO CH.2440	9/12/2022					
RC-0005	CROSS SECTION - MR209 DENMAN ROAD - MC00 - CH.2460 TO CH.2520	9/12/2022					
RC-0006	CROSS SECTION - MR209 DENMAN ROAD - MC00 - CH.2540 TO CH.2600	9/12/2022	8/02/2023				
RC-0007	CROSS SECTION - MR209 DENMAN ROAD - MC00 - CH.2620 TO CH.2680	9/12/2022	8/02/2023				
RC-0008	CROSS SECTION - MR209 DENMAN ROAD - MC00 - CH.2700 TO CH.2760	9/12/2022					
RC-0009	CROSS SECTION - MR209 DENMAN ROAD - MC00 - CH.2780	9/12/2022					

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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\P-PLAN-GENERAL.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 GENERAL	A3
EXTERNAL REFERENCE FILES XXXXXX	REV DATE AMENDMENT / REVISION DESCRIPTION	WVR No. APPROVAL	SCALES ON A3 SIZE DRAWING	TITLE	NAME	DATE	 Transport for NSW PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	TNSW REGISTRATION No. DS2021 / 000702 ISSUE STATUS ISSUED FOR CONSTRUCTION
	A 9-12-22 ISSUED FOR CONSTRUCTION	XX XXX	NOT TO SCALE CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020) HEIGHT DATUM AHD	DRAWN	C.BURNS	08.02.23		
	B 8-02-23 INDEX UPDATED FOR ISSUE B			DRG CHECK	L.MATTSSON	08.02.23		
				DESIGN	C.BURNS	08.02.23		
				DESIGN CHECK	L.MATTSSON	08.02.23		
				DESIGN MNGR	B.SPALDING	08.02.23		
				PROJECT MNGR	L.HUANG	08.02.23		SHEET No. GE-0002 ISSUE B


SHEET INDEX - 2 OF 2

SHEET NUMBER	SHEET DESCRIPTION	ISSUE					
		1	2	3	4	5	6
RF	ROADSIDE FURNITURE, SIGNPOSTING AND LINEMARKING						
RF-0001	ROAD FURNITURE AND LINEMARKING - MR209 DENMAN ROAD - MC00 - CH.2140 TO CH.2205	9/12/2022					
RF-0002	ROAD FURNITURE AND LINEMARKING - MR209 DENMAN ROAD - MC00 - CH.2205 TO CH.2330	9/12/2022					
RF-0003	ROAD FURNITURE AND LINEMARKING - MR209 DENMAN ROAD - MC00 - CH.2330 TO CH.2455	9/12/2022					
RF-0004	ROAD FURNITURE AND LINEMARKING - MR209 DENMAN ROAD - MC00 - CH.2455 TO CH.2580	9/12/2022	8/02/2023				
RF-0005	ROAD FURNITURE AND LINEMARKING - MR209 DENMAN ROAD - MC00 - CH.2580 TO CH.2705	9/12/2022	8/02/2023				
RF-0006	ROAD FURNITURE AND LINEMARKING - MR209 DENMAN ROAD - MC00 - CH.2705 TO CH.2762	9/12/2022					
MS	SURVEY INFRASTRUCTURE						
MS-0001	SURVEY INFRASTRUCTURE - MR209 DENMAN ROAD - MC00 - CH.2140 TO CH.2205	9/12/2022					
MS-0002	SURVEY INFRASTRUCTURE - MR209 DENMAN ROAD - MC00 - CH.2205 TO CH.2330	9/12/2022					
MS-0003	SURVEY INFRASTRUCTURE - MR209 DENMAN ROAD - MC00 - CH.2330 TO CH.2455	9/12/2022					
MS-0004	SURVEY INFRASTRUCTURE - MR209 DENMAN ROAD - MC00 - CH.2455 TO CH.2580	9/12/2022	8/02/2023				
MS-0005	SURVEY INFRASTRUCTURE - MR209 DENMAN ROAD - MC00 - CH.2580 TO CH.2705	9/12/2022	8/02/2023				
MS-0006	SURVEY INFRASTRUCTURE - MR209 DENMAN ROAD - MC00 - CH.2705 TO CH.2762	9/12/2022					
MS-0007	SURVEY INFRASTRUCTURE SCHEDULES	9/12/2022					

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50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-GENERAL.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 GENERAL	A3		
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE	
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	NOT TO SCALE		DRAWN	C.BURNS	08.02.23	
	B	8-02-23	INDEX UPDATED FOR ISSUE B					DRG CHECK	L.MATTSSON	08.02.23	
								DESIGN	C.BURNS	08.02.23	
								DESIGN CHECK	L.MATTSSON	08.02.23	
								DESIGN MNGR	B.SPALDING	08.02.23	
								PROJECT MNGR	L.HUANG	08.02.23	
							PREPARED FOR	ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	TNSW REGISTRATION No. DS2021 / 000702		
									ISSUE STATUS	ISSUED FOR CONSTRUCTION	EDMS No.
									SHEET No.	GE-0003	ISSUE
										B	

E BDGE (BRIDGE STRUCTURES)

- ABUTMENT BOTTOM (AB)
- ABUTMENT BOTTOM POINT (PABB)
- ABUTMENT TOP (AT)
- ABUTMENT TOP POINT (PABT)
- CAP-PILE (PBCP)
- DECK (BR)
- EXPANSION JOINT (XJ)
- EXPANSION PLATE (XP)
- HEADSTOCK (HS)
- PIER-COLUMN (BC)
- PIER-COLUMN POINT (PBPI)
- UNDERNEATH CLEARANCE (UC)
- WING WALL (WW)

E BDYS (BOUNDARIES)

- DIGITAL CADASTRE (ACCURACY 1.0m?) (BM)
- DIGITISING EXTENT (PHOTO) (DE)
- DP OVERLAY (ACCURACY 0.1m) (BO)
- EASEMENT (BE)
- FIELD COMPLETION (PHOTO) (NF)
- FIELD SURVEY EXTENT (PHOTO) (FS)
- LOCAL GOVERNMENT (BL)
- PARISH (BP)
- TITLE (ACCURACY 0.02m) (BT)

E BUIL (BUILDINGS & STRUCTURES)

- AWNING (AW)
- AWNING - POINT (PAWN)
- BOTTOM OF WALL (BW)
- BUILDING EAVES (BV)
- BUILDING WALLS (BU)
- CEMETERY (OC)
- CONCRETE SLAB AT GROUND LEVEL (VE)
- CORNER OF BUILDING AT NS (PCBU)
- DOORWAY (DO)
- FLOOR LEVEL (PFLR)
- GENERAL BUILT-UP AREA (OB)
- LOADING BAY-DOCK (LB)
- MISCELLANEOUS STRUCTURE (OM)
- RETAINING WALL (RW)
- RUIIN (OR)
- SILO OR TANK (OS)
- SPORTING ARENA (OO)
- STAIRS - OUTSIDE (SO)
- SWIMMING POOL (OT)
- TOP OF WALL (TW)

E COMM (COMMUNICATIONS)

- ABOVE GROUND JOINING POST (PTJP)
- ITS ITS
- OPTICAL FIBRE - ABOVE GROUND (OA)
- OPTICAL FIBRE - DIGITISED (OZ)
- OPTICAL FIBRE - UNDERGROUND (OU)
- OPTICAL FIBRE CABLE MARKER (POFM)
- OPTICAL FIBRE CONDUIT (OD)
- OPTICAL FIBRE JUNCTION BOX (POFJ)
- OPTICAL FIBRE PIT (POFP)
- STD 1.1m BY 1.1m MAIN PIT (PTMP)
- TELEPHONE - HOUSE CONNECTION (TY)
- TELEPHONE BOX (TX)
- TELEPHONE BOX POINT (PTBX)
- TELEPHONE CABLE MARKER (PTCM)
- TELEPHONE CONDUIT (TD)
- TELEPHONE DISTRIBUTION PILLAR (PTDP)
- TELEPHONE LINE (TN)
- TELEPHONE LINE - DIGITISED (TZ)
- TELEPHONE POLE (PTPL)
- TELEPHONE SINGLE CONCRETE PIT (PTSP)
- TELEPHONE SUMP (TS)
- TELEPHONE TRANSMITTER - MOBILE (PMPT)
- TELEPHONE TRIPLE CONCRETE PIT (PT3P)
- TELEPHONE TWIN CONCRETE PIT (PTTP)

E CONT (PHOTOGRAMMETRY)

- CONTOUR - AUX (DECIMETRE) (YQ)
- CONTOUR - AUX (WHOLE METRE) (Y)
- CONTOUR - INDEX (Z)
- CONTOUR - INDEX DEPRESSION (ZQ)
- CONTOUR - INTER DEPRESSION (XQ)
- CONTOUR - STANDARD-INTER (X)

E CULT (CULTURAL)

- BIN - LARGE (BI)
- BOLLARD (AC)
- BUS SHELTER (BH)
- BUS STOP (PBUS)
- FENCE (FE)
- FENCE LINE (FL)
- FENCE MANPROOF (FM)
- FENCE OTHER (FC)
- FENCE POST-GUIDE POST (POST)
- FIREPLACE (PFPL)
- FLAG POLE (PFLG)
- GATE (AG)
- HEADSTONE (PHST)

E CULT (CULTURAL) CONTINUED

- HISTORICAL POINT OF INTEREST (PHIS)
- LARGE SIGN (SI)
- MAILBOX (PMBX)
- PARKING METER (PKME)
- PICNIC TABLE (TA)
- PUMP (PWEP)
- RUBBISH BIN (PBIN)
- SAFETY FENCE (SF)
- SEAT (SE)
- SIGN POST (PSIN)
- SIGN POST - DOUBLE SIDED (PSDS)
- SIGN WITH OUTREACH (SX)
- WINDMILL (OW)
- WINDMILL - POINT (PWML)

E DRAI (STORMWATER)

- BATTER DRAIN GI FLUME (DF)
- BOX CULVERT - 150 HIGH (B0)
- BOX CULVERT - 225 HIGH (B1)
- BOX CULVERT - 300 HIGH (B2)
- BOX CULVERT - 375 HIGH (B3)
- BOX CULVERT - 450 HIGH (B4)
- BOX CULVERT - 600 HIGH (B6)
- BOX CULVERT - 750 HIGH (B7)
- BOX CULVERT - 900 HIGH (B9)
- BOX CULVERT - 1050 HIGH (D0)
- BOX CULVERT - 1200 HIGH (D1)
- BOX CULVERT - 1500 HIGH (D2)
- BOX CULVERT - 1800 HIGH (D3)
- BOX CULVERT - 2100 HIGH (D4)
- BOX CULVERT - 2400 HIGH (D5)
- BOX CULVERT - 2700 HIGH (D6)
- BOX CULVERT - 3000 HIGH (D7)
- BOX CULVERT - 3300 HIGH (D8)
- BOX CULVERT - 3600 HIGH (D9)
- BOX CULVERT - UNSPECIFIED HEIGHT (UB)
- DISH DRAIN (DD)
- DRAIN - TABLE DRAIN (DT)
- DRAINAGE - DIGITISED (DZ)
- DRAINAGE BOX (DX)
- DRAINAGE JUNCTION MANHOLE (PDJM)
- DRAINAGE PIT (DP)
- END OF WINGWALL (PEWW)
- FLOOD HEIGHT (PFHT)
- GULLY PIT (IP)
- GULLY PIT POINT (PGUL)

E DRAIN (STORMWATER) CONTINUED

- HEADWALL BOTTOM (HB)
- HEADWALL BOTTOM POINT (PHWB)
- HEADWALL TOP (HW)
- HEADWALL TOP POINT (PHWT)
- INLET TO SUMP (PILT)
- INVERT - 225 DIA (PI01)
- INVERT - 300 DIA (PI02)
- INVERT - 375 DIA (PI03)
- INVERT - 450 DIA (PI04)
- INVERT - 525 DIA (PI05)
- INVERT - 600 DIA (PI06)
- INVERT - 750 DIA (PI07)
- INVERT - 900 DIA (PI09)
- INVERT - 1050 DIA (PI10)
- INVERT - 1200 DIA (PI12)
- INVERT - 1350 DIA (PI13)
- INVERT - 1500 DIA (PI15)
- INVERT - 1650 DIA (PI16)
- INVERT - 1800 DIA (PI18)
- INVERT OF PIPE (PINV)
- INVERT OF SUBSOIL DRAIN OUTLET (PSDO)
- KERB INLET (KI)
- OBVERT OF PIPE (POBV)
- PIPE - 225 DIA (U1)
- PIPE - 300 DIA (U2)
- PIPE - 375 DIA (U3)
- PIPE - 450 DIA (U4)
- PIPE - 525 DIA (U5)
- PIPE - 600 DIA (U6)
- PIPE - 750 DIA (U7)
- PIPE - 900 DIA (U9)
- PIPE - 1050 DIA (V1)
- PIPE - 1200 DIA (V2)
- PIPE - 1350 DIA (V3)
- PIPE - 1500 DIA (V5)
- PIPE - 1650 DIA (V6)
- PIPE - 1800 DIA (V8)
- PIPE - UNSPECIFIED DIAMETER (UU)
- SUBSOIL DRAIN FLUSH POINT (PSFP)
- TOP OF CONCRETE JUNCTION BOX (PJBX)
- WATER COURSE (WC)
- WATER LEVEL POINT (PWLP)

E ELEC (ELECTRICITY SERVICES)

- CABLE JUNCTION BOX (PEJB)
- CABLE MANHOLE (PEMH)
- CABLE MARKER (PECM)
- CONDUIT (ED)
- DISTRIBUTION FUSE POINT (PEFP)
- GARDEN LIGHT (PLGN)
- HIGH TENSION PYLON (PHTT)
- HOUSE CONNECTION (EY)
- LIGHT WITH OUTREACH (LI)
- LINE - DIGITISED (EZ)
- LINE - MAJOR TRANSMISSION (UE)
- LINE - MINOR TRANSMISSION (UL)
- LINE - UNDERGROUND (EU)
- MAIN SUMP (EN)
- POLE - LIGHT (PLPL)
- POLE - POWER (PPPL)
- POLE - POWER AND LIGHT (PPLP)
- POLE - POWER AND TRANSFORMER (PPTR)
- PYLON LEG (EL)
- STAY ANCHOR POLE (PSAP)
- STAY POLE (PSPL)
- SUSPENDED LIGHT (PLSU)
- TRANSFORMER CABINET (EC)
- TRANSFORMER CABINET CENTRE (PETC)
- UNDERGROUND POWER SERVICE PILLAR (PEUP)

E FOTO (PHOTOGRAMMETRY)

- HORIZONTAL CONTROL POINT (PHCP)
- MINOR CONTROL POINT (PMCP)
- PHOTO CENTRE (PPCN)
- VERTICAL CONTROL POINT (PVCP)

E FUEL (GAS SERVICES)

- ETHANE PIPELINE (HA)
- HOUSE CONNECTION (DG)
- MAIN - DIGITISED (ZG)
- MAIN - HIGH PRESSURE PIPELINE (HG)
- MAIN - LOW PRESSURE (LG)
- MAIN - NYLON (NG)
- MAIN - POLYETHELENE (YG)
- MANHOLE COVER (PGHL)
- METER (PGMR)
- PIPELINE MARKER (PGPM)
- PIPELINE MARKER - HIGH PRESSURE (PGHM)
- REGULATOR BOX (PGRB)
- TEST POINT (PGTP)
- VALVE BOX (PGAS)
- VENT PIPE (PGVP)

E HERI (HERITAGE, ECOLOGICAL, HAZARD)

- ENDANGERED COMMUNITY (PHEC)
- ENDANGERED ECOLOGICAL COMMUNITY (PHEE)
- HAZARDOUS SITE (PHAZ)
- INDIGENOUS HERITAGE AREA (PHIA)
- NON INDIGENOUS HERITAGE SITE (PHNI)

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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY		TITLE	NAME	DATE	 Transport for NSW	PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	TNSW REGISTRATION No.	DS2021 / 000702	PART	1
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	NOT TO SCALE	 Transport for NSW		DRAWN	C.BURNS	09.12.22			ISSUE	A		
								DRG CHECK	L.MATTSSON	09.12.22							
								DESIGN	C.BURNS	09.12.22							
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								DESIGN MNGR	B.SPALDING	09.12.22							
								PROJECT MNGR	L.HUANG	09.12.22							
												EDMS No.					
												SHEET No.	GE-0004				
														ISSUED FOR CONSTRUCTION			

E LNМК (LINEMARKING FEATURES)

	ARROW - LEFT TURN (AL)
	ARROW - RIGHT TURN (AR)
	ARROW - STRAIGHT AHEAD (AS)
	ARROW - STRAIGHT AND LEFT (AE)
	ARROW - STRAIGHT AND RIGHT (AI)
	BARRIER AND SEPARATION (BS)
	CHEVRON MARKING LEFT (CV)
	CHEVRON MARKING RIGHT (CY)
	CLEARWAY (6x6) (CW)
	CONTINUITY (1x3) (CC)
	DOUBLE BARRIER (DB)
	DRAGONS TEETH LEFT (DA)
	DRAGONS TEETH RIGHT (DC)
	GIVEWAY-TURN (CG)
	LANE (3x9) (LL)
	PEDESTRIAN CROSSING (SIGNALS) (CX)
	PEDESTRIAN CROSSING (ZEBRA) (CZ)
	PEDESTRIAN CROSSING APPROACH (ZIG ZAG) (CA)
	SEPARATION (6x6) (CN)
	SEPARATION AND BARREIR (SB)
	SPEED ZONE - 40kmh (S4)
	SPEED ZONE - 50kmh (S5)
	SPEED ZONE - 60kmh (S6)
	SPEED ZONE - 70kmh (S7)
	SPEED ZONE - 80kmh (S8)
	SPEED ZONE - 90kmh (S9)
	SPEED ZONE - 100kmh (S1)
	SPEED ZONE - 110kmh (S2)
	TRAFFIC MARKER (SILENT COP) (PTMX)
	UNBROKEN (CD)

E MARK (SURVEY MARKS)

	ALIGNMENT PIN (PAPN)
	BENCH MARK (PBMK)
	BOLT (PBLT)
	BOUNDARY PEG (PBPG)
	BROAD ARROW (PSSB)
	DRILL HOLE AND WING (PDHL)
	DUMPY PEG (PDPY)
	GI NAIL (PGIN)
	GI PIPE (PGPI)
	MISCELLANEOUS SURVEY MARK (PPMK)
	NAIL (PNAL)
	PERMANENT MARK (PPMK)
	RM CONCRETE BLOCK (PRMB)
	RTA CONTROL MARK (PCMK)

E MARK (SURVEY MARKS) CONTINUED

	SPIKE (PSKI)
	STAR PICKET (PSTA)
	STATE SURVEY MARK (PSSM)
	TRIG STATION-CONCRETE PILLAR (PTSS)
	WATER BOARD PM (PDSM)

E MISC (MISCELLANEOUS FEATURES)

	AS5488 QUALITY LEVEL A (PQLA)
	AS5488 QUALITY LEVEL B (PQLB)
	AS5488 QUALITY LEVEL C (PQLC)
	AS5488 QUALITY LEVEL D (PQLD)
	BORE HOLE (PBHX)
	CAMERA - FLASH UNIT (PCFU)
	CHECK STRING (QQ)
	FEATURE ATTRIBUTE (PFAT)
	GATIC COVER LID (PGAT)
	GOLF COURSE (OG)
	HIGH PRESSURE OIL PIPELINE (HO)
	HIGH PRESSURE OIL PIPELINE MARK (POHM)
	JOIN LINE (BOUNDARY) (JL)
	MX BREAK STRINGS (PBRK)
	PARK OR OPEN SPACE (OP)
	PETROL PUMP (PPET)
	PHOTO PICTURE (PPIC)
	POT HOLE - NULL LEVEL (PHNL)
	POT HOLE - WITH RL (PHRL)
	RED LIGHT-SPEED-TRAFFIC CAMERA (PCAM)
	SEISMIC LINE (SL)
	SEISMIC TEST SHOT (PSTS)
	SERVICE-JUNCTION BOX (US)
	STOCK GRID (SG)
	STOCKPILE (OH)
	TEST PIT (PGE0)
	UNDERGROUND TANK (UT)
	UNDERGROUND TANK POINT (PUTP)
	UNIDENTIFIED POLE (PUTP)
	UNIDENTIFIED SERVICE (PUSR)

E RAIL (RAIL FEATURES)

	RAILWAY CONTROL BOX (PRBX)
	RAILWAY FORMATION EDGE (RF)
	RAILWAY RAMP (RR)
	RAILWAY SIGNAL (PRSG)
	RAILWAY SIGNAL TROUGH (RS)
	RAILWAY SIGNAL TROUGH - POINT (PRCC)
	RAILWAY STANCHION (PSTR)
	RAILWAY TRACK CENTRE (RT)

E RAIL (RAIL FEATURES) CONTINUED

	RAILWAY TRACK MONUMENT (PRTM)
	TOP OF RAIL (RA)
	TOP OF RAIL - POINT (PRAL)
	TOP OF RAILWAY PLATFORM (RP)

E ROAD (ROAD FEATURES)

	BACK OF KERB (BK)
	CENTRE OF ROAD (RC)
	DRIVEWAY (DW)
	EDGE OF FORMATION (EJ)
	EDGE OF MEDIAN (EM)
	EDGE OF PAVEMENT (EP)
	EDGE OF TRACK (EK)
	EDGE OF UNSEALED ROAD (UR)
	FOOTPATH (FP)
	GUTTER FLOW LINE (FI)
	LIP LINE (LP)
	OFFSET CROWN-CROWN (OF)
	PRAM RAMP (KR)
	SAFETY BARRIER GUARD FENCE (FG)
	SAFETY BARRIER TYPE F (KJ)
	SAFETY BARRIER WIRE ROPE (FW)
	TOP OF KERB (KB)
	TOP OF MEDIAN (TM)
	VEHICULAR TRACK EDGE (VT)

E SEWR (SEWER FEATURES)

	HOUSE CONNECTION (SY)
	LAMPHOLE (PSLH)
	MAIN (SM)
	MAIN - DIGITISED (SZ)
	MANHOLE COVER (PSMH)
	SEPTIC TANK (ST)
	SEWAGE POND (SP)
	VENT PIPE (PSVP)

E STNS (SURVEY CONTROL 4D STRINGS)

* SURVEY CONTROL POINTS HAVE 4 DIMENSIONS (X, Y, Z, CODE NAME)

	AP-DH-GI PIPE OR RMCB (PSSD)
	BOLT-DUMPY-NAIL-SPIKE (PSSE)
	DEFAULT MX SURVEY MARK (PSSA)
	PEG (PSSC)
	PM SSM OR CONTROL MARK (PSSG)
	TRIG STATION (PSSF)

E TEXT

	1 ORANGE (*1)
	2 BLACK (*2)
	3 RED (*3)
	4 BLUE (*4)
	5 GREEN (*5)
	7 CYAN (*7)

E TOPO (TOPOGRAPHIC)

	BOTTOM OF BANK (BB)
	BREAKLINE OR RIDGE (NB)
	CLIFF-ESCARPMENT (VC)
	CULTIVATION PASTURE (JC)
	EDGE OF GARDEN (EG)
	FORD (FO)
	GRASSLAND (JG)
	LAKE (WL)
	LANDSLIDE-ERODED BANK (VL)
	NATURAL SURFACE (NS)
	NATURAL SURFACE POINT (PNSS)
	ORCHARD (JO)
	RESERVOIR (RE)
	RIVER OR CREEK EDGE (WR)
	ROCK AREA (JR)
	SPOT HEIGHT (PSHT)
	SWAMP OUTLINE (JW)
	SWAMP-MARSH (PSWA)
	TIMBER OR SCRUB (DENSE) (JD)
	TIMBER OR SCRUB (MEDIUM) (JM)
	TIMBER OR SCRUB (SCATTERED) (JS)
	TOP OF BANK (TC)
	TOP OF CUTTING (CU)

	TREE FOILAGE (TR)
	TREE FOILAGE - 1m SPREAD (PF01)
	TREE FOILAGE - 2m SPREAD (PF02)
	TREE FOILAGE - 3m SPREAD (PF03)
	TREE FOILAGE - 4m SPREAD (PF04)
	TREE FOILAGE - 5m SPREAD (PF05)
	TREE FOILAGE - 6m SPREAD (PF06)

E TOPO (TOPOGRAPHIC) CONTINUED

	TREE FOILAGE - 7m SPREAD (PF07)
	TREE FOILAGE - 8m SPREAD (PF08)
	TREE FOILAGE - 9m SPREAD (PF09)
	TREE FOILAGE - 10m SPREAD (PF10)
	TREE FOILAGE - 12m SPREAD (PF12)
	TREE FOILAGE - 15m SPREAD (PF15)
	TREE TRUNK - 100mm DIA (PT01)
	TREE TRUNK - 200mm DIA (PT02)
	TREE TRUNK - 300mm DIA (PT03)
	TREE TRUNK - 400mm DIA (PT04)
	TREE TRUNK - 500mm DIA (PT05)
	TREE TRUNK - 600mm DIA (PT06)
	TREE TRUNK - 700mm DIA (PT07)
	TREE TRUNK - 800mm DIA (PT08)
	TREE TRUNK - 900mm DIA (PT09)
	TREE TRUNK - 1000mm DIA (PT10)
	TREE TRUNK - 1200mm DIA (PT12)
	TREE TRUNK - 1500mm DIA (PT15)
	TREE TRUNK - UNSPECIFIED DIAMETER (PTRE)
	WATER EDGE-LEVEL (WE)

E TSIG (TRAFFIC SIGNALS)

	SIGNAL DETECTOR (SD)
	TRAFFIC CONTROL SIGNAL (PSGL)
	TRAFFIC LIGHT WITH OUTREACH (TO)
	TRAFFIC SIGNAL CONTROLLER (PSCL)
	TRAFFIC SIGNAL DETECTOR (PSDR)
	TRAFFIC SIGNAL JUNCTION VOX (PSJX)

E WATR (WATER SERVICES FEATURES)

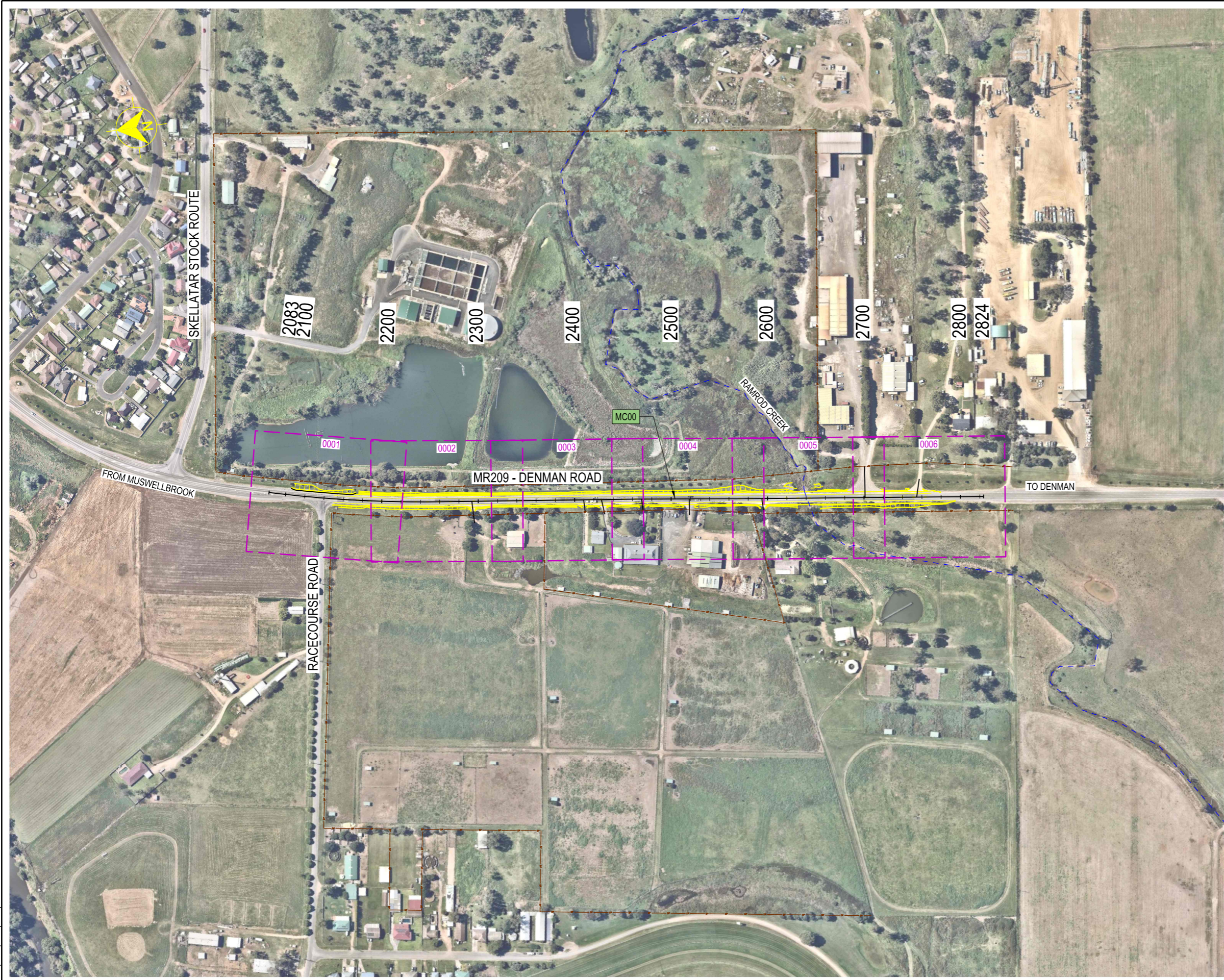
	AIR VALUE (PWAU)
	AIR VALUE - RECYCLED (PRAW)
	EARTH TERMINAL (PWET)
	EARTH TERMINAL-RECYCLED (PRET)
	FIRE HYDRANT (PWFB)
	HOUSE CONNECTION (WY)
	HYDRANT (PWHY)
	HYDRANT - RECYCLED (PRHY)
	MAIN (WM)
	MAIN - DIGITISED (WZ)
	MAIN - RECYCLED (RM)
	MAIN MARKER (PWMM)
	MAIN MARKER - RECYCLED (PRMM)
	METER (PWMR)
	METER - RECYCLED (PRMR)
	OVERHEAD PIPELINE (UO)
	STOP VALVE (PWSV)
	STOP VALVE - RECYCLED (PRSV)
	TAP (PWTP)
	TAP - RECYCLED (PRTPT)
	UNIDENTIFIED PIPELINE (UP)

ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-GENERAL.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 GENERAL	A3												
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE		PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	TNSW REGISTRATION No.	DS2021 / 000702	PART	1				
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	NOT TO SCALE								ISSUE STATUS	ISSUED FOR CONSTRUCTION	EDMS No.		SHEET No.	GE-0005	ISSUE	A

- LEGEND**
- MC?? DESIGN CONTROL CALLOUT
 - FULL PLAN SHEETS AT 1:500
 - RAMROD CREEK



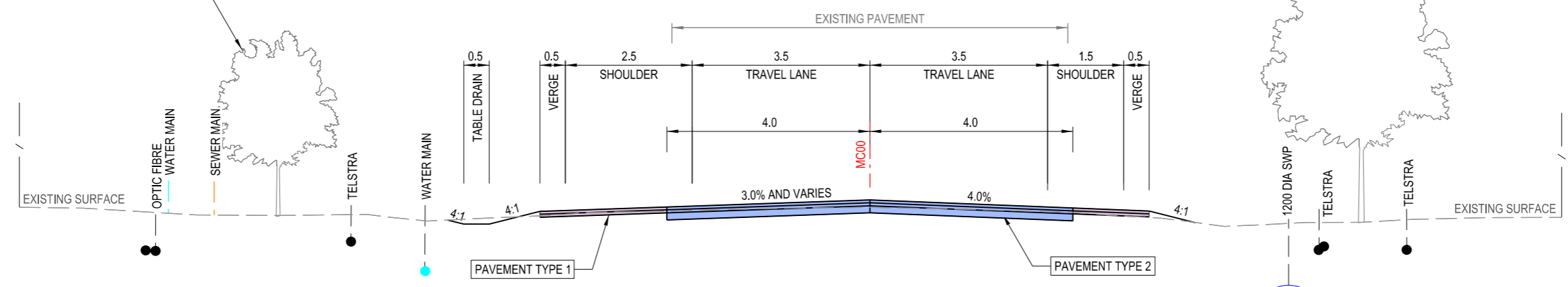
- NOTES**
1. AERIAL PHOTOGRAPHY IS UNDER LICENSE TO TNSW BY NEARMAP. IMAGE DATED APRIL 2021.
 2. THE DRAWINGS ARE A DIAGRAMMATIC REPRESENTATION ONLY OF THE WORK TO BE CARRIED OUT AND THE DIMENSIONS SHALL NOT BE OBTAINED BY SCALING.
 3. THE CADASTRAL BOUNDARY OVERLAY HAS BEEN DERIVED FROM A TNSW INTERPRETATION OF EXISTING DEPOSITED PLAN INFORMATION AND HAS NOT BEEN VERIFIED IN THE FIELD AND CAN THEREFORE VARY IN ACCURACY. A LAND SURVEY, AS DEFINED UNDER THE SURVEYING AND SPATIAL INFORMATION ACT 2002, SHOULD BE UNDERTAKEN PRIOR TO CONSTRUCTION ACTIVITY BEING UNDERTAKEN ON OR NEAR THE LAND BOUNDARIES DEPICTED BY THIS MODEL.

ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME C:\Data\Worksheets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-GENERAL.dgn			DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 GENERAL	A3				
EXTERNAL REFERENCE FILES XXXXXX	REV A	DATE 9-12-22	AMENDMENT / REVISION DESCRIPTION ISSUED FOR CONSTRUCTION	WVR No. XX	APPROVAL XXX	SCALES ON A3 SIZE DRAWING 0 50 100 150 SCALE 1:4000m		DRAWINGS / DESIGN PREPARED BY		 	TNSW REGISTRATION No. DS2021 / 000702	PART 1		
						TITLE	NAME	DATE	 		ISSUE STATUS ISSUED FOR CONSTRUCTION	EDMS No.	SHEET No. GE-0006	ISSUE A
						DRAWN	C.BURNS	09.12.22			PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN			
						DRG CHECK	L.MATTSSON	09.12.22						
						DESIGN	C.BURNS	09.12.22						
						DESIGN CHECK	L.MATTSSON	09.12.22						
						DESIGN MNGR	B.SPALDING	09.12.22						
						PROJECT MNGR	L.HUANG	09.12.22						

REPRESENTS APPROXIMATE TREE LINE RATHER THAN EXACT TREE LOCATION



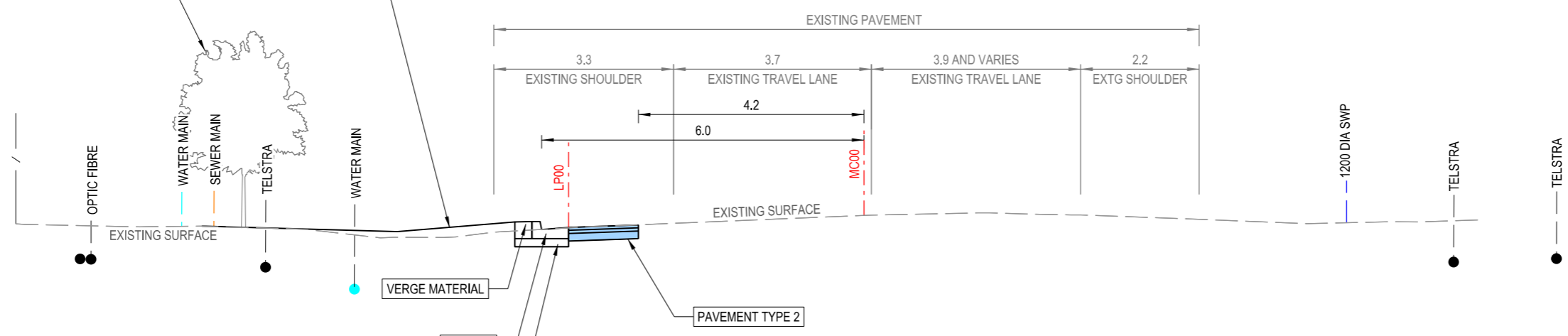
TYPICAL SECTION 2 - 1:100 SCALE
MR209 DENMAN ROAD - MC00
CHAINAGE - 2340

- LEGEND**
- PAVEMENT TYPE P1
 - PAVEMENT TYPE P2
 - PAVEMENT TYPE P3
 - PAVEMENT TYPE P4

- NOTES**
1. REFER TO SHEET RD-0003 FOR PAVEMENT DETAILS.
 2. TOPSOIL AND HYDROSEED ALL BATTERS.
 3. TABLE DRAINS TO HAVE ORGANIC FIBRE MESH, PLACED IN ACCORDANCE WITH TNSW STANDARD DRAWING R0100-03

GENERAL FILL. SHAPE SMALL DEPRESSION TO DRAIN LONGITUDINALLY IN EITHER DIRECTION TO MEET TABLE DRAIN.

REPRESENTS APPROXIMATE TREE LINE RATHER THAN EXACT TREE LOCATION



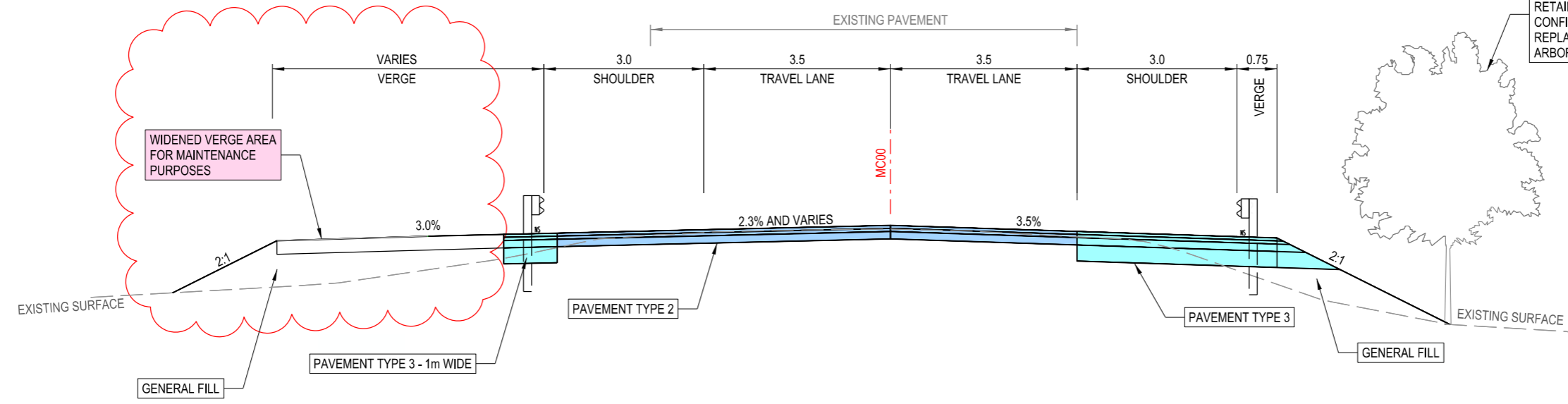
TYPICAL SECTION 1 - 1:100 SCALE
MR209 DENMAN ROAD - MC00
CHAINAGE - 2120

ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-TYPICALS.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 TYPICAL SECTIONS	A3						
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE					
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 1 2 3 4 SCALE 1:100m		DRAWN	C.BURNS	09.12.22					
							 	DRG CHECK	L.MATTSSON	09.12.22					
								DESIGN	C.BURNS	09.12.22					
								DESIGN CHECK	L.MATTSSON	09.12.22					
								DESIGN MNGR	B.SPALDING	09.12.22					
							PROJECT MNGR	L.HUANG	09.12.22	PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN					
								TNSW REGISTRATION No.		DS2021 / 000702	PART	1			
								ISSUE STATUS	ISSUED FOR CONSTRUCTION	EDMS No.		SHEET No.	RD-0001	ISSUE	A
										© Transport for NSW					

REPRESENTS APPROXIMATE TREE LINE RATHER THAN EXACT TREE LOCATION. FEASIBILITY OF RETAINING TREE DURING CONSTRUCTION TO BE CONFIRMED WITH ARBORIST. TREE TO BE REPLACED IF IT CANNOT BE SAVED. REFER TO ARBORIST REPORT

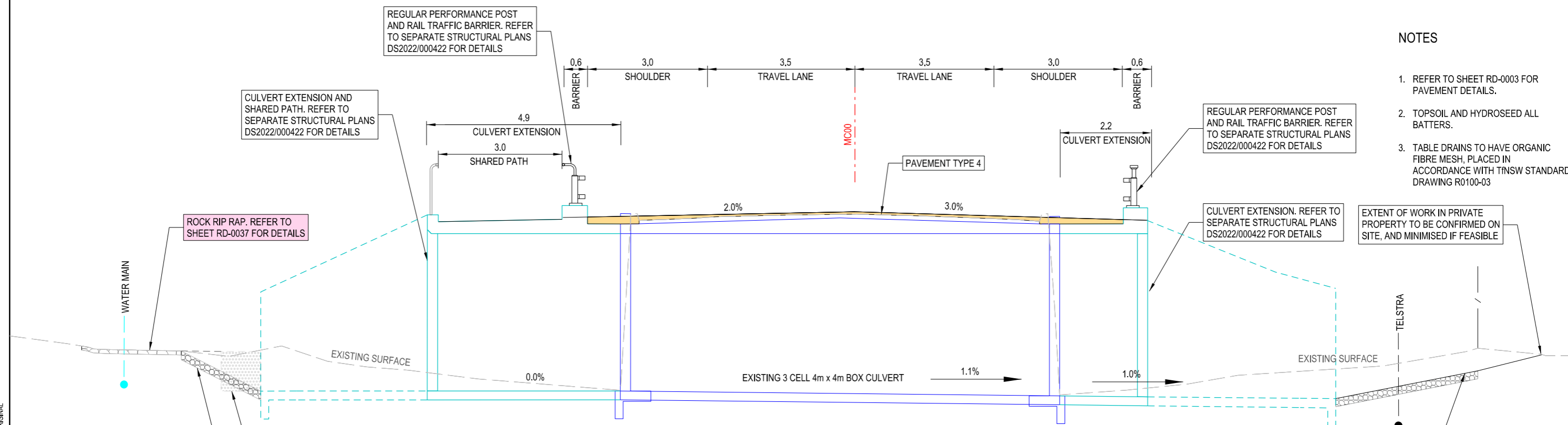


TYPICAL SECTION 4 - 1:100 SCALE
MR209 DENMAN ROAD - MC00
CHAINAGE - 2660

LEGEND

	PAVEMENT TYPE P1
	PAVEMENT TYPE P2
	PAVEMENT TYPE P3
	PAVEMENT TYPE P4

- NOTES**
- REFER TO SHEET RD-0003 FOR PAVEMENT DETAILS.
 - TOPSOIL AND HYDROSEED ALL BATTERS.
 - TABLE DRAINS TO HAVE ORGANIC FIBRE MESH, PLACED IN ACCORDANCE WITH TNSW STANDARD DRAWING R0100-03



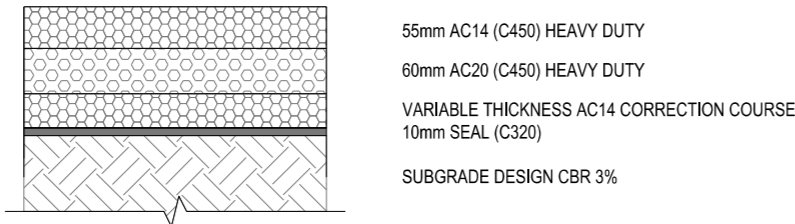
TYPICAL SECTION 3 - 1:100 SCALE
MR209 DENMAN ROAD - MC00
CHAINAGE - 2640 (SKEW)

ACCEPTED FOR CONSTRUCTION

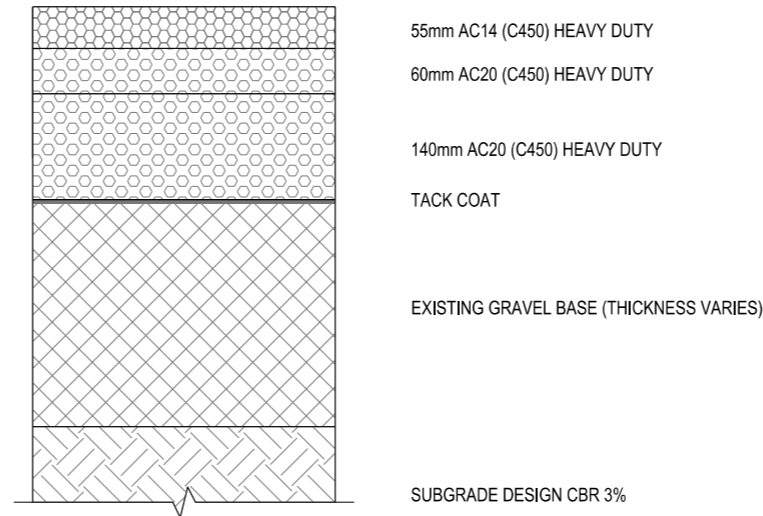
THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-TYPICALS.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 TYPICAL SECTIONS	A3
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	TITLE	NAME	DATE	 Transport for NSW
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	DRAWN	C.BURNS	08.02.23	
	B	8-02-23	TYPICAL SECTION 4 - VERGE WIDENED			DRG CHECK	L.MATTSSON	08.02.23	
						DESIGN	C.BURNS	08.02.23	
						DESIGN CHECK	L.MATTSSON	08.02.23	
						DESIGN MNGR	B.SPALDING	08.02.23	PREPARED FOR
						PROJECT MNGR	L.HUANG	08.02.23	ASSETS NORTH REGIONAL AND OUTER METROPOLITAN
				 SCALE 1:100m		 Transport for NSW		TNSW REGISTRATION No. DS2021 / 000702	PART 1
				CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020) AHD				ISSUE STATUS ISSUED FOR CONSTRUCTION	EDMS No.
								SHEET No. RD-0002	ISSUE B

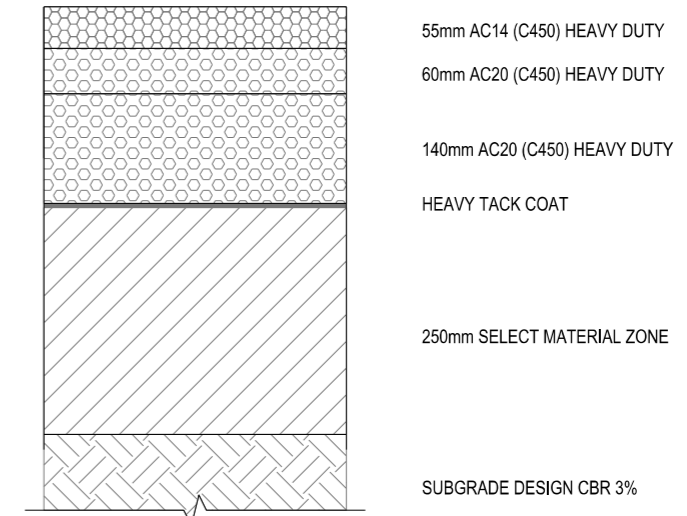
PAVEMENT TYPE P1
SHOULDER - AC PAVEMENT



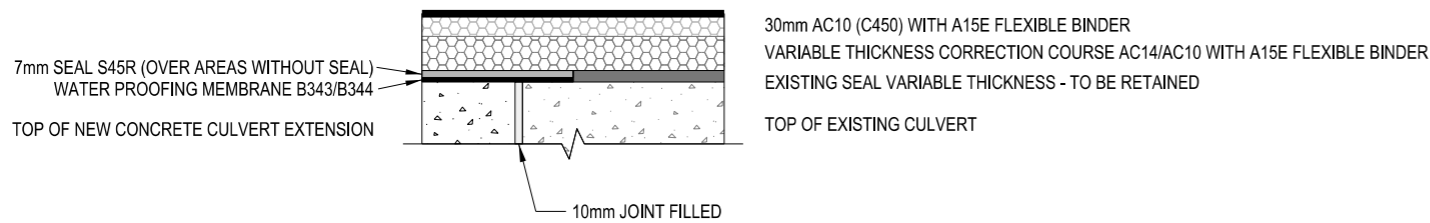
PAVEMENT TYPE P2
FULL DEPTH AC PAVEMENT WITH MILLING



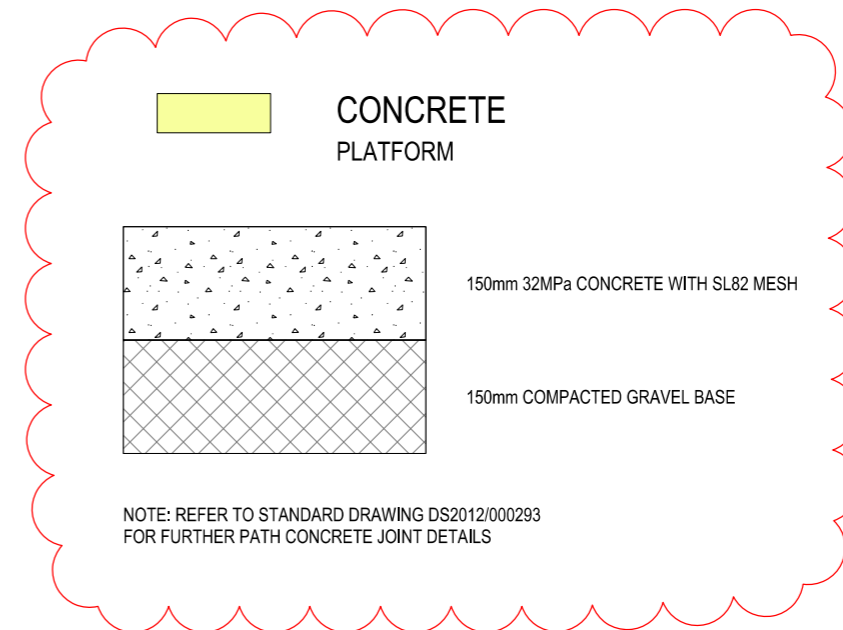
PAVEMENT TYPE P3
WIDENING - FULL DEPTH AC PAVEMENT



PAVEMENT TYPE P4
VARIABLE DEPTH OVERLAY





CONCRETE PLATFORM



NOTE: REFER TO STANDARD DRAWING DS2012/000293 FOR FURTHER PATH CONCRETE JOINT DETAILS

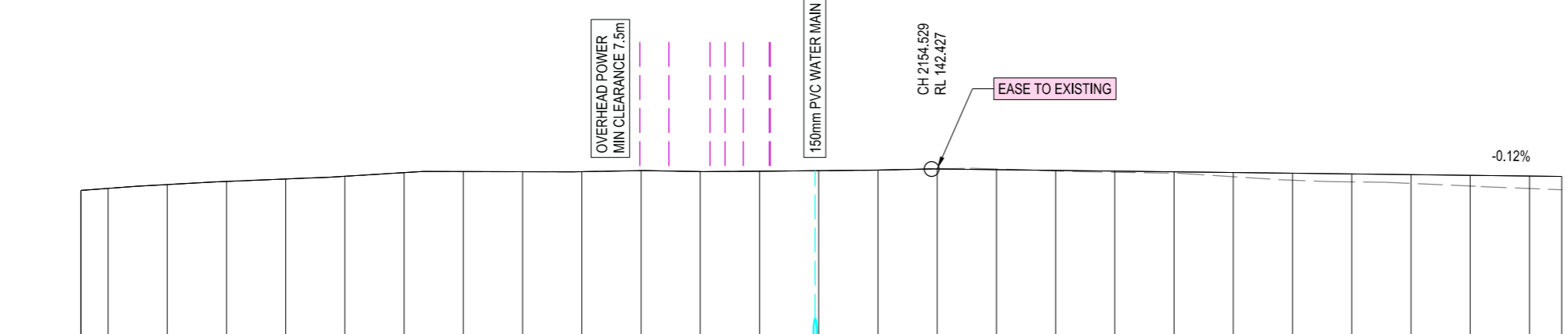
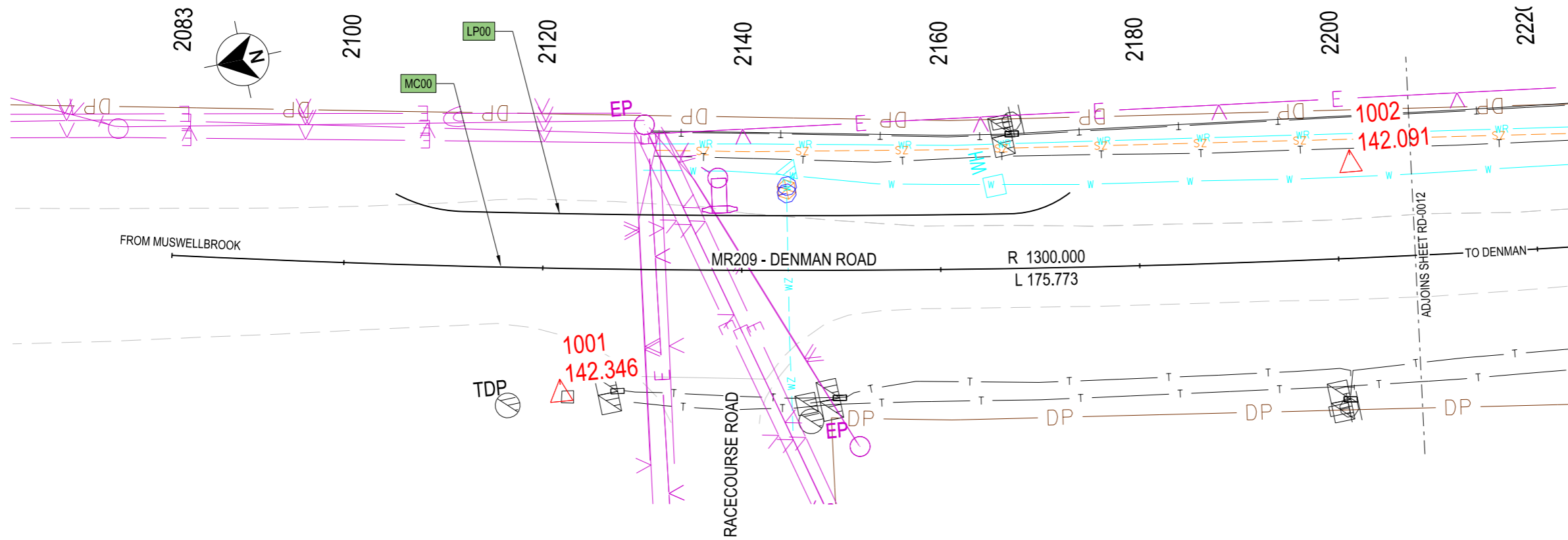
ACCEPTED FOR CONSTRUCTION

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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-TYPICALS.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 PAVEMENT DETAILS	A3								
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE	 Transport for NSW	PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	TNSW REGISTRATION No.	DS2021 / 000702	PART		
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	NOT TO SCALE	 Transport for NSW	DRAWN	C.BURNS	08.02.23			SHEET No. RD-0003	ISSUED FOR CONSTRUCTION	EDMS No.	SHEET No. RD-0003	ISSUE B
	B	8-02-23	CONCRETE DETAIL ADDED					DESIGN	C.BURNS	08.02.23							
						DESIGN CHECK		L.MATTSSON	08.02.23								
						DESIGN CHECK		L.MATTSSON	08.02.23								
						DESIGN MNGR		B.SPALDING	08.02.23								
						PROJECT MNGR		L.HUANG	08.02.23								
CO-ORDINATE SYSTEM		HEIGHT DATUM															
MGA ZONE 56 (GDA2020)		AHD															

LEGEND

- MC?? DESIGN CONTROL CALLOUT
- MASTER CONTROL
- △ NAME R.L. SURVEY CONTROL MARK



NOTES

1. PURSUANT TO THE SURVEYING AND SPATIAL INFORMATION ACT, ANY PM, SSM OR CADASTRAL REFERENCE MARKS THAT MAY BE AFFECTED BY CONSTRUCTION OR MAINTENANCE NEED TO BE IDENTIFIED AND SURVEYED BY A REGISTERED SURVEYOR IN CONSULTATION WITH SPATIAL SERVICES BEFORE THEY ARE DESTROYED OR DISTURBED. PERSONAL FINES APPLY FOR BREACH OF THE ACT. PLEASE CONTACT TFNSW SURVEY SECTION PRIOR TO ENGAGEMENT AND REFER TO TFNSW QA SPECIFICATION G71 CONSTRUCTION SURVEYS.
2. ALL SURVEY CONTROL IS NOT TO BE DISTURBED BEFORE ASSESSMENT BY SURVEYOR.
3. REFER TO SHEET RD-0021 FOR ALIGNMENT SETOUT DETAILS.
4. REFER TO SHEET MS-0007 FOR SURVEY CONTROL SCHEDULE.
5. REFER TO MS SERIES PLANS FOR INFORMATION REGARDING SURVEY INFRASTRUCTURE.
6. REFER TO DETAIL PLANS FOR UTILITY LOCATIONS AND INFORMATION.

DATUM RL 141		2155	2160	2165	2170	2175	2180	2185	2190	2195	2200	2205	2207.715
VERTICAL ALIGNMENT		G=-0.12% L = 97.505											
HORIZONTAL ALIGNMENT		R = 1300.000 L = 175.773											
CUT / FILL		0.001	0.007	-0.003	-0.008	-0.011	-0.034	-0.059	-0.067	-0.074	-0.090	-0.104	-0.112
DESIGN SURFACE LEVELS		142.427	142.421	142.415	142.409	142.403	142.397	142.391	142.385	142.380	142.374	142.368	142.365
EXISTING SURFACE LEVELS		142.428	142.427	142.412	142.401	142.392	142.363	142.332	142.318	142.306	142.283	142.264	142.252
CHAINAGE		2155	2160	2165	2170	2175	2180	2185	2190	2195	2200	2205	2207.715

LONGITUDINAL SECTION MC00

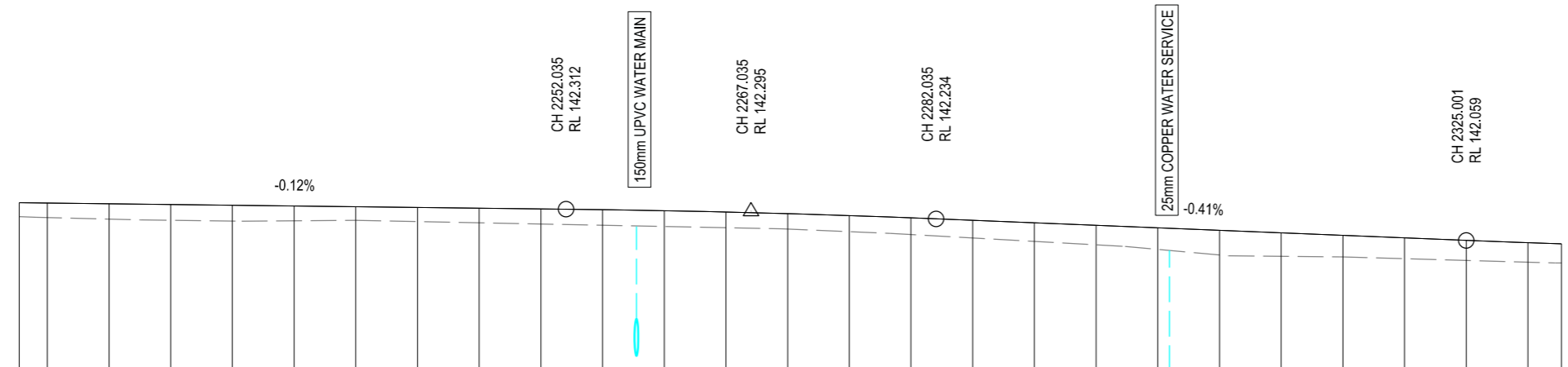
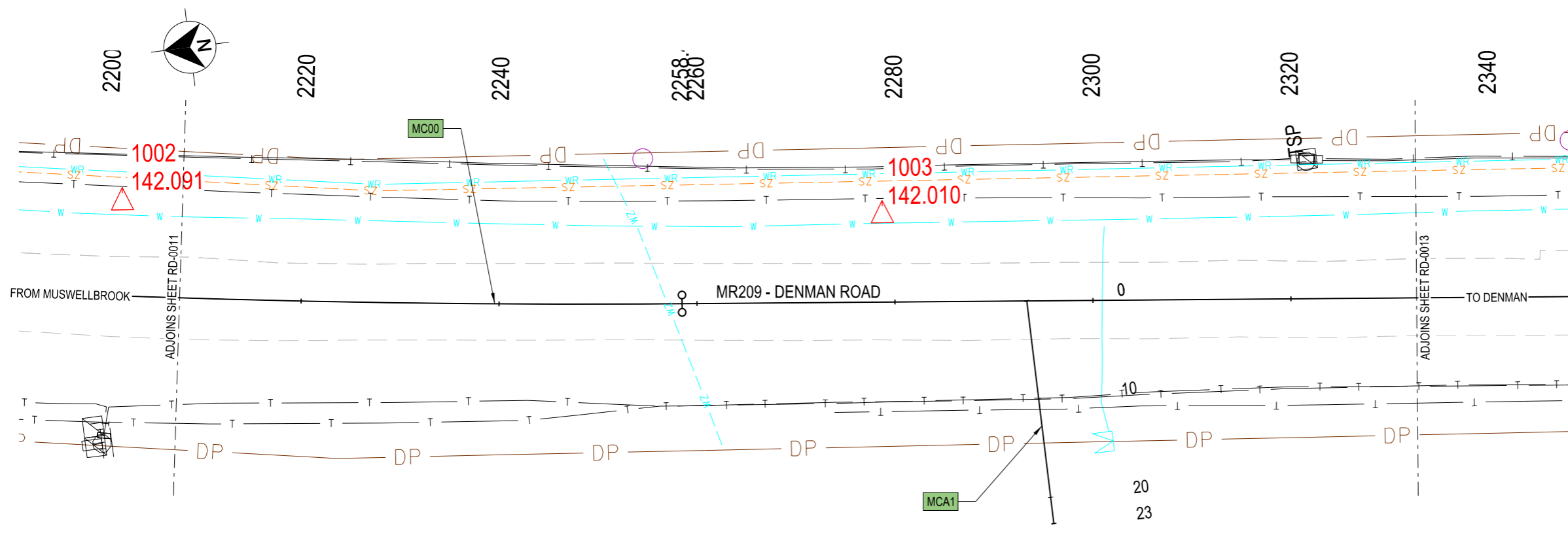
ACCEPTED FOR CONSTRUCTION

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DRAWING FILE LOCATION / NAME C:\Data\Workssets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-ALIGNMENT-LSEC.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 ALIGNMENT PLAN	A3	
EXTERNAL REFERENCE FILES	REV DATE AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY		Transport for NSW	TNSW REGISTRATION No. DS2021 / 000702 ISSUE STATUS: ISSUED FOR CONSTRUCTION EDMS No.	PART 1 ISSUE A	
XXXXXX	A 9-12-22 ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 HORIZONTAL SCALE 1:500m 0 0.5 1.0 1.5 2.0 VERTICAL SCALE 1:50m	TITLE NAME DATE DRAWN C.BURNS 09.12.22 DRG CHECK L.MATTSSON 09.12.22 DESIGN C.BURNS 09.12.22 DESIGN CHECK L.MATTSSON 09.12.22 DESIGN MNGR B.SPALDING 09.12.22 PROJECT MNGR L.HUANG 09.12.22					PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN
CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020) HEIGHT DATUM AHD				Transport for NSW		SHEET No. RD-0011 ISSUED FOR CONSTRUCTION				

LEGEND

- MC?? DESIGN CONTROL CALLOUT
- MASTER CONTROL
- △ NAME R.L. SURVEY CONTROL MARK



DATUM RL 141

VERTICAL ALIGNMENT	G = -0.12% L = 97.505		K = -103.783 L = 30.000		G = -0.41% L = 42.966		K = 70.838 L = 30.000																								
HORIZONTAL ALIGNMENT	R = 1300.000 L = 175.773				L = 197.746																										
CUT / FILL	-0.112	-0.117	-0.124	-0.128	-0.128	-0.119	-0.110	-0.116	-0.121	-0.128	-0.131	-0.131	-0.129	-0.125	-0.130	-0.135	-0.142	-0.150	-0.158	-0.174	-0.199	-0.190	-0.175	-0.169	-0.163	-0.158	-0.156				
DESIGN SURFACE LEVELS	142.365	142.362	142.356	142.350	142.344	142.338	142.332	142.326	142.321	142.315	142.308	142.300	142.289	142.276	142.260	142.242	142.222	142.201	142.181	142.160	142.140	142.120	142.099	142.079	142.059	142.040	142.032				
EXISTING SURFACE LEVELS	142.252	142.245	142.232	142.222	142.216	142.219	142.222	142.211	142.199	142.187	142.178	142.169	142.160	142.150	142.130	142.107	142.080	142.052	142.023	141.986	141.941	141.930	141.925	141.910	141.896	141.882	141.875				
CHAINAGE	2207.715	2210	2215	2220	2225	2230	2235	2240	2245	2250	2252.035	2255	2258.487	2260	2265	2267.035	2270	2275	2280	2282.035	2285	2290	2295	2300	2305	2310	2315	2320	2325.001	2330	2332.715

LONGITUDINAL SECTION MC00

NOTES

1. PURSUANT TO THE SURVEYING AND SPATIAL INFORMATION ACT, ANY PM, SSM OR CADASTRAL REFERENCE MARKS THAT MAY BE AFFECTED BY CONSTRUCTION OR MAINTENANCE NEED TO BE IDENTIFIED AND SURVEYED BY A REGISTERED SURVEYOR IN CONSULTATION WITH SPATIAL SERVICES BEFORE THEY ARE DESTROYED OR DISTURBED. PERSONAL FINES APPLY FOR BREACH OF THE ACT. PLEASE CONTACT TFNSW SURVEY SECTION PRIOR TO ENGAGEMENT AND REFER TO TFNSW QA SPECIFICATION G71 CONSTRUCTION SURVEYS.
2. ALL SURVEY CONTROL IS NOT TO BE DISTURBED BEFORE ASSESSMENT BY SURVEYOR.
3. REFER TO SHEET RD-0021 FOR ALIGNMENT SETOUT DETAILS.
4. REFER TO SHEET MS-0007 FOR SURVEY CONTROL SCHEDULE.
5. REFER TO MS SERIES PLANS FOR INFORMATION REGARDING SURVEY INFRASTRUCTURE.
6. REFER TO DETAIL PLANS FOR UTILITY LOCATIONS AND INFORMATION.

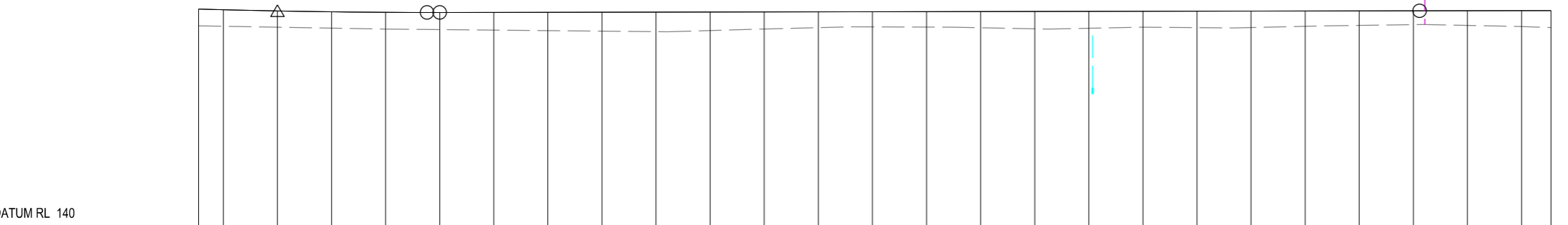
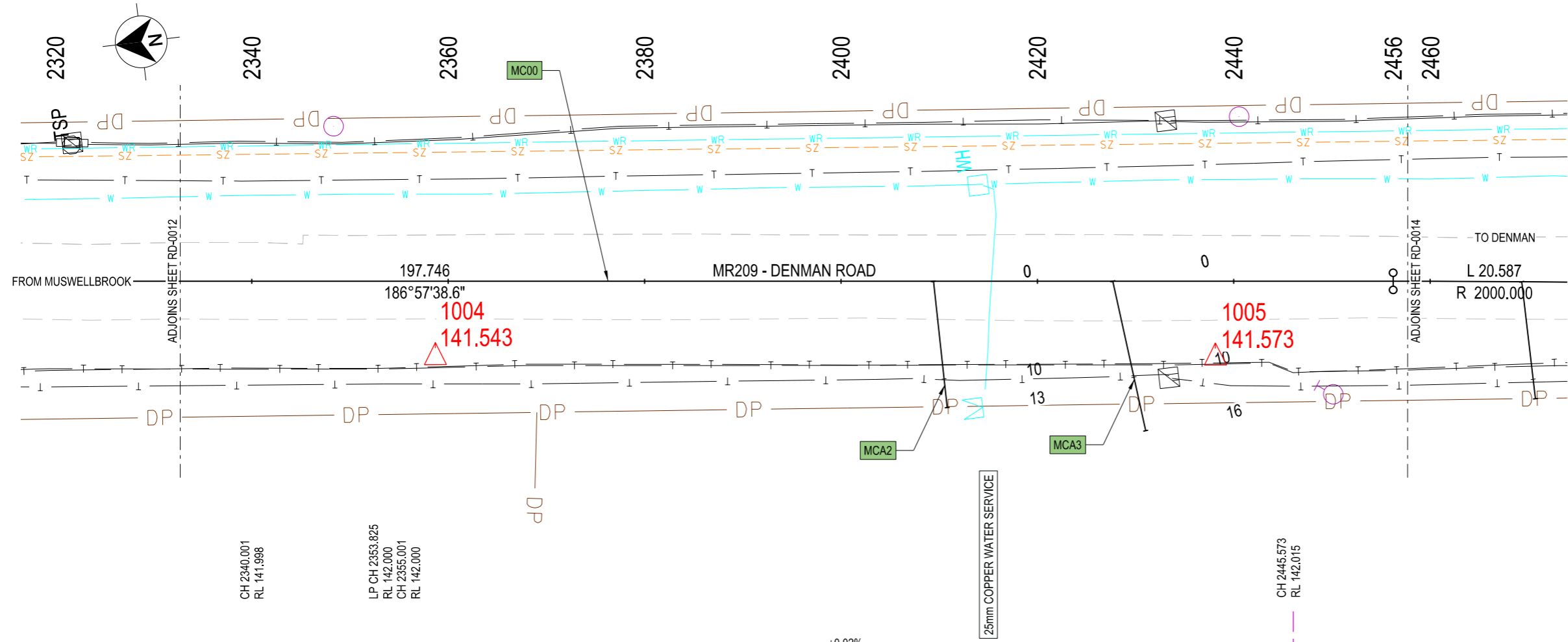
ACCEPTED FOR CONSTRUCTION

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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-ALIGNMENT-LSEC.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 ALIGNMENT PLAN	A3
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY	
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 HORIZONTAL SCALE 1:500m 0 0.5 1.0 1.5 2.0 VERTICAL SCALE 1:50m		TITLE: C.BURNS NAME: L.MATTSSON DATE: 09.12.22 DRG CHECK: C.BURNS NAME: L.MATTSSON DATE: 09.12.22 DESIGN CHECK: B.SPALDING NAME: L.HUANG DATE: 09.12.22 PROJECT MNGR: L.HUANG	
CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		NSW GOVERNMENT		Transport for NSW		NSW GOVERNMENT Transport for NSW PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	
TNSW REGISTRATION No. DS2021 / 000702		ISSUE STATUS ISSUED FOR CONSTRUCTION		EDMS No.		SHEET No. RD-0012		PART 1 ISSUE A	

LEGEND

- MC?? DESIGN CONTROL CALLOUT
- MASTER CONTROL
- NAME R.L. SURVEY CONTROL MARK



VERTICAL ALIGNMENT	K = 70.838 L = 30.000		G=0.02% L = 90.572																		K = -805.084 L = 30.000									
HORIZONTAL ALIGNMENT	L = 197.746																				R = 2000.000 L = 20.587									
CUT / FILL	-0.156	-0.153	-0.149	-0.150	-0.155	-0.161	-0.168	-0.174	-0.179	-0.182	-0.172	-0.158	-0.147	-0.140	-0.143	-0.150	-0.161	-0.156	-0.147	-0.153	-0.153	-0.141	-0.134	-0.128	-0.136	-0.148	-0.157			
DESIGN SURFACE LEVELS	142.032	142.025	142.014	142.006	142.001	142.000	142.001	142.002	142.003	142.004	142.004	142.005	142.006	142.007	142.008	142.009	142.009	142.010	142.011	142.012	142.013	142.014	142.014	142.015	142.016	142.016	142.016	142.016		
EXISTING SURFACE LEVELS	141.875	141.872	141.865	141.856	141.846	141.839	141.833	141.828	141.824	141.821	141.833	141.847	141.859	141.867	141.865	141.859	141.849	141.854	141.864	141.859	141.860	141.872	141.881	141.887	141.880	141.869	141.859	141.859		
CHAINAGE	2332.715	2335	2340.001	2345	2350	2353.825	2355.001	2360	2365	2370	2375	2380	2385	2390	2395	2400	2405	2410	2415	2420	2425	2430	2435	2440	2445	2445.573	2450	2455	2456.234	2457.715

LONGITUDINAL SECTION MC00

- NOTES**
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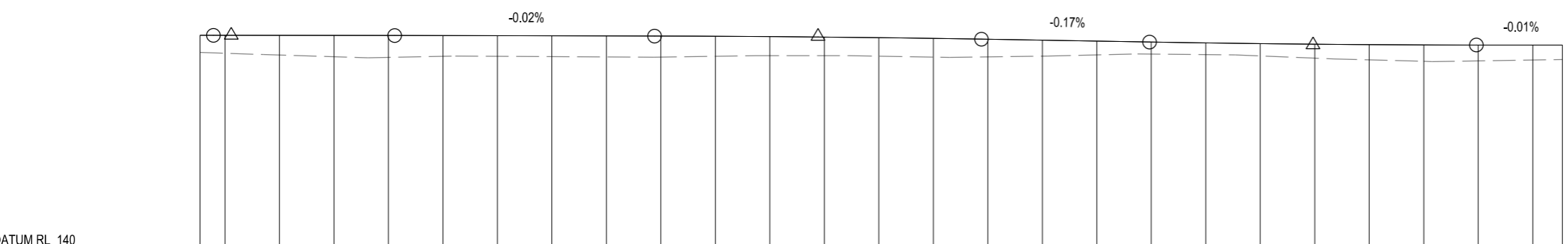
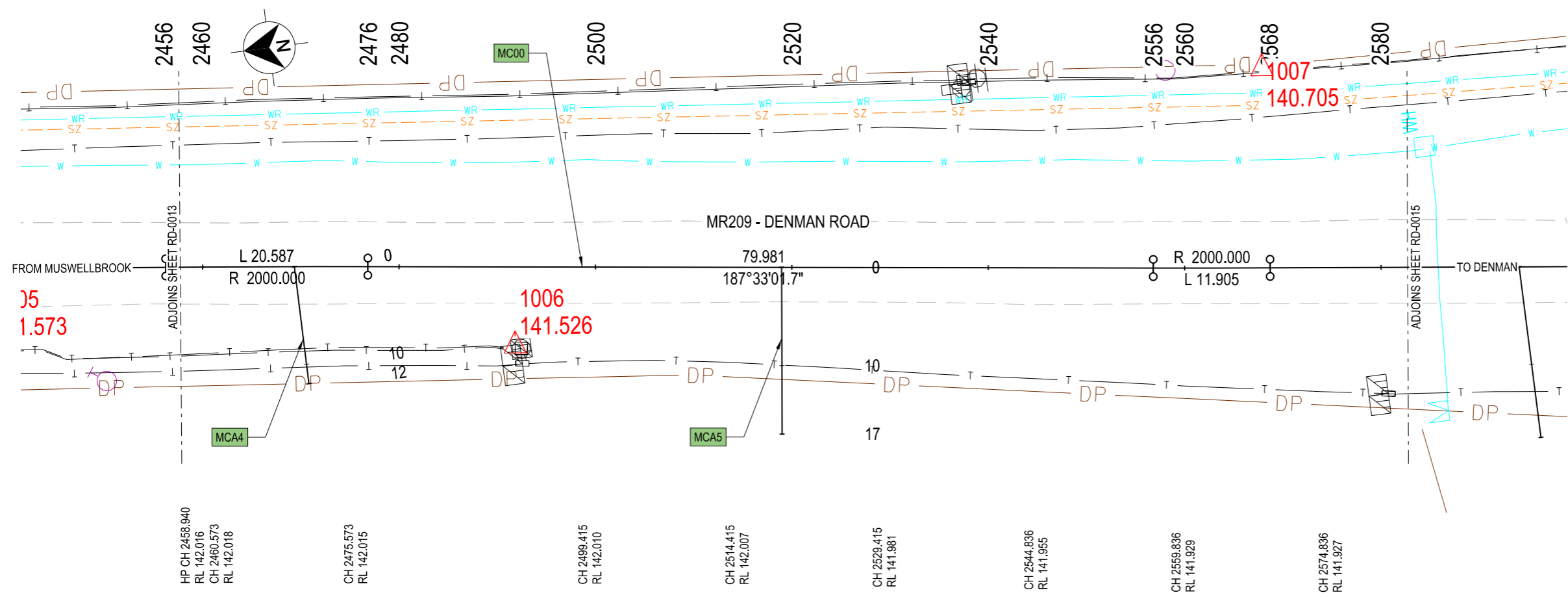
ACCEPTED FOR CONSTRUCTION

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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE	 	PREPARED FOR	TNSW REGISTRATION No.	DS2021 / 000702	PART				
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 HORIZONTAL SCALE 1:500m 0 0.5 1.0 1.5 2.0 VERTICAL SCALE 1:50m	 	DRAWN	C.BURNS	09.12.22		ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	ISSUE STATUS	ISSUED FOR CONSTRUCTION	EDMS No.	SHEET No.	RD-0013	ISSUE	
								DESIGN	C.BURNS	09.12.22									
								DESIGN CHECK	L.MATTSSON	09.12.22									
								DESIGN MNGR	B.SPALDING	09.12.22									
								PROJECT MNGR	L.HUANG	09.12.22									

LEGEND

- MC?? DESIGN CONTROL CALLOUT
- MASTER CONTROL
- △ NAME SURVEY CONTROL MARK



VERTICAL ALIGNMENT	K = -805.084 L = 30.000		G = -0.02% L = 23.842		K = -200.365 L = 30.000		G = -0.17% L = 15.421		K = 189.818 L = 30.000		G = -0.01% L = 84.628																											
HORIZONTAL ALIGNMENT	R = 2000.000 L = 20.587				L = 79.981				R = 2000.000 L = 11.905		L = 255.276																											
CUT / FILL	-0.157	-0.165	-0.180	-0.195	-0.200	-0.190	-0.188	-0.192	-0.193	-0.193	-0.184	-0.175	-0.170	-0.169	-0.171	-0.161	-0.146	-0.126	-0.110	-0.106	-0.112	-0.128	-0.139	-0.150	-0.144	-0.135	-0.131											
DESIGN SURFACE LEVELS	142.016	142.016	142.016	142.016	142.015	142.014	142.013	142.012	142.011	142.010	142.008	142.005	142.000	141.995	141.988	141.980	141.972	141.963	141.955	141.947	141.940	141.935	141.931	141.929	141.927	141.927	141.926											
EXISTING SURFACE LEVELS	141.859	141.852	141.836	141.820	141.814	141.824	141.824	141.820	141.818	141.817	141.824	141.830	141.830	141.826	141.817	141.819	141.825	141.837	141.845	141.840	141.828	141.807	141.792	141.779	141.783	141.792	141.795											
CHAINAGE	2457.715	2458.940	2460	2465	2470	2475	2475.573	2476.820	2480	2485	2490	2495	2499.415	2500	2505	2510	2514.415	2515	2520	2525	2529.415	2530	2535	2540	2544.836	2545	2550	2555	2556.801	2559.836	2560	2565	2568.706	2570	2574.836	2575	2580	2582.715

LONGITUDINAL SECTION MC00

NOTES

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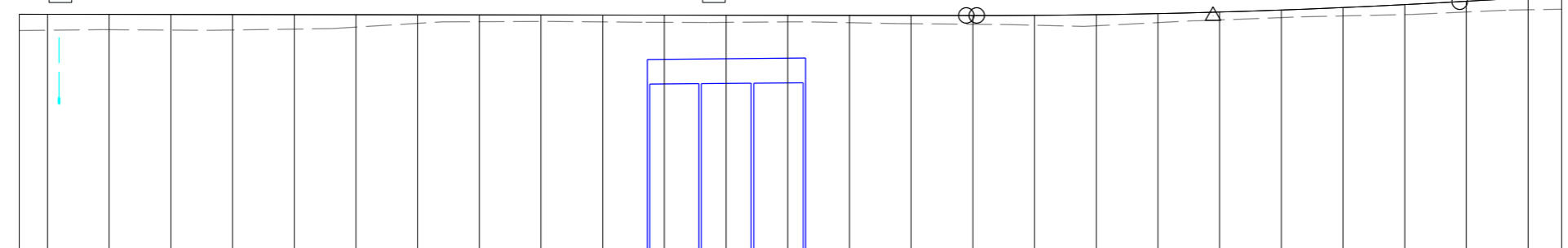
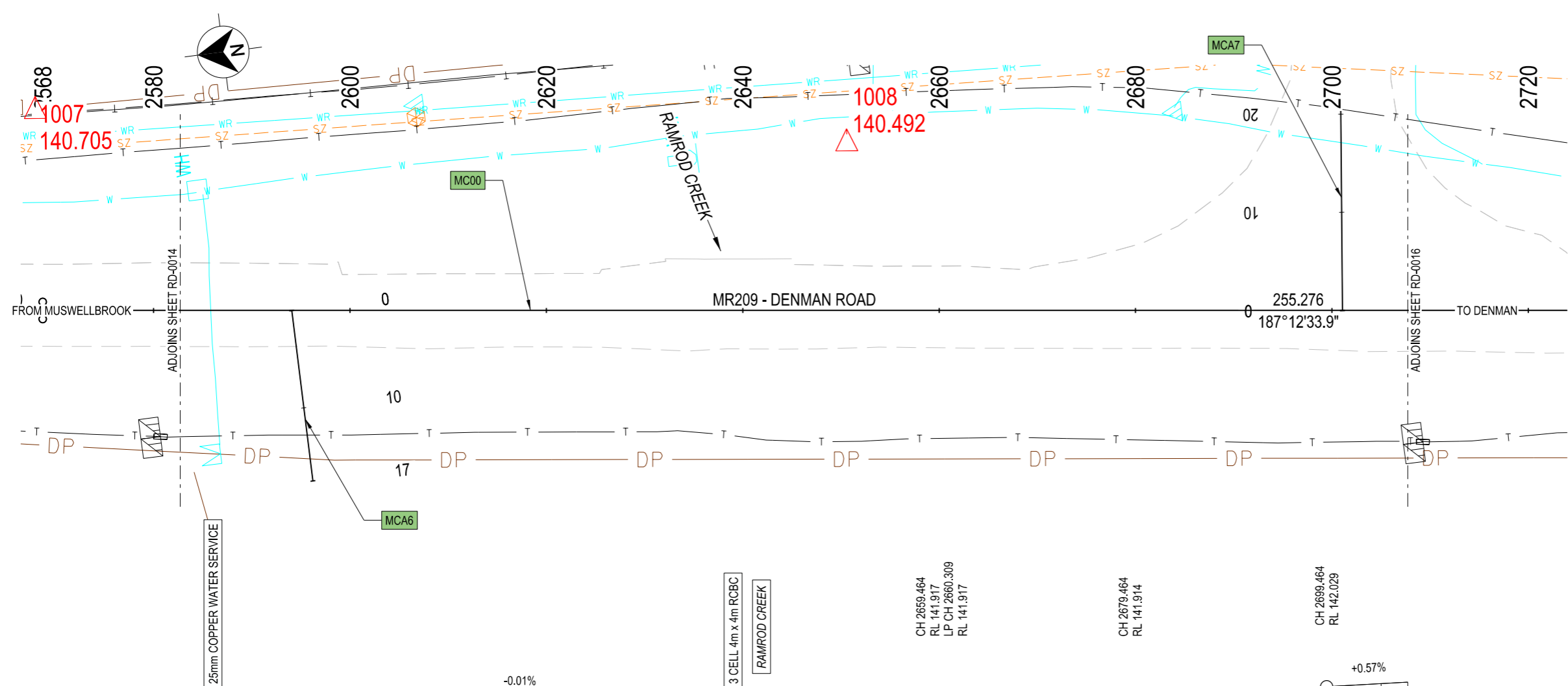
ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

DRAWING FILE LOCATION / NAME C:\Data\Worksheets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-ALIGNMENT-LSEC.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 ALIGNMENT PLAN	A3					
EXTERNAL REFERENCE FILES XXXXXX	REV A	DATE 9-12-22	AMENDMENT / REVISION DESCRIPTION ISSUED FOR CONSTRUCTION	WVR No. XX	APPROVAL XXX	SCALES ON A3 SIZE DRAWING 0 5 10 15 20 HORIZONTAL SCALE 1:500m 0 0.5 1.0 1.5 2.0 VERTICAL SCALE 1:50m	DRAWINGS / DESIGN PREPARED BY	TITLE DRAWN DRG CHECK DESIGN DESIGN CHECK DESIGN MNGR PROJECT MNGR	NAME C.BURNS L.MATTSSON C.BURNS L.MATTSSON B.SPALDING L.HUANG	DATE 09.12.22 09.12.22 09.12.22 09.12.22 09.12.22 09.12.22	NSW GOVERNMENT Transport for NSW	PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	TNSW REGISTRATION No. DS2021 / 000702	PART 1
CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		NSW GOVERNMENT Transport for NSW		ISSUE STATUS ISSUED FOR CONSTRUCTION		EDMS No.	SHEET No. RD-0014	ISSUE A				

LEGEND

- MC?? DESIGN CONTROL CALLOUT
- MASTER CONTROL
- NAME R.L. SURVEY CONTROL MARK



VERTICAL ALIGNMENT	G = -0.01% L = 84.628		K = 68.497 L = 40.000												G = 0.57% L = 45.051												
HORIZONTAL ALIGNMENT	L = 255.276																										
CUT / FILL	-0.131	-0.129	-0.125	-0.127	-0.125	-0.117	-0.100	-0.070	-0.056	-0.053	-0.056	-0.059	-0.058	-0.063	-0.060	-0.067	-0.070	-0.080	-0.090	-0.073	-0.064	-0.061	-0.068	-0.080	-0.087	-0.098	-0.109
DESIGN SURFACE LEVELS	141.926	141.926	141.926	141.925	141.924	141.924	141.923	141.922	141.922	141.921	141.921	141.920	141.919	141.919	141.918	141.917	141.917	141.918	141.924	141.933	141.945	141.961	141.981	142.005	142.032	142.060	142.076
EXISTING SURFACE LEVELS	141.795	141.797	141.801	141.798	141.799	141.806	141.823	141.853	141.866	141.868	141.866	141.861	141.862	141.865	141.859	141.851	141.847	141.839	141.834	141.860	141.881	141.900	141.914	141.925	141.945	141.963	141.967
CHAINAGE	2582.715	2585	2590	2595	2600	2605	2610	2615	2620	2625	2630	2635	2640	2645	2650	2655	2659.464 2660 2660.309	2665	2670	2675	2680 2680.464	2685	2690	2695	2699.464 2700	2705	2707.715

LONGITUDINAL SECTION MC00

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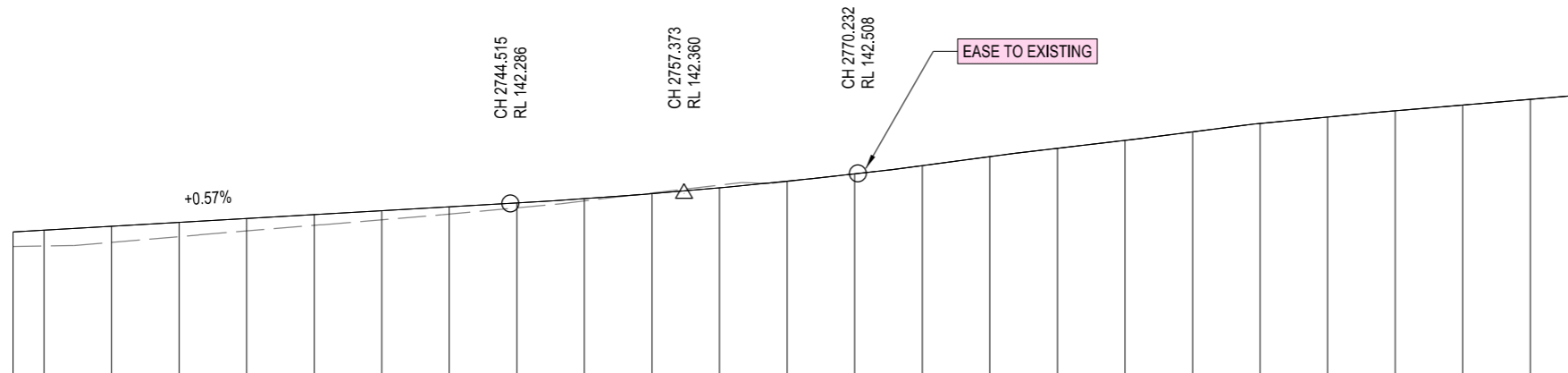
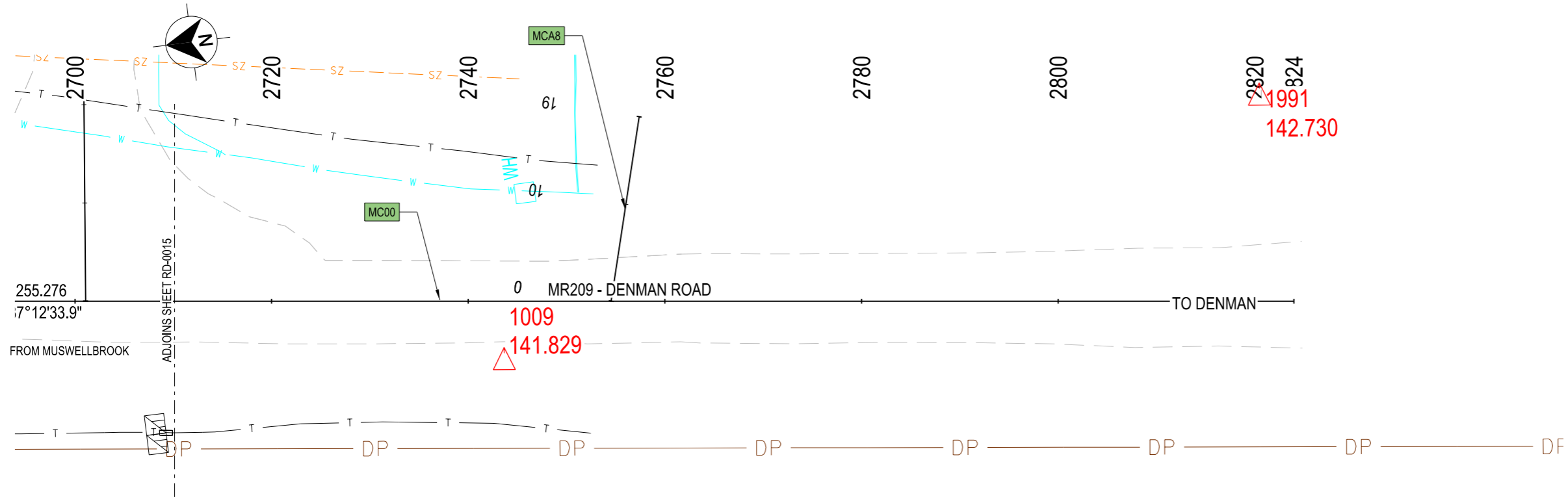
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DRAWING FILE LOCATION / NAME C:\Data\Worksheets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-ALIGNMENT-LSEC.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 ALIGNMENT PLAN	A3							
EXTERNAL REFERENCE FILES XXXXXX	REV A	DATE 9-12-22	AMENDMENT / REVISION DESCRIPTION ISSUED FOR CONSTRUCTION	WVR No. XX	APPROVAL XXX	SCALES ON A3 SIZE DRAWING 0 5 10 15 20 HORIZONTAL SCALE 1:500m 0 0.5 1.0 1.5 2.0 VERTICAL SCALE 1:50m		DRAWINGS / DESIGN PREPARED BY		TITLE DRAWN DRG CHECK DESIGN DESIGN CHECK DESIGN MNGR PROJECT MNGR	NAME C.BURNS L.MATTSSON C.BURNS L.MATTSSON B.SPALDING L.HUANG	DATE 09.12.22 09.12.22 09.12.22 09.12.22 09.12.22 09.12.22	NSW GOVERNMENT Transport for NSW	PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	TNSW REGISTRATION No. DS2021 / 000702	PART 1
CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		NSW GOVERNMENT Transport for NSW		ISSUE STATUS ISSUED FOR CONSTRUCTION		EDMS No.	SHEET No. RD-0015	ISSUE A	© Transport for NSW					

LEGEND

- MC?? DESIGN CONTROL CALLOUT
- MASTER CONTROL
- △ NAME R.L. SURVEY CONTROL MARK



DATUM RL 141

VERTICAL ALIGNMENT	G=0.57% L = 45.051		K = 44.141 L = 25.717												
HORIZONTAL ALIGNMENT	L = 255.276														
CUT / FILL	-0.109	-0.118	-0.119	-0.105	-0.093	-0.080	-0.067	-0.053	-0.036	-0.017	0.005	0.020	-0.003	-0.001	
DESIGN SURFACE LEVELS	142.076	142.089	142.118	142.146	142.175	142.203	142.232	142.261	142.289	142.321	142.358	142.402	142.451	142.505	
EXISTING SURFACE LEVELS	141.967	141.971	141.998	142.041	142.082	142.124	142.165	142.207	142.253	142.304	142.364	142.422	142.447	142.504	
CHAINAGE	2707.715	2710	2715	2720	2725	2730	2735	2740	2744.515 2745	2750	2755	2757.373	2760	2765	2770

LONGITUDINAL SECTION MC00

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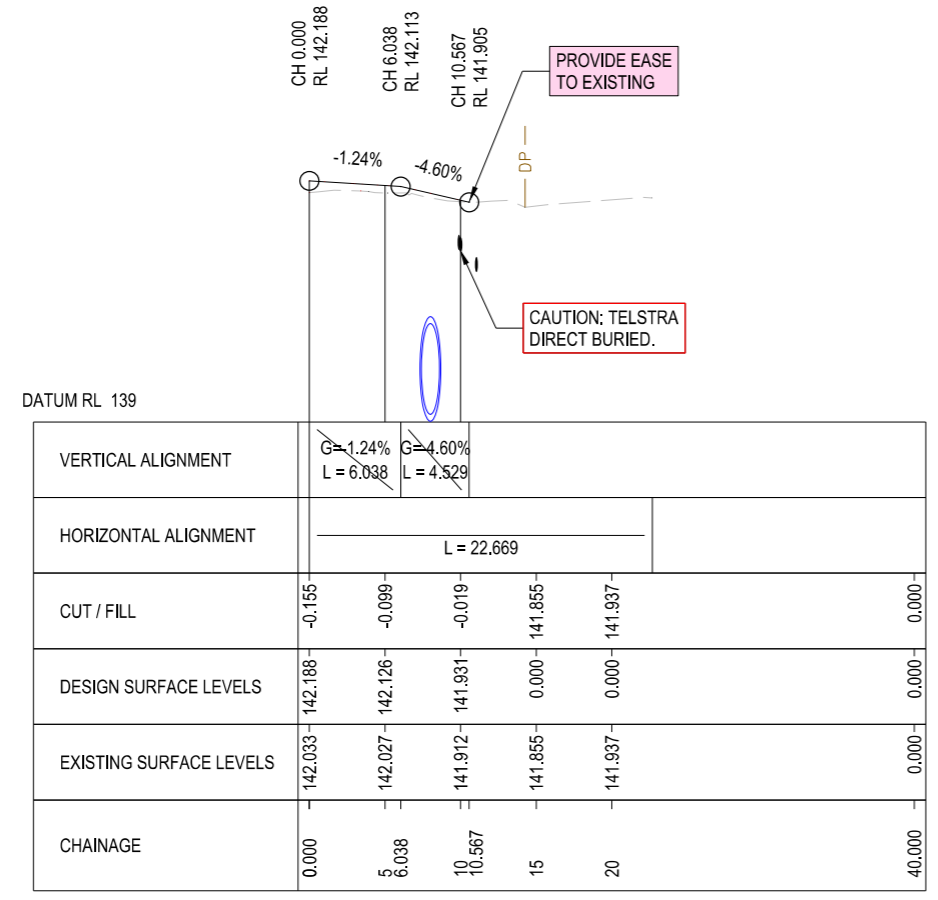
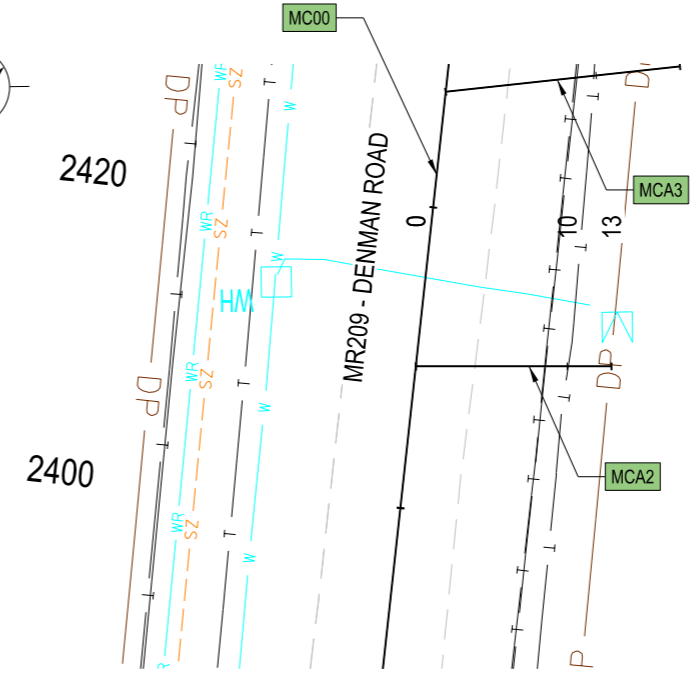
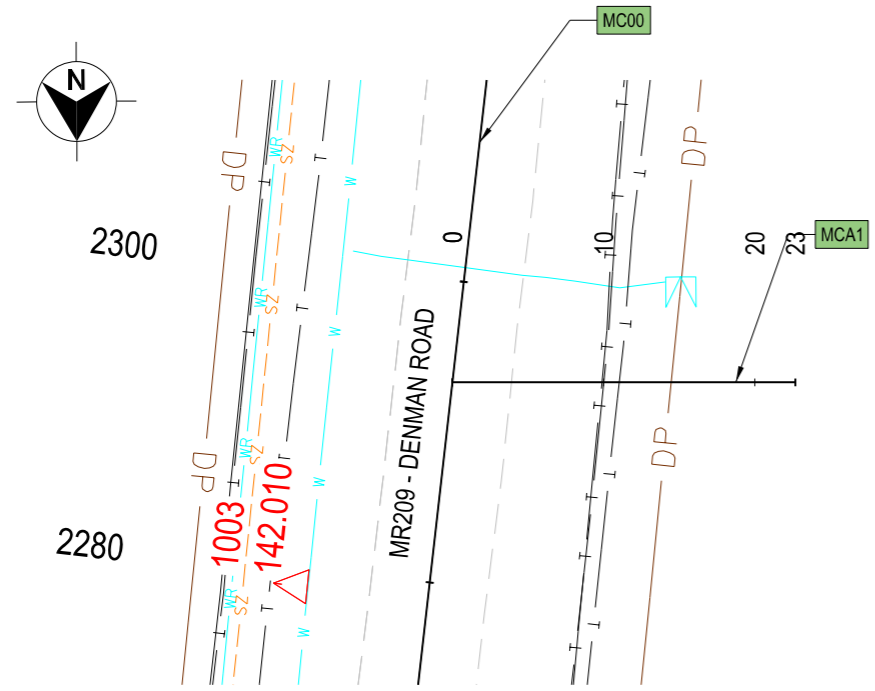
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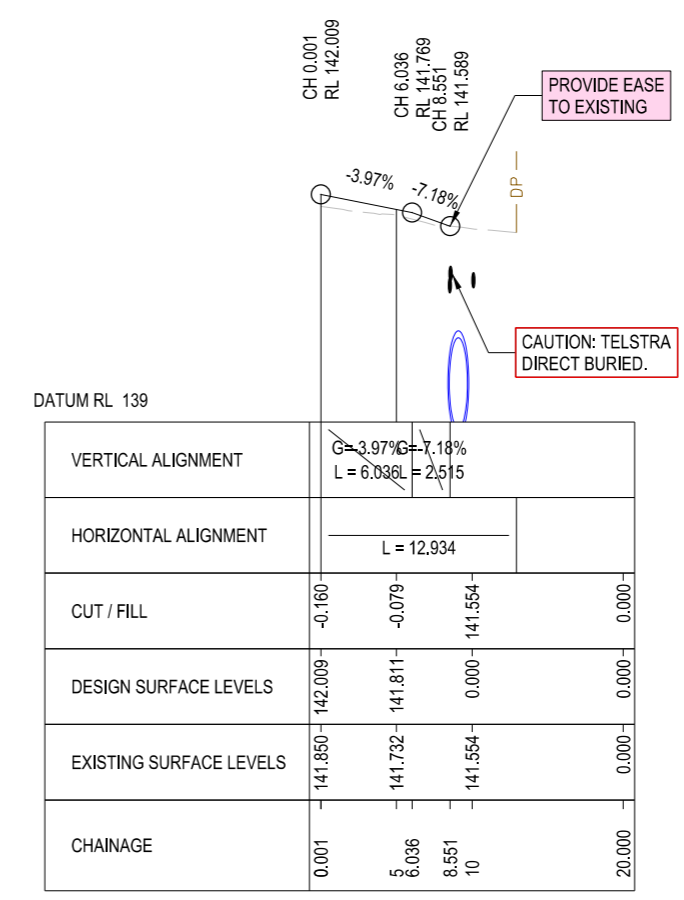
DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-ALIGNMENT-LSEC.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 ALIGNMENT PLAN	A3
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 HORIZONTAL SCALE 1:500m 0 0.5 1.0 1.5 2.0 VERTICAL SCALE 1:50m	Transport for NSW	DRAWN: C.BURNS 09.12.22 DRG CHECK: L.MATTSSON 09.12.22 DESIGN: C.BURNS 09.12.22 DESIGN CHECK: L.MATTSSON 09.12.22 DESIGN MNGR: B.SPALDING 09.12.22 PROJECT MNGR: L.HUANG 09.12.22
CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		Transport for NSW		PREPARED FOR: ASSETS NORTH REGIONAL AND OUTER METROPOLITAN TNSW REGISTRATION No. DS2021 / 000702 ISSUE STATUS: ISSUED FOR CONSTRUCTION EDMS No. SHEET No. RD-0016 ISSUE A		

LEGEND

- MC?? DESIGN CONTROL CALLOUT
- MASTER CONTROL
- △ NAME R.L. SURVEY CONTROL MARK



LONGITUDINAL SECTION MCA1



LONGITUDINAL SECTION MCA2

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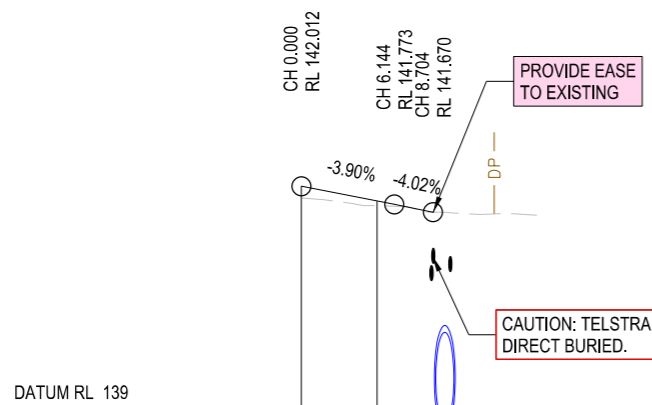
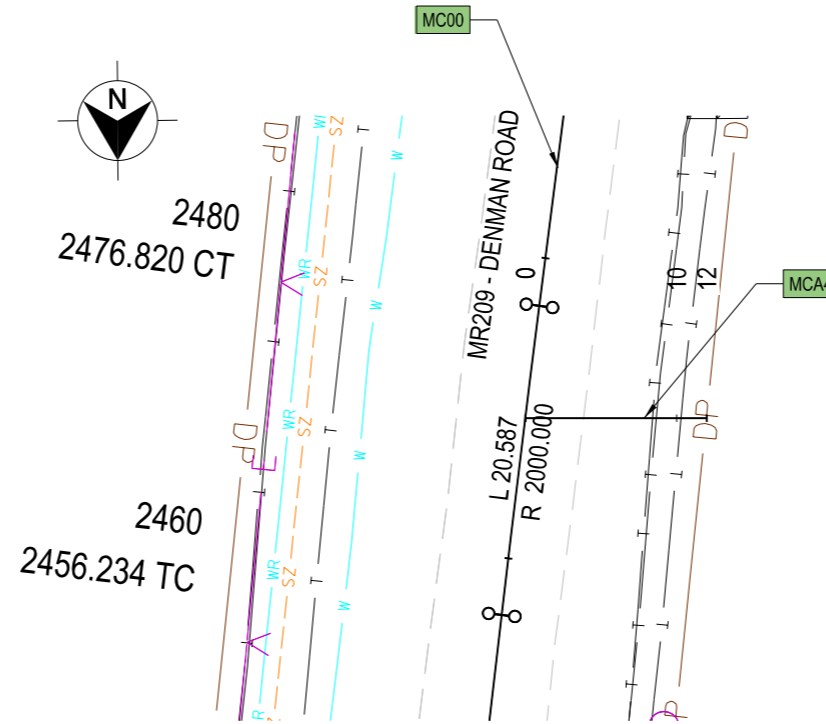
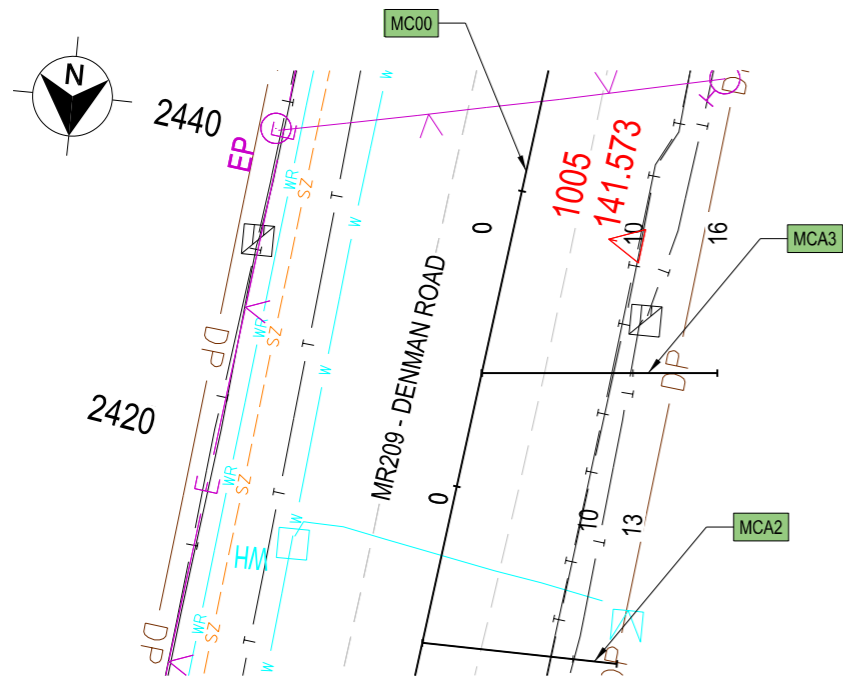
ACCEPTED FOR CONSTRUCTION

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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY			
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 HORIZONTAL SCALE 1:500m 0 1 2 3 4 VERTICAL SCALE 1:100m		TITLE NAME DATE DRAWN C.BURNS 09.12.22 DRG CHECK L.MATTSSON 09.12.22 DESIGN C.BURNS 09.12.22 DESIGN CHECK L.MATTSSON 09.12.22 DESIGN MNGR B.SPALDING 09.12.22 PROJECT MNGR L.HUANG 09.12.22			
									PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN		
								TNSW REGISTRATION No. DS2021 / 000702			
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								ISSUED FOR CONSTRUCTION		RD-0017	A

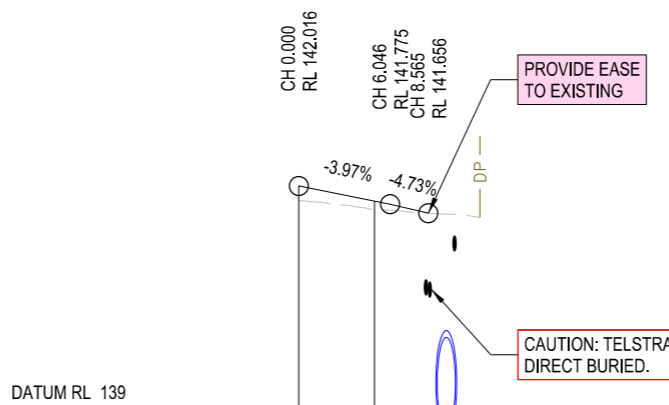
© Transport for NSW

LEGEND
MC?? DESIGN CONTROL CALLOUT
 _____ MASTER CONTROL
 NAME
 △ R.L. SURVEY CONTROL MARK



VERTICAL ALIGNMENT	G = -3.90% / -4.02% L = 6.144 / 2.560			
HORIZONTAL ALIGNMENT	L = 15.573			
CUT / FILL	-0.156	-0.061	-0.000	-0.000
DESIGN SURFACE LEVELS	142.012	141.817	141.658	141.638
EXISTING SURFACE LEVELS	141.857	141.756	141.658	141.638
CHAINAGE	0.000	6.144	8.704	15

LONGITUDINAL SECTION MCA3



VERTICAL ALIGNMENT	G = -3.97% / -4.73% L = 6.046 / 2.519			
HORIZONTAL ALIGNMENT	L = 11.992			
CUT / FILL	-0.193	-0.113	-0.000	-0.000
DESIGN SURFACE LEVELS	142.016	141.817	141.643	141.643
EXISTING SURFACE LEVELS	141.822	141.704	141.643	141.643
CHAINAGE	0.000	6.046	8.565	10

LONGITUDINAL SECTION MCA4

- NOTES**
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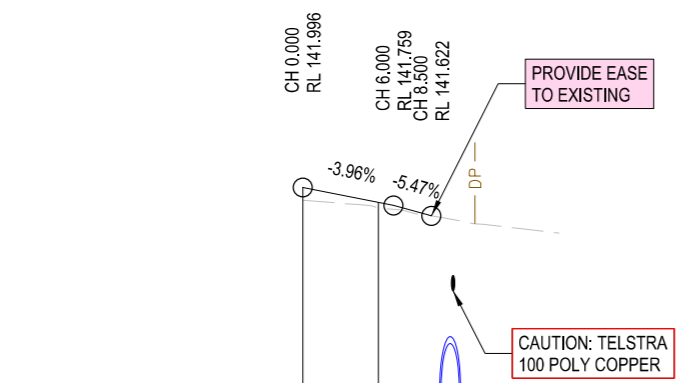
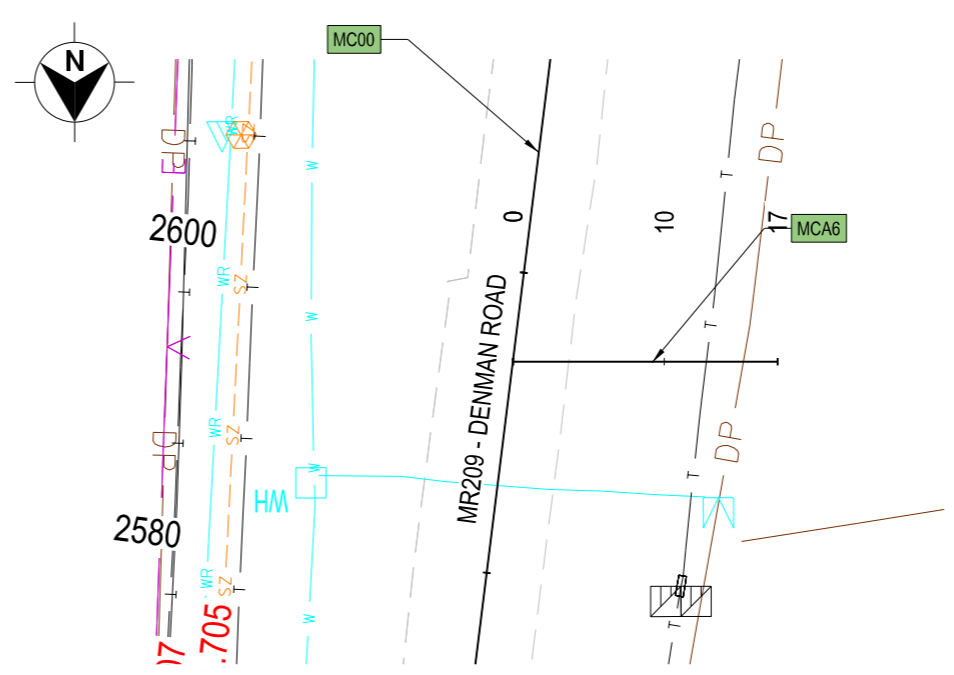
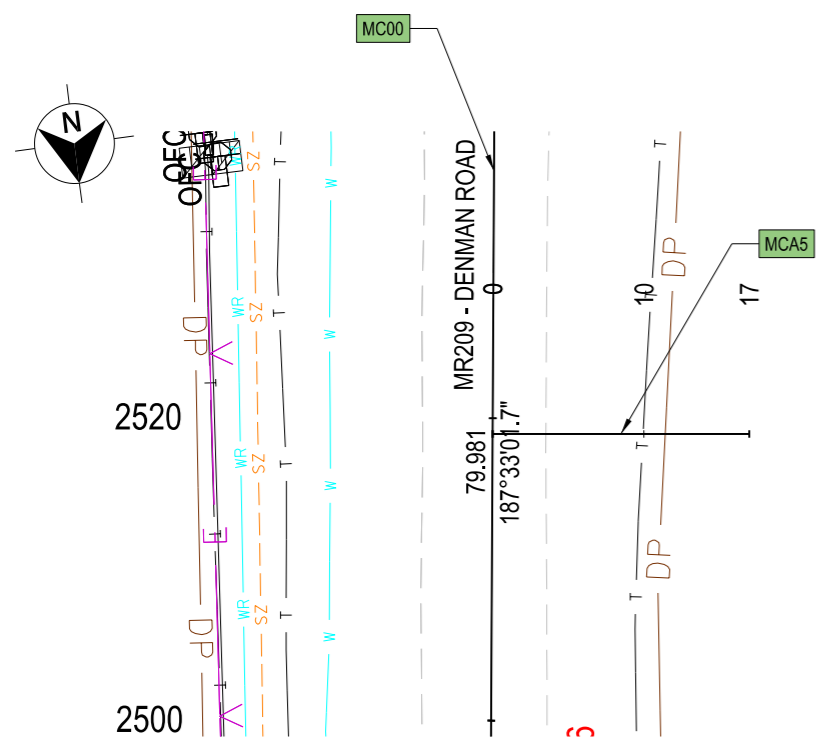
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DRAWING FILE LOCATION / NAME C:\Data\Works\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-ALIGNMENT-LSEC.dgn		DESIGN LOT CODE XX	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	PLOT DATE / TIME	PLOT BY	CLIENT Transport for NSW	MUSWELLBROOK SHIRE COUNCIL MR209 - DENNAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 ALIGNMENT PLAN	A3
EXTERNAL REFERENCE FILES XXXXXX	REV A	DATE 9-12-22	AMENDMENT / REVISION DESCRIPTION ISSUED FOR CONSTRUCTION	WVR No. XX	APPROVAL XXX	SCALES ON A3 SIZE DRAWING 0 5 10 15 20 HORIZONTAL SCALE 1:500m 0 1 2 3 4 VERTICAL SCALE 1:100m	DRAWINGS / DESIGN PREPARED BY Transport for NSW	TITLE DRAWN DRG CHECK DESIGN DESIGN CHECK DESIGN MNGR PROJECT MNGR
						Transport for NSW PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN		TNSW REGISTRATION No. DS2021 / 000702 ISSUE STATUS ISSUED FOR CONSTRUCTION
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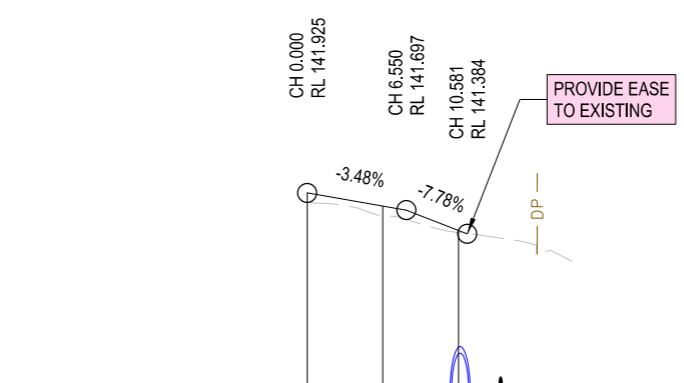
LEGEND

- MC?? DESIGN CONTROL CALLOUT
- MASTER CONTROL
- NAME SURVEY CONTROL MARK
- R.L. SURVEY CONTROL MARK



VERTICAL ALIGNMENT	G = -3.96% G = -5.47% L = 6.000 L = 2.500			
HORIZONTAL ALIGNMENT	L = 16.960			
CUT / FILL	-0.169	-0.070	141.571	141.437
DESIGN SURFACE LEVELS	141.996	141.798	0.000	0.000
EXISTING SURFACE LEVELS	141.827	141.729	141.571	141.437
CHAINAGE	0.000	6.000	8.500	10

LONGITUDINAL SECTION MCA5



VERTICAL ALIGNMENT	G = -3.48% G = -7.78% L = 6.550 L = 4.031			
HORIZONTAL ALIGNMENT	L = 17.500			
CUT / FILL	-0.127	-0.124	-0.029	141.241
DESIGN SURFACE LEVELS	141.925	141.751	141.429	0.000
EXISTING SURFACE LEVELS	141.798	141.627	141.400	141.241
CHAINAGE	0.000	5	6.550	10

LONGITUDINAL SECTION MCA6

NOTES

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- ALL SURVEY CONTROL IS NOT TO BE DISTURBED BEFORE ASSESSMENT BY SURVEYOR.
- REFER TO SHEET RD-0021 FOR ALIGNMENT SETOUT DETAILS.
- REFER TO SHEET MS-0007 FOR SURVEY CONTROL SCHEDULE.
- REFER TO MS SERIES PLANS FOR INFORMATION REGARDING SURVEY INFRASTRUCTURE.
- REFER TO DETAIL PLANS FOR UTILITY LOCATIONS AND INFORMATION.

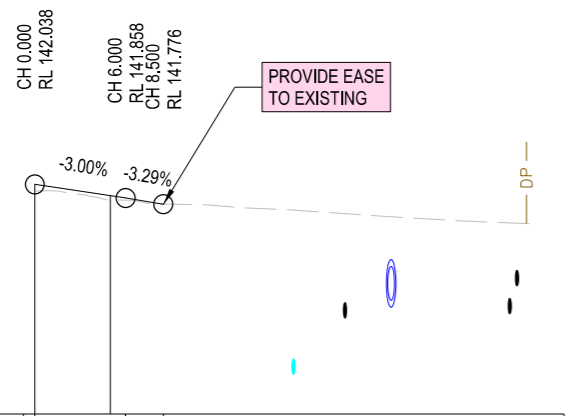
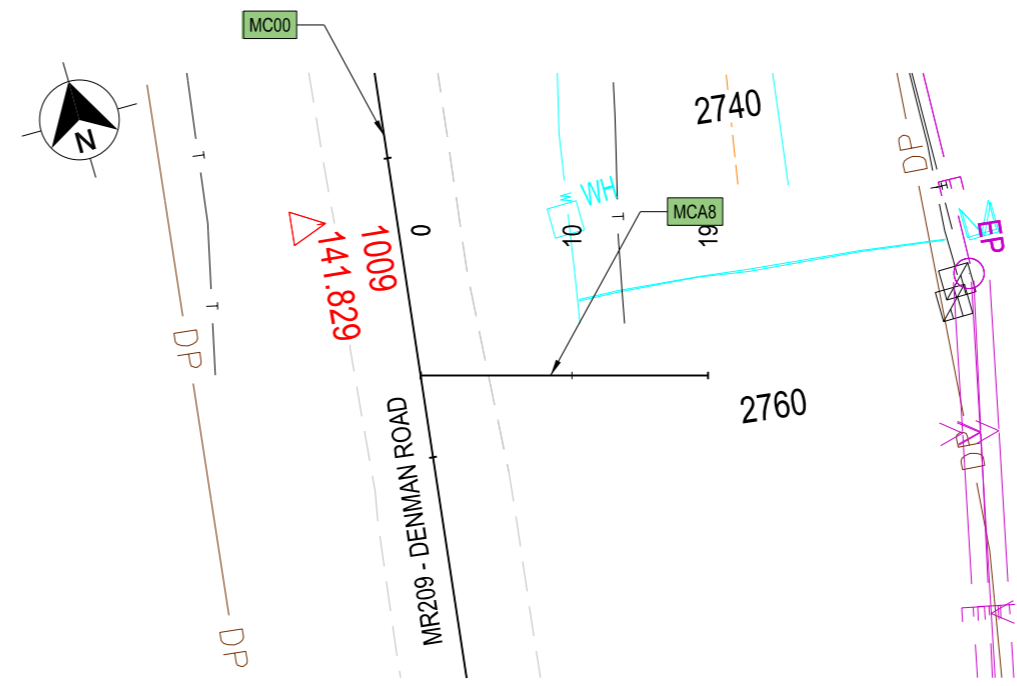
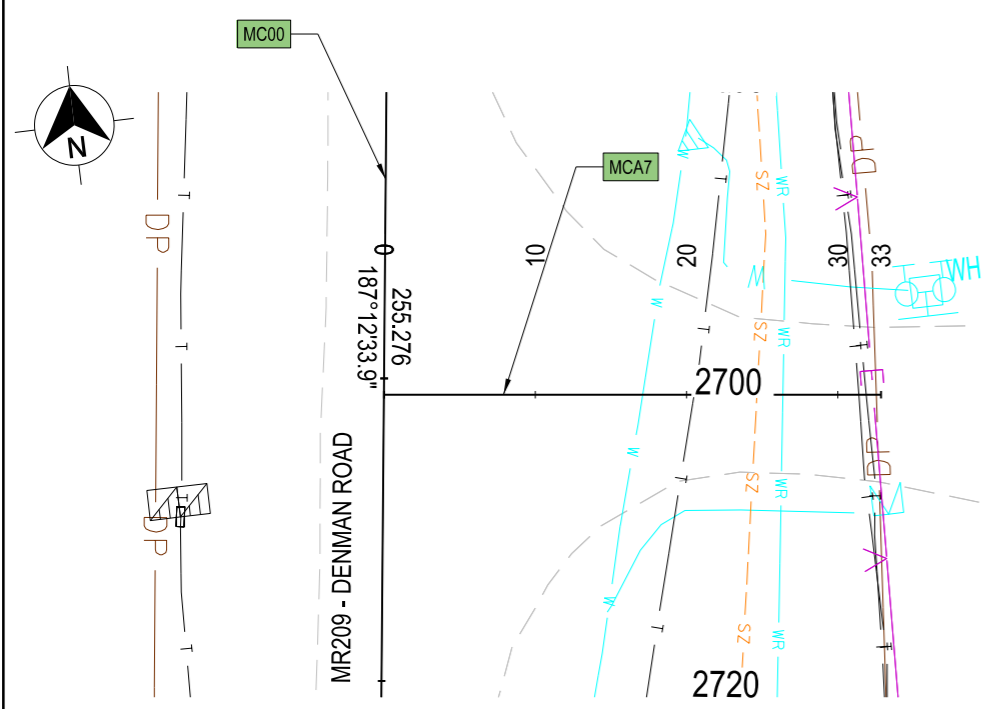
ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

DRAWING FILE LOCATION / NAME C:\Data\Worksheets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-ALIGNMENT-LSEC.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 ALIGNMENT PLAN	A3
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 HORIZONTAL SCALE 1:500m 0 1 2 3 4 VERTICAL SCALE 1:100m	NSW Government Transport for NSW	DRAWN C.BURNS 09.12.22 DRG CHECK L.MATTSSON 09.12.22 DESIGN C.BURNS 09.12.22 DESIGN CHECK L.MATTSSON 09.12.22 DESIGN MNGR B.SPALDING 09.12.22 PROJECT MNGR L.HUANG 09.12.22
CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		NSW Government Transport for NSW		ASSETS NORTH REGIONAL AND OUTER METROPOLITAN		PREPARED FOR
TNSW REGISTRATION No.		DS2021 / 000702		ISSUE STATUS		ISSUED FOR CONSTRUCTION		PART 1
EDMS No.		SHEET No.		RD-0019		ISSUE A		© Transport for NSW

LEGEND

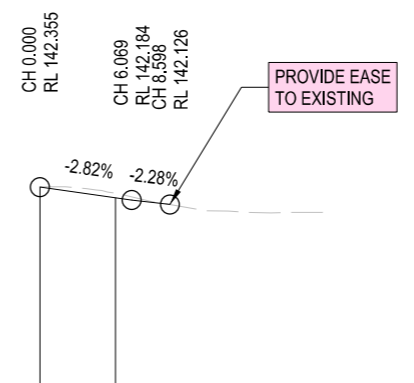
MC??	DESIGN CONTROL CALLOUT
—	MASTER CONTROL
△ NAME R.L.	SURVEY CONTROL MARK



DATUM RL 139

VERTICAL ALIGNMENT	G = -3.00% / -3.29% L = 6.000L = 2.500					
HORIZONTAL ALIGNMENT	L = 32.858					
CUT / FILL	-0.088	-0.055	0.000	0.000	0.000	0.000
DESIGN SURFACE LEVELS	142.038	141.888	141.776	141.716	141.659	141.593
EXISTING SURFACE LEVELS	141.950	141.832	141.771	141.716	141.659	141.593
CHAINAGE	0.000	5.000	8.500	10	15	20

LONGITUDINAL SECTION MCA7



DATUM RL 139

VERTICAL ALIGNMENT	G = -2.82% / -2.28% L = 6.069L = 2.529			
HORIZONTAL ALIGNMENT	L = 18.998			
CUT / FILL	0.004	0.061	0.000	0.000
DESIGN SURFACE LEVELS	142.355	142.214	142.077	142.016
EXISTING SURFACE LEVELS	142.368	142.275	142.077	142.016
CHAINAGE	0.000	5.069	8.598	10

LONGITUDINAL SECTION MCA8

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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	 	TNSW REGISTRATION No. DS2021 / 000702 ISSUE STATUS ISSUED FOR CONSTRUCTION	PART 1 ISSUE A
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX			
SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY		TITLE	NAME			
0 5 10 15 20 HORIZONTAL SCALE 1:500m 0 1 2 3 4 VERTICAL SCALE 1:100m		 		DESIGNED	C.BURNS	09.12.22		
CO-ORDINATE SYSTEM		HEIGHT DATUM		DESIGN CHECK	L.MATTSSON	09.12.22	PREPARED FOR	ASSETS NORTH
MGA ZONE 56 (GDA2020)		AHD		DESIGN MNGR	B.SPALDING	09.12.22	REGIONAL AND OUTER METROPOLITAN	EDMS No.
				PROJECT MNGR	L.HUANG	09.12.22	SHEET No.	RD-0020

MASTER CONTROL ALIGNMENT MC00 - MR209 DENMAN ROAD

CHAINAGE (m)	NORTHING (m)	EASTING (m)	ELEMENT	LENGTH (m)	BEARING		
					(STRAIGHT)	(R=STARTING ANGLE)	(R=END ANGLE)
2082.715	6426713.386	299660.377	R = -1300.000	175.773		194°42'27.6"	186°57'38.6"
2258.487	6426540.878	299627.363	STRAIGHT	197.746	186°57'38.6"		
2456.234	6426344.589	299603.398	R = +2000.000	20.587		186°57'38.6"	187°33'01.7"
2476.820	6426324.167	299600.798	STRAIGHT	79.981	187°33'01.7"		
2556.801	6426244.880	299590.288	R = -2000.000	11.905		187°33'01.7"	187°12'33.9"
2568.706	6426233.073	299588.759	STRAIGHT	255.276	187°12'33.9"		
2823.983	6425979.815	299556.723					

MASTER CONTROL ALIGNMENT MCA1

CHAINAGE (m)	NORTHING (m)	EASTING (m)	ELEMENT	LENGTH (m)	BEARING		
					(STRAIGHT)	(R=STARTING ANGLE)	(R=END ANGLE)
0.000	6426506.308	299623.142	STRAIGHT	22.669	270°29'55.3"		
22.669	6426506.505	299600.474					

MASTER CONTROL ALIGNMENT MCA2

CHAINAGE (m)	NORTHING (m)	EASTING (m)	ELEMENT	LENGTH (m)	BEARING		
					(STRAIGHT)	(R=STARTING ANGLE)	(R=END ANGLE)
0.000	6426391.057	299609.072	STRAIGHT	12.934	270°44'33.9"		
12.934	6426391.225	299596.139					

MASTER CONTROL ALIGNMENT MCA3

CHAINAGE (m)	NORTHING (m)	EASTING (m)	ELEMENT	LENGTH (m)	BEARING		
					(STRAIGHT)	(R=STARTING ANGLE)	(R=END ANGLE)
0.000	6426372.928	299606.858	STRAIGHT	15.573	264°31'43.8"		
15.573	6426371.444	299591.356					

MASTER CONTROL ALIGNMENT MCA4

CHAINAGE (m)	NORTHING (m)	EASTING (m)	ELEMENT	LENGTH (m)	BEARING		
					(STRAIGHT)	(R=STARTING ANGLE)	(R=END ANGLE)
0.000	6426331.589	299601.767	STRAIGHT	11.992	270°18'43.6"		
11.992	6426331.654	299589.775					

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DRAWING FILE LOCATION / NAME C:\Data\Workssets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-ALIGNMENT-LSEC.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 ALIGNMENT SCHEDULES	A3							
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE	 	PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	TNSW REGISTRATION No.	DS2021 / 000702	PART	1
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	NOT TO SCALE		DRAWN	C.BURNS	09.12.22			ISSUE	A		
								DRG CHECK	L.MATTSSON	09.12.22						
								DESIGN	C.BURNS	09.12.22						
								DESIGN CHECK	L.MATTSSON	09.12.22						
								DESIGN MNGR	B.SPALDING	09.12.22						
								PROJECT MNGR	L.HUANG	09.12.22						

MASTER CONTROL ALIGNMENT MCA5

CHAINAGE (m)	NORTHING (m)	EASTING (m)	ELEMENT	LENGTH (m)	BEARING		
					(STRAIGHT)	(R=STARTING ANGLE)	(R=END ANGLE)
0.000	6426282.399	299595.262	STRAIGHT	16.960	277°15'50.9"		
16.960	6426284.544	299578.438					

MASTER CONTROL ALIGNMENT MCA6

CHAINAGE (m)	NORTHING (m)	EASTING (m)	ELEMENT	LENGTH (m)	BEARING		
					(STRAIGHT)	(R=STARTING ANGLE)	(R=END ANGLE)
0.000	6426207.914	299585.577	STRAIGHT	17.500	270°09'08.3"		
17.500	6426207.960	299568.077					

MASTER CONTROL ALIGNMENT MCA7

CHAINAGE (m)	NORTHING (m)	EASTING (m)	ELEMENT	LENGTH (m)	BEARING		
					(STRAIGHT)	(R=STARTING ANGLE)	(R=END ANGLE)
0.000	6426101.751	299572.147	STRAIGHT	32.858	96°43'39.3"		
32.858	6426097.902	299604.779					

MASTER CONTROL ALIGNMENT MCA8

CHAINAGE (m)	NORTHING (m)	EASTING (m)	ELEMENT	LENGTH (m)	BEARING		
					(STRAIGHT)	(R=STARTING ANGLE)	(R=END ANGLE)
0.000	6426048.719	299565.439	STRAIGHT	18.998	105°51'09.4"		
18.998	6426043.530	299583.714					

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CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)							HEIGHT DATUM AHD	NSW GOVERNMENT Transport for NSW		PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN
TNSW REGISTRATION No. DS2021 / 000702								PART 1		
ISSUE STATUS ISSUED FOR CONSTRUCTION								EDMS No.	SHEET No. RD-0022	ISSUE A

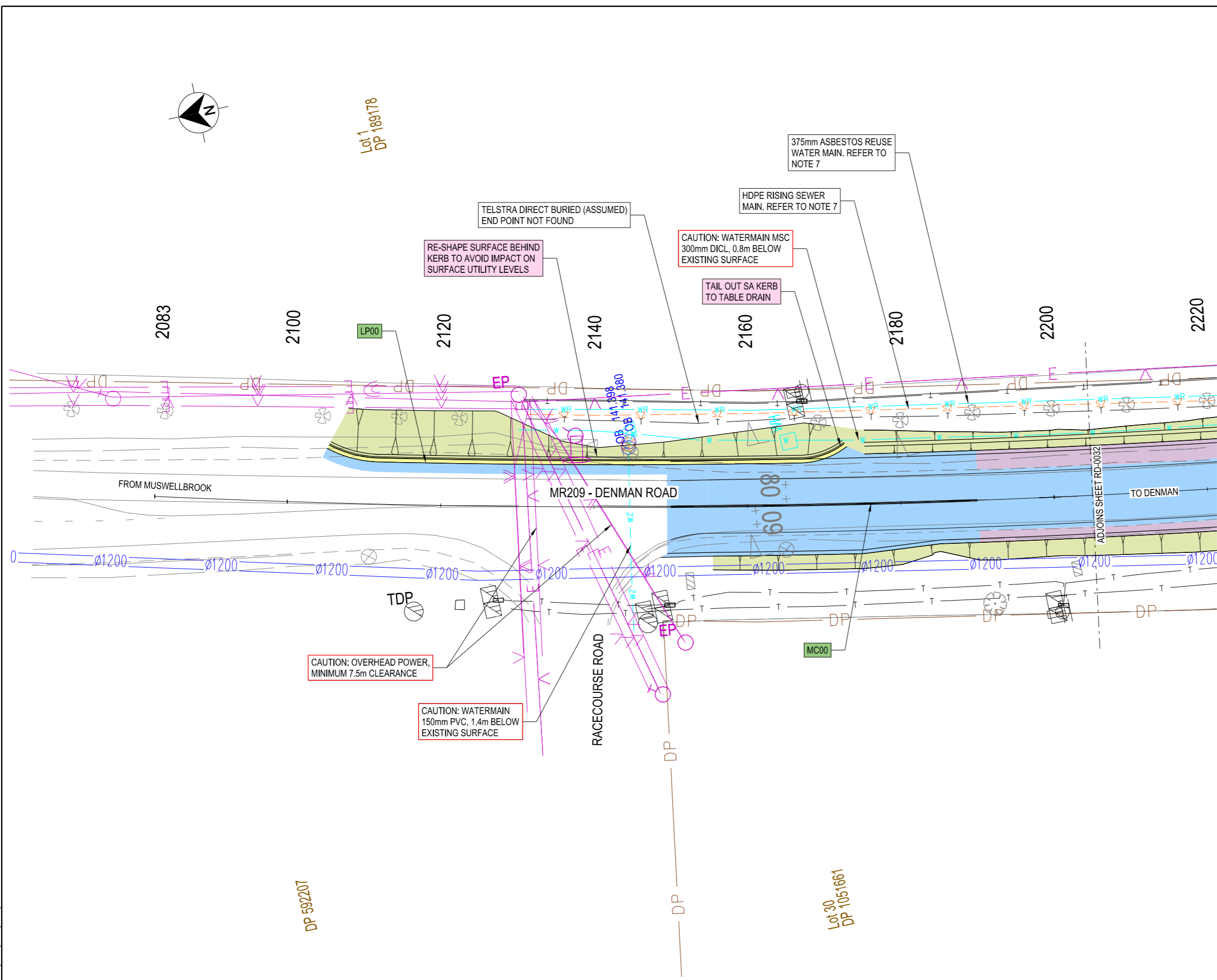
LEGEND

- MC?? — DESIGN CONTROL CALLOUT
- XXXX — CONSTRUCTION CALLOUT
- PAVEMENT TYPE P1
- PAVEMENT TYPE P2
- PAVEMENT TYPE P3
- PAVEMENT TYPE P4
- VERGE AND BATTERS
- PROPOSED WATER SERVICE LOCATION
- ⊗ EXISTING TREE - MINOR ENCROACHMENT
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- ⊗ EXISTING TREE - FEASIBILITY OF RETAINING TREE DURING CONSTRUCTION TO BE CONFIRMED WITH ARBORIST. TREE TO BE REPLACED IF IT CANNOT BE SAVED. REFER TO NOTE 8

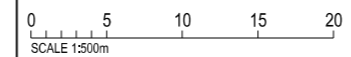


NOTES

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3. ACCESS TO PROPERTIES TO BE MADE AVAILABLE BY THE CONTRACTOR AT ALL TIMES DURING CONSTRUCTION.
4. REFER TO SHEET RD-0002 FOR PAVEMENT PROFILES.
5. REFER TO MODEL DRAWING R0300-01 FOR KERB PROFILES.
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7. HDPE RISING SEWER MAIN AND 375mm DIA ASBESTOS REUSE WATER MAIN WERE NOT FOUND ON SITE. DIGITISED LOCATION SHOWN BY SURVEYOR IN CONSULTATION WITH MSC.
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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-DETAIL PLAN.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT		MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 DETAIL PLAN	A3																						
EXTERNAL REFERENCE FILES XXXXXX		REV A	DATE 9-12-22	AMENDMENT / REVISION DESCRIPTION ISSUED FOR CONSTRUCTION	WVR No. XX	APPROVAL XXX	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY																							
								<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="font-size: 6px;">TITLE</th> <th style="font-size: 6px;">NAME</th> <th style="font-size: 6px;">DATE</th> </tr> </thead> <tbody> <tr> <td style="font-size: 6px;">DRAWN</td> <td style="font-size: 6px;">C.BURNS</td> <td style="font-size: 6px;">09.12.22</td> </tr> <tr> <td style="font-size: 6px;">DRG CHECK</td> <td style="font-size: 6px;">L.MATTSSON</td> <td style="font-size: 6px;">09.12.22</td> </tr> <tr> <td style="font-size: 6px;">DESIGN</td> <td style="font-size: 6px;">C.BURNS</td> <td style="font-size: 6px;">09.12.22</td> </tr> <tr> <td style="font-size: 6px;">DESIGN CHECK</td> <td style="font-size: 6px;">L.MATTSSON</td> <td style="font-size: 6px;">09.12.22</td> </tr> <tr> <td style="font-size: 6px;">DESIGN MNGR</td> <td style="font-size: 6px;">B.SPALDING</td> <td style="font-size: 6px;">09.12.22</td> </tr> <tr> <td style="font-size: 6px;">PROJECT MNGR</td> <td style="font-size: 6px;">L.HUANG</td> <td style="font-size: 6px;">09.12.22</td> </tr> </tbody> </table>		TITLE	NAME	DATE	DRAWN	C.BURNS	09.12.22	DRG CHECK	L.MATTSSON	09.12.22	DESIGN	C.BURNS	09.12.22	DESIGN CHECK	L.MATTSSON	09.12.22	DESIGN MNGR	B.SPALDING	09.12.22	PROJECT MNGR	L.HUANG	09.12.22		
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				ISSUE STATUS ISSUED FOR CONSTRUCTION		EDMS No.	SHEET No. RD-0031	ISSUE A		© Transport for NSW																						

LEGEND

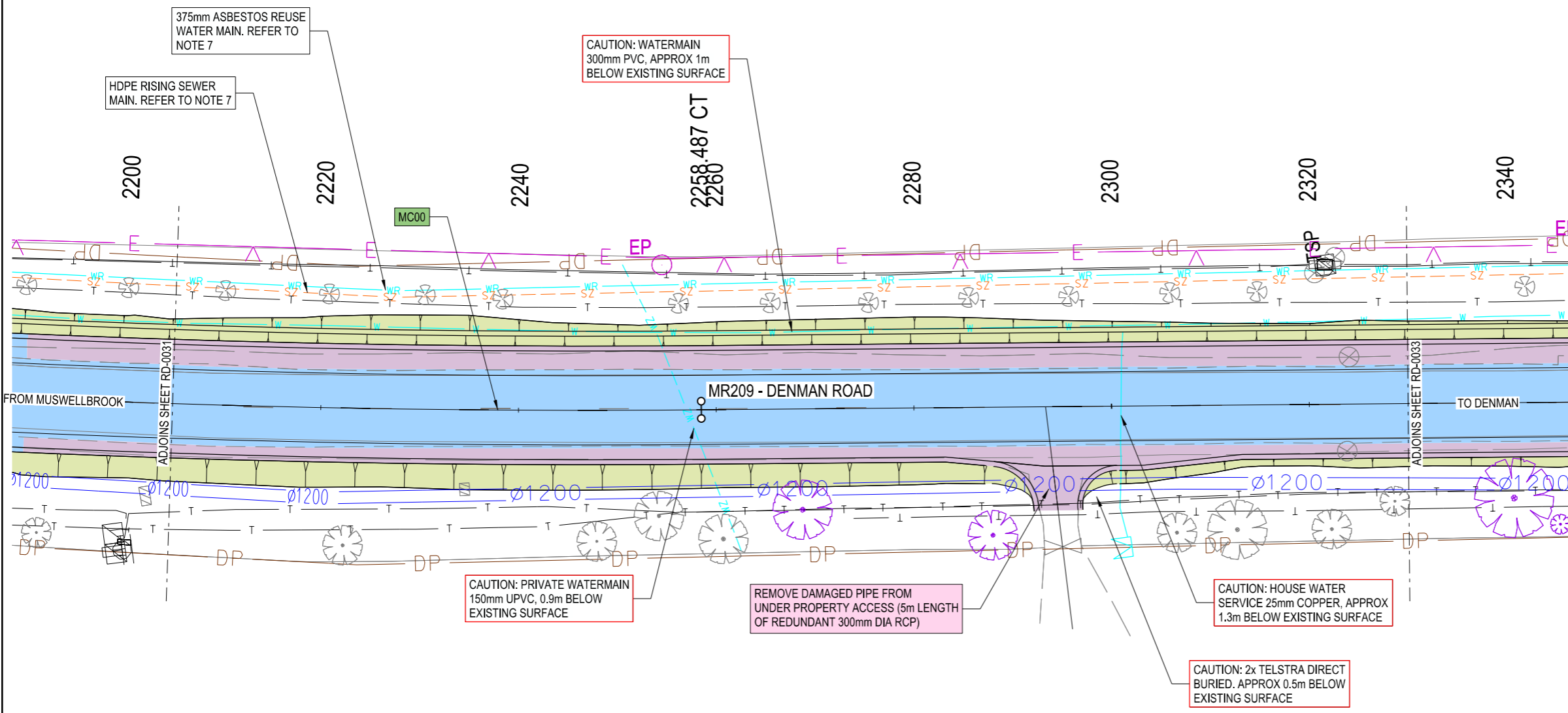
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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-DETAIL PLAN.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 DETAIL PLAN	A3	
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 SCALE 1:500m		DRAWN	C.BURNS	09.12.22
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							NSW GOVERNMENT Transport for NSW		NSW GOVERNMENT Transport for NSW	
							CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD	
							ASSETS NORTH REGIONAL AND OUTER METROPOLITAN		PREPARED FOR	
							TNSW REGISTRATION No.		DS2021 / 000702	
							ISSUE STATUS		ISSUED FOR CONSTRUCTION	
							EDMS No.		SHEET No. RD-0032	
									PART 1	
									ISSUE A	

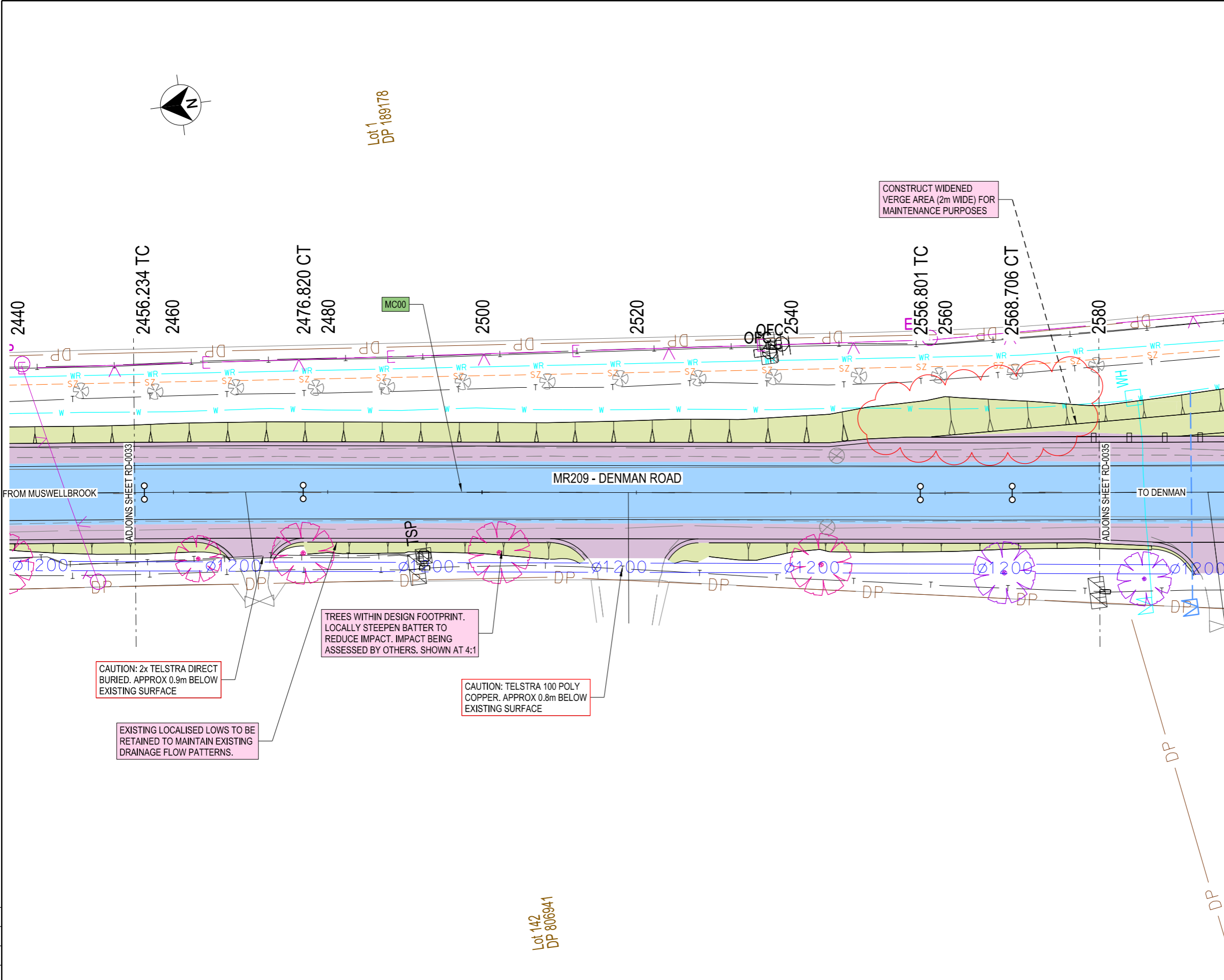
LEGEND

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- ✿ EXISTING TREE - MINOR ENCROACHMENT
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- ✿ EXISTING TREE - FEASIBILITY OF RETAINING TREE DURING CONSTRUCTION TO BE CONFIRMED WITH ARBORIST. TREE TO BE REPLACED IF IT CANNOT BE SAVED. REFER TO NOTE 8

NOTES

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3. ACCESS TO PROPERTIES TO BE MADE AVAILABLE BY THE CONTRACTOR AT ALL TIMES DURING CONSTRUCTION.
4. REFER TO SHEET RD-0002 FOR PAVEMENT PROFILES.
5. REFER TO MODEL DRAWING R0300-01 FOR KERB PROFILES.
6. REFER TO SHEETS GE-0003 AND GE-0004 FOR SURVEY FEATURE LEGEND.
7. HDPE RISING SEWER MAIN AND 375mm DIA ASBESTOS REUSE WATER MAIN WERE NOT FOUND ON SITE. DIGITISED LOCATION SHOWN BY SURVEYOR IN CONSULTATION WITH MSC.
8. REFER TO TREE AND HOLLOW REPLACEMENT PLANS FOR PROPOSED TREE PLANTING - CONTACT PROJECT MANAGER



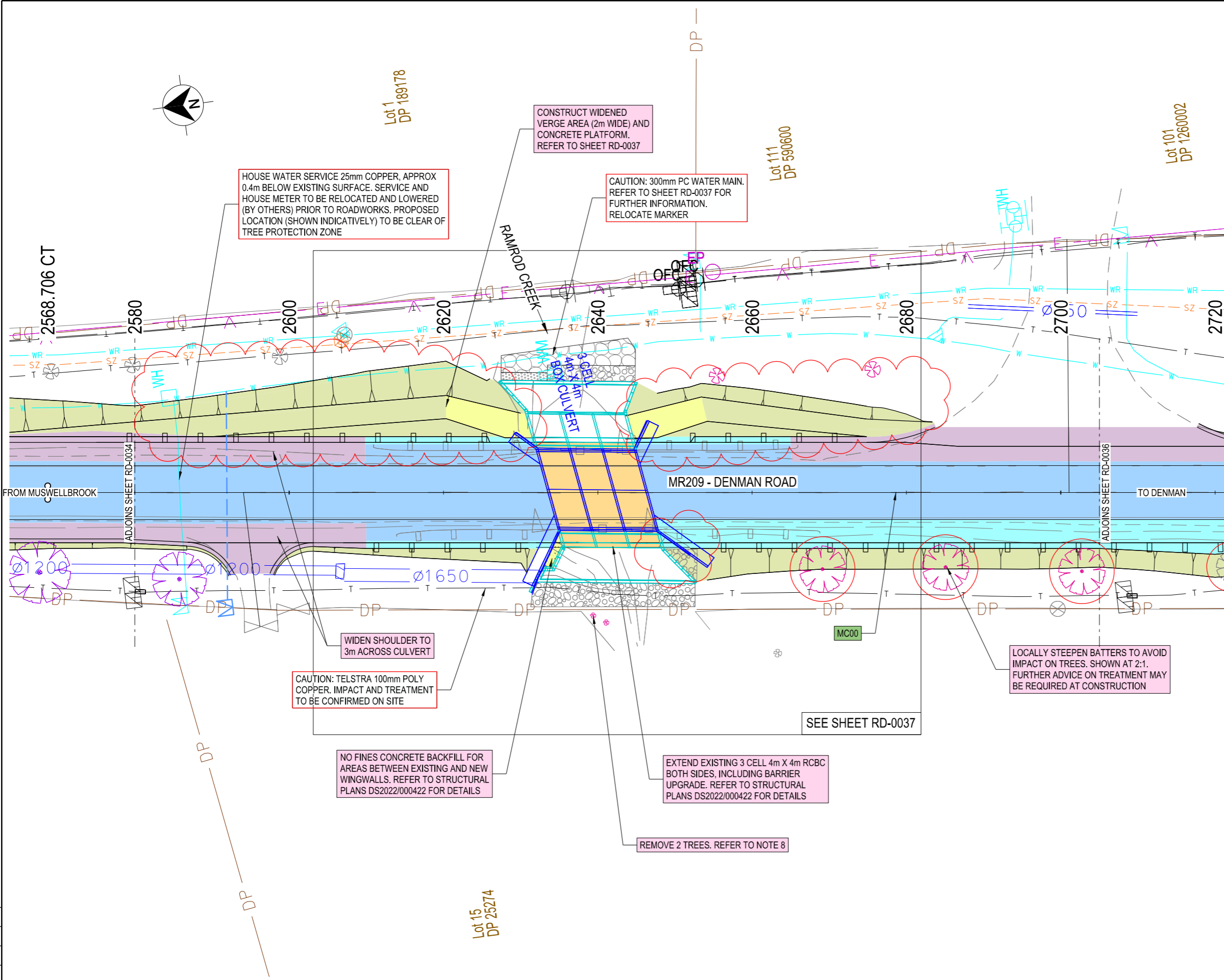
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XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 SCALE 1:500m		DRAWN	C.BURNS	08.02.23
	B	8-02-23	VERGE AND BATTER AT CULVERT AMENDED					DRG CHECK	L.MATTSSON	08.02.23
								DESIGN	C.BURNS	08.02.23
								DESIGN CHECK	L.MATTSSON	08.02.23
								DESIGN MNGR	B.SPALDING	08.02.23
								PROJECT MNGR	L.HUANG	08.02.23
CO-ORDINATE SYSTEM		HEIGHT DATUM		NSW GOVERNMENT		Transport for NSW		NSW GOVERNMENT		Transport for NSW
MGA ZONE 56 (GDA2020)		AHD						PREPARED FOR		ASSETS NORTH REGIONAL AND OUTER METROPOLITAN
								TNSW REGISTRATION No.		DS2021 / 000702
								ISSUE STATUS		ISSUED FOR CONSTRUCTION
								EDMS No.		
								SHEET No.		RD-0034
								PART		1
								ISSUE		B

ACCEPTED FOR CONSTRUCTION

LEGEND

- MC?? DESIGN CONTROL CALLOUT
- XXXX CONSTRUCTION CALLOUT
- PAVEMENT TYPE P1
- PAVEMENT TYPE P2
- PAVEMENT TYPE P3
- PAVEMENT TYPE P4
- VERGE AND BATTERS
- CONCRETE
- PROPOSED WATER SERVICE LOCATION
- ✿ EXISTING TREE - MINOR ENCROACHMENT
- ✿ EXISTING TREE - MAJOR ENCROACHMENT. REFER TO ARBORIST REPORT FOR FURTHER DETAILS AND PROTECTION ADVICE. CONTACT PROJECT MANAGER FOR REPORT
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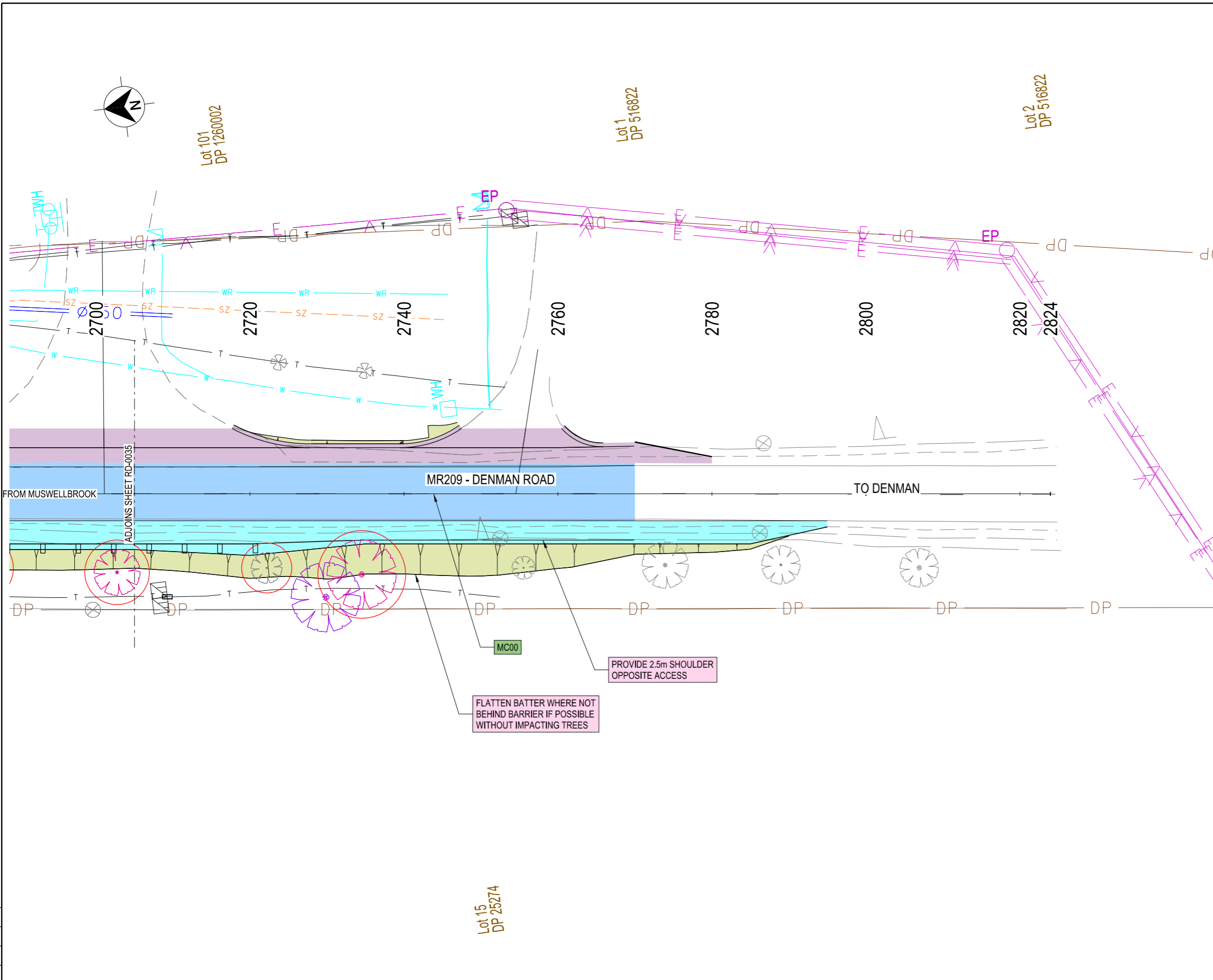
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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 SCALE 1:500m		DRAWN	C.BURNS	08.02.23
	B	8-02-23	VERGE AND BATTER AT CULVERT AMENDED					DRG CHECK	L.MATTSSON	08.02.23
								DESIGN	C.BURNS	08.02.23
								DESIGN CHECK	L.MATTSSON	08.02.23
								DESIGN MNGR	B.SPALDING	08.02.23
								PROJECT MNGR	L.HUANG	08.02.23
CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		NSW GOVERNMENT		Transport for NSW		NSW GOVERNMENT		Transport for NSW
								PREPARED FOR		ASSETS NORTH REGIONAL AND OUTER METROPOLITAN
								TNSW REGISTRATION No.		DS2021 / 000702
								ISSUE STATUS		ISSUED FOR CONSTRUCTION
								EDMS No.		
								SHEET No.		RD-0035
								PART		1
								ISSUE		B
© Transport for NSW										

LEGEND

- MC?? — DESIGN CONTROL CALLOUT
- XXXX — CONSTRUCTION CALLOUT
- PAVEMENT TYPE P1
- PAVEMENT TYPE P2
- PAVEMENT TYPE P3
- PAVEMENT TYPE P4
- VERGE AND BATTERS
- PROPOSED WATER SERVICE LOCATION
- ⊗ EXISTING TREE - MINOR ENCROACHMENT
- ⊗ EXISTING TREE - MAJOR ENCROACHMENT, REFER TO ARBORIST REPORT FOR FURTHER DETAILS AND PROTECTION ADVICE. CONTACT PROJECT MANAGER FOR REPORT
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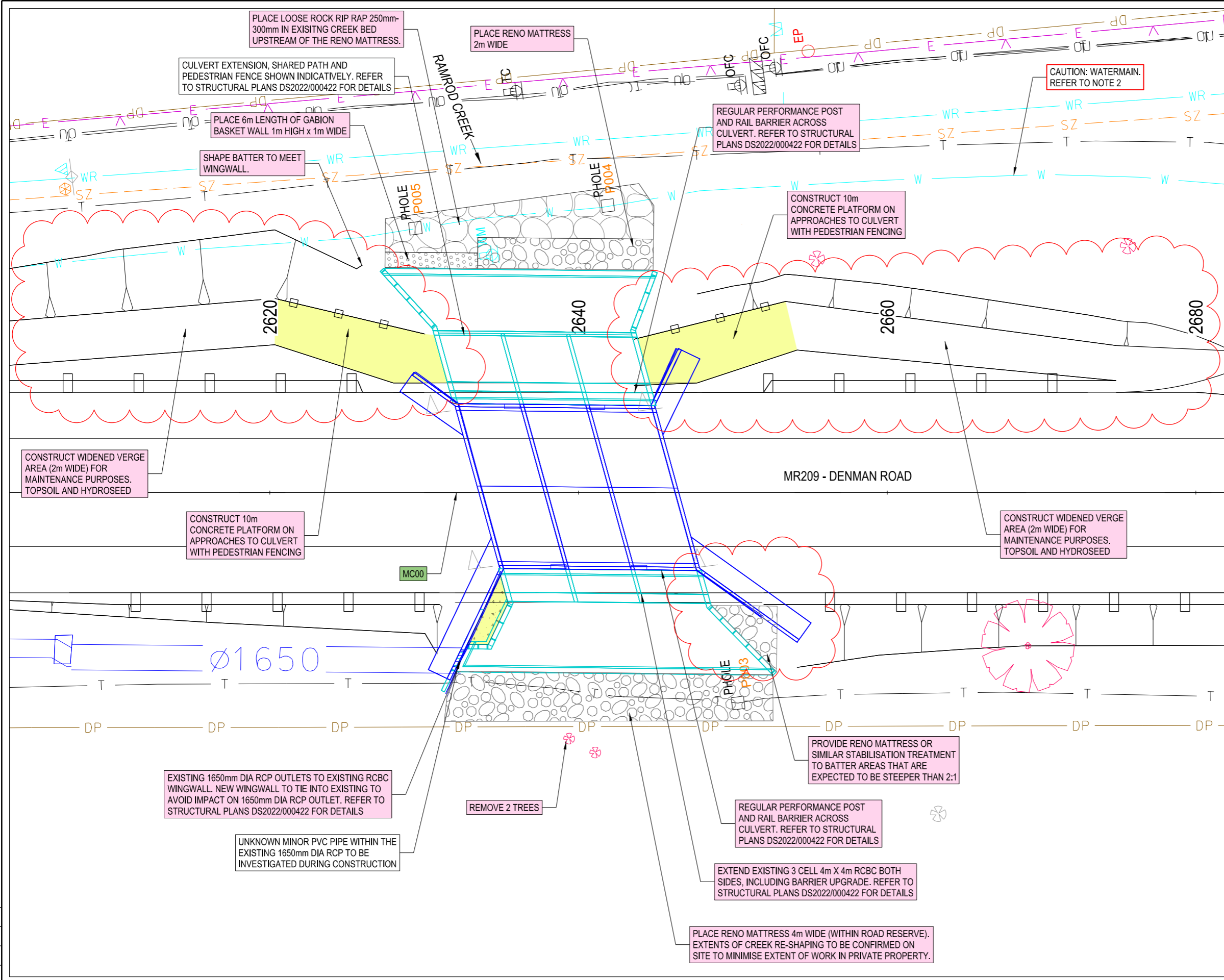
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		A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX				
						TITLE	NAME	DATE	PREPARED FOR	
						DRAWN	C.BURNS	09.12.22	ASSETS NORTH	
						DRG CHECK	L.MATTSSON	09.12.22	REGIONAL AND OUTER METROPOLITAN	
						DESIGN	C.BURNS	09.12.22		
						DESIGN CHECK	L.MATTSSON	09.12.22		
						DESIGN MNGR	B.SPALDING	09.12.22		
						PROJECT MNGR	L.HUANG	09.12.22		
								TNSW REGISTRATION No.	DS2021 / 000702	PART
								ISSUE STATUS	ISSUED FOR CONSTRUCTION	1
								EDMS No.		SHEET No.
										RD-0036
										ISSUE
										A



LEGEND

- ROCK RIP RAP 250-300mm
- RENO MATTRESS
- GABION BASKET WALL
- NO FINES CONCRETE BACKFILL
- PHOLE UTILITY POTHOLE LOCATION. REFER TO SEPARATE UTILITY REPORT (WITH PROJECT MANAGER)
- CONCRETE
- PEDESTRIAN FENCING

NOTES

- FOR ANY CREEK REMEDIATION WORK ON PRIVATE PROPERTY, PERMISSION TO ACCESS THE PROPERTY MUST BE AUTHORISED BY THE OWNER.

ACCEPTED FOR CONSTRUCTION

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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-CULVERT INSET.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT		 	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 DETAIL PLAN	A3
EXTERNAL REFERENCE FILES XXXXXX		WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	TITLE	NAME	DATE	PREPARED FOR			TNSW REGISTRATION No.
REV	DATE	AMENDMENT / REVISION DESCRIPTION		XX	0	2.5	5.0	7.5	10.0	DS2021 / 000702	1
A	9-12-22	ISSUED FOR CONSTRUCTION		XXX	SCALE 1:250m		DRAWINGS / DESIGN PREPARED BY		CO-ORDINATE SYSTEM	HEIGHT DATUM	ISSUE
B	8-02-23	CONCRETE AREAS AND FENCING ADJACENT TO CULVERT ADDED. VERGE AND BATTER AMENDED. NO FINES CONCRETE INFILL AREAS REMOVED FROM ADJACENT TO WINGWALLS.			MGA ZONE 56 (GDA2020)		 		AHD	ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	B
DESIGN CHECK		DESIGN CHECK		DESIGN MNGR		PROJECT MNGR		EDMS No.	SHEET No.	ISSUED FOR CONSTRUCTION	RD-0037
L.MATTSSON		L.MATTSSON		B.SPALDING		L.HUANG					
08.02.23		08.02.23		08.02.23		08.02.23					




DESIGN FEATURES

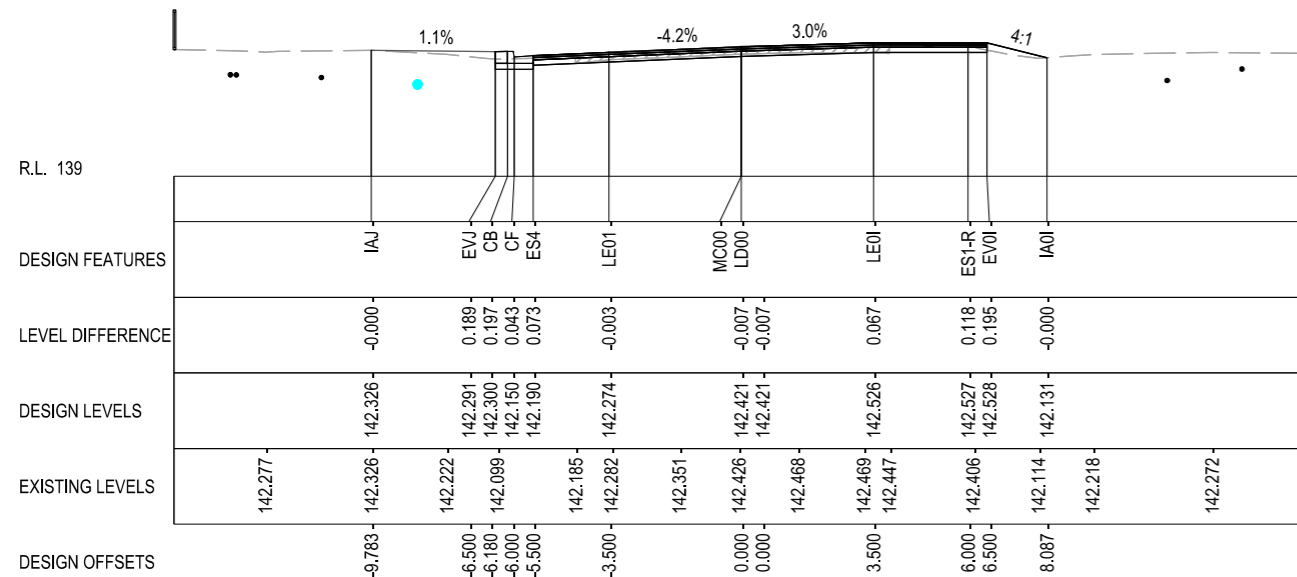
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 CF = SA GUTTER FLOW LINE
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NOTES

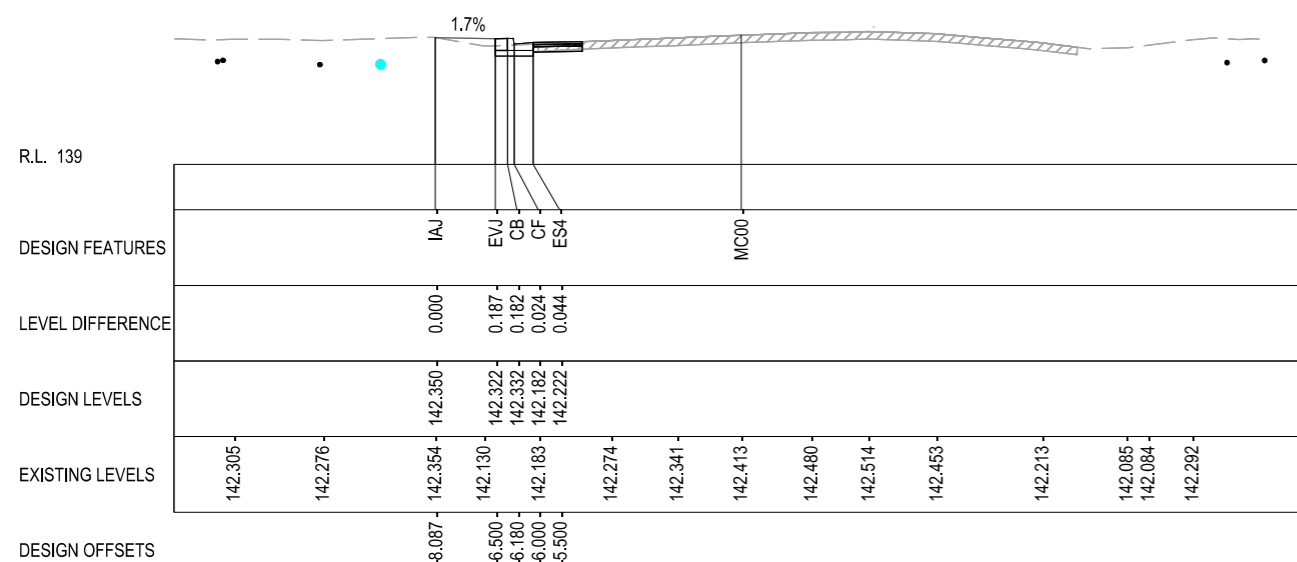
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LEGEND

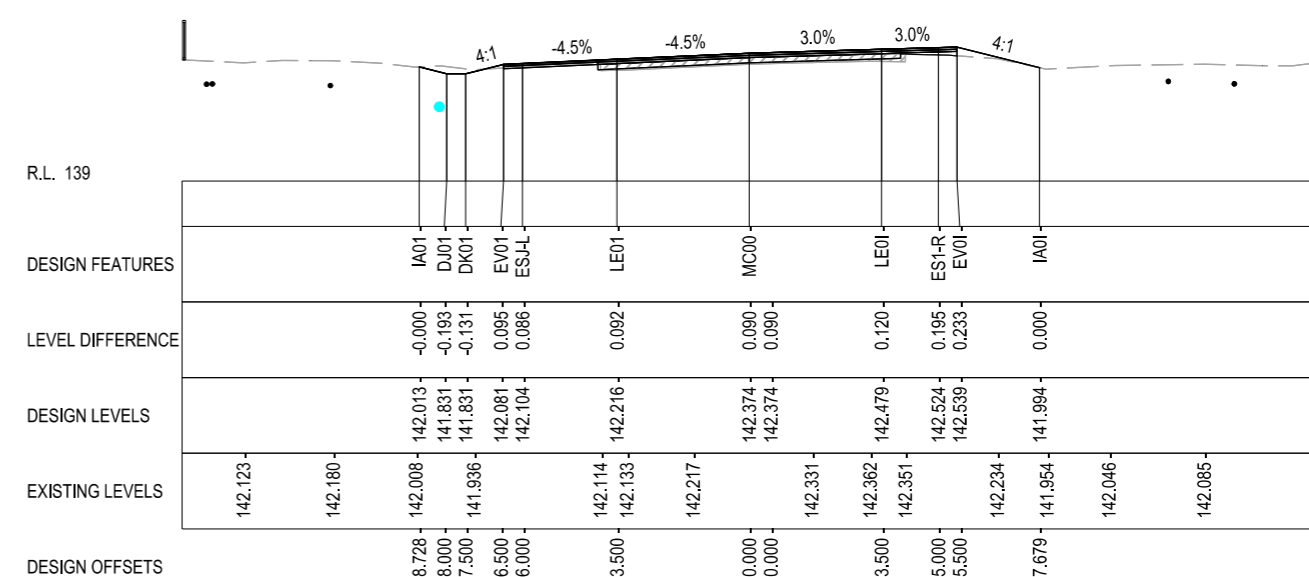
-  EXTENT OF EXISTING PAVEMENT
-  POST AND RAIL SAFETY BARRIER
-  EXISTING POST AND RAIL SAFETY BARRIER



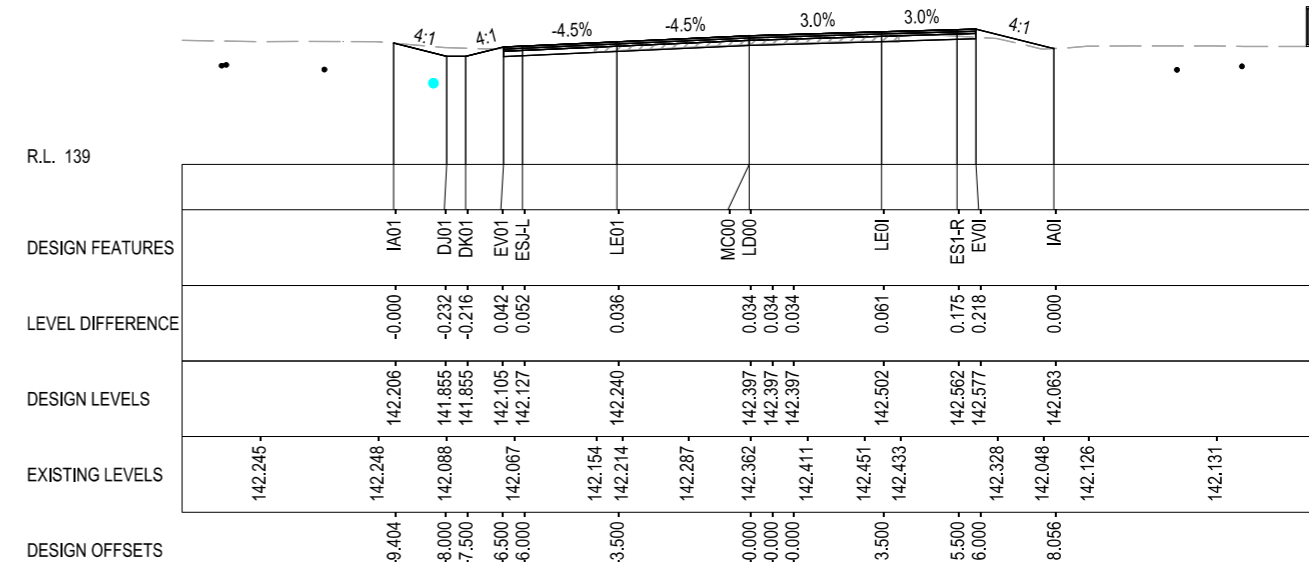
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2145.000



2200.000



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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TNSW REGISTRATION No. DS2021 / 000702	PART 1
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 2 4 6 8 SCALE 1:200m	L.MATTSSON C.BURNS L.MATTSSON B.SPALDING L.HUANG	ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	ISSUE A
				CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		ISSUED FOR CONSTRUCTION	EDMS No.
								SHEET No. RC-0001	ISSUE A






DESIGN FEATURES

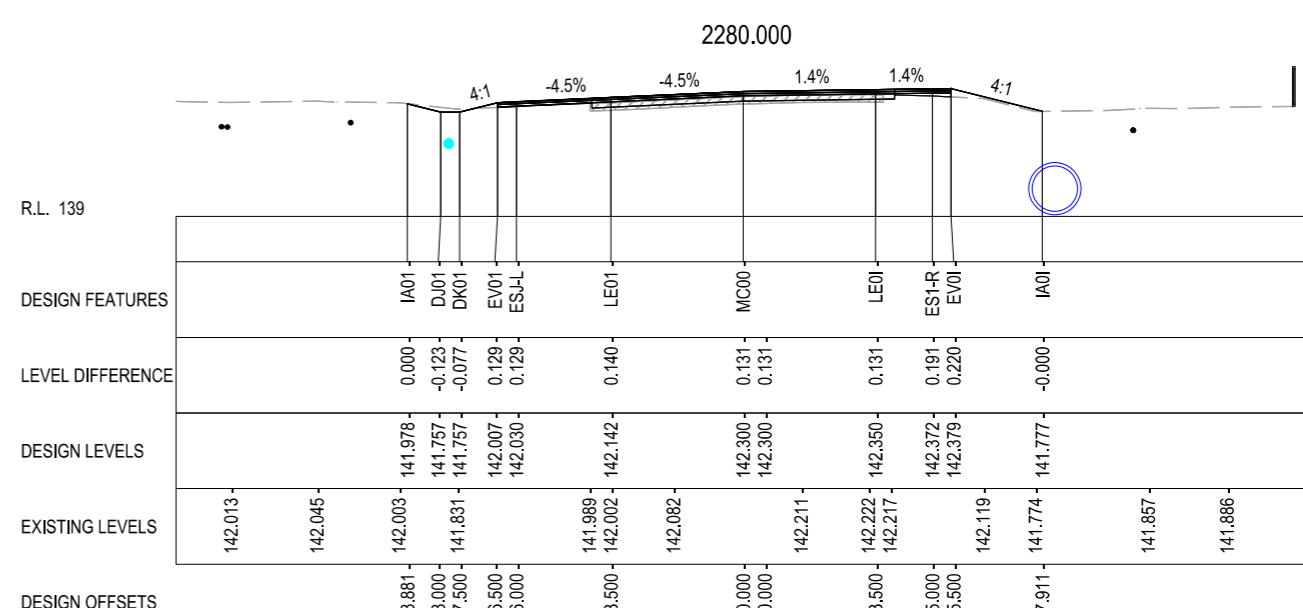
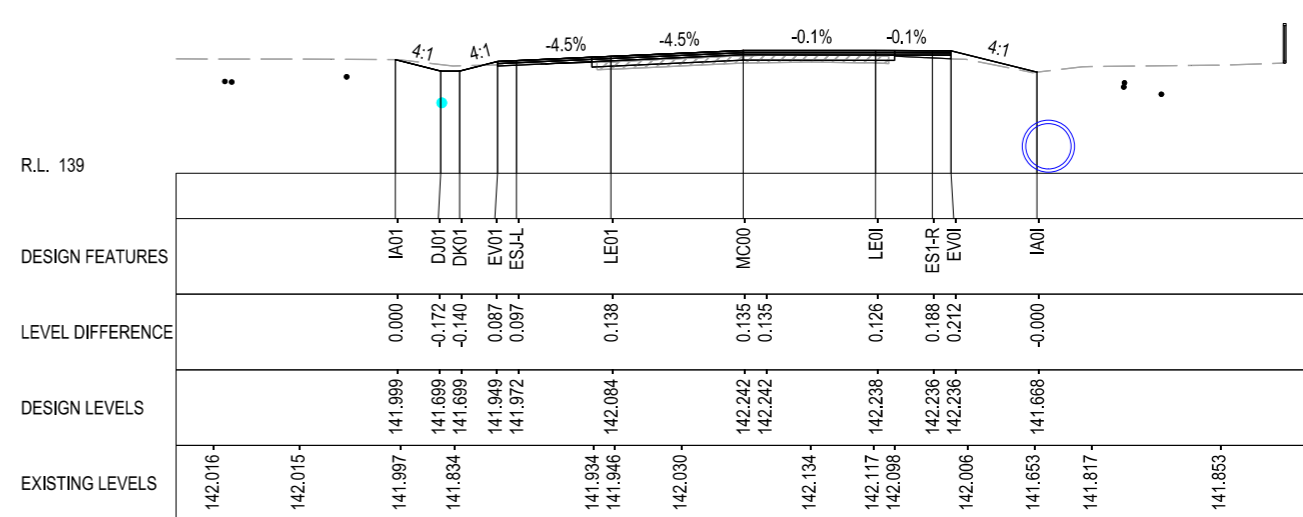
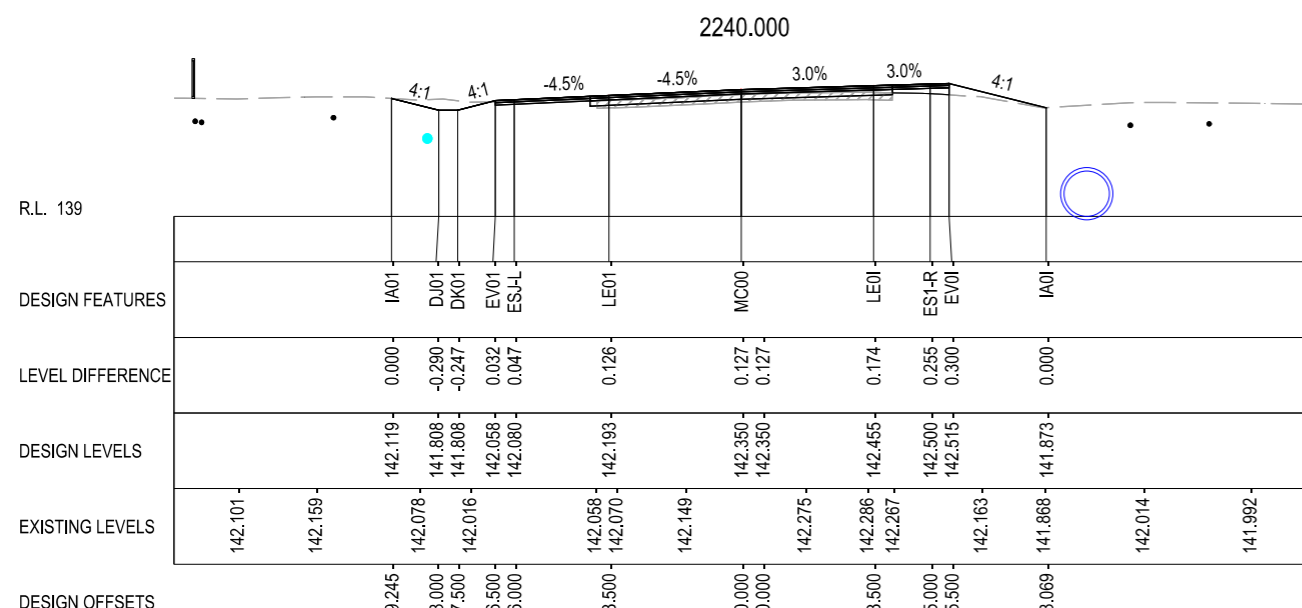
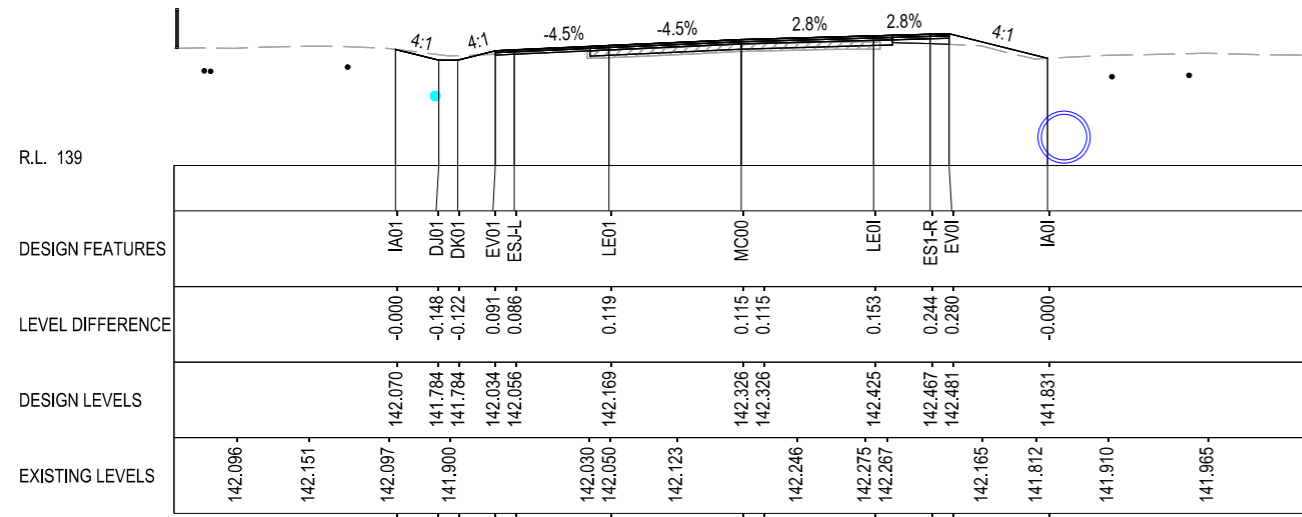
LE = EDGE LINE
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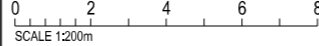

LEGEND

-  EXTENT OF EXISTING PAVEMENT
-  POST AND RAIL SAFETY BARRIER
-  EXISTING POST AND RAIL SAFETY BARRIER



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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY	
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	 SCALE 1:200m		 Transport for NSW	
TITLE		NAME	DATE	PREPARED FOR		ASSETS NORTH REGIONAL AND OUTER METROPOLITAN		TNSW REGISTRATION No.	PART
DRAWN		C.BURNS	09.12.22	DS2021 / 000702		ISSUE STATUS		ISSUED FOR CONSTRUCTION	1
DRG CHECK		L.MATTSSON	09.12.22	EDMS No.		SHEET No.		RC-0002	ISSUE
DESIGN		C.BURNS	09.12.22	SHEET No.		ISSUE		A	
DESIGN CHECK		L.MATTSSON	09.12.22	PROJECT MNGR		L.HUANG		© Transport for NSW	
DESIGN MNGR		B.SPALDING	09.12.22						
PROJECT MNGR		L.HUANG	09.12.22						




DESIGN FEATURES

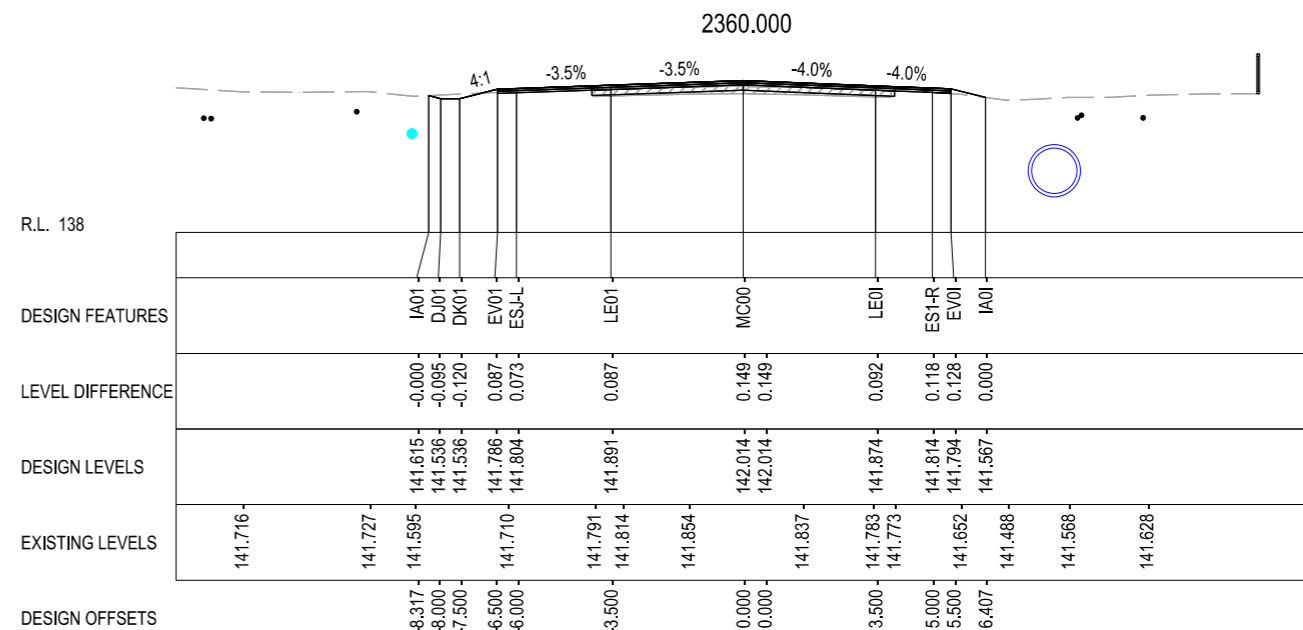
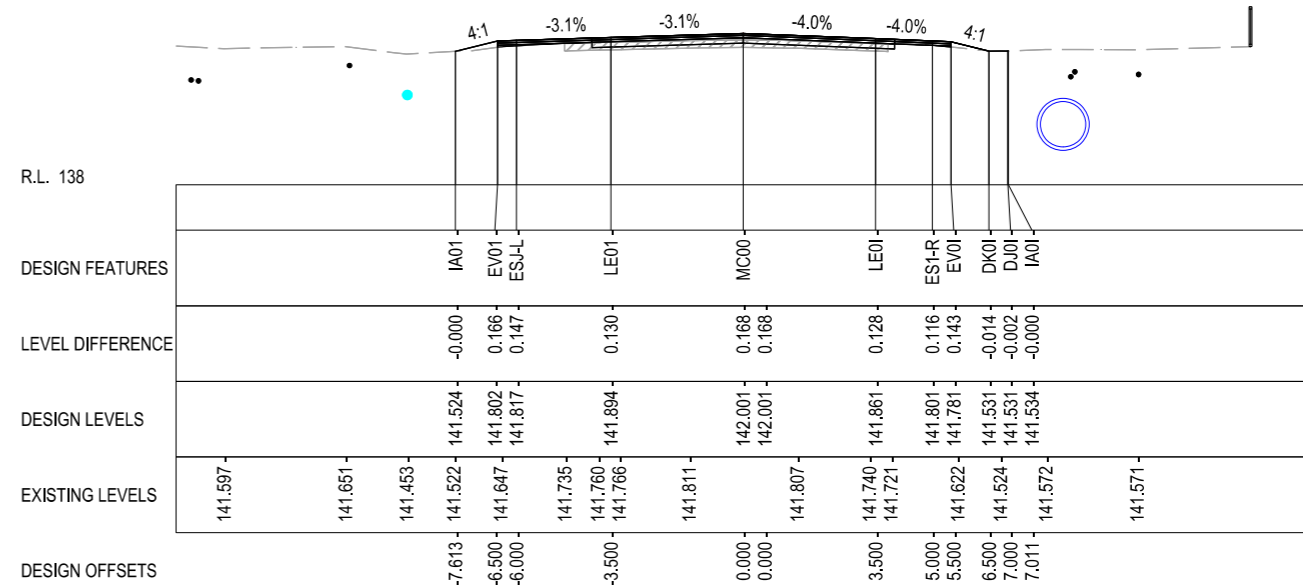
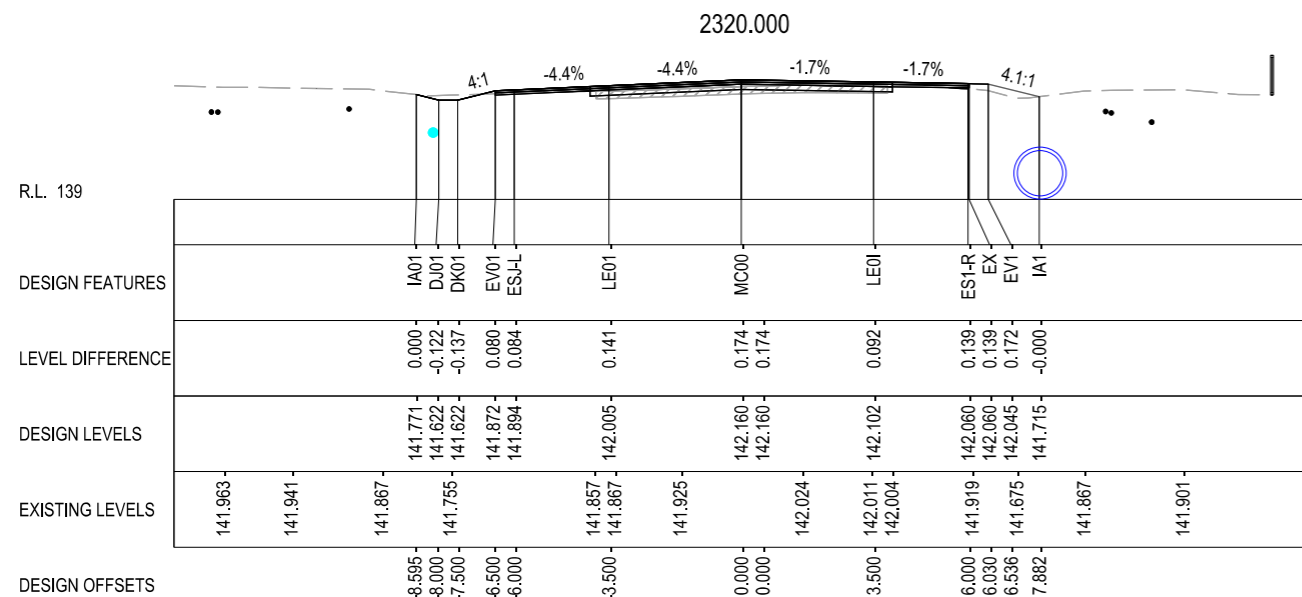
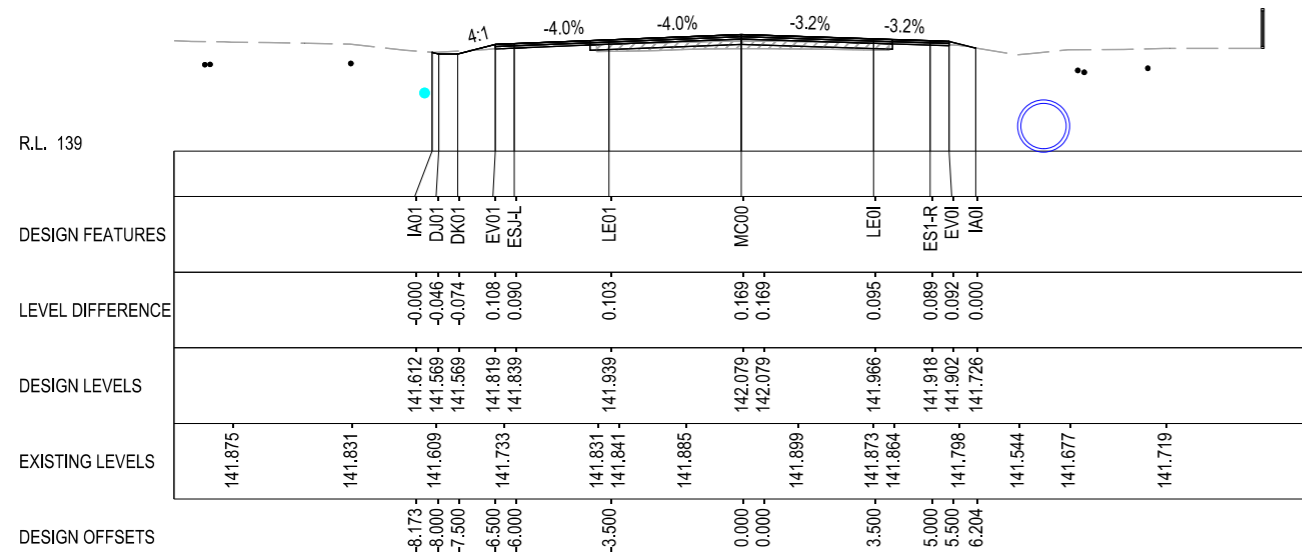
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LEGEND

-  EXTENT OF EXISTING PAVEMENT
-  POST AND RAIL SAFETY BARRIER
-  EXISTING POST AND RAIL SAFETY BARRIER



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CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		TITLE DRAWN C.BURNS 09.12.22	NAME L.MATTSSON 09.12.22	DATE 09.12.22	PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN
DESIGN CHECK L.MATTSSON 09.12.22		DESIGN MNGR B.SPALDING 09.12.22		PROJECT MNGR L.HUANG 09.12.22		TNSW REGISTRATION No. DS2021 / 000702	PART 1
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DESIGN FEATURES

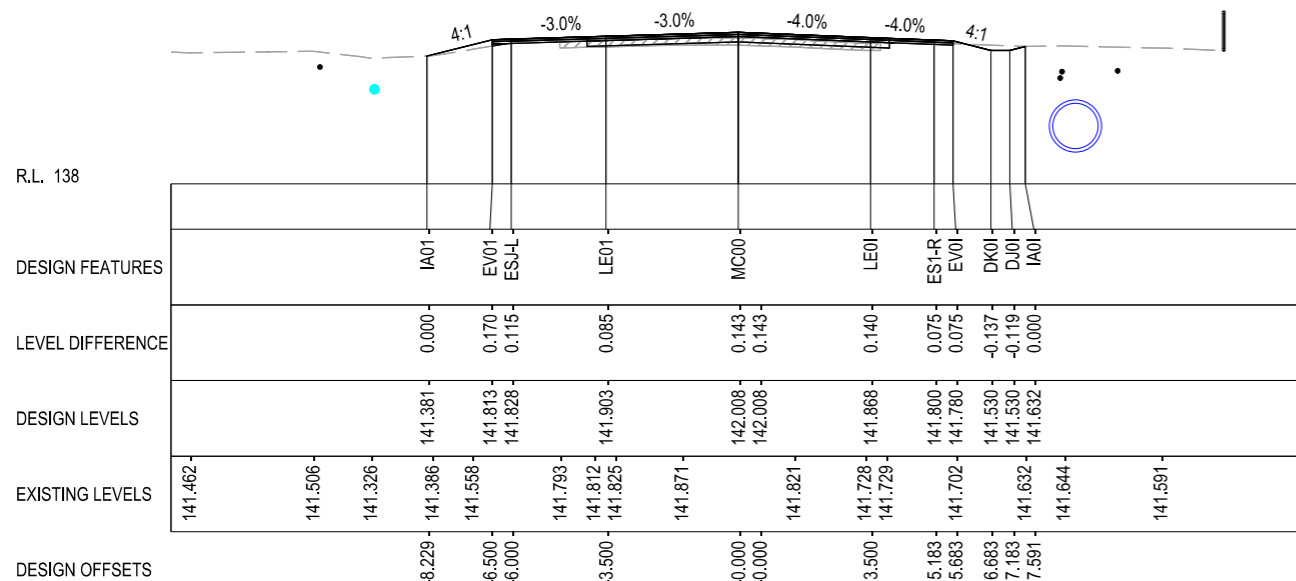
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 CB = BACK OF KERB

NOTES

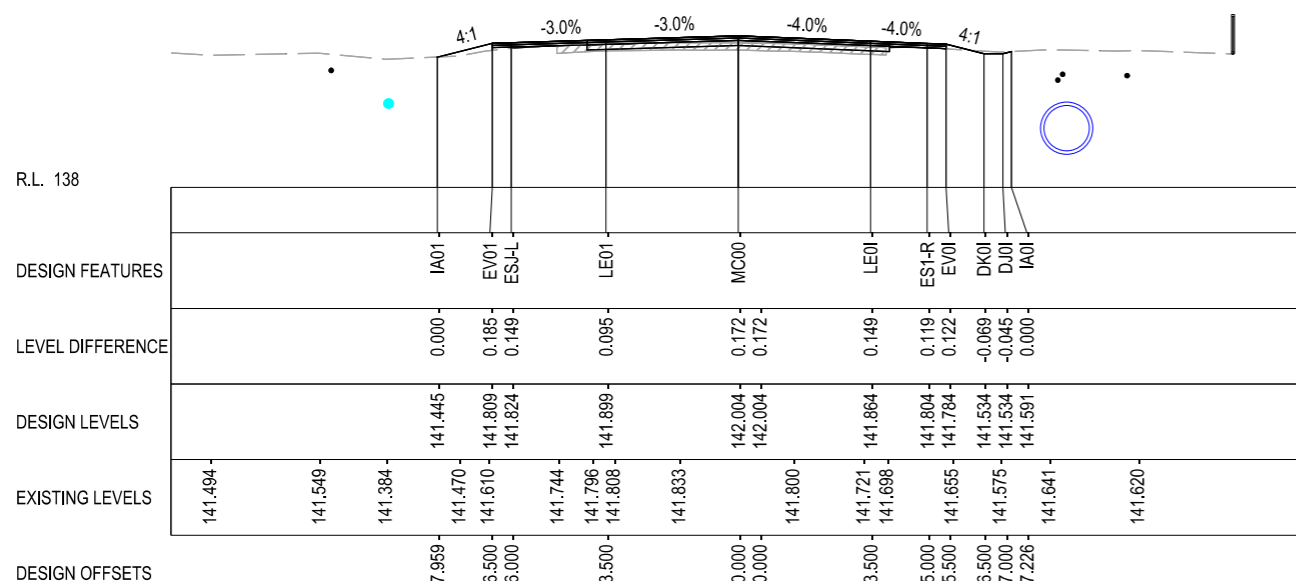
1. HDPE RISING SEWER MAIN AND 375mm DIA ASBESTOS REUSE WATER MAIN WERE NOT FOUND ON SITE AND HAVE THEREFORE NOT BEEN SHOWN ON THE CROSS SECTIONS. REFER TO DETAIL PLANS FOR DIGITISED LOCATION.
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LEGEND

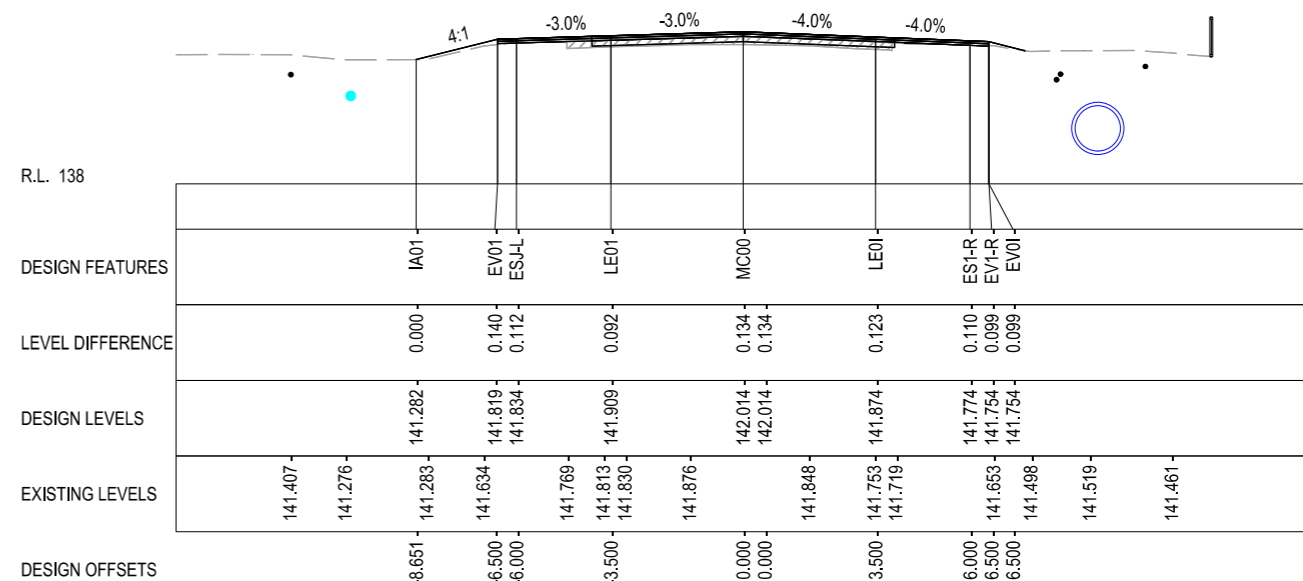
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-  POST AND RAIL SAFETY BARRIER
-  EXISTING POST AND RAIL SAFETY BARRIER



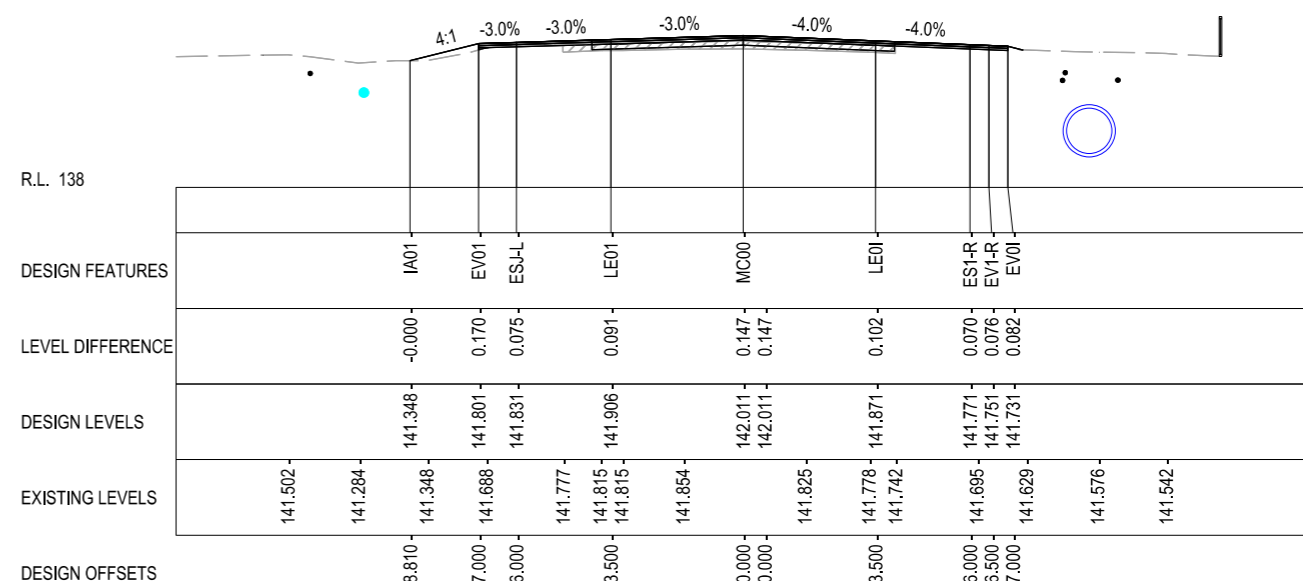
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2380.000



2440.000



2420.000

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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TNSW REGISTRATION No. DS2021 / 000702	PART 1
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 2 4 6 8 SCALE 1:200m	L.MATTSSON C.BURNS L.MATTSSON B.SPALDING L.HUANG	ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	ISSUE STATUS ISSUED FOR CONSTRUCTION
						CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)	HEIGHT DATUM AHD	EDMS No.	SHEET No. RC-0004
								ISSUED FOR CONSTRUCTION	ISSUE A






DESIGN FEATURES

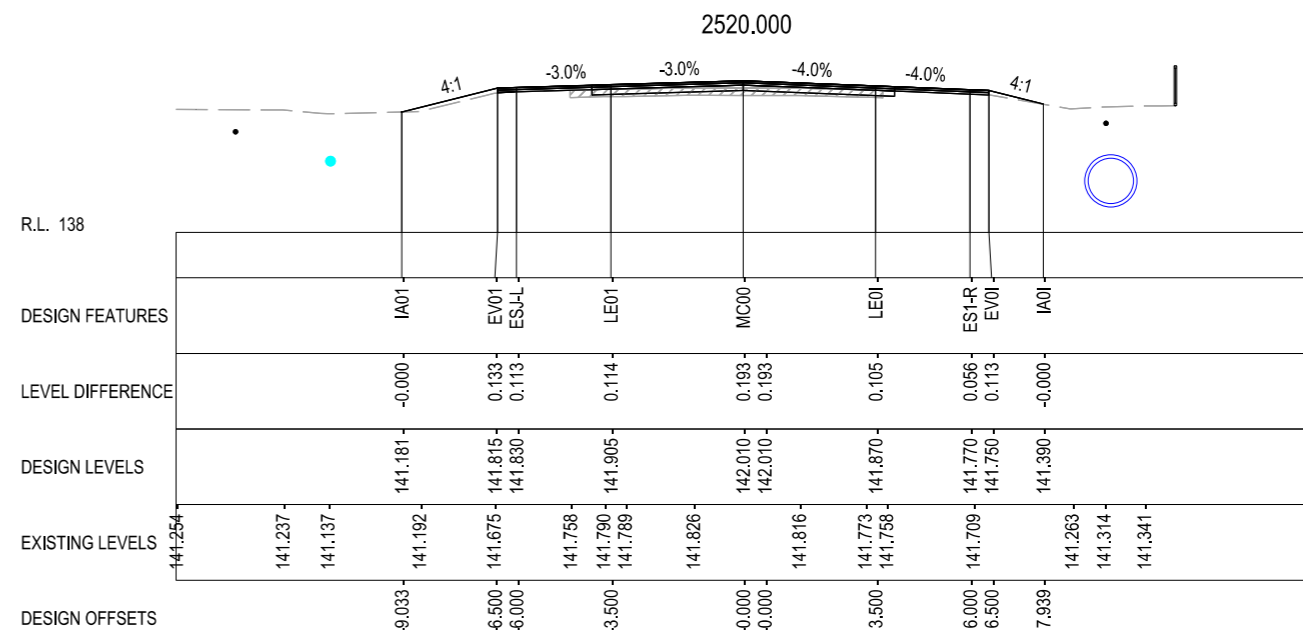
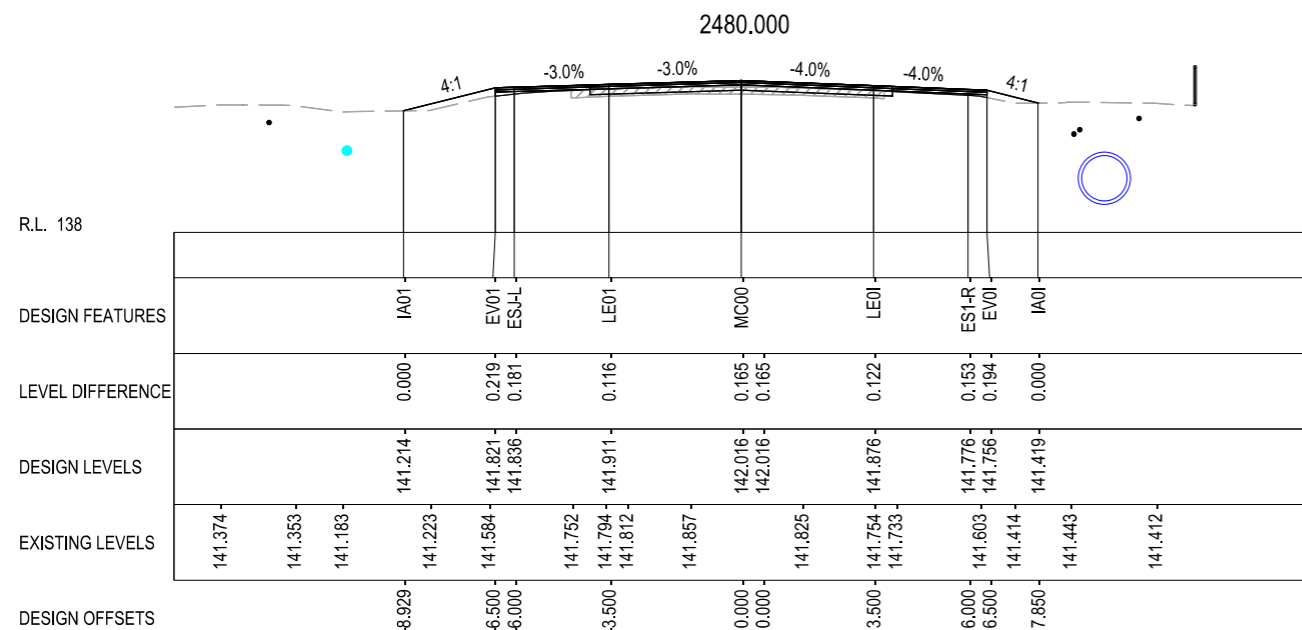
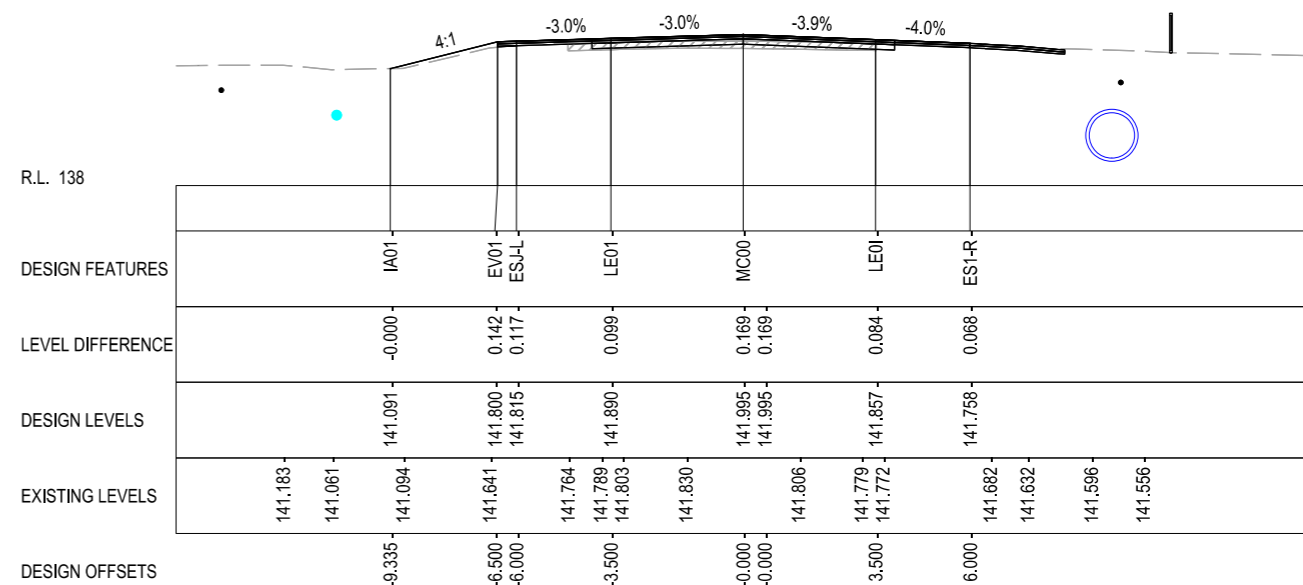
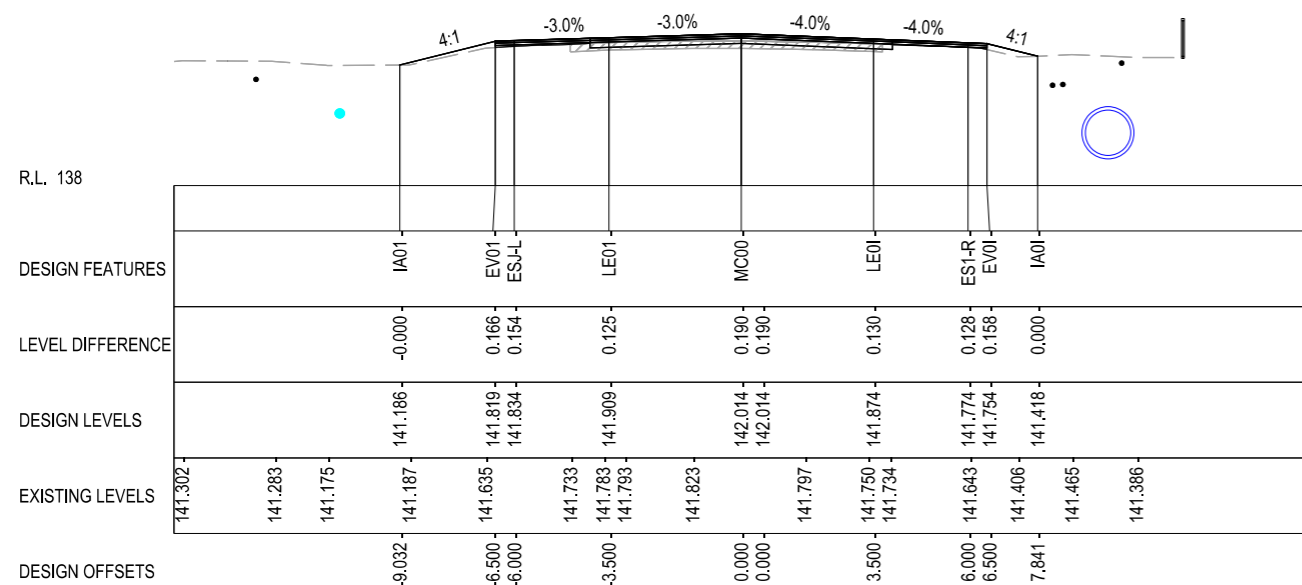
LE = EDGE LINE
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 EV = EDGE OF VERGE
 DK / DJ = TABLE DRAIN
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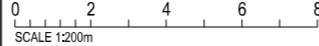

LEGEND

-  EXTENT OF EXISTING PAVEMENT
-  POST AND RAIL SAFETY BARRIER
-  EXISTING POST AND RAIL SAFETY BARRIER



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DRAWING FILE LOCATION / NAME C:\Data\Workssets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\XSEC OPT2 - Copy.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 CROSS SECTION	A3
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY	
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	 SCALE 1:200m		 Transport for NSW	
TITLE		NAME	DATE	PREPARED FOR		ASSETS NORTH REGIONAL AND OUTER METROPOLITAN		TNSW REGISTRATION No.	PART
DRAWN		C.BURNS	09.12.22	DS2021 / 000702		ISSUE STATUS		EDMS No.	SHEET No.
DRG CHECK		L.MATTSSON	09.12.22	ISSUED FOR CONSTRUCTION		RC-0005		ISSUE	A
DESIGN		C.BURNS	09.12.22					© Transport for NSW	
DESIGN CHECK		L.MATTSSON	09.12.22						
DESIGN MNGR		B.SPALDING	09.12.22						
PROJECT MNGR		L.HUANG	09.12.22						




DESIGN FEATURES

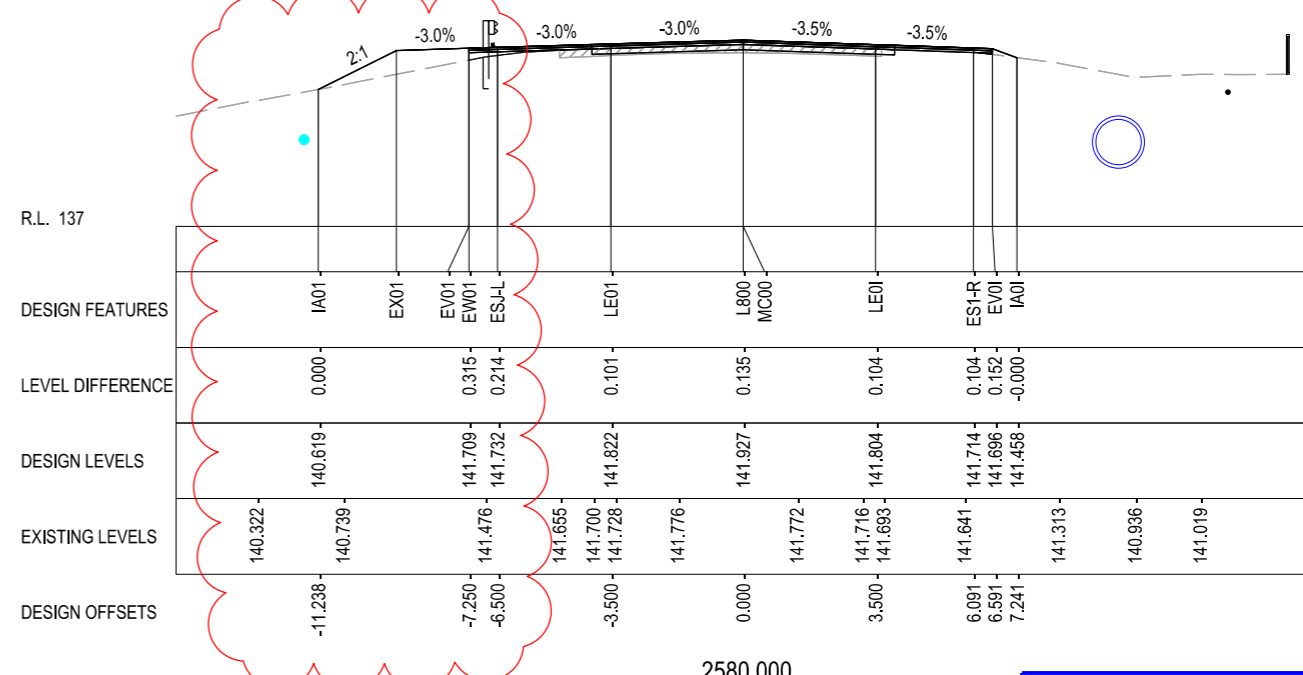
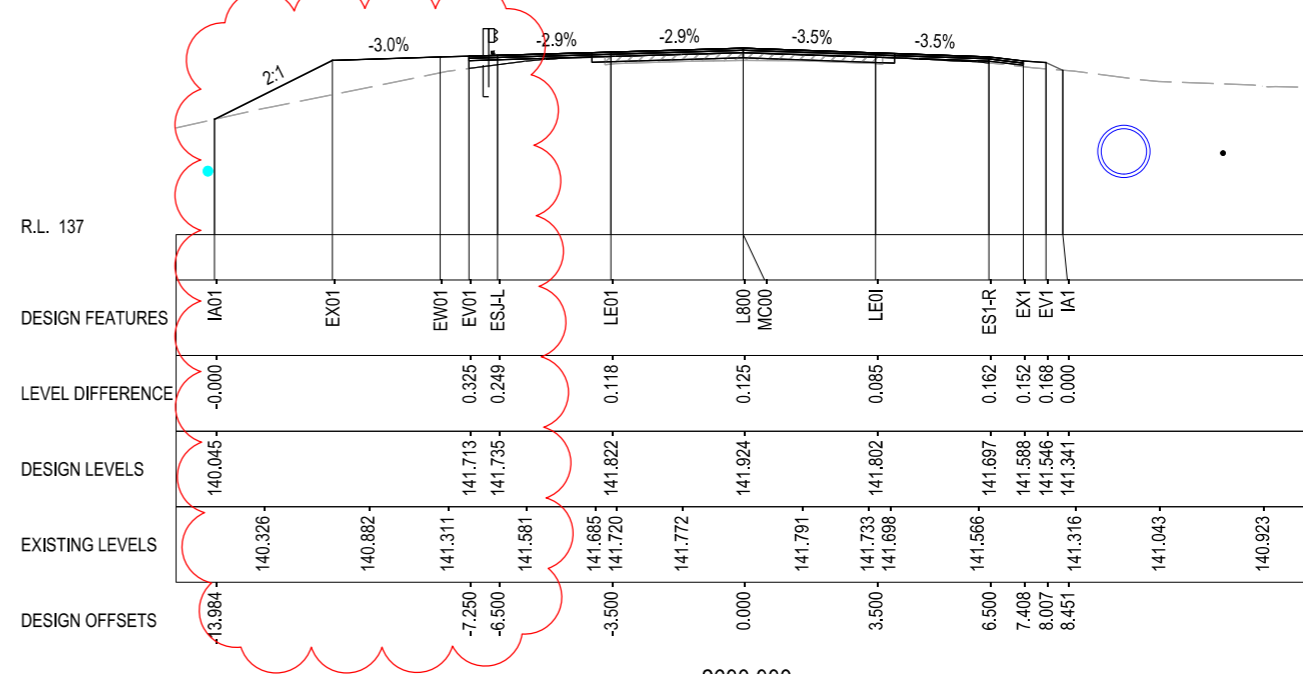
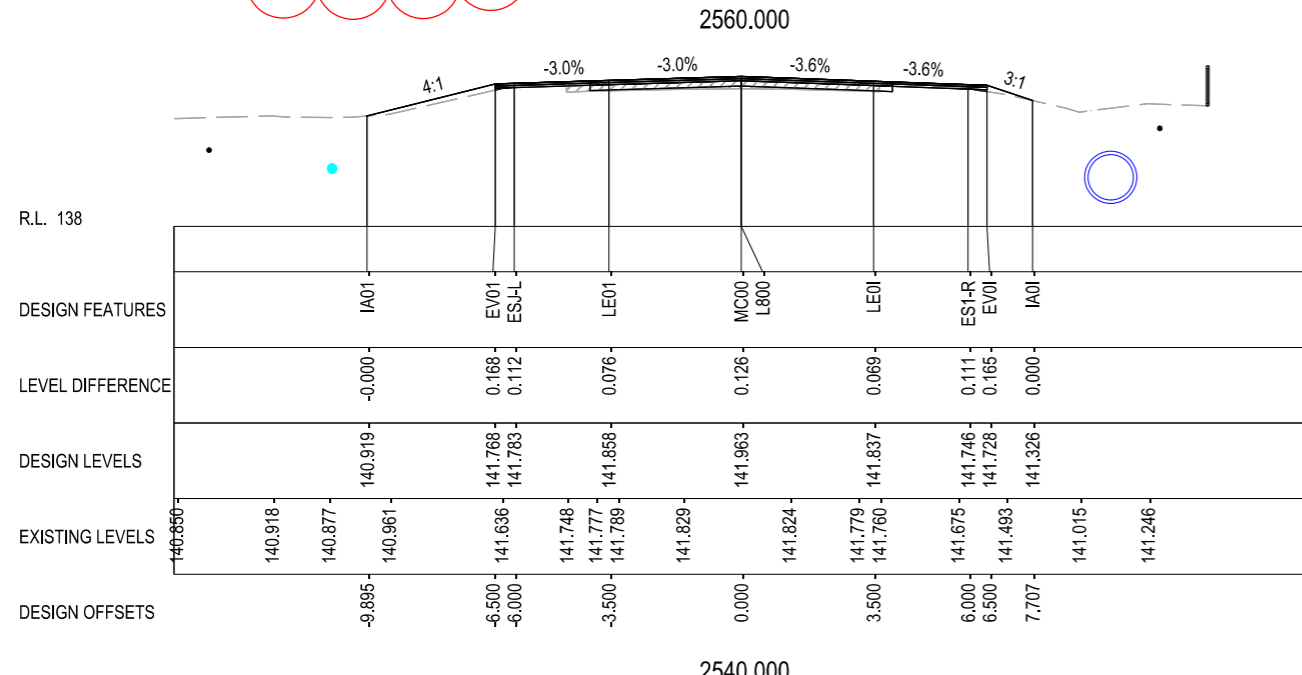
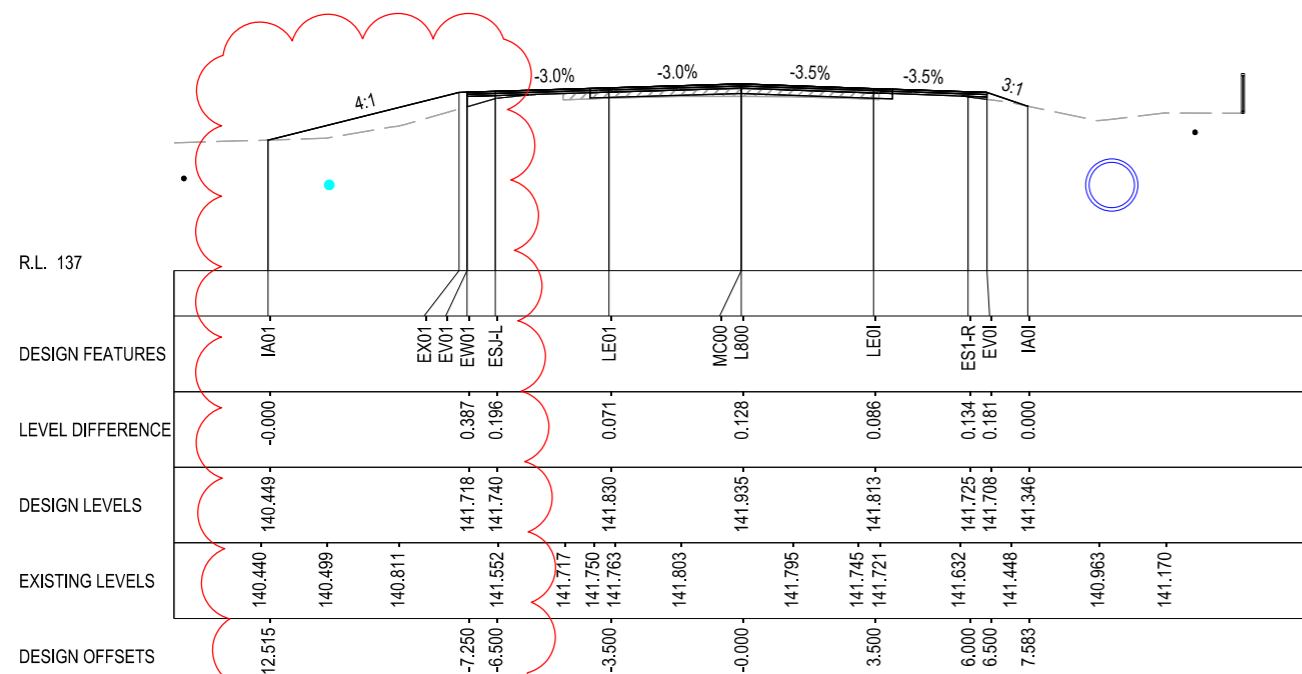
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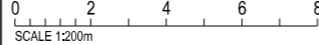


LEGEND

-  EXTENT OF EXISTING PAVEMENT
-  POST AND RAIL SAFETY BARRIER
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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE	 	PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	TNSW REGISTRATION No.	DS2021 / 000702	PART	1				
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX		 	DRAWN	C.BURNS	08.02.23			ISSUE STATUS	ISSUED FOR CONSTRUCTION	EDMS No.		SHEET No.	RC-0006	ISSUE	B
	B	8-02-23	VERGE AND BATTER AT CULVERT AMENDED					CO-ORDINATE SYSTEM	HEIGHT DATUM	DESIGN CHECK			L.MATTSSON	08.02.23						
						MGA ZONE 56 (GDA2020)	AHD	DESIGN MNGR	B.SPALDING	08.02.23										
								PROJECT MNGR	L.HUANG	08.02.23										




DESIGN FEATURES

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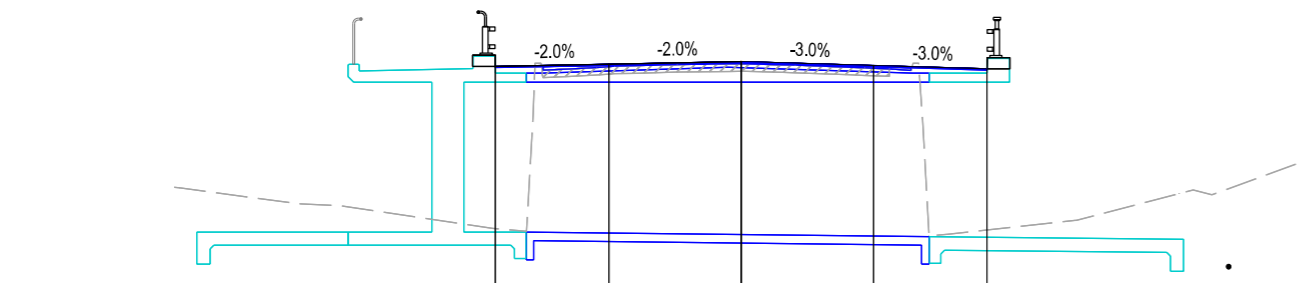
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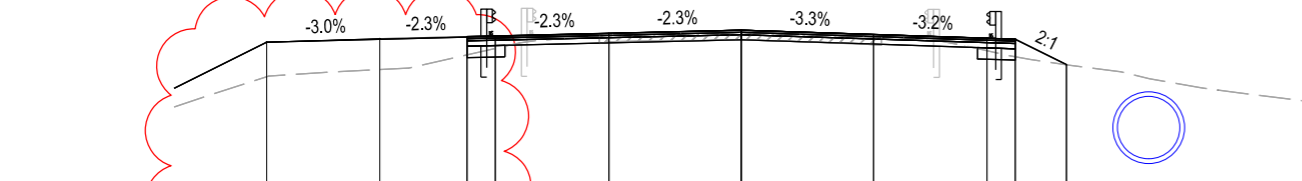
-  EXTENT OF EXISTING PAVEMENT
-  POST AND RAIL SAFETY BARRIER
-  EXISTING POST AND RAIL SAFETY BARRIER

RAMROD CREEK CULVERT. REFER TO SEPARATE STRUCTURAL PLANS DS2022/000422 FOR EXTENSION AND BARRIER DETAILS



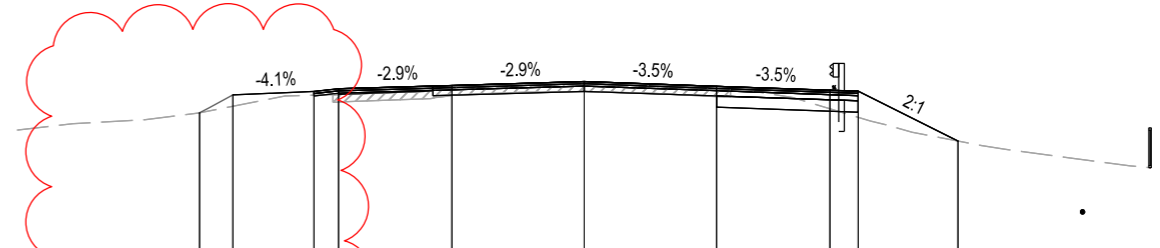
R.L. 134									
DESIGN FEATURES	ESJ-L	LE01	L800 MC00	LE01	ES1-R				
LEVEL DIFFERENCE	4.290	0.064	0.058	0.073	4.262				
DESIGN LEVELS	141.789	141.849	141.919	141.814	141.724				
EXISTING LEVELS	138.577	141.876 141.693	141.762 141.797	141.839	141.824	141.753 141.726 141.683 141.872	137.722		
DESIGN OFFSETS	-6.500	-3.500	0.000	3.500	6.500				

2640.000



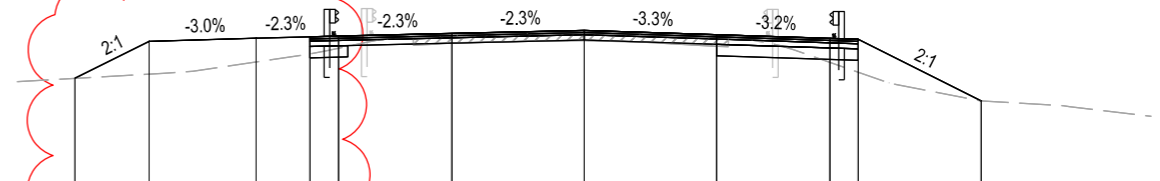
R.L. 137										
DESIGN FEATURES	EX01	EW01	EV01	ES-L	LE01	L800 MC00	LE01	ES1-R	EV01	IA01
LEVEL DIFFERENCE			0.485	0.332	0.028	0.056	0.070	0.328	0.464	0.000
DESIGN LEVELS			141.753	141.770	141.840	141.922	141.808	141.711	141.686	141.010
EXISTING LEVELS	140.713	140.919	141.592	141.769 141.817	141.848	141.822	141.755 141.730	141.515	141.150	140.825
DESIGN OFFSETS			-7.250	-6.500	-3.500	0.000	3.500	6.500	7.250	8.602

2620.000



R.L. 137										
DESIGN FEATURES	IA1	EV1	EX3	ESJ-L	LE01	L800 MC00	LE01	ES1-R	EV01	IA01
LEVEL DIFFERENCE		0.002	0.304	0.088	0.150	0.064	0.073	0.492	0.692	-0.000
DESIGN LEVELS		141.122	141.596	141.685	141.756	141.843	141.945	141.823	141.718	140.373
EXISTING LEVELS	140.938	141.113	141.566	141.601	141.693 141.722	141.797	141.864	141.844	141.759 141.730	141.521
DESIGN OFFSETS		-10.171	-9.292	-7.145	-6.500	-3.500	0.000	3.500	6.500	7.250

2680.000



R.L. 137											
DESIGN FEATURES	IA01	EX01	EW01	EV01	ES-L	LE01	MC00 L800	LE01	ES1-R	EV01	IA01
LEVEL DIFFERENCE	0.000			0.451	0.320	0.054	0.070	0.104	0.635	0.871	0.000
DESIGN LEVELS	140.650			141.748	141.765	141.835	141.917	141.803	141.706	141.681	140.066
EXISTING LEVELS		140.837		141.359	141.729 141.761	141.792	141.833	141.812	141.710 141.687	141.458	140.529
DESIGN OFFSETS				-7.250	-6.500	-3.500	0.000	3.500	6.500	7.250	10.501

2660.000

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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 2 4 6 8 SCALE 1:200m		DRAWN	C.BURNS	08.02.23
	B	8-02-23	VERGE AND BATTER AT CULVERT AMENDED					DRG CHECK	L.MATTSSON	08.02.23
								DESIGN	C.BURNS	08.02.23
								DESIGN CHECK	L.MATTSSON	08.02.23
								DESIGN MNGR	B.SPALDING	08.02.23
								PROJECT MNGR	L.HUANG	08.02.23
CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		NSW GOVERNMENT Transport for NSW		NSW GOVERNMENT Transport for NSW		PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN		TNSW REGISTRATION No. DS2021 / 000702
								ISSUE STATUS ISSUED FOR CONSTRUCTION		EDMS No.
										SHEET No. RC-0007
										PART 1
										ISSUE B




DESIGN FEATURES

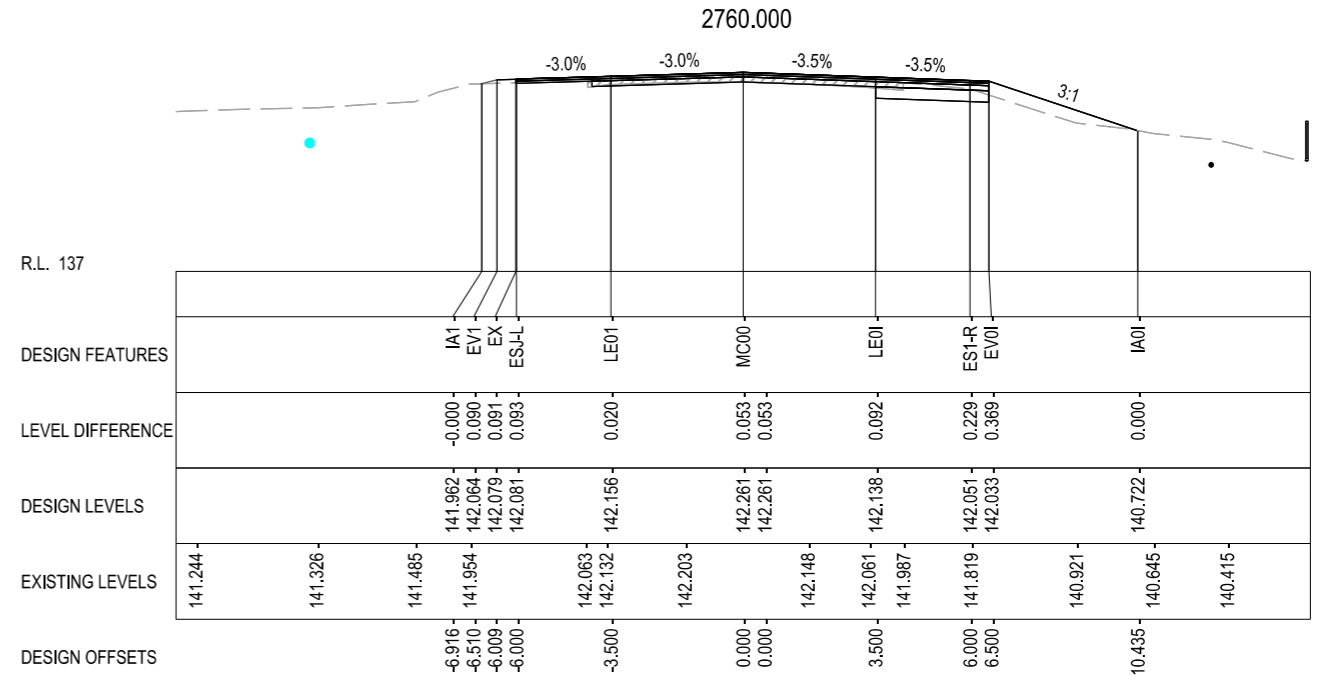
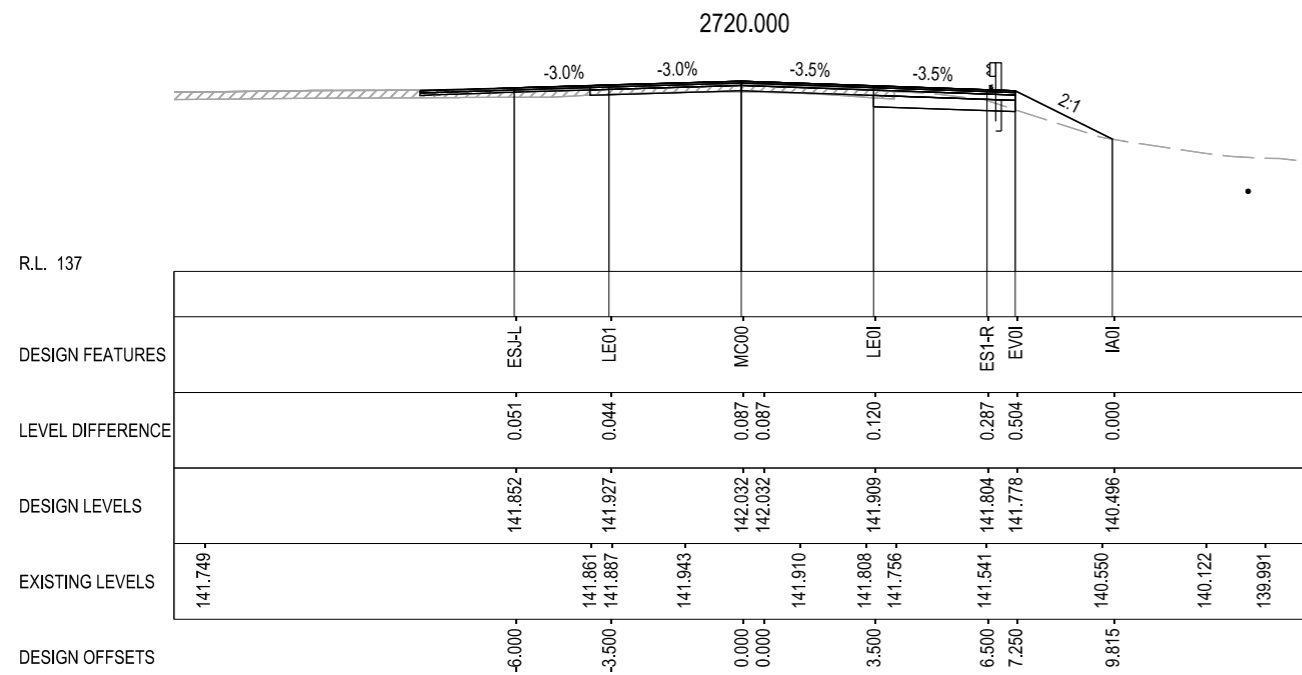
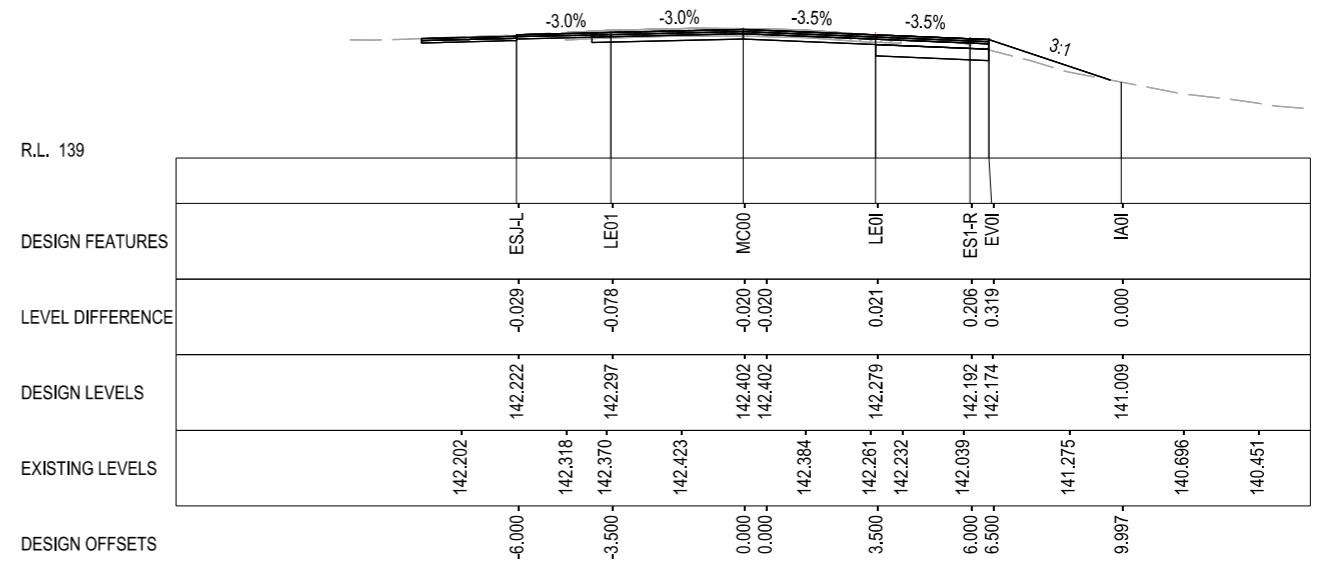
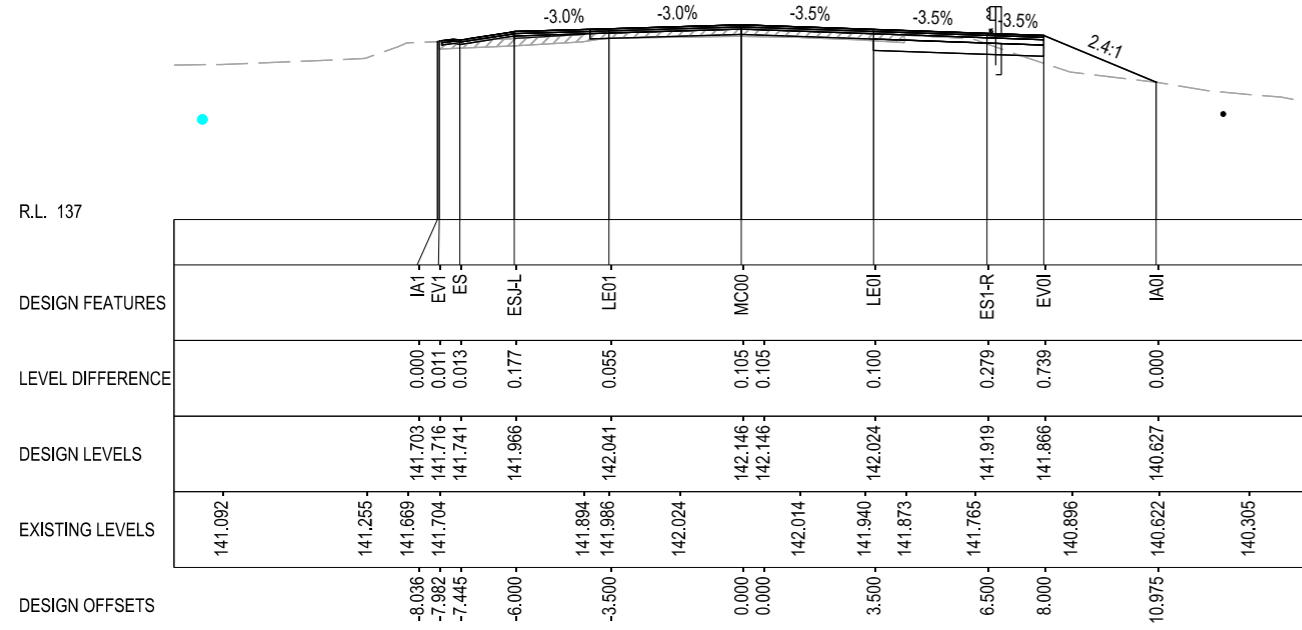
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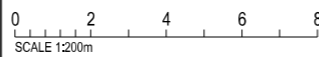


LEGEND

-  EXTENT OF EXISTING PAVEMENT
-  POST AND RAIL SAFETY BARRIER
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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY																							
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	 SCALE 1:200m		 Transport for NSW																							
CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		<table border="1"> <tr> <th>TITLE</th> <th>NAME</th> <th>DATE</th> </tr> <tr> <td>DRAWN</td> <td>C.BURNS</td> <td>09.12.22</td> </tr> <tr> <td>DRG CHECK</td> <td>L.MATTSSON</td> <td>09.12.22</td> </tr> <tr> <td>DESIGN</td> <td>C.BURNS</td> <td>09.12.22</td> </tr> <tr> <td>DESIGN CHECK</td> <td>L.MATTSSON</td> <td>09.12.22</td> </tr> <tr> <td>DESIGN MNGR</td> <td>B.SPALDING</td> <td>09.12.22</td> </tr> <tr> <td>PROJECT MNGR</td> <td>L.HUANG</td> <td>09.12.22</td> </tr> </table>		TITLE	NAME	DATE	DRAWN	C.BURNS	09.12.22	DRG CHECK	L.MATTSSON	09.12.22	DESIGN	C.BURNS	09.12.22	DESIGN CHECK	L.MATTSSON	09.12.22	DESIGN MNGR	B.SPALDING	09.12.22	PROJECT MNGR	L.HUANG	09.12.22	 Transport for NSW		PREPARED FOR	TNSW REGISTRATION No. DS2021 / 000702	PART 1
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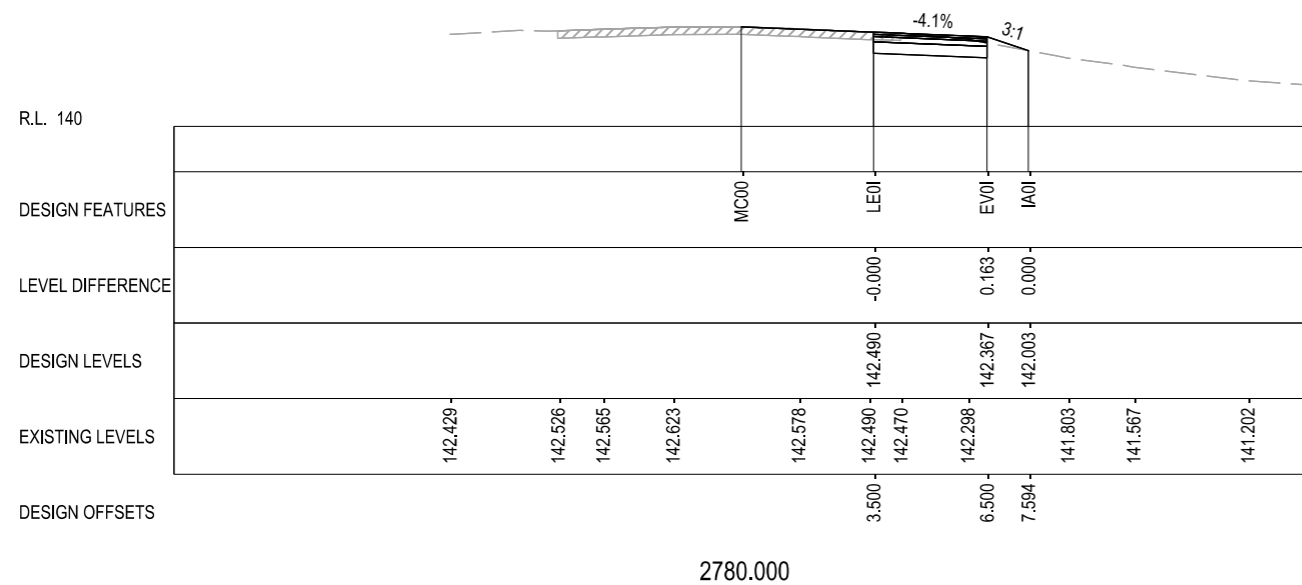
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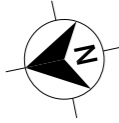
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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\XSEC OPT2 - Copy.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 CROSS SECTION	A3	
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						CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		DRG CHECK	L.MATTSSON	09.12.22
						HEIGHT DATUM AHD		DESIGN	C.BURNS	09.12.22
								DESIGN CHECK	L.MATTSSON	09.12.22
								DESIGN MNGR	B.SPALDING	09.12.22
								PROJECT MNGR	L.HUANG	09.12.22
								PREPARED FOR	ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	
								TNSW REGISTRATION No.	DS2021 / 000702	
								ISSUE STATUS	ISSUED FOR CONSTRUCTION	EDMS No.
										SHEET No. RC-0009
										ISSUE A



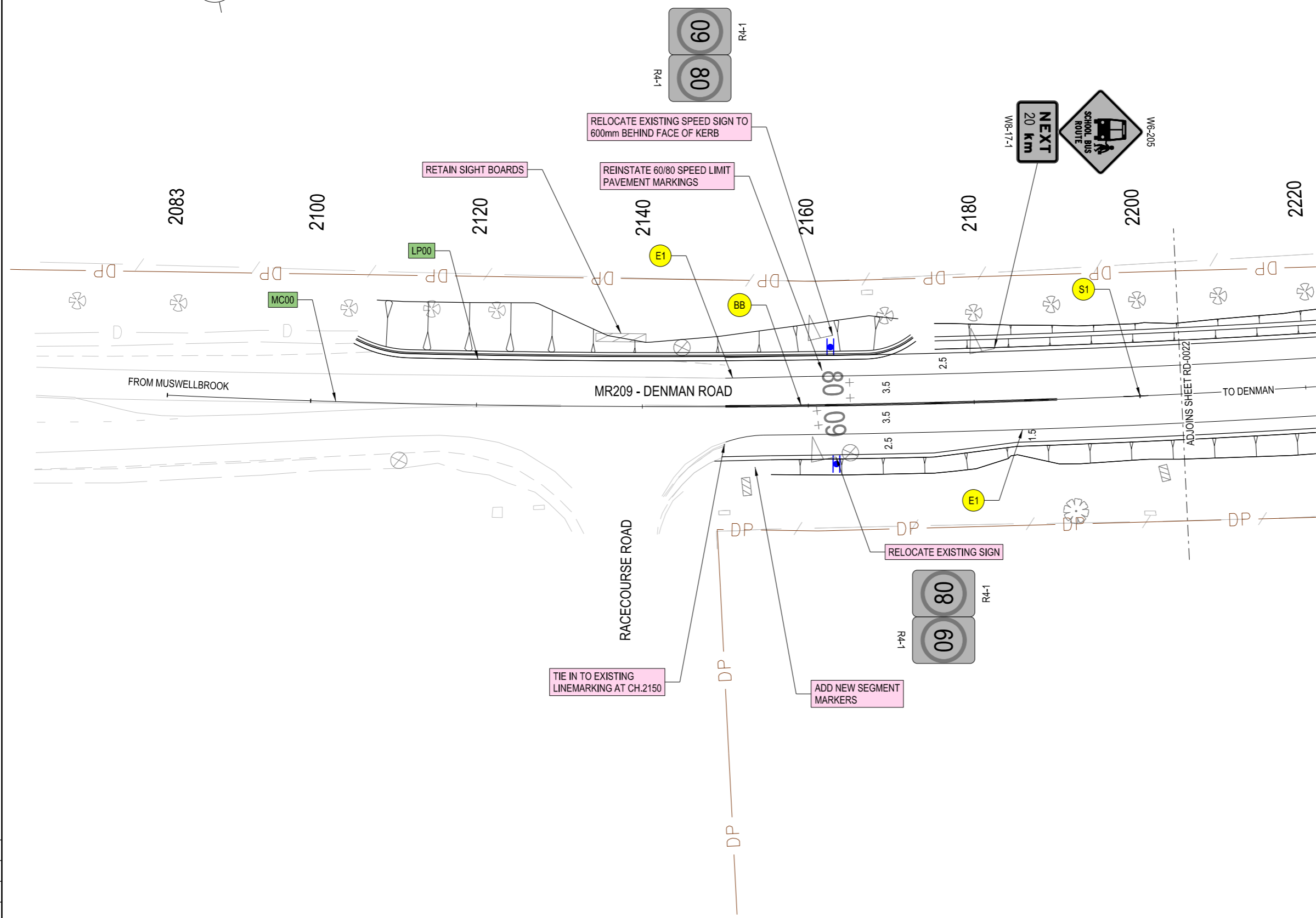
LEGEND

- MC?? — DESIGN CONTROL CALLOUT
- XXXX — CONSTRUCTION CALLOUT
- BB — LINEMARKING CALLOUT
- SB01 — SAFETY BARRIER CALLOUT
- PROPOSED LINEMARKING
- LINEMARKING TO BE REMOVED
- PEDESTRIAN FENCE
- W BEAM / THRIE BEAM GUARD RAIL
- EXISTING SIGNAGE LOCATION
- PROPOSED SIGNAGE LOCATION
- — PROPOSED GUIDE POSTS
- NEW SIGN TO BE INSTALLED
- EXISTING SIGN TO BE RETAINED OR RELOCATED
- EXISTING SIGN TO BE REMOVED

NOTES

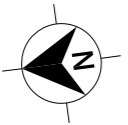
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8. REFER TO SHEETS GE-0004 AND GE-0005 FOR SURVEY FEATURE LEGEND.
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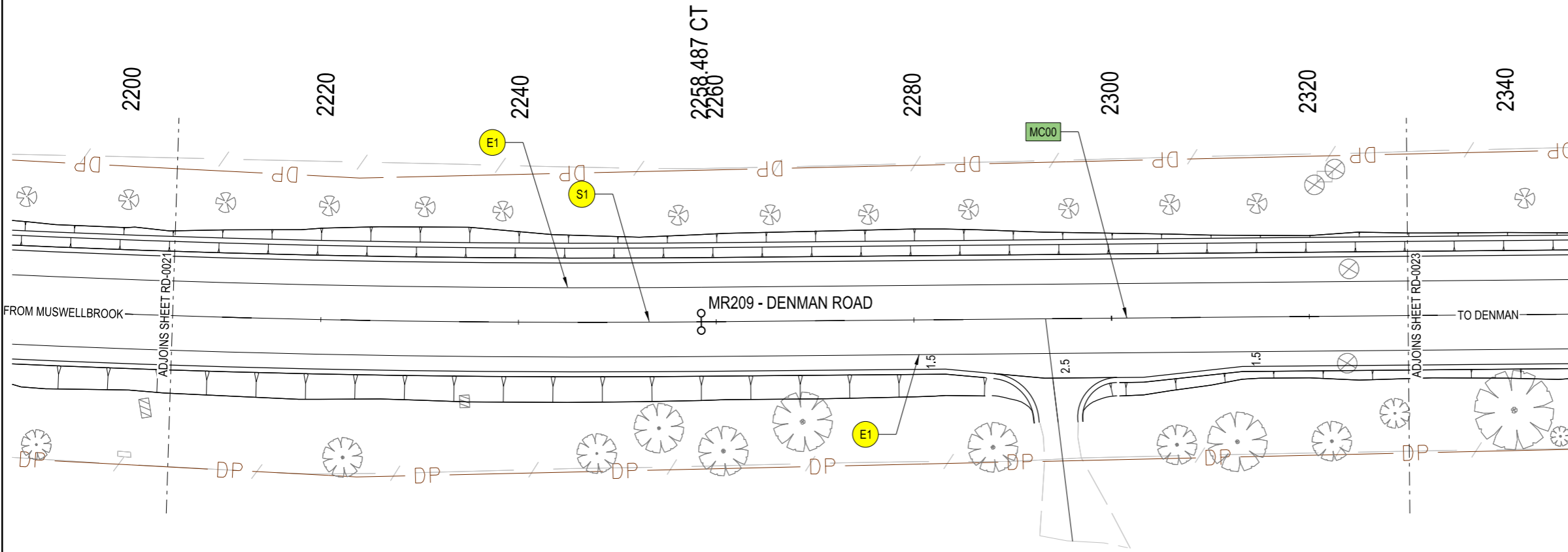
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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	TITLE	NAME	DATE	 	PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN	TNSW REGISTRATION No.	DS2021 / 000702	PART	1
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SCALES ON A3 SIZE DRAWING 						DESIGN	C.BURNS	09.12.22			SHEET No. RF-0001	© Transport for NSW		
						DESIGN CHECK	L.MATTSSON	09.12.22						
CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)						DESIGN MNGR	B.SPALDING	09.12.22						
HEIGHT DATUM AHD						PROJECT MNGR	L.HUANG	09.12.22						



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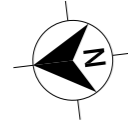
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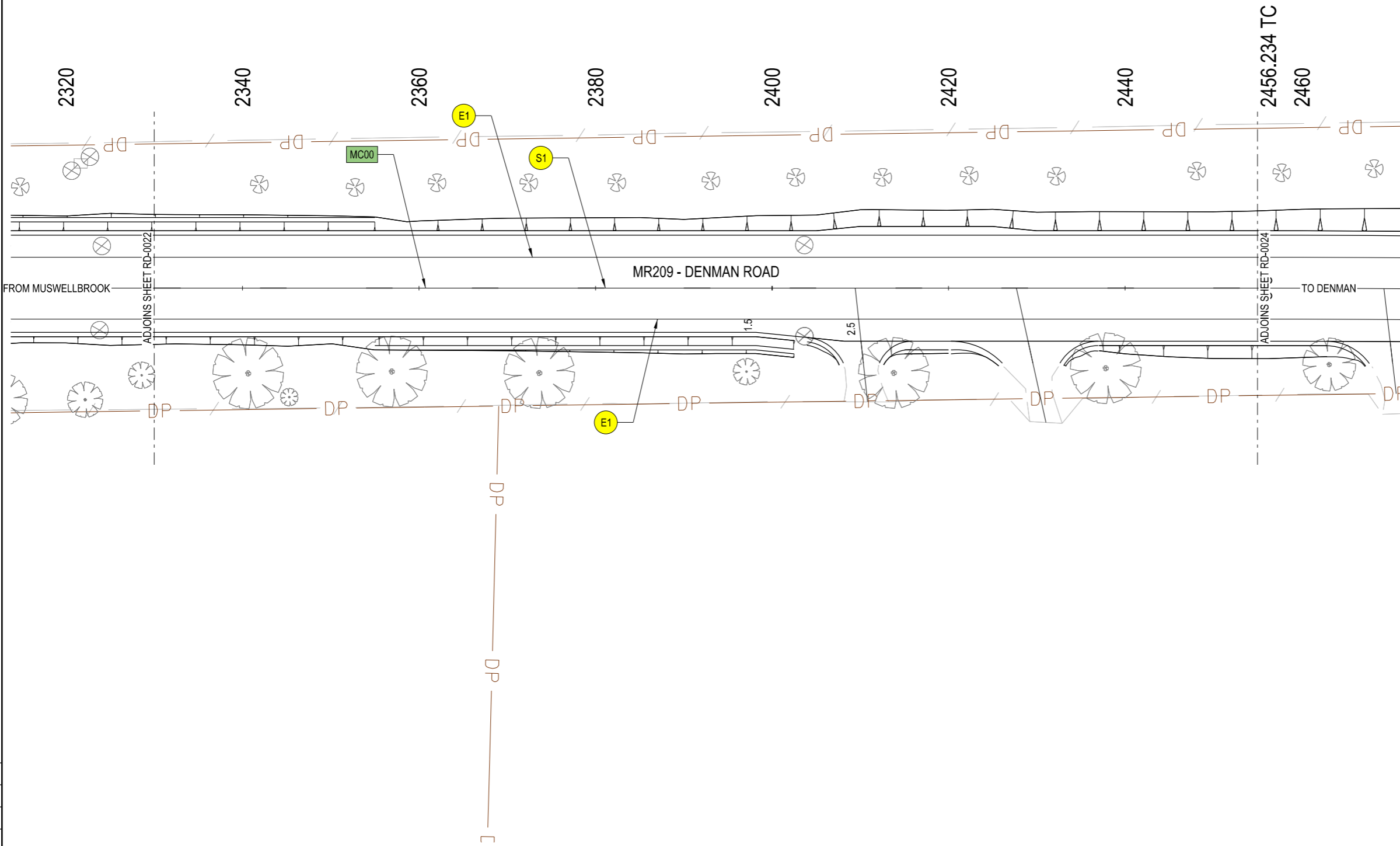
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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\P-PLAN-RF.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 ROADSIDE FURNITURE AND LINEMARKING PLAN	A3									
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE	 	 	PREPARED FOR	TNSW REGISTRATION No.	PART			
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 SCALE 1:500m		DRAWN	C.BURNS	09.12.22			ASSETS NORTH	DS2021 / 000702	1			
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								DESIGN CHECK	L.MATTSSON	09.12.22								
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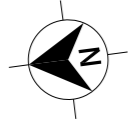
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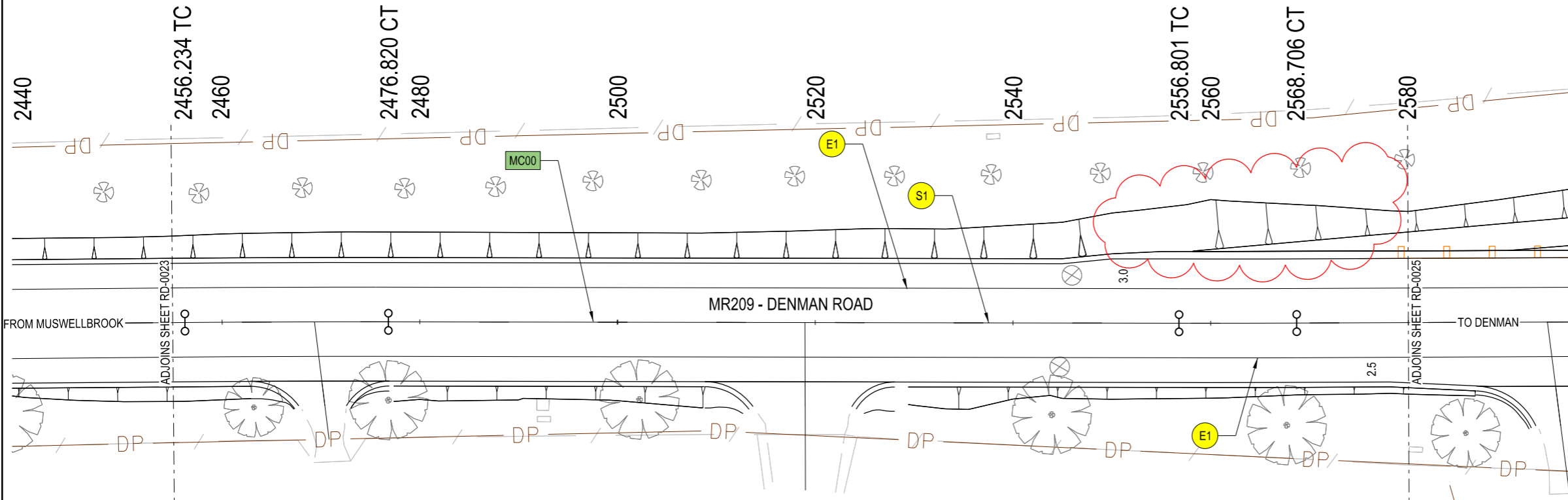
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EXTERNAL REFERENCE FILES XXXXXX			REV A	DATE 9-12-22	AMENDMENT / REVISION DESCRIPTION ISSUED FOR CONSTRUCTION	WVR No. XX	APPROVAL XXX	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY		Transport for NSW		Transport for NSW		PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN		TNSW REGISTRATION No. DS2021 / 000702	PART 1																		
SCALE 1:500m			CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		TITLE	NAME	DATE	DRAWN	C.BURNS							09.12.22	DRG CHECK	L.MATTSSON	09.12.22	DESIGN	C.BURNS	09.12.22	DESIGN CHECK	L.MATTSSON	09.12.22	DESIGN MNGR	B.SPALDING	09.12.22	PROJECT MNGR	L.HUANG	09.12.22	ISSUE STATUS ISSUED FOR CONSTRUCTION	EDMS No.	SHEET No. RF-0003	ISSUE A



- LEGEND**
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SAFETY BARRIER SCHEDULE

LABEL	TYPE (1)	START			END			LENGTH (m)	
		CONTROL	CHAINAGE	FROM (2)	CONTROL	CHAINAGE	TO (2)	EXCLUDES TERMINAL	
SB01	APPROACH TRANSITION	MC00	2590	SAFETY BARRIER TERMINAL	MC00	2592	HIGH CONTAINMENT STEEL GUARDRAIL BARRIER	2	APPROACH TRANSITION TO HIGH CONTAINMENT BARRIER INCLUDES CONNECTION TO BRIDGE BARRIER. REFER TO MODEL DRAWING R0720-07
	HIGH CONTAINMENT STEEL GUARDRAIL BARRIER	MC00	2592	APPROACH TRANSITION	MC00	2628	BRIDGE BARRIER CONNECTION	36	
SB02	BRIDGE BARRIER MEDIUM PERFORMANCE BARRIER	MC00	2628	BRIDGE BARRIER CONNECTION	MC00	2648	BRIDGE BARRIER CONNECTION	20	REFER TO STRUCTURAL PLANS DS2022-000422 FOR BRIDGE BARRIER DETAILS
SB03	HIGH CONTAINMENT STEEL GUARDRAIL BARRIER	MC00	2648	BRIDGE BARRIER CONNECTION	MC00	2656	SAFETY BARRIER TERMINAL	8	INCLUDES CONNECTION FROM BRIDGE BARRIER AND TRANSITION TO TERMINAL DEPARTURE TRANSITION FROM HIGH CONTAINMENT BARRIER
	DEPARTURE TRANSITION	MC00	2656	HIGH CONTAINMENT STEEL GUARDRAIL BARRIER	MC00	2658	SAFETY BARRIER TERMINAL	2	
SB04	DEPARTURE TRANSITION	MC00	2622	SAFETY BARRIER TERMINAL	MC00	2624	BRIDGE BARRIER CONNECTION	2	DEPARTURE TRANSITION FROM HIGH CONTAINMENT BARRIER
	HIGH CONTAINMENT STEEL GUARDRAIL BARRIER	MC00	2624	SAFETY BARRIER TERMINAL	MC00	2632	CONNECTION TO BRIDGE BARRIER AT CULVERT	8	
SB05	BRIDGE BARRIER MEDIUM PERFORMANCE BARRIER	MC00	2632	BRIDGE BARRIER CONNECTION	MC00	2652	BRIDGE BARRIER CONNECTION	20	REFER TO STRUCTURAL PLANS DS2022-000422 FOR BRIDGE BARRIER DETAILS
SB06	HIGH CONTAINMENT STEEL GUARDRAIL BARRIER	MC00	2652	BRIDGE BARRIER CONNECTION	MC00	2704	APPROACH TRANSITION	52	INCLUDES CONNECTION FROM BRIDGE BARRIER. REFER TO MODEL DRAWING R0720-07 APPROACH TRANSITION FROM HIGH CONTAINMENT BARRIER
	APPROACH TRANSITION	MC00	2704	TRANSITION FROM HIGH CONTAINMENT STEEL GUARDRAIL BARRIER	MC00	2706	SAFETY BARRIER TERMINAL	2	

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- ALL BARRIER SYSTEMS TO BE TNSW APPROVED MEETING MINIMUM TL3 MASH CRASH TEST LEVEL.
- REFER TO SELECTED BARRIER SYSTEM PRODUCT MANUAL FOR LENGTHS OF TERMINALS AND TRANSITIONS.

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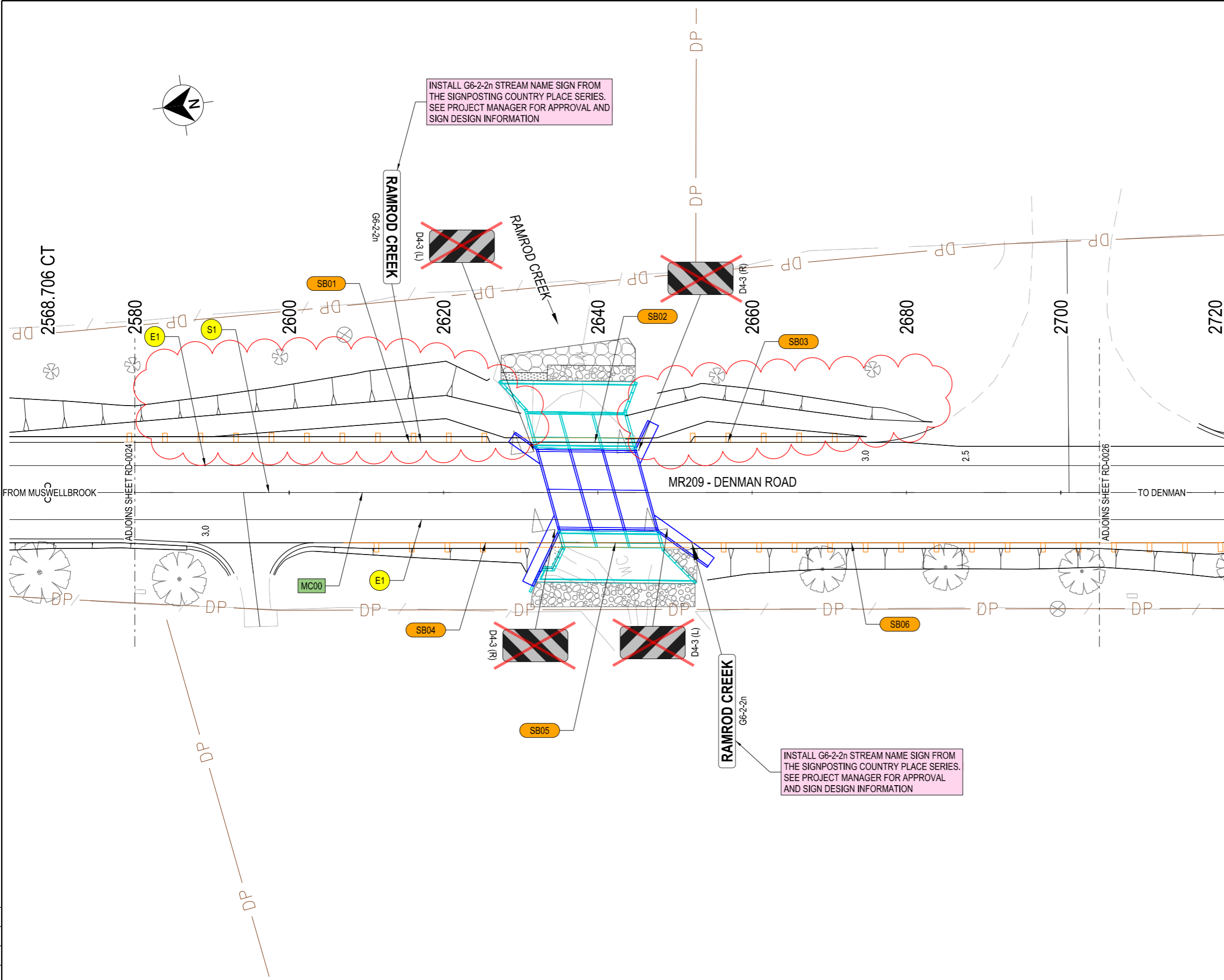
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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	0 5 10 15 20 SCALE 1:500m		DRAWN C.BURNS 08.02.23
	B	8-02-23	VERGE AND BATTER AT CULVERT AMENDED					DRG CHECK L.MATTSSON 08.02.23
								DESIGN C.BURNS 08.02.23
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CO-ORDINATE SYSTEM MGA ZONE 56 (GDA2020)		HEIGHT DATUM AHD		NSW GOVERNMENT Transport for NSW		NSW GOVERNMENT Transport for NSW		PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN
TNSW REGISTRATION No. DS2021 / 000702		ISSUE STATUS ISSUED FOR CONSTRUCTION		EDMS No.		SHEET No. RF-0004		PART 1 ISSUE B
								© Transport for NSW

LEGEND

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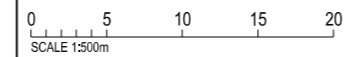




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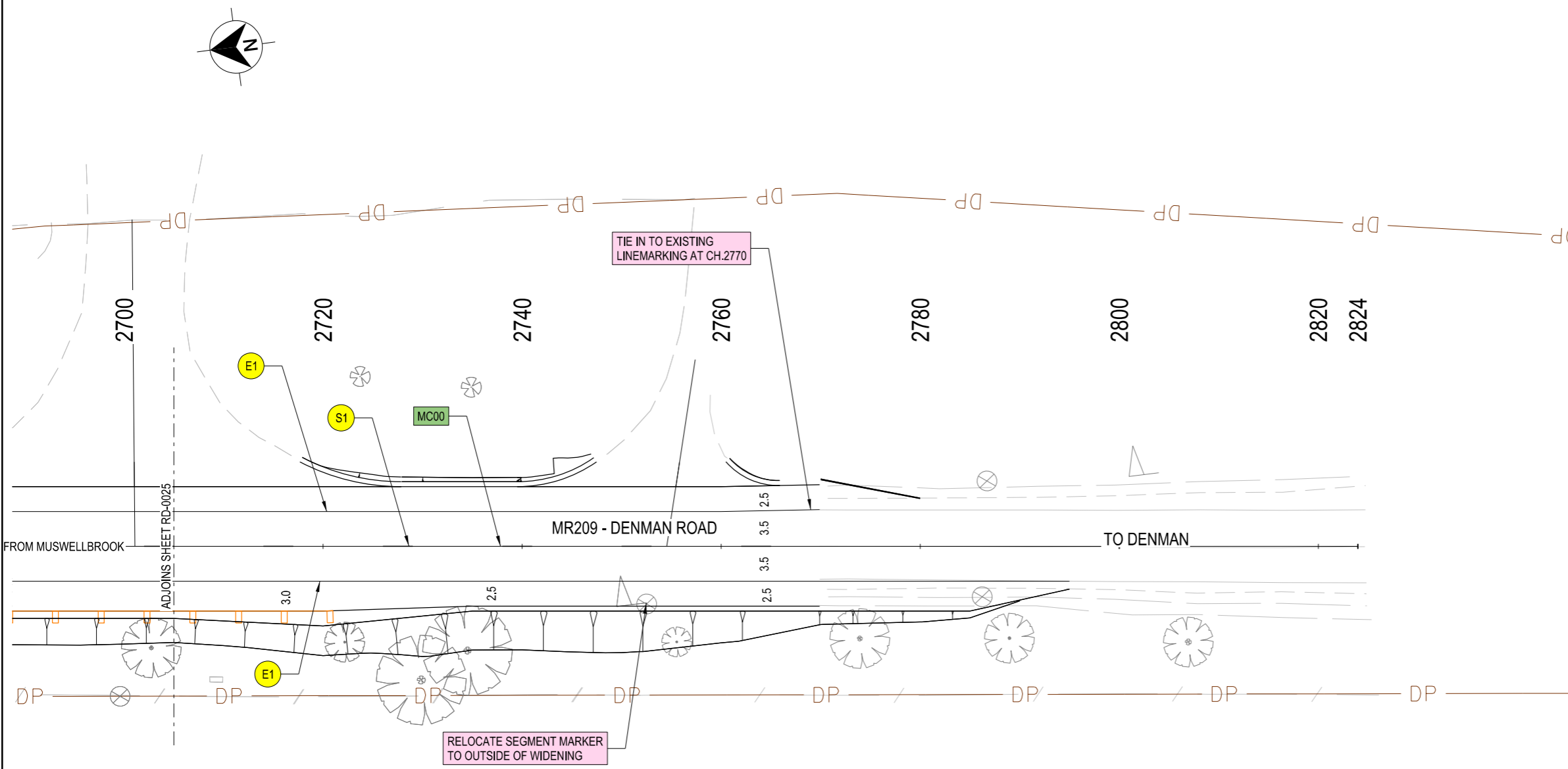
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		A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="font-size: 8px;">TITLE</th> <th style="font-size: 8px;">NAME</th> <th style="font-size: 8px;">DATE</th> </tr> </thead> <tbody> <tr> <td style="font-size: 8px;">DRAWN</td> <td style="font-size: 8px;">C.BURNS</td> <td style="font-size: 8px;">08.02.23</td> </tr> <tr> <td style="font-size: 8px;">DRG CHECK</td> <td style="font-size: 8px;">L.MATTSSON</td> <td style="font-size: 8px;">08.02.23</td> </tr> <tr> <td style="font-size: 8px;">DESIGN</td> <td style="font-size: 8px;">C.BURNS</td> <td style="font-size: 8px;">08.02.23</td> </tr> <tr> <td style="font-size: 8px;">DESIGN CHECK</td> <td style="font-size: 8px;">L.MATTSSON</td> <td style="font-size: 8px;">08.02.23</td> </tr> <tr> <td style="font-size: 8px;">DESIGN MNGR</td> <td style="font-size: 8px;">B.SPALDING</td> <td style="font-size: 8px;">08.02.23</td> </tr> <tr> <td style="font-size: 8px;">PROJECT MNGR</td> <td style="font-size: 8px;">L.HUANG</td> <td style="font-size: 8px;">08.02.23</td> </tr> </tbody> </table>		TITLE	NAME	DATE	DRAWN	C.BURNS	08.02.23	DRG CHECK	L.MATTSSON	08.02.23	DESIGN	C.BURNS	08.02.23	DESIGN CHECK	L.MATTSSON	08.02.23	DESIGN MNGR	B.SPALDING	08.02.23	PROJECT MNGR	L.HUANG	08.02.23
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3. LINEMARKING AND RETRO REFLECTIVE PAVEMENT MARKERS (RRPM) TO BE INSTALLED IN ACCORDANCE WITH TNSW DELINEATION GUIDELINES.
4. SIGNPOSTING LOCATION AND ORIENTATION TO BE INSTALLED IN ACCORDANCE WITH AS1742.2 AND TNSW SUPPLEMENTS.
5. EXISTING SIGNS TO BE REMOVED OR RELOCATED HAVE BEEN IDENTIFIED ONLY. EXISTING SIGNS WHICH ARE NOT NOTED ARE TO REMAIN UNLESS APPROVED BY THE PRINCIPALS REPRESENTATIVE.
6. FOR SIGN POST AND FOOTING DETAILS REFER TO TNSW ACCEPTANCE DOCUMENT FOR FRANGIBLE SIGN POST PRODUCT.
7. REFER TO MODEL DRAWING R0300-01 FOR KERB PROFILES.
8. REFER TO SHEETS GE-0004 AND GE-0005 FOR SURVEY FEATURE LEGEND.
9. NEW GUIDEPOSTS TO BE INSTALLED AT 60m SPACINGS IN THE VERGE AREAS WITHOUT SAFETY BARRIER.

ACCEPTED FOR CONSTRUCTION

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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\idgn107-Drawing Production\P-PLAN-RF.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 ROADSIDE FURNITURE AND LINEMARKING PLAN	A3
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	TITLE	NAME	DATE	Transport for NSW PREPARED FOR ASSETS NORTH REGIONAL AND OUTER METROPOLITAN
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						PROJECT MNGR	L.HUANG	09.12.22	
SCALES ON A3 SIZE DRAWING SCALE 1:500m CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020) HEIGHT DATUM: AHD				Transport for NSW					

LEGEND

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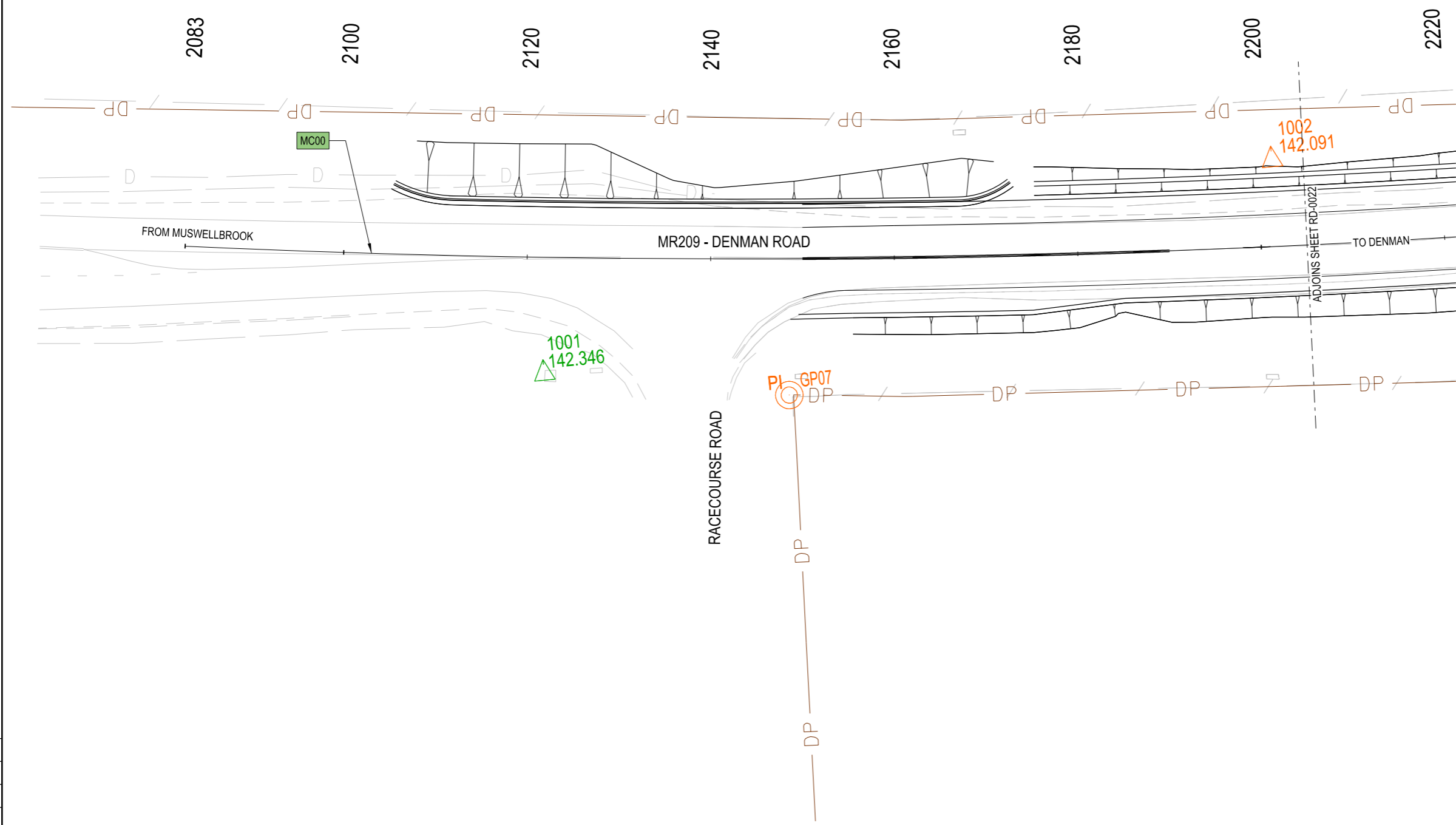
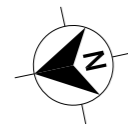
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50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-SURVEY INFRASTRUCTURE.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 SURVEY INFRASTRUCTURE	A3																																		
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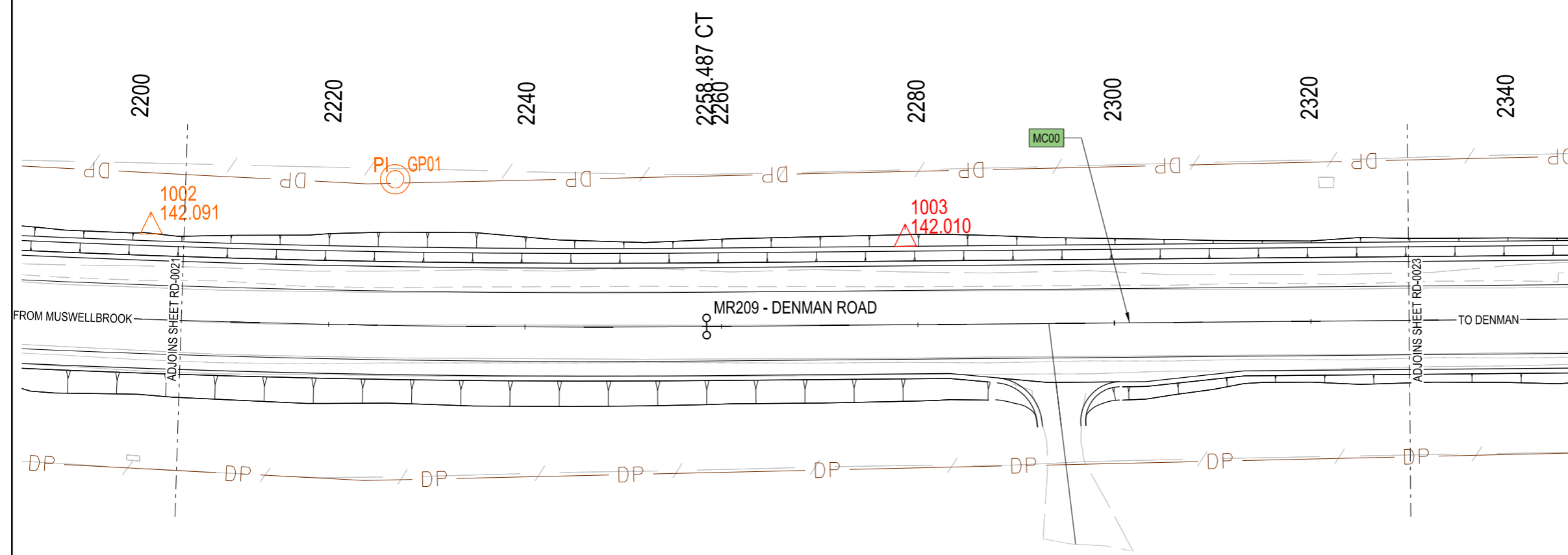
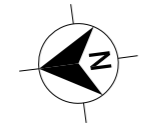
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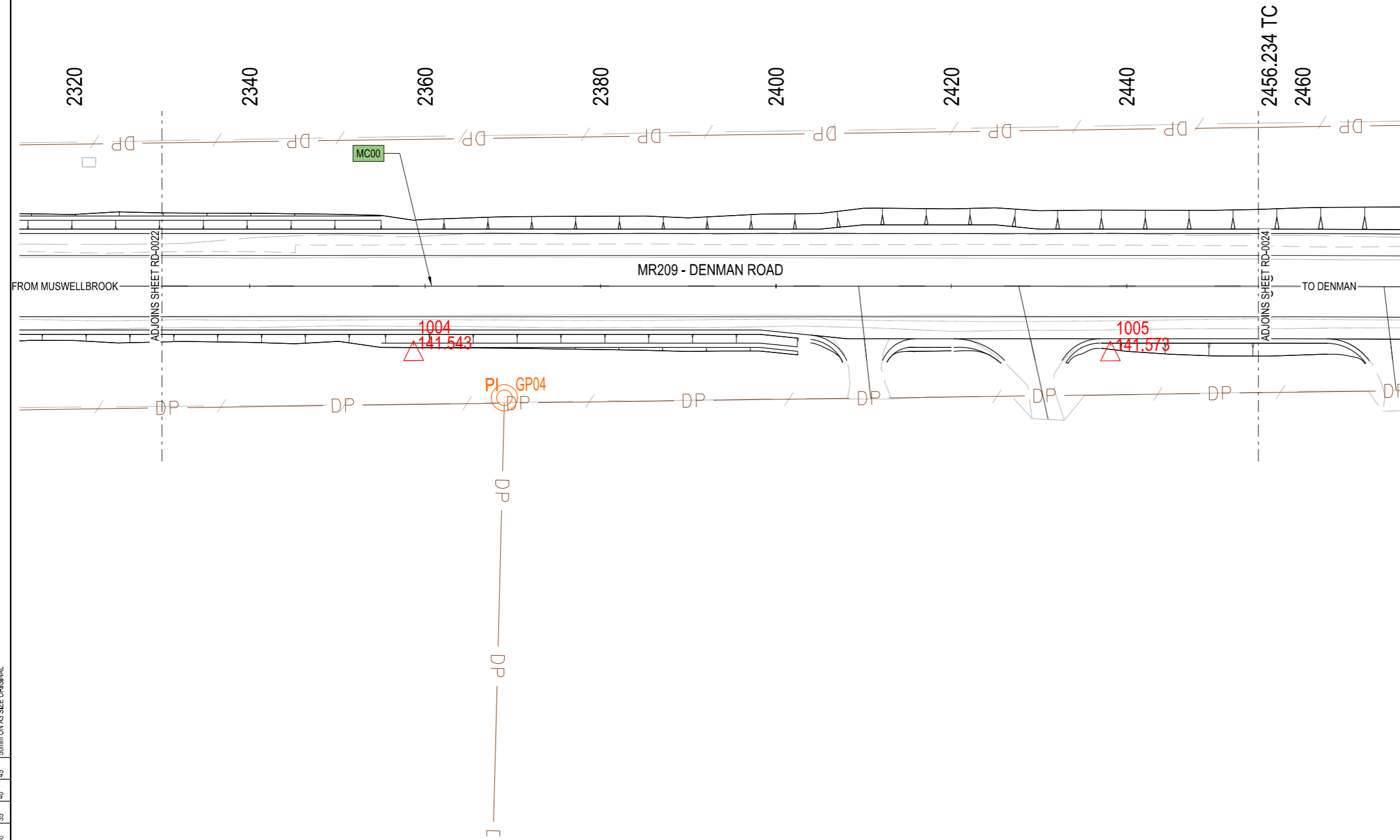
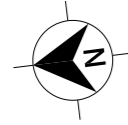
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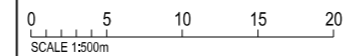


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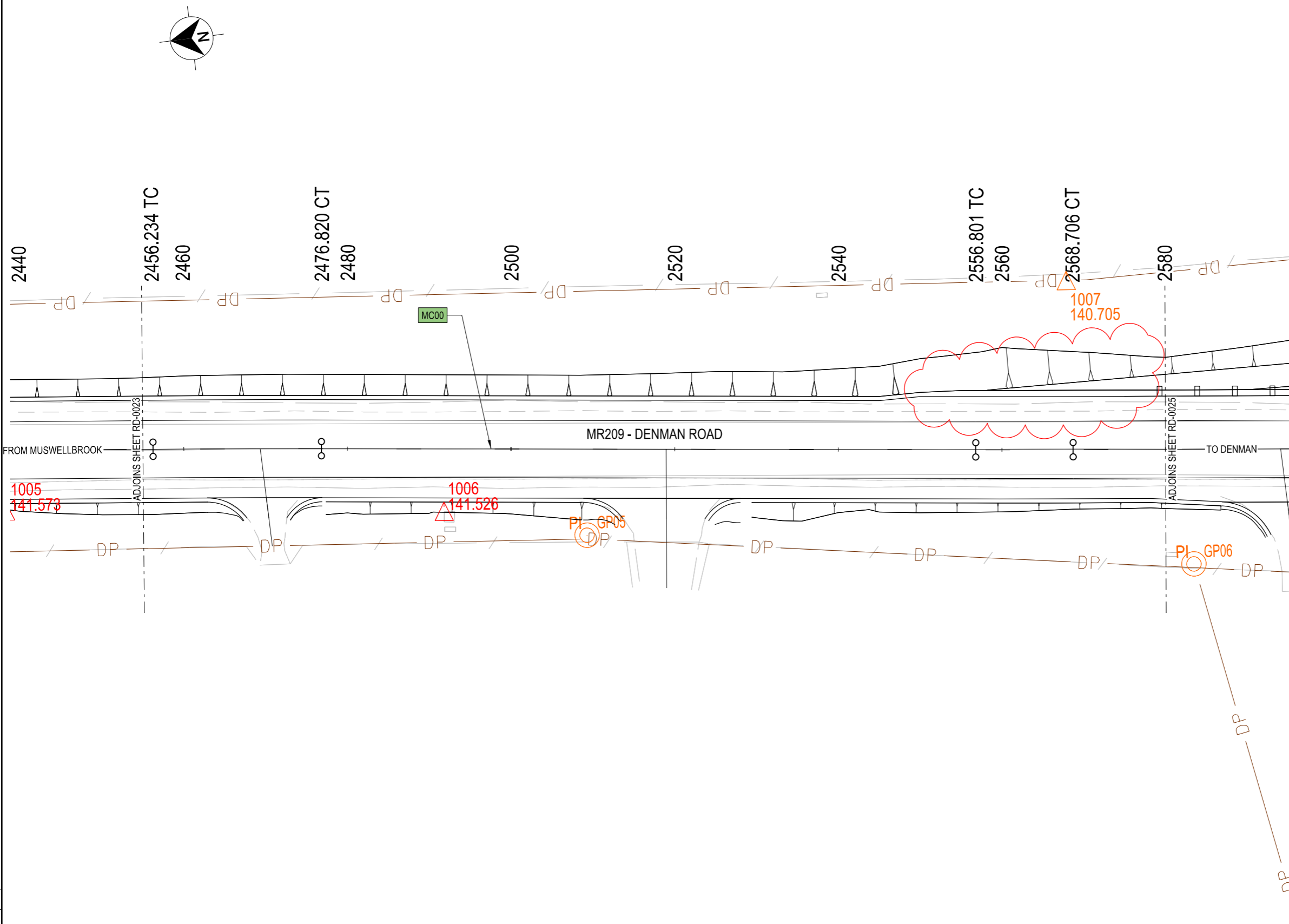
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ACCEPTED FOR CONSTRUCTION

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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\dgn\07-Drawing Production\PLAN-SURVEY INFRASTRUCTURE.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 SURVEY INFRASTRUCTURE	A3																					
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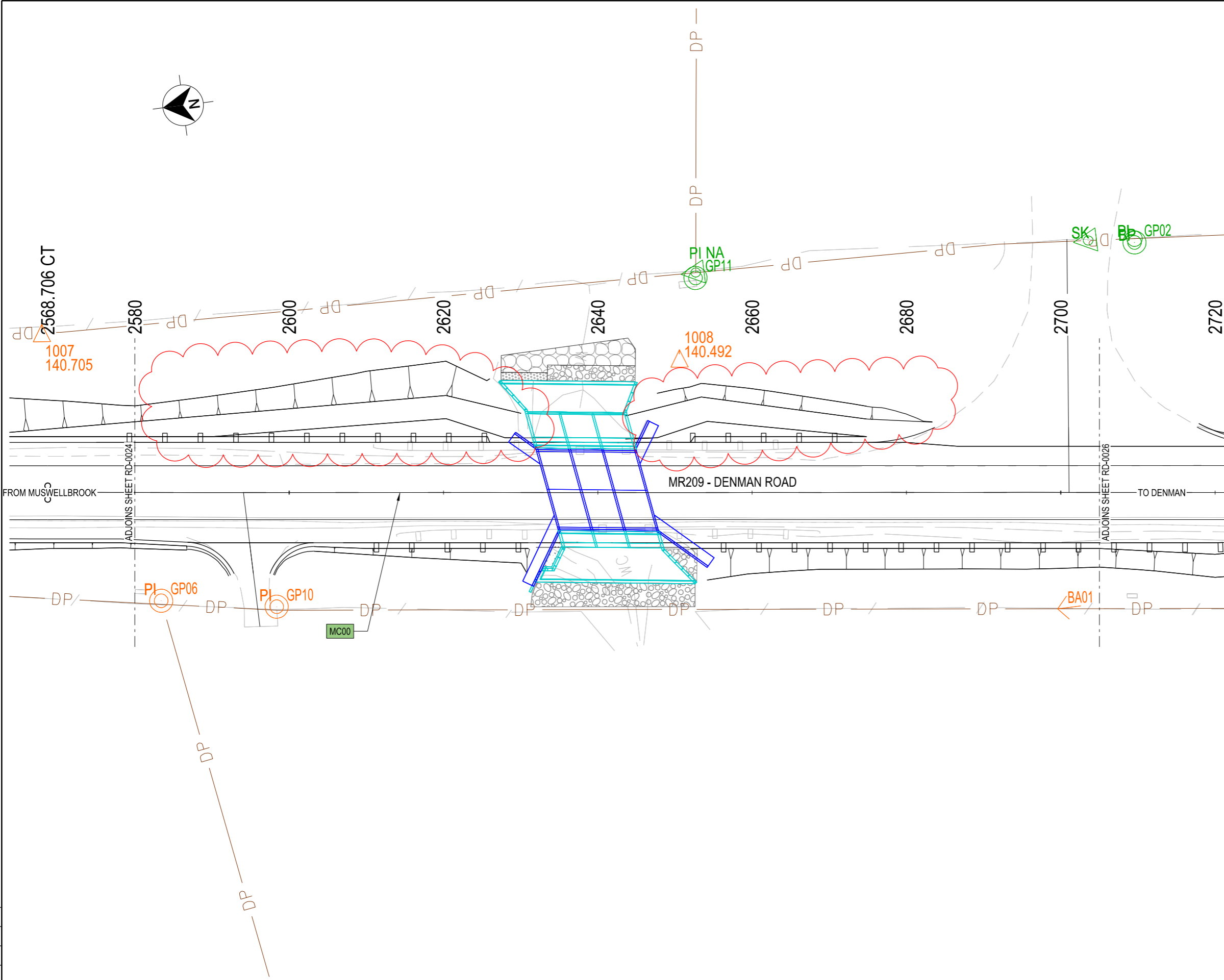
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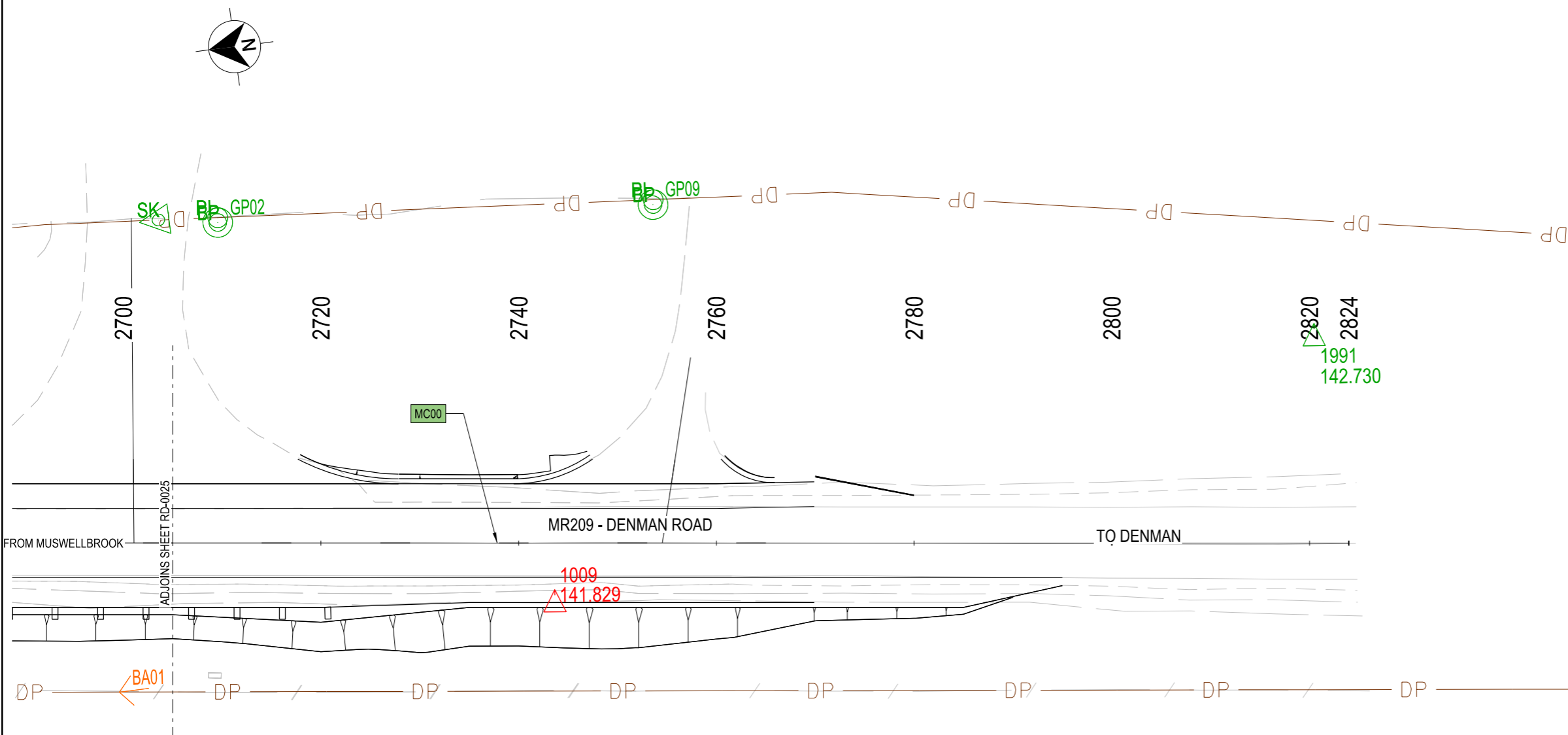
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Survey Control Mark Register - (HV4366) - MGA Zone 56


MX Mark ID	Mark	Type	GDA2020 Grid Coordinates RMS		GDA2020 Grid Coordinates SCIMS		Combined Scale Factor	MGA		Source	Transformation	AHD	AHD		Source	Date	Project Impact
			Easting	Northing	Easting	Northing		Class	Order				Class	Order			
4570	PM 34570	Permanent Mark	299908.961	6427045.700	299908.961	6427045.700	1.000067	B	2	SCIMS	GDA94 to GDA2020	141.832	LB	L2	SCIMS	26/7/2019	Safe
7388	PM 37388	Permanent Mark	299665.000	6426782.155	299665.006	6426782.144	1.000068	B	2	SCIMS	GDA94 to GDA2020	142.158	B	2	SCIMS	26/7/2019	Safe
7393	PM 37393	Permanent Mark	299887.462	6427065.777	299887.469	6427065.767	1.000067	B	2	SCIMS	GDA94 to GDA2020	142.306	LB	L2	SCIMS	26/7/2019	Safe
1991	PM 81991	Permanent Mark	299578.077	6425980.660	299578.081	6425980.651	1.000068	B	2	SCIMS	GDA94 to GDA2020	142.730	B	2	SCIMS	26/7/2019	Safe
1993	PM 81993	Permanent Mark	300256.347	6426699.632	300256.353	6426699.626	1.00006	B	2	SCIMS	GDA94 to GDA2020	173.845	B	2	SCIMS	26/7/2019	Safe
1001	1001	Steel Spike	299639.026	6426677.974			1.000068	D	4	RMS	GDA94 to GDA2020	142.346	LD	L4	RMS	16.08.2019	Safe
1002	1002	Steel Spike	299645.176	6426595.589			1.000068	D	4	RMS	GDA94 to GDA2020	142.091	LD	L4	RMS	16.08.2019	Vulnerable
1003	1003	Steel Spike	299633.970	6426519.619			1.000068	D	4	RMS	GDA94 to GDA2020	142.010	LD	L4	RMS	16.08.2019	To be destroyed
1004	1004	Steel Spike	299607.909	6426442.303			1.000068	D	4	RMS	GDA94 to GDA2020	141.543	LD	L4	RMS	16.08.2019	To be destroyed
1005	1005	Steel Spike	299598.241	6426363.455			1.000068	D	4	RMS	GDA94 to GDA2020	141.573	LD	L4	RMS	16.08.2019	To be destroyed
1006	1006	Concrete Nail	299591.253	6426310.289			1.000068	D	4	RMS	GDA94 to GDA2020	141.526	LD	L4	RMS	16.08.2019	To be destroyed
1007	1007	Steel Spike	299609.364	6426231.234			1.000068	D	4	RMS	GDA94 to GDA2020	140.705	LD	L4	RMS	16.08.2019	Vulnerable
1008	1008	Steel Spike	299595.730	6426149.660			1.000068	D	4	RMS	GDA94 to GDA2020	140.492	LD	L4	RMS	16.08.2019	Vulnerable
1009	1009	Steel Spike	299561.014	6426060.230			1.000068	D	4	RMS	GDA94 to GDA2020	141.829	LD	L4	RMS	16.08.2019	To be destroyed

Infrastructure Mark Schedule - (HV4366) - MGA Zone 56

Mark ID	Source / Plan	GDA2020 Grid Coordinates		Accuracy (m)	Date	Status	Transformation	Project Impact	Comments
		MGA Easting	MGA Northing						
PM34570	SCIMS	299908.961	6427045.700	0.020	1/8/2019	Surveyed	GDA94 to GDA2020	Safe	
PM37388	SCIMS	299665.000	6426782.155	0.020	1/8/2019	Surveyed	GDA94 to GDA2020	Safe	
PM37393	SCIMS	299887.462	6427065.777	0.020	1/8/2019	Surveyed	GDA94 to GDA2020	Safe	
PM81991	SCIMS	299578.077	6425980.660	0.020	1/8/2019	Surveyed	GDA94 to GDA2020	Safe	
PM81993	SCIMS	300256.347	6426699.632	0.020	1/8/2019	Surveyed	GDA94 to GDA2020	Safe	
GP01	DP536745	299646.4	6426570.4	0.100	1/8/2019	Surveyed	GDA94 to GDA2020	Vulnerable	
GP02	DP1125984	299603.2	6426089.3	0.100	1/8/2019	Surveyed	GDA94 to GDA2020	Safe	
GP03	DP806941	299538.6	6425950.8	0.100	1/8/2019	Surveyed	GDA94 to GDA2020	Safe	
GP04	DP806941	299601.3	6426432.7	0.100	1/8/2019	Surveyed	GDA94 to GDA2020	Vulnerable	
GP05	DP806941	299586.1	6426293.3	0.100	1/8/2019	Surveyed	GDA94 to GDA2020	Vulnerable	
GP06	DP806941	299573.0	6426220.2	0.100	1/8/2019	Surveyed	GDA94 to GDA2020	Vulnerable	
GP07	DP806941	299630.7	6426652.4	0.100	1/8/2019	Surveyed	GDA94 to GDA2020	Vulnerable	
GP08	DP1125984	299582.5	6425945.7	0.100	1/8/2019	Surveyed	GDA94 to GDA2020	Safe	
GP09	DP1125984	299599.5	6426045.4	0.100	1/8/2019	Surveyed	GDA94 to GDA2020	Safe	
GP10	DP806941	299570.4	6426205.5	0.100	1/8/2019	Calculated	GDA94 to GDA2020	Vulnerable	
GP11	DP1125984	299605.8	6426146.3	0.100	1/8/2019	Calculated	GDA94 to GDA2020	Safe	
GP12	DP261812	299724.0	6426850.9	0.300	6/7/2022	Calculated	GDA94 to GDA2020	Safe	
GP13	DP1260002	299600.9	6426107.2	0.300	6/7/2022	Calculated	GDA94 to GDA2020	Safe	
GP14	DP516822	299590.0	6425985.2	0.300	6/7/2022	Calculated	GDA94 to GDA2020	Safe	
GP15	DP225369	299565.7	6425867.2	0.300	6/7/2022	Calculated	GDA94 to GDA2020	Safe	
GP16	DP225369	299535.0	6425725.3	0.300	6/7/2022	Calculated	GDA94 to GDA2020	Safe	
GP17	CP33650-1603	299533.7	6425725.5	0.300	6/7/2022	Calculated	GDA94 to GDA2020	Safe	
BA01	UNKNOWN	299557.4	6426105.1	0.100	1/8/2019	Surveyed	GDA94 to GDA2020	Vulnerable	
CB01	CP7288-3070	299689.5	6426765.5	0.100	1/8/2019	Calculated	GDA94 to GDA2020	Safe	
CB02	DP261812	299801.5	6426770.5	0.300	6/7/2022	Calculated	GDA94 to GDA2020	Safe	

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DRAWING FILE LOCATION / NAME C:\Data\Worksets\MR209 Denman Road - Segment 209030\idgn107-Drawing Production\PLAN-SURVEY INFRASTRUCTURE.dgn		DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING		PLOT DATE / TIME	PLOT BY	CLIENT	MUSWELLBROOK SHIRE COUNCIL MR209 - DENMAN ROAD PAVEMENT REHABILITATION SEGMENT 209030 SURVEY INFRASTRUCTURE SCHEDULES	A3									
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING	DRAWINGS / DESIGN PREPARED BY	TITLE	NAME	DATE	 Transport for NSW	PREPARED FOR	TNSW REGISTRATION No.	DS2021 / 000702	PART			
XXXXXX	A	9-12-22	ISSUED FOR CONSTRUCTION	XX	XXX	NOT TO SCALE		DRAWN	C.BURNS	09.12.22		ASSETS NORTH	ISSUE STATUS	ISSUED FOR CONSTRUCTION	EDMS No.	SHEET No.	MS-0007	ISSUE
								DRG CHECK	L.MATTSSON	09.12.22		REGIONAL AND OUTER METROPOLITAN					A	
								DESIGN	C.BURNS	09.12.22								
								DESIGN CHECK	L.MATTSSON	09.12.22								
								DESIGN MNGR	B.SPALDING	09.12.22								
								PROJECT MNGR	L.HUANG	09.12.22								

Appendix B

Correspondence

7 April 2022

Lionel Huang
The Store, 6 Stewart Avenue
NEWCASTLE 2300

Dear Mr Huang,

Denman Road Pavement Rehabilitation and Culvert Extension

Further to your email dated 28 January where you provided the formal notification letter and revised 80% concept design drawings for Council to provide comment. This matter was reported to 5 April 2022 Council meeting and the following comments are made in relation to the proposed works.

Council has a design for a shared use path to be constructed in the future on the eastern side of Denman Road extending from Skellatar Stock Route to Thomas Mitchell Drive. This plan makes provision to cross Ramrod Creek through the construction of a small box culvert intended to be overtopped in wet weather events. The proposal to widen the road now presents an opportunity to accommodate an all weather crossing of the creek for active forms of transport as well as vehicles. An option to accommodate a cycle lane in the widening of the road and extension of the culvert over Ramrod Creek as per the concept attached to the report as Attachment B would improve access for pedestrians and cyclists, and all active forms of transport using the road. Council supports this option as the best long-term solution for providing active transport uses.

In accordance with Muswellbrook Shire Council's Development Control Plan Section 13 – Floodplain management, a flood impact and risk assessment is required to be undertaken when development will result in increases to the 1% Annual Exceedance Probability flood of more than 100mm within 10m of the development.

Council does not support the removal of the existing plane trees on the western side of the road as these provide an important entry statement to the town of Muswellbrook.

Council requests that the details of the timing and duration of any proposed construction works will be communicated to Council, the adjoining residents, businesses and the general public.

Council requests that a permanent additional sign to be erected at the creek displaying 'Ramrod Creek' with the purpose of Ramrod Creek being identifiable to the public.

Yours faithfully

A handwritten signature in black ink, appearing to read 'K Scholes', written in a cursive style.

Kellie Scholes
Manager – Roads, Drainage & Technical Services



17 May 2022

To whom it may concern

NSW State Emergency Service
erm@ses.nsw.gov.au

Consultation regarding proposed pavement rehabilitation and culvert extension on Denman Road, Muswellbrook

Transport for NSW is proposing to pavement rehabilitation and culvert extension on Denman Road, Muswellbrook.

Under the State Environmental Planning Policy (Transport and Infrastructure) 2021, Transport for NSW is required to consult with NSW State Emergency Service under clause 2.13 due to potential impacts on flood liable lands.

It has been determined that this proposal is located flood liable land, and as such consultation with the State Emergency Service (SES) is required.

An outline of the proposal is attached to this letter. Preliminary hydraulic modelling indicates that the proposal would have neutral impact on the upstream flooding in 1 in 100 year Annual Recurrence Interval (ARI) floods.

It would be appreciated if you could provide any comments at the earliest opportunity.

Transport for NSW would be pleased to provide further information if required. In this regard Lionel Huang may be contacted on 0407 135 897 or by email Lionel.Huang@transport.nsw.gov.au.

Yours faithfully

A handwritten signature in black ink, appearing to read 'L. Huang'.

Lionel Huang
Project Engineer

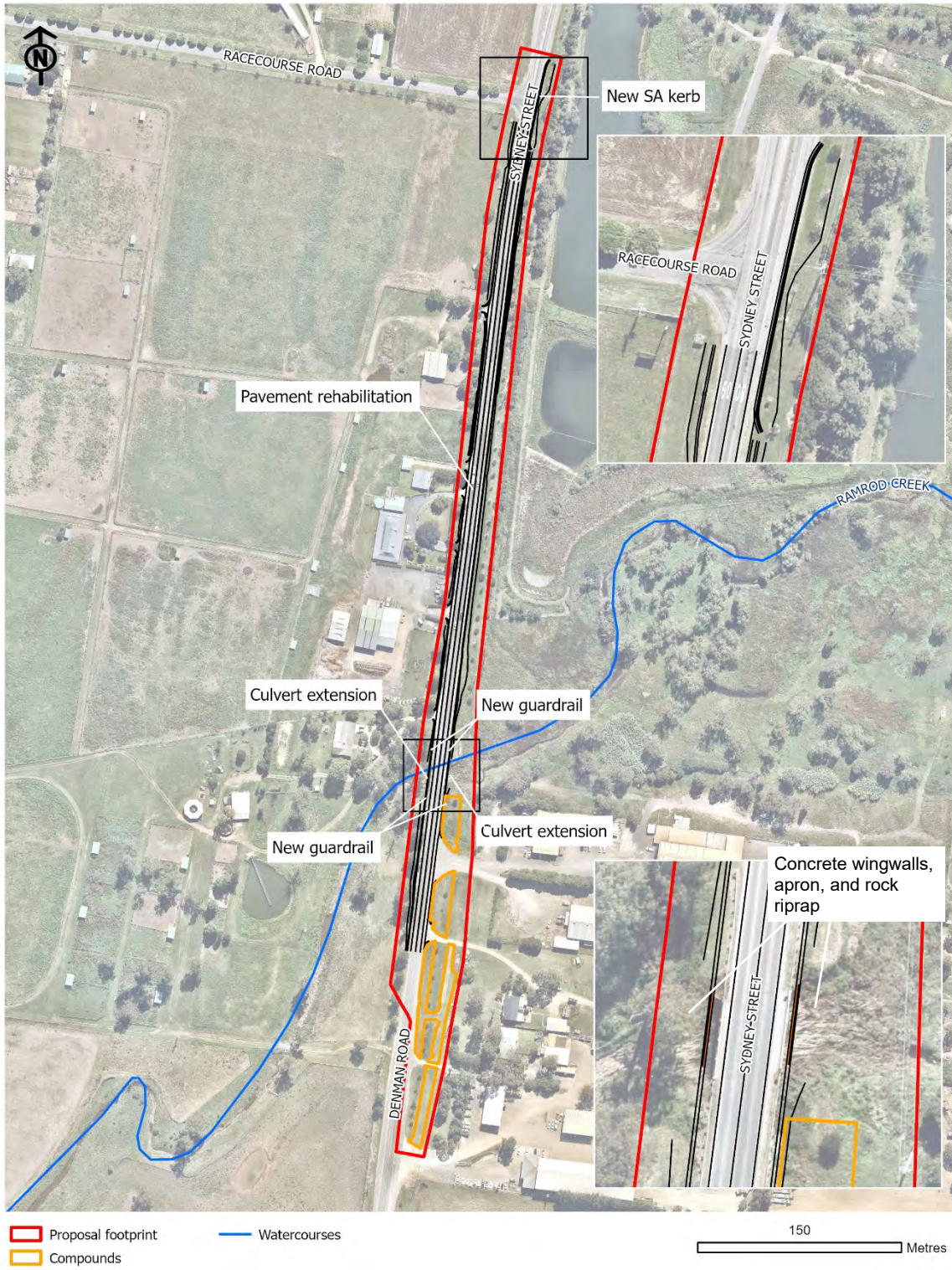
Attachment A

The proposal

Transport for NSW proposes to carry out pavement rehabilitation and extend a culvert on Denman Road between Racecourse Road and Thomas Mitchell Drive, Muswellbrook (the proposal).

Key features of the proposal include:

- Pavement rehabilitation over a length of about 610 metres, including
 - Construction of new three metre wide road shoulders with heavy duty asphaltic pavement.
 - Milling sections of existing pavement and constructing new heavy duty asphaltic pavement (primarily for the 3.5 metre wide travel lanes).
 - Construction of new full depth pavement sections (on the western shoulder, south of the Ramrod Creek culvert).
- Construction of new road verges and batters to suite new road profile
- Extension of existing Ramrod Creek three cell reinforced concrete box culvert on upstream and downstream sides, including reshaping of culvert inlet/outlet and the provision of scour protection (rock rip rap 3-6 metres beyond the end of the apron slab both upstream and downstream)
- Removal of existing width marker signage at the Ramrod Creek box culvert
- Provision of new cyclist friendly barriers and new asphaltic pavement on top of the Ramrod Creek box culvert
- Provision of guardrail on the approach/departure sides of the Ramrod Creek culvert
- Construction of new section of SA kerb on the eastern side of the Racecourse Road intersection
- Reinstatement of pavement markings speed limit pavement markings near Racecourse Road
- Temporary construction compounds and stockpiles.



Transport for NSW

Level 2, 1 Bryant Drive, TUGGERAH NSW 2259

P 13 22 13 | W roads-maritime.transport.nsw.gov.au | ABN 18 804 239 602

FW: Fisheries - Proposed Culvert Extension Ramrod Creek Denman Road Muswellbrook

Lionel Huang <Lionel.Huang@transport.nsw.gov.au>

Tue 10/05/2022 2:15 PM

To: Stuart Hill <stuart@hillsenvironmental.com.au>

FYI Stuart

From: Sarah Conacher <sarah.conacher@dpi.nsw.gov.au>

Sent: Tuesday, 10 May 2022 1:15 PM

To: Lionel Huang <Lionel.Huang@transport.nsw.gov.au>

Subject: RE: Fisheries - Proposed Culvert Extension Ramrod Creek Denman Road Muswellbrook

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Hi Lionel,

Congratulations on the new job with Transport.

Sorry for the delay in responding, we're down a few staff at the moment.

Please ensure the invert level of the culvert is level with the natural creek bed to avoid blocking fish passage up/down stream. The upper surface of the apron and rock riprap must also be level with the natural creek bed.

Erosion and sediment controls must be used throughout construction, in accordance with best practice.

Any pest species of fish, such as carp, should be euthanised. A s37 permit under the Fisheries Management Act is required to do this. Please contact Cath Foster on:

catherine.foster@dpi.nsw.gov.au

Thanks,
Sarah

Sarah Conacher | A/Senior Fisheries Manager – Coastal Systems Unit
NSW Department of Primary Industries | Fisheries
12 Shirley Rd, Wollstonecraft NSW
ALL MAIL TO: DPI Fisheries, Attn: R. Philips, 1243 Bruxner Hwy, Wollongbar NSW 2477
T: 02 8437 4981 | M: 0419 314 437 | E: sarah.conacher@dpi.nsw.gov.au

PERMIT APPLICATION FORMS & FISH HABITAT POLICIES AVAILABLE AT:

<https://www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats/toolkit>

Submit permit applications via email to: ahp.central@dpi.nsw.gov.au

Turnaround times: from date of receipt of application, please allow up to 28 days for Land Owners Consent, Permits and Consultations. Please allow up to 40 days for Integrated Development Applications.



DPI Fisheries acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

From: Lionel Huang <Lionel.Huang@transport.nsw.gov.au>

Sent: Monday, 9 May 2022 3:42 PM

To: Sarah Conacher <sarah.conacher@dpi.nsw.gov.au>

Subject: FW: Fisheries - Proposed Culvert Extension Ramrod Creek Denman Road Muswellbrook

Hi Sarah,

Would you please help me follow up with this enquiry?

Regards

Lionel

From: Lionel Huang

Sent: Thursday, 21 April 2022 5:19 PM

To: Sarah.conacher@dpi.nsw.gov.au

Cc: Stuart Hill (stuart@hillsenvironmental.com.au) <stuart@hillsenvironmental.com.au>
Subject: FW: Fisheries - Proposed Culvert Extension Ramrod Creek Denman Road Muswellbrook

Hi Sarah,

Looks like Scott is on extended leave, and probably not returning.

Would you please help me with this enquiry?

Regards

Lionel

From: Lionel Huang
Sent: Thursday, 21 April 2022 5:09 PM
To: scott.carter@dpi.nsw.gov.au
Cc: Stuart Hill (stuart@hillsenvironmental.com.au) <stuart@hillsenvironmental.com.au>
Subject: Fisheries - Proposed Culvert Extension Ramrod Creek Denman Road Muswellbrook

Hi Scott,

I recently joint TfNSW, working on developing projects.

We are proposing to extent the triple cell culvert on both upstream and downstream side as part of the road rehabilitation / widening project.

Cast in situ is the proposed construction method. Cofferdam and water pumping is also proposed to keep the work area dry.

Attached are:

1. Road works 100% concept design drawings (for the culvert proposal please refer to sheet 6 for typical cross section & sheet 19 for a plan view)
2. Preliminary culvert construction staging plan
3. Indicative construction program

The culvert design is still in progress, we do not have a drawing yet.

It is anticipated the concrete apron will be extend to the end of the new wingwalls. And rock rip-rap will be provided 3m to 6m beyond the end of apron slab on both u/s and d/s. Some tail in and tail out works beyond the rock rip-rap may also be required for transition the creek bed levels.

I record from my previous research that this area is a Key Fish Habitat. And during site inspections, carp fishes were observed living near the culvert.

Would you please advise if there any specific control measure we need to include in the minor works REF current being prepared, and if we require a fisheries permit to the proposed works.

Feel free to give me a call if you have any questions.

Regards

Lionel

Lionel Huang
Project Engineer
Project Services North | Maintenance & Delivery | Network & Assets
Regional and Outer Metropolitan
Transport for NSW

M 0407 135 897 | E Lionel.Huang@transport.nsw.gov.au | [Chat with me in Teams](#)
Level 2, 1 Bryant Drive, Tuggerah, NSW 2259



From: Scott Carter <scott.carter@dpi.nsw.gov.au>
Sent: Tuesday, 14 December 2021 9:54 AM
To: Darren Jackson <Darren.JACKSON@transport.nsw.gov.au>
Cc: Brad Whittard <Brad.Whittard@transport.nsw.gov.au>; Simon Steel <Simon.STEEL@transport.nsw.gov.au>
Subject: RE: Ramrod Creek culvert Denman Road Muswellbrook - Culvert condition assessment -ponded water pump-out

CAUTION: This email is sent from an external source. Do not click any links or open attachments unless you recognise the sender and know the content is safe.

Darren

No issues from Fisheries.
Note the usual sed controls etc.

regards

Scott Carter
Senior Fisheries Manager Coastal Systems
NSW Department of Primary Industries | Fisheries
Port Stephens Fisheries Institute| Taylors Beach | NSW 2316
T: +61 2 4916 3931 | E: scott.carter@dpi.nsw.gov.au

ALL MAIL TO: DPI Fisheries, Attn: R. Philips, 1243 Bruxner Hwy, Wollongbar NSW 2477

PERMIT APPLICATION FORMS & FISH HABITAT POLICIES AVAILABLE AT:
<https://www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats/toolkit>

Submit permit applications via email to: ahp.central@dpi.nsw.gov.au

Turnaround times: from date of receipt of application, please allow up to 28 days for Land Owners Consent, Permits and Consultations. Please allow up to 40 days for Integrated Development Applications.

From: Darren Jackson <Darren.JACKSON@transport.nsw.gov.au>
 Sent: Thursday, 9 December 2021 10:45 AM
 To: Scott Carter <scott.carter@dpi.nsw.gov.au>
 Cc: Brad Whittard <Brad.Whittard@transport.nsw.gov.au>; Simon Steel <Simon.STEEL@transport.nsw.gov.au>
 Subject: Ramrod Creek culvert Denman Road Muswellbrook - Culvert condition assessment -ponded water pump-out

Hi Scott,
 TfNSW is undertaking an inspection of an existing large culvert 3 cells (4mx4m) on Denman road, Muswellbrook. The culvert is located on Ramrod creek that drains into the Hunter River. The river is ephemeral and conveys water only when rains it only. Reeds grow in creek in the lower sections that hold shallow water. No vegetation removal is required for the inspection.

Due to long-term sedimentation of the d/s channel the culvert base holds standing water approx. 200-300m deep. To enable safe access for culvert inspection purposes TfNSW require to pump-out this standing water over a 2-3 day period whilst inspections are occurring.

Details of the location (with photos) and work proposal are in the attached step 2 memo which is TfNSW internal environment assessment for such minor maintenance work. The standing water pump-out work will occur in forecast dry times when the creek is not flowing.

Is there any issues DPI- Fisheries have with the proposal?
 The standing water pump-out work is planned for end of jan/ early Feb 2022.

regards

Darren Jackson
 Bridge Maintenance Engineer – Hunter
 Region North - Network and Assets
 Regional and Outer Metropolitan

M 0407 490 646 E Darren.Jackson@transport.nsw.gov.au
 6 Stewart Ave Newcastle West NSW 2302



From: Brad Whittard <Brad.Whittard@transport.nsw.gov.au>
 Sent: Thursday, 9 December 2021 9:18 AM
 To: Darren Jackson <Darren.JACKSON@transport.nsw.gov.au>
 Subject: RE: Draft Step 2 Memo- Ramrod Creek culvert - Culvert condition assessment -ponded water pump-out

G'day Darren,

I'm now wondering if we should inform Scott Carter (fisheries) about this proposed investigation. Also, with all this rain in the region I would be interested to see if there has been changes to the sediment build and vegetation within the creek.

Cheers!
 BRAD

Brad Whittard
 Environment Officer, Hunter Region
 Safety, Environment & Regulation
 Transport for NSW

M 0427215634
 Level 8 266 King St Newcastle NSW 2300



From: Darren Jackson <Darren.JACKSON@transport.nsw.gov.au>
 Sent: Wednesday, 8 December 2021 8:09 PM
 To: Brad Whittard <Brad.Whittard@transport.nsw.gov.au>
 Cc: Simon Steel <Simon.STEEL@transport.nsw.gov.au>; Deve Manchanayake <Deve.MANCHANAYAKE@transport.nsw.gov.au>; Mikhail Lyte <Mikhail.LYTE@transport.nsw.gov.au>
 Subject: Draft Step 2 Memo- Ramrod Creek culvert - Culvert condition assessment -ponded water pump-out

Brad,
 As requested find attached draft step 2 memo for the pump-out of standing water at Ramrod Creek culvert, Muswellbrook.

Works is planned around end jan/ early Feb 2022 subject to suitable weather and personnel to undertake the pumping from M&D bridges.

Attached is also the selected safeguards applicable.

As I am on annual leave from Friday midday returning post shutdown 2022.

Please cc Simon Steel into reply for any amendments required.

regards

Darren Jackson

Bridge Maintenance Engineer – Hunter
Region North - Network and Assets
Regional and Outer Metropolitan

M 0407 490 646 E Darren.Jackson@transport.nsw.gov.au
6 Stewart Ave Newcastle West NSW 2302



Transport
for NSW

From: Darren Jackson

Sent: Wednesday, 8 December 2021 1:27 PM

To: Brad Whittard <Brad.Whittard@transport.nsw.gov.au>

Subject: RE: 1378 - Ramrod Creek culvert - Existing Culvert condition durability assessment -ponded water pump-out enquiry

Brad,

I am commencing drafting step 2 as per your advice below.

Do you have an example of environmental work method statement that I could use as reference?

I have talked to M&D and have come up with a basic work method but just want to know how to format it.

Thanks

Darren Jackson

Bridge Maintenance Engineer – Hunter
Region North - Network and Assets
Regional and Outer Metropolitan

M 0407 490 646 E Darren.Jackson@transport.nsw.gov.au
6 Stewart Ave Newcastle West NSW 2302



Transport
for NSW

From: Brad Whittard <Brad.Whittard@transport.nsw.gov.au>

Sent: Tuesday, 19 October 2021 8:11 AM

To: Darren Jackson <Darren.JACKSON@transport.nsw.gov.au>

Cc: Deve Manchanayake <Deve.MANCHANAYAKE@transport.nsw.gov.au>; Simon Steel <Simon.STEEL@transport.nsw.gov.au>

Subject: RE: 1378 - Ramrod Creek culvert - Existing Culvert condition durability assessment -ponded water pump-out enquiry

G'day Darren,

If the durability assessment can be completed when there's no flow within ramrod creek and the ponding of water is at a very low level, I'm of the opinion a step 2 memo in an email format would be sufficient. Include a safeguard that an environmental work method statement is required because of working within a waterway.

Cheers!

BRAD

Brad Whittard

Environment Officer, Hunter Region
Safety, Environment & Regulation
Transport for NSW

M 0427215634
Level 8 266 King St Newcastle NSW 2300



Transport
for NSW

From: Darren Jackson <Darren.JACKSON@transport.nsw.gov.au>

Sent: Thursday, 14 October 2021 11:39 AM

To: Brad Whittard <Brad.Whittard@transport.nsw.gov.au>

Cc: Deve Manchanayake <Deve.MANCHANAYAKE@transport.nsw.gov.au>; Simon Steel <Simon.STEEL@transport.nsw.gov.au>

Subject: FW: 1378 - Ramrod Creek culvert - Existing Culvert condition durability assessment -ponded water pump-out enquiry

Brad,

As part of the design for the culvert widening at Ramrod Ck, Denman road Muswellbrook, a condition assessment of the existing structure is required.

The existing concrete culverts are near 50 years old, and their condition needs to be checked as suitable before we modify them with the proposed extension.

The condition/ durability assessment typically involves a suite of non-destructive onsite tests and extraction of concrete core samples for lab testing.

Tests includes:

- Hammer tapping concrete elements for soundness and surface hardness.
- Visual inspection of defects.

- Measurement of concrete cover using electronic cover meters.
- Measurement of concrete element depths and lower reinforcement locations using ground radar equipment.
- Carbonation test to check for migration of carbon dioxide into the concrete.
- Half cell potential survey.
- Coring samples of concrete for lab testing.

All of these test are standard tests are commonly done for concrete condition assessment.

An example report that described the tests in more detail is attached for reference (previously completed at Doctors Ck Golden Hwy).

These tests would be conducted by a specialist consultant via walking access into the culverts during normal daytime work hours with no noise or traffic impact.

At time of inspection water was ponded approx. 200mm deep above the base slab.

See photo attached.

The proposed inspection of the concrete base slab would require temporary pump-out of the ponded water over the base slab.

Deposition of silt and vegetation growth u/s and d/s of the culvert (in the creek beyond the road corridor) has caused local ponding at the culvert even during dry times.

Pump-out would be by a 1-2 inch pump during the day of the proposed condition assessment inspection.

Discharge water would be pumped into the d/s channel as per natural flows.

Ramrod Ck is an ephemeral creek and only flows during dry times.

Timing of the pump-out would be during forecast dry weather.

My understanding is that the condition inspection/ non-destructive testing of large culvert/ bridges is covered as resource 1 activity (exempt from specific environmental approvals).

What I am not clear about is environmental approvals for the proposed pump-out of ponded water.

Could you please advise on what (if any) environmental approvals are required for the proposed pump-out of ponded water for culvert condition inspection purposes.

regards

Darren Jackson

Bridge Maintenance Engineer – Hunter

Region North - Network and Assets

Regional and Outer Metropolitan

M 0407 490 646 E Darren.Jackson@transport.nsw.gov.au

6 Stewart Ave Newcastle West NSW 2302



Transport
for NSW

From: Brad Whittard

Sent: Tuesday, 31 August 2021 11:09 AM

To: Darren Jackson <Darren.JACKSON@transport.nsw.gov.au>

Subject: RE: 1378 Geotech Investigation - Bridge 1573 widening and barrier upgrade - BH locations

G'day Darren,

Since the proposed geotech investigation only requires drilling in the disturbed embankment area, passive testing within the waterway and assuming no impact on sensitive areas eg AHIMS site, I agree the investigative works are exempted in accordance with Resource 1- activity checklist EIA-P05-G01-T01.

Cheers!

BRAD

Brad Whittard

Environment Officer, Hunter Region

Safety, Environment & Regulation

Transport for NSW

M 0427215634

Level 8 266 King St Newcastle NSW 2300



Transport
for NSW

From: Darren Jackson

Sent: Friday, 27 August 2021 9:29 AM

To: Olivia Cowell <Olivia.Cowell@transport.nsw.gov.au>; Brad Whittard <Brad.Whittard@transport.nsw.gov.au>

Cc: Steve Board <steve.board@transport.nsw.gov.au>; Simon Steel <Simon.STEEL@transport.nsw.gov.au>; Mark Hornby <Mark.Hornby@transport.nsw.gov.au>

Subject: RE: 1378 Geotech Investigation - Bridge 1573 widening and barrier upgrade - BH locations

Olivia,

Thanks for following up alternate drilling options at Ramrod Ck to minimise environmental impact and resultant approvals.

It seems like the consultant (Golders) is OK to do two boreholes in the shoulder/ embankment as near as possible to culvert, supplemented with DCP within the waterway itself.

They must be content that this will give reliable information for determination of foundation design conditions for the culvert extension. I know with bridges the bridge code requires BH's to be located at the proposed pier locations. Given that this culvert is a shallow base slab foundation I assume there is no need to locate boreholes closer to the structure extension.

This will not trigger any environmental approvals and negates need for temp rock access platform which is great and saving of 4 months and approx. \$40k.

Attached is photos of all four abutment corners showing borehole location options (red ring).

My suggestion is to undertake the two BH's at NE and SW corners as they have clear access and located off the road.

These locations are also clear of overhead power lines.

Can you confirm if driller would be able to negotiate the slightly steeper embankment at SW corner with the track mounted drill rig. The presence of an underground pipe at the NW corner limits the available space for drill rig.

TFNSW would provide traffic control but would only need reduced speed without lane closures if we can locate the drill rig off road. I would need approx. 10 days' notice to coordinate through Upper Hunter M&D, and get ROL.

TFNSW will do utility clearance survey (due in next 2 weeks). I will get locator to mark existing utility locations on site so clear to all.

Brad – The above is for geotech drilling out of the waterway on the adjacent banks/ shoulders without need for temp rock platform, vegetation removal or dewatering. Can you please confirm that the above would not trigger any special environmental assessment as the geotech drilling would be located in a disturbed bridge embankment areas out of the waterway, which I understand is an exempt activity (refer extract from activity checklist below).

Note that the only requirement to access into the waterway is passive DCP testing. This would involve a person walking into the waterway with handheld DCP and manually driving steel probe into ground to determine resistance. No spoil generated or ground disturbance required with this passive DCP approach.

Geotechnical investigations	
Geotechnical investigations - no excavation required	INCLUDES: <ul style="list-style-type: none"> Activities required to carry out geotechnical investigations including but not limited to: pavement beaming, laser roughness testing, radar testing, standard penetration testing, Cone Penetrometer Testing (CPT), Dynamic Cone

Routine Maintenance and Minor Works – Activity Checklist

11

Printed copies of this document are uncontrolled

Activity	Description
Geotechnical investigations - requiring excavations	Penetrometer (DCP), Seismic refraction / reflection testing, and electrical resistivity testing. INCLUDES: <ul style="list-style-type: none"> Activities required to carry out geotechnical activities (including drilling, test pitting and sampling) EXCLUDES: <ul style="list-style-type: none"> Drilling in waterway Drilling in embargoed areas (https://www.industry.nsw.gov.au/water/licensing-trade/licences/embargoes) Activities that will result in any increase in stormwater drainage or run-off from the site

regards

Darren Jackson

Bridge Maintenance Engineer – Hunter

Region North - Network and Assets

Regional and Outer Metropolitan

M 0407 490 646 E Darren.Jackson@transport.nsw.gov.au

6 Stewart Ave Newcastle West NSW 2302



From: Olivia Cowell

Sent: Thursday, 26 August 2021 3:14 PM

To: Darren Jackson <Darren.JACKSON@transport.nsw.gov.au>

Subject: FW: 1378 Geotech Investigation - Bridge 1573 widening and barrier upgrade

Hi Darren,

See below for the option for Golder to undertake the geotech investigation from the bridge. However, their preference is to use a track mounted drill rig to get as close the bridge on the embankment to drill, getting as close to the water as possible. Would this be a possibility or is the access too restricted and embankment too steep?

Regards,

Olivia Cowell

Graduate Engineer

Technical Services

Infrastructure and Place

Transport for NSW

M 0409 225 705

Level 7 6 Stewart Ave Newcastle West NSW 2302



From: Savage, Steven [mailto:SSavage@golder.com.au]
 Sent: Monday, 23 August 2021 11:50 AM
 To: Olivia Cowell <Olivia.Cowell@transport.nsw.gov.au>
 Subject: RE: 1378 Geotech Investigation - Bridge 1573 widening and barrier upgrade

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NOTE: This email chain appears to contain email from outside Golder

Hi Olivia,

As discussed over the phone, it would be ideal to get as close to the creek as possible with a small track mounted drilling rig that would avoid the requirement for traffic control. If this is not possible, we could drill from the road as per the following methodology:

1. Set up traffic control to provide temporary closure of the southbound lane (traffic control to be provided by TfNSW).
2. Set out two boreholes and use passive techniques to check for underground services (underground service locator to be provided by TfNSW). One borehole set out at each bridge culvert approach, away from wheel paths, preferably in the road shoulder. Ideally boreholes would be set out and cleared prior to mobilizing the drilling rig, recognizing that traffic control may be required during these activities.
3. Drill boreholes using a track or truck mounted drilling rig:
 - a. Penetrate asphalt surface with auger drilling methods.
 - b. Auger drilling through embankment materials without sampling or testing.
 - c. Washbore drilling below groundwater table.
 - d. SPTs @ 1m intervals in alluvial materials, disturbed samples to be subject to lab testing.
 - e. Boreholes to target 3m of stiff/ medium dense material, or a maximum depth of 10m.
 - f. Boreholes to be backfilled with spoil material, capped with concrete plug, and topped with coldmix asphalt at the road surface.
4. Undertake DCP testing near and within the creek (subject to environmental approvals). This information will supplement the boreholes.
5. Remove traffic control and re-open road to traffic.

I've updated the cost estimate as per this scope.

Pay Item	Description	Unit	Rate	Quantity	Cost	Comment
1	Nominated personnel	100% rates				
	Graham Scholey	hr	\$ 350	2	\$ 700	Review WHS and technical deliverables
	Experienced Engineer/ Geologist (3 to 5 yrs exp)	hr	\$ 180	20	\$ 3,600	Prepare WHS and technical deliverables, engage drilli
	Engineer/ Geologist (<3 yrs)	hr	\$ 140	16	\$ 2,240	Preparation, field work, gINT logs and labs
2	Travel time	80% rates				
	Engineer/ Geologist (<3 yrs)	hr	\$ 112	4	\$ 448	2 hours each way ex-Newcastle
3	Overnight Accommodation	day	\$ 150	0	\$ -	
4	Travel expense (in non-TfNSW car)	km	\$ 1.25	260	\$ 325	130 km each way ex-Newcastle
5	Meals (outside business hrs)	day	\$ 75	1	\$ 75	
6	Incidentals	day	\$ 25	1	\$ 25	
7	Urgent call-out (outside business hours 18:00-07:30)	150% rates				
8	Moisture content (RMS T120)	each	\$ 20	3	\$ 60	
	Atterberg Limits (RMS T108/T109)	each	\$ 150	3	\$ 450	
	Particle Size Distribution (AS 1289.3.6.1)	each	\$ 140	3	\$ 420	
	Soil aggressivity suite (pH, EC, chlorides, sulphates)	each	\$ 90	3	\$ 270	
	Laboratory batch fee	batch	\$ 60	1	\$ 60	
9	Drilling rig	day	\$ 3,400	1	\$ 3,400	Includes time for travel and drilling
	Offsite waste disposal	200L drum	\$ 300	1	\$ 300	Includes supply and offsite disposal of 200L waste dr
	Drilling consumables	sum	\$ 300	1	\$ 300	Tarps & geofabric, cold mix asphalt, concrete
Estimated total cost (excluding GST)					\$ 12,673	

Let me know if you need any further information or if you have any questions.

Thanks,

Steven Savage (BE (Hons), BCom)
 Geotechnical Engineer



Golder Associates Pty Ltd
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 Sent: Friday, 20 August 2021 12:08 PM
 To: Savage, Steven <SSavage@golder.com.au>
 Subject: RE: 1378 Geotech Investigation - Bridge 1573 widening and barrier upgrade

EXTERNAL EMAIL

Hi Steven,

Thanks for your time on the phone this morning. As discussed, the environmental approvals and costs associated with dewatering and constructing temporary rock pads would add significant cost and time delays to the works. In light of this I would appreciate if you could provide an option for drilling from the bridge deck without the need for dewatering. We would need to contain the drill rig in the existing single lane and shoulder (max width approx. 4.6m) to keep one lane of traffic flowing with Golder to engage the drilling contractor.

Regards,

Olivia Cowell
 Graduate Engineer
 Technical Services
 Infrastructure and Place
 Transport for NSW

M 0409 225 705
 Level 7 6 Stewart Ave Newcastle West NSW 2302



From: Savage, Steven [<mailto:SSavage@golder.com.au>]
 Sent: Thursday, 19 August 2021 2:52 PM
 To: Olivia Cowell <Olivia.Cowell@transport.nsw.gov.au>
 Subject: RE: 1378 Geotech Investigation - Bridge 1573 widening and barrier upgrade

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Hi Olivia,

A small tracked mounted drilling rig would be better suited. From looking at the site on Google street view, a rig could track down each embankment and drill a hole using casing. I wouldn't suggest drilling from the road.

Let me know if you need any more info.

Cheers,

Steven Savage (BE (Hons), BCom)
 Geotechnical Engineer



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 MEMBER OF WSP

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Appendix C

Aboriginal cultural heritage advice

2 September 2022

Lionel Huang
Project Manager
Transport for NSW

Dear Lionel,

Preliminary assessment results for the Denman Road Pavement Rehabilitation and Culvert Extension, Muswellbrook based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (the procedure).

The project, as described in the Stage 1 assessment checklist, was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The assessment is based on the following due diligence considerations:

- The project works are within the existing road corridor and embankments (disturbed zones).
- The project is unlikely to harm known Aboriginal objects or places (AHIMS sites).
- The AHIMS search indicated that there are 65 recorded Aboriginal sites within the search area, however, there are no recorded sites within the proposed works area.
- The study area does contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Roads and Maritime Services' procedure, however, the cultural heritage potential of the study area appears to be reduced due to past disturbances in the form of the construction of the current road corridor.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If the scope of your project changes you must contact me and your regional environmental staff Claire Naylor to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Transport for NSW *Unexpected Heritage Items Procedure*.

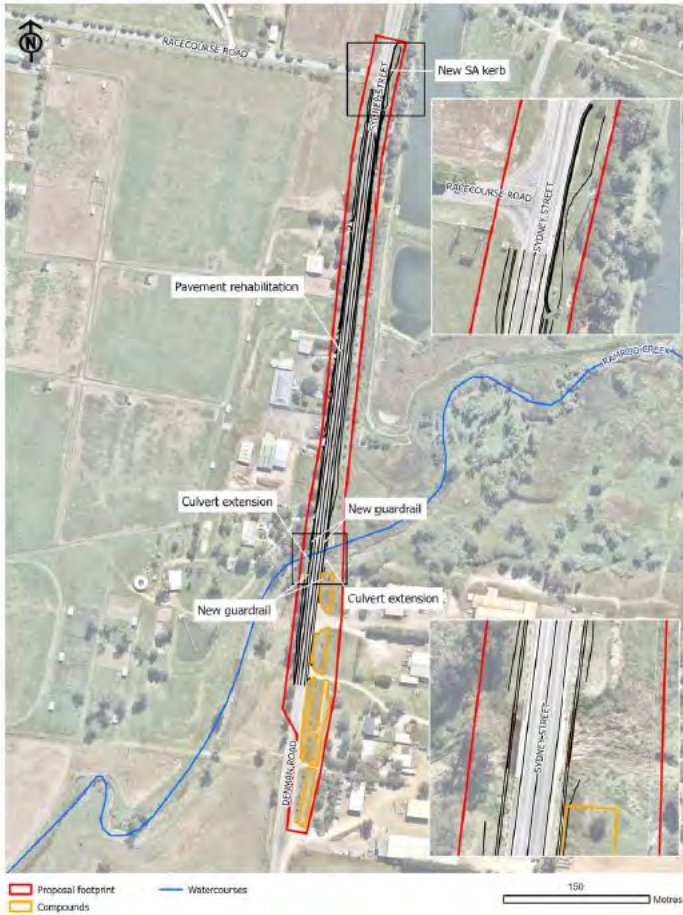
For further assistance in this matter do not hesitate to contact me.

Yours sincerely

Lee Davison

Lee Davison
Aboriginal Community and Heritage Partner

Project area



Appendix D

Biodiversity Assessment Report



Biodiversity Assessment Report

Undertaking of road works along a 650-metre length of Denman Road, Muswellbrook, NSW

JANUARY 2023

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Executive summary

A Biodiversity Assessment has been conducted as Transport for NSW is proposing to upgrade the road, pavement and a culvert that is present along a section of Denman Road, Muswellbrook, NSW.

This Biodiversity Assessment has been carried out by Lesryk Environmental Pty Ltd and will form part of the Review of Environmental Factors being prepared for the proposal.

To permit the proposal, based on a worst-case estimate, a disturbance footprint of about 2.89 hectares would be required. Within this area, some exotic and native vegetation will require removal.

With reference to the Arboricultural Impact Assessment and Tree Protection Plan prepared for the project by Tree Survey Pty Ltd, the works will require the clearing of eleven trees (these composed of four small, two medium and five large trees), two of which are hollow-bearing. To off-set the loss of these trees, Transport for NSW proposes to transfer funds into the Conservation fund at the required rates per Transport for NSW's 2022 publication: *Tree and hollow replacement guidelines*; this, for the number of trees and hollow-bearing plants being cleared, being \$8000.00. Additionally, Transport for NSW has proposed to plant twenty-seven amenity trees along the road verge of Denman Road and Sydney Street to address the visual impact of the removal of the amenity trees required to permit the proposal.

No threatened ecological communities, threatened flora or fauna species, or their populations, listed, or currently being considered for listing under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* or the New South Wales *Biodiversity Conservation Act 2016*, were recorded during the field investigation.

Given the presence of suitable habitat (i.e., hollow-bearing trees), and as they have been previously recorded within proximity to the proposal area, a precautionary approach was adopted in regard to the potential presence of threatened hollow-dependent Yangochiroptera (insectivorous bats). An assessment referring to the criteria provided under Section 7.3 of the New South Wales *Biodiversity Conservation Act 2016* was conducted on these species; this concluding that the proposal would not have a significant impact on threatened hollow-dependent Yangochiroptera.

The proposal does not trigger a Species Impact Statement [or alternatively a Biodiversity Development Assessment Report]; while referrals under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* are no longer required for Transport for NSW proposals assessed under Part 5 of the NSW *Environment Planning and Assessment Act 1979* in accordance with the Strategic Assessment process.

The proposal is located within identified Key Fish Habitat in association with Ramrod Creek. With regard to the New South Wales *Fisheries Management Act 1994*, no threatened aquatic species, ecological communities or habitats are considered to occur within the proposal area. In accordance with Section 199 of the *Fisheries Management Act 1994*, regarding proposed 'dredging and reclamation' work to be conducted within, or in proximity to, Ramrod Creek, Transport for NSW has entered into consultation with the New South Wales Department of Primary Industries [Fisheries] (Reference no. C22/399). The Department of Primary Industries has no objection to the proposed work, provided provisions detailed within Section 5.1.3 of this report are adhered to.

Mitigation measures have been provided in Section 6 of the report. Two primary measures include:

- Minimising impact through detailed design.
- Adhering to Transport's *Biodiversity Guidelines*.

In addition, the following key mitigation measures have been provided:

- Limit vegetation removal to the minimum required to successfully permit the proposal.

- A licenced Ecologist to be present on-site to supervise the clearing of the two hollow-bearing trees.
- Retained trees to be clearly identified on-site prior to the commencement of work to ensure they are not indirectly impacted or cleared.
- Prepare an Erosion and Sediment Control Plan to minimise soil erosion and sediment transfer off-site.
- Adhere to provisions stipulated by DPI Fisheries.
- TfNSW to transfer \$8000 into the Conservation fund.
- TfNSW to plant 27 amenity trees along the road verge of Denman Road and Sydney Street to address the visual impact of the removal of the amenity trees required to permit the proposal.

Adoption of these would ensure that the work proposed is carried out in an ecologically sustainable manner.

Glossary

Definitions

Biodiversity Assessment Method	The Biodiversity Assessment Method is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (State of NSW and DPIE 2020c)
Construction footprint	The area to be directly impacted by the proposal during construction activities.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat, and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation). This includes impacts from activities related to the construction or operational phase of the proposal (State of NSW and DPIE 2020c).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (State of NSW and DPIE 2020c).
Important population	Is a population that is necessary for a species' long-term survival and recovery; this may include populations identified as such in recovery plans, and/or that are: <ul style="list-style-type: none">○ Key source populations either for breeding or dispersal○ Populations that are necessary for maintaining genetic diversity Populations that are near the limit of the species range (DE 2013).
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g., transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (State of NSW and DPIE 2020c).
Local population	Local population: the population that occurs in the proposal area. The assessment of the local population may be extended to include individuals beyond the proposal area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the proposal area, according to the following definitions: <ul style="list-style-type: none">○ The local population of a threatened plant species comprises those individuals occurring in the proposal area or the cluster of individuals that extend into habitat adjoining and contiguous with the proposal area that could reasonably be expected to be cross-pollinating with those in the proposal area.

Definitions

- The local population of resident fauna species comprises those individuals known or likely to occur in the proposal area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the proposal area.
- The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the proposal area from time to time or return year to year.

MNES	A matter of national environmental significance (MNES) protected by a provision of Part 3 of the EPBC Act.
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (State of NSW and DPIE 2020c).
Mitigation	Action to reduce the severity of an impact.
Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality or injury.
Native vegetation	(a) trees (including any sapling or shrub or any scrub), (b) understorey <u>plants</u> , (c) groundcover (being any type of herbaceous vegetation), (d) <u>plants</u> occurring in a wetland. A <u>plant</u> is native to New South Wales if it was established in New South Wales before European settlement (BC Act).
Operational footprint	The area that will be subject to ongoing operational impacts from the proposal. This includes the road, surrounding safety verges and infrastructure, fauna connectivity structures and maintenance access tracks and compounds.
Proposal area/site/ footprint	The area of land that is directly impacted on by the proposal that is being assessed under the EP&A Act, including access roads, and areas used to store construction materials. It includes the construction and operational areas for the proposal.
Study region	Is considered to 'include the lands that surround the subject site for a distance of 10 km' (DECC 2007).
Target species	A species has been identified within the proposal area or is considered to have a moderate to high likelihood of occurrence and may be impacted by the proposal.

Abbreviations

AOBV	Areas of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BC Act	<i>Biodiversity Conservation Act 2016 (State)</i>
BDAR	Biodiversity Development Assessment Report
BOM	Bureau of Meteorology
BOS	Biodiversity Offset Scheme under the BC Act
BVMTT	Biodiversity Values Map and Threshold Tool
CEMP	Construction Environmental Management Plan
DAWE	Commonwealth Department of Agriculture, Water and the Environment (now known as DCCEEW)
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DEC	NSW Department of Environment and Conservation (now known as DPE)
DECC	NSW Department of Environment and Climate Change (now known as DPE)
DECCW	NSW Department of Environment, Climate Change and Water (now known as DPE)
DEWHA	Commonwealth Department of the Environment, Water, Heritage and Arts (now known as DCCEEW)
DSWEPC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now known as DCCEEW)
DoE	Commonwealth Department of Environment (now known as DCCEEW)
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and Environment (now known as DPE)
EEC	Endangered ecological community
EES	Environment Energy and Science Group, Department of Planning, Industry and Environment
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth).</i>
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>

Abbreviations

GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
KTP	Key Threatening Process
Lesryk	Lesryk Environmental Pty Ltd
LGA	Local Government Area
mm/cm/m/m ² /km/ha	Millimetres, centimetres, metres, square metres, kilometres, hectares
MNES	Matters of National Environmental Significance
NPWS	NSW National Parks and Wildlife Service
NSW	New South Wales
OEH	NSW Office of Environment and Heritage (now known as DPE)
PCT	Plant Community Type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TEC	Threatened Ecological Communities
TfNSW	Transport for NSW
VIS	Vegetation information system
WoNS	Weeds of National Significance

1 Introduction

1.1 Proposal background

At the request of Hills Environmental, on behalf of Transport for NSW (TfNSW), Lesryk Environmental Pty Ltd (Lesryk) has been engaged to carry out a Biodiversity Assessment of a 650 m length of Denman Road, this including an existing culvert structure (Bridge No B01537) (Figure 1-1). For reference, the regional context of the proposal area is provided in Figure 1-2.

As part of the road and pavement upgrade of Denman Road, this aimed at improving safety, TfNSW proposes to extend the existing culvert that is present at this location. The culvert requires extension to accommodate the widening of the road shoulder, thereby complying with current standards.

The proposed culvert extension work will be conducted simultaneous to the Denman Road upgrade project including pavement work.

The Biodiversity Assessment has been carried out to accompany the proposal's REF, and to consider and assess any ecological impact associated with the proposed road upgrades and culvert extension work.

1.2 The proposal

Concept designs for the road and pavement upgrades have been prepared by TfNSW, and are presented in Appendix 1. Detailed designs for the culvert extension have been prepared by Focus Bridge Engineering for TfNSW (Appendix 2). Broadly, the proposed work would include:

- Pavement rehabilitation over a length of about 650 m, including
 - Construction of new road shoulders between 1.5 to 3 m wide with heavy duty asphaltic pavement.
 - Milling sections of existing pavement and constructing new heavy duty asphaltic pavement (primarily for the 3.5 m wide travel lanes).
 - Construction of new full depth pavement sections (on the western shoulder, south of the Ramrod Creek culvert).
- Removal of up to eleven trees within the proposal area.
- Construction of new grassed road verges and batters to suit new road profile.
- Extension of existing Ramrod Creek three cell reinforced concrete box culvert on upstream and downstream sides, including reshaping of culvert inlet/outlet and the provision of scour protection (rock rip rap 3-6 m beyond the end of the apron slab both upstream and downstream).
- Scour protection works on both the upstream and downstream sides of the bridge, this including construction of an about 6 m long by 1 m high, 1 m wide Gabion wall at the north-eastern corner (upstream) of the bridge and reno mattress and rock rip rap in the remaining areas (these being up to an approximately length of 6 m).
- Placement of organic mesh and suitable planting to stabilise the banks of Ramrod Creek near the proposed culvert works.
- Removal of existing width marker signage at the Ramrod Creek box culvert.
- Provision of new cyclist friendly barriers and new asphaltic pavement on top of the Ramrod Creek box culvert.
- Provision of bridge and road safety barriers.
- Construction of new section of SA kerb on the eastern side of the Racecourse Road intersection.

Figure 1-1 Proposal area

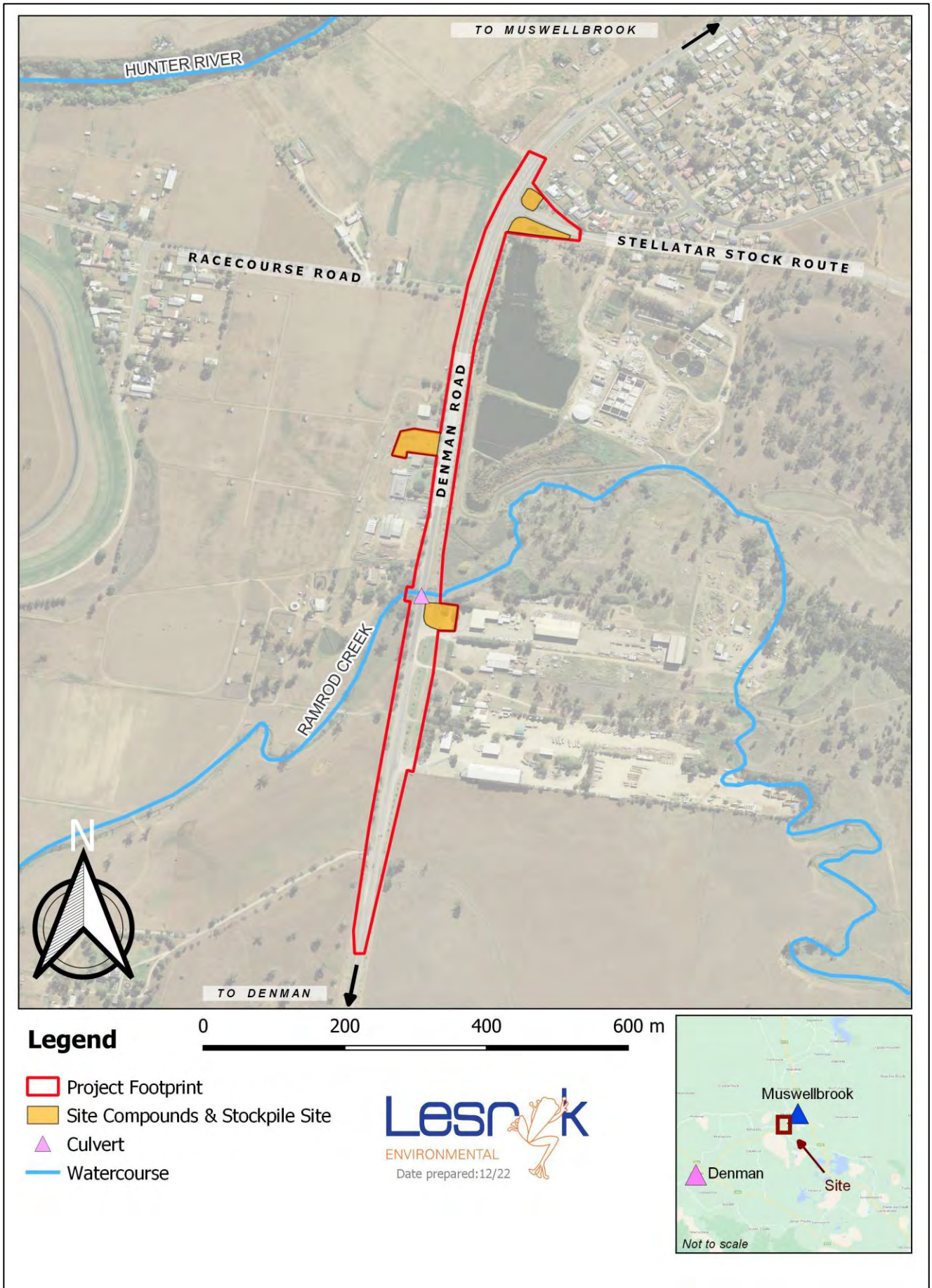
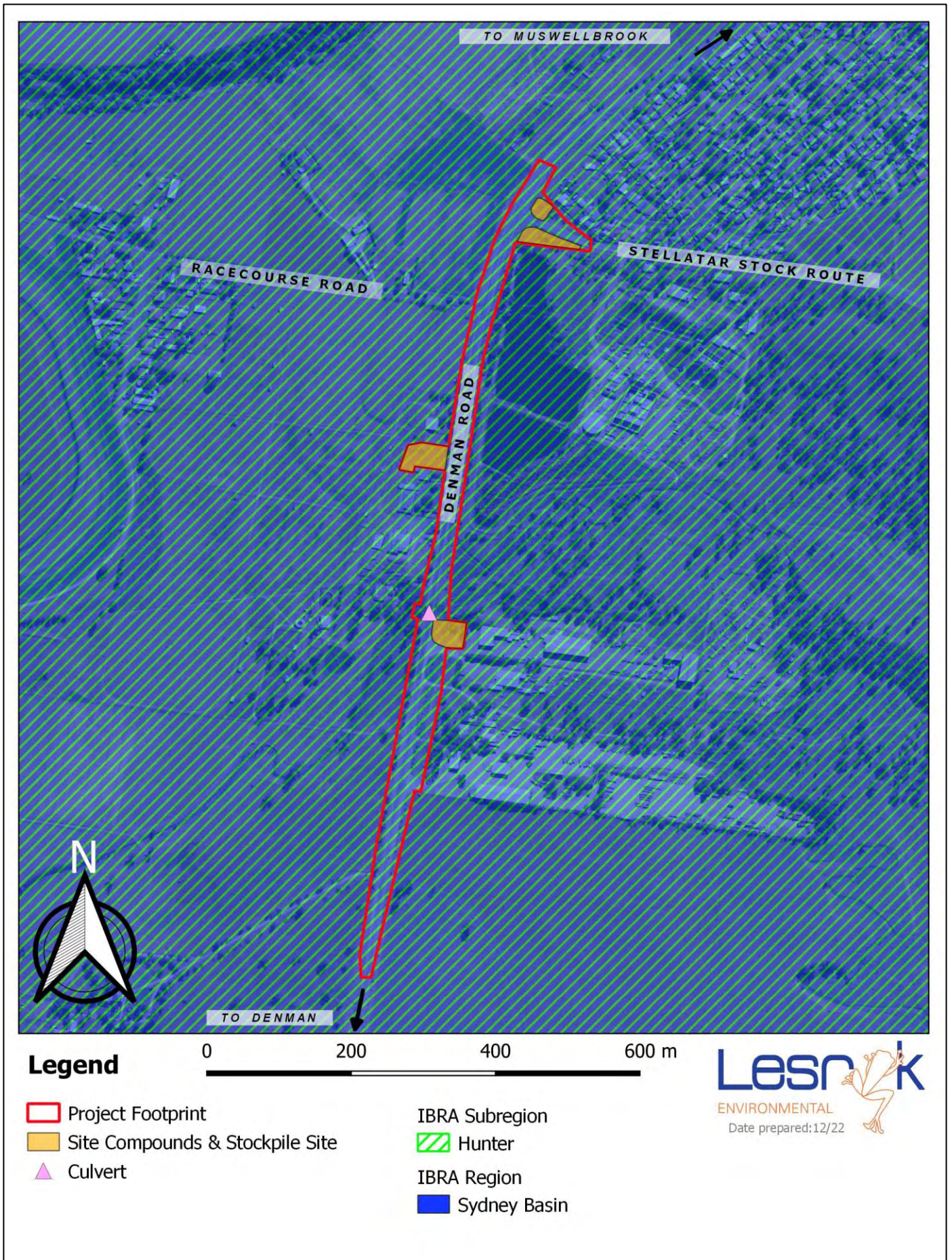


Figure 1-2 Proposal regional context



- Reinstatement of pavement markings speed limit pavement markings near Racecourse Road.
- Reforming of driveway accesses along the length of works.
- Temporary access tracks from the road to the upstream and downstream culvert work areas (comprising geofabric with a layer of recycled asphalt pavement on top).
- Temporary construction compounds, stockpiles and over-size over-mass (OSOM) vehicle pullover bays.
- Replanting of amenity trees along road verges of Denman Road and Sydney Street, and transferring contribution into the Conservation fund.

A Landscaping Plan prepared by TfNSW is provided in Appendix 3.

Works undertaken within, or on the banks of, Ramrod Creek would require the temporary use of a coffer dam. The coffer dam would divert stream flows around the works area and would be progressively adjusted. The coffer dam would be constructed from steel sheet piles and sand bags, while stream flows would either be pumped over the coffer dam or gravity fed to the other side using a storm water pipe inserted in an earth/sand bags dam adjacent to the sheet piles. The coffer dam would only be erected during the course of those works conducted near Ramrod Creek; being a temporary structure that would be removed.

To permit the proposal, based on a worst-case estimate, a disturbance footprint (i.e., footprint in which 'disturbances would occur') totalling about 2.89 ha would be required, this composed of:

- The 650 m length of Denman Road (indicative)
- About 10 m either side of Denman Road
- Additional eastern section of roadside within proximity to the culvert being further 20 to 40 m wide.
- 25 m upstream and 20 m downstream of the culvert
- up to 4 m either side of the existing culvert and a 4 m wide access corridor to the culvert
- 6,2432.30 metres squared (m²) of site compounds and stockpile area
- Disturbance/removal of exotic and native vegetation to achieve the objectives of the proposal.
- The movement of personnel and vehicles/machinery
- Ancillary facilities.

Reference to the design plans indicate the operational footprint of the culvert is expected to be 619.5 m² (approximate 11 m existing length and 18.5 m extension by 21 m wide).

With reference to the Arboricultural Impact Assessment (AIA) & Tree Protection Plan (TPP) prepared as part of the proposal (AIATPP) (Appendix 4), a total of eleven trees would require removal, two of these (Tree ID 83 & 84) being hollow-bearing. TfNSW proposes to contribute funds into the TfNSW Conservation fund at the required rates per TfNSW's 2022 publication: *Tree and hollow replacement guidelines* (Refer to section 7.2 of this report).

Denman Road is a two-lane carriageway; however, sections of the road are currently under traffic control and reduced to single lane traffic with alternate flow arrangements due to nearby road constructions. It is expected that the proposed road upgrades and culvert extension works would be conducted simultaneous to the other projects.

Unless a specific aspect is referred to, the work would hereafter be referred to as 'the proposed work'.

To permit the proposed 18.5 m culvert extension, upstream inlet and downstream outlet areas would require dredging and reclamation work. Due to existing character of the

culvert, it is considered likely that the works can be undertaken from the existing road pavement.

Temporary compound/stockpiles will be required for materials, plant and equipment; these located within existing cleared and highly disturbed areas (Figure 1-1).

1.3 Legislative context

As part of this project, an REF will be prepared to satisfy TfNSW's duties under s.5.5 of the EP&A Act to "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity" and s.5.5 in making decisions on the likely significance of any environmental impacts. This biodiversity impact assessment forms part of this REF and assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

The BC Act requires that the significance of the impact on threatened species, populations and threatened ecological communities is assessed using the test listed in Section 7.3 of the BC Act. Similarly, Part 7A of the FM Act requires that significance assessments are undertaken in accordance with Division 12 of the FM Act. Where a significant impact is likely to occur, a SIS must be prepared in accordance with the Environment Agency Head's requirements, or a BDAR (should TfNSW select this option) must be prepared by an accredited assessor in accordance with the BAM (DPIE 2020c).

As a result, TfNSW's Road proposals assessed via an REF:

- Must address and consider potential impacts on nationally listed threatened species, populations, ecological communities and migratory species, including application of the "avoid, minimise, mitigate and offset" hierarchy
- Do not require referral to the DCCEEW for these matters, even if the activity is likely to have a significant impact.
- Must use the BAM to calculate credits that would offset significant impacts on EPBC Act listed threatened species, populations, ecological communities and migratory species.

Assessments of impact significance are required for all relevant biodiversity values in accordance with the Matters of National Environmental Significance: Significant impact guidelines 1.1. *Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013).

2 Methods

2.1 Personnel

Table 2-1 Personnel

Name	Role	Qualifications
Chelsea Tiller	Field ecologist: conducted site investigation, document preparation.	B. Soc.Sc
Itzel Gonzalez	Field ecologist: conducted site investigation, document preparation.	B.Sc. (Hons)
Deryk Engel	Principal ecologist: document review, updating and quality assurance.	B.Env.Sc. (Hons)
Kirsty Bloomfield	Research assistant: document review and quality assurance.	–

2.2 Background research

Prior to carrying out any fieldwork, known databases and any previous studies conducted in the region were consulted to identify the diversity of ecological communities, flora and fauna species known for, or potentially occurring in, the study region. The identification of those known or potentially occurring native species and communities within this portion of the Muswellbrook LGA, particularly those listed under the Schedules to the EPBC, BC and/or FM Acts, thereby permits the tailoring of the field survey strategies to the detection of these plants and animals, their vegetation associations and/or necessary habitat requirements. By identifying likely species, particularly any threatened plants and animals, either the most appropriate species-specific survey techniques may be selected [should their associated vegetation communities/habitat requirements be present] or a precautionary approach to their presence adopted.

The carrying out of a literature search also ensures that the results from surveys conducted during different climatic, seasonal and date periods are considered and drawn upon as required. This approach therefore increases the probability of considering the presence of, and possible impact on, all known and likely native species, particularly any plants and animals that are of regional, State and/or national conservation concern. This approach also avoids issues inherent with a one off 'snap-shot' study.

A list of all databases, date these were accessed, and the search area employed is provided in Table 2-2.

Other reports and documents referred to are provided within the bibliography section of this report.

All these databases and reports were reviewed and drawn upon where relevant. While reviewing these documents, particular attention was paid to identifying relevant ecological matters listed, or currently being considered for listing, under the Schedules of the EPBC, BC and/or FM Acts, plants, animals and ecological communities that have been recorded in the region and which may occur within, or in the vicinity of, the proposal area.

Table 2-2 Database searches

Database	Date accessed	Search area
PMST (DCCEEW 2022a)	December 2022	10 km buffer on study area
Register of critical habitat (DCCEEW 2022c)	December 2022	N/A
BioNet Atlas (DPE 2022a)	December 2022	10 km buffer on study area
Areas of Outstanding Biodiversity Value register (DPE 2022b)	December 2022	N/A
SEPP (Coastal Management) 2018 – maps (DPE 2022c)	December 2022	Locality
NSW WeedWise Database (DPI 2022a)	December 2022	Hunter region
Fisheries NSW Spatial Data Portal (DPI 2022b)	December 2022	Central Rivers layer
BioNet Vegetation Classification database (NSW Government 2022c)	December 2022	N/A
Biodiversity Values Map and Threshold Tool (NSW Government 2022d)	December 2022	Locality
PlantNet (2022)	December 2022	Locality
Groundwater Dependent Ecosystems Atlas (BoM 2022b)	December 2022	Locality

Field guides and standard texts used include:

- Brooker and Kleinig (1999) [used to identify eucalypt]
- Robinson (2003) [other vegetation]
- Cogger (2014) [reptiles and frogs]
- Anstis (2017) [frogs]
- Churchill (2008) [flying mammals]
- Simpson and Day (2019) [birds]
- Van Dyck and Strahan (2008) [non-flying mammals]
- Triggs (1996) [identification of scats, tracks and markings].

Nomenclature follows that in these texts, or within the EPBC, BC and/or FM Acts.

It is noted that the current accepted scientific names for some of the threatened fauna species previously recorded in this locality are not consistent with the names used/provided under either the EPBC, BC and/or FM Acts. In these instances, nomenclature used within this report follows the current approved scientific conventions.

Where applicable, any TECs were classified and named according to the NSW Scientific Committee's Final and Preliminary Determinations [various dates].

The conservation significance of those ecological communities, plants and animals recorded is made with reference to:

- The EPBC, BC and FM Acts
- NSW State Vegetation mapping (NSW Government and DPE 2022)
- The BioNet Vegetation Classification database (NSW Government 2022c).

2.3 Habitat assessment

An assessment of available habitat for each threatened species, population or community identified in the database searches, and their likelihood of occurrence, is provided in Appendix 5.

2.4 Field survey

A biodiversity assessment of the proposed road works area was conducted between the hours of 12 pm and 2 pm on 17 August 2022 by Ms Chelsea Tiller [Field Ecologist] and Ms Itzel Gonzalez [Field Ecologist]. For reference, the weather conditions experienced during the site investigation were warm temperatures (22 °C), no winds or cloud cover.

While conducting the habitat assessments, efforts were made to identify features such as known vegetation associations, geological features, feed trees, mature trees with hollows, connectivity of fauna corridors, aquatic environments and other habitat features important to the lifecycle requirements of those threatened plants and animals previously recorded in the study region (as listed in Appendix 5).

The aims of the investigation were:

- To identify those flora and fauna species and vegetation communities present within, and in close proximity to, the areas of likely disturbance, including both direct and indirect impact
- Diurnal calls of fauna species present identified in the field
- Identification of any indirect evidence such as tracks, scats, scratchings and diggings suggestive of the presence of a particular fauna species
- Leaf litter and ground debris searched for sheltering reptiles and amphibians.
- To identify the structure of those vegetation communities and fauna habitats present within, and close to, the subject site
- Conduct targeted searches for those species of State and/or national conservation concern, as listed the EPBC, BC and/or FM Acts, or their likely habitat areas, that were identified during the literature review stage of the project.

Where required, a more detailed description on one or more of the survey methods employed is provided below.

Where safe to do so, all sections of the proposed work area were traversed by foot.

2.5 Vegetation surveys

When surveying the proposal area, the 'Random Meander Method' (Cropper 1993) was employed. This method involves conducting foot traverses through the site that requires investigation, during which time notes are made on the structure and floristic composition of the native vegetation present.

The 'Random Meander Method' is consistent with the stratified random sampling design as specified in section 5.1 (Stratification, sampling and replication) of the publication titled *Threatened biodiversity survey and assessment: Guidelines for development and activities* (DEC 2004). This method is also mentioned under sections 5.2.1 (Sampling techniques) and 5.2.7 (Targeting threatened plants) of that publication. The Random Meander Method is suitable for covering large areas and for locating any rare species (and their associated vegetation communities/habitat types) that may occur within a particular site.

The 'Random Meander Method' is employed until no new species have been recorded for at least 30 minutes.

Given the modified nature of the proposal area, no plot-based sampling surveys (such as those conducted in accordance with the BAM) were considered necessary.

2.5.1 Targeted flora surveys

Targeted (species specific) surveys for threatened plants were undertaken based on the results of the literature review, this including a consideration of the habitat requirements of those threatened flora species identified as potentially occurring in the proposal area (see Appendix 5), air photography interpretation and the site specifics of the proposal area.

The survey methods employed and level of effort required were generally based on the descriptions provided in the following:

- The DEC 2004 publication
- The State of NSW and DPIE's Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method (2020b).

All of the plant species were considered to have a low potential to occur in the proposal area.

2.5.2 Targeted fauna surveys and habitat assessment

Based on the observations made during the diurnal investigations, the disturbed and modified nature of the area investigated (i.e., road corridor) and the identification of those habitats present, it was not considered necessary to employ any species-specific fauna survey methods (e.g., nocturnal surveys, echolocation targeting Yangochiroptera [hereafter referred to as microbats]). Those survey methods that were employed during the site inspection are as follows:

Diurnal investigation

During the field investigation birds were identified using visual identification of observed individuals or aural identification of their vocalisations. Any opportunistic observations obtained whilst carrying out other field activities were also recorded.

Ground debris searches

Ground debris searches were carried out on foot within the limited number of vegetated portions of the subject site. This involved conducting random meanders through this area and turning over any occurrences of natural debris or urban refuse.

While conducting the ground debris searches, tracks, diggings and characteristic scats were also searched for, and identified in the field.

Hollow-bearing tree survey

Within the surveyed proposal area, the position of those mature trees that were, or considered to be, hollow-bearing (potentially used by microbats, birds and arboreal mammals), were recorded through use of a Garmen™ hand-held Global Positioning System (GPS).

Hollow-bearing trees were recorded in accordance with methods described in the Operation Manual for BioMetric 3.1 (DECCW 2011), in that hollows were only recorded if the:

- Entrance could be seen from the ground
- Hollow appeared to have depth
- Hollow was at least 1 m above the ground (basal hollows were only recorded if they continued up into the tree above 1 m).

For each recorded hollow-bearing tree, the following data was collected.

- Status: whether the tree is alive or dead
- Species identification, if alive
- Height and diameter at breast height (DBH)
- Approximate number of hollows and position in the tree (e.g., trunk, limb, basal or fissure, termitaria)

- Estimated size classes of hollows:
 - Small <50 millimetres (mm)
 - Medium 50-150 mm
 - Large > 150 mm.

It is noted that it was possible to physically access and inspect those hollows on one of the trees present.

The survey methods employed and level of effort required were generally based on descriptions provided in the following:

- The DEC 2004 publication
- The DECC Threatened species survey and assessment guidelines - field survey methods for fauna: amphibians (DECC 2009)
- DEWHA survey guidelines for Australia's threatened bats, bird and frogs (DEWHA 2010a, 2010b, 2010c)
- The DSEWPC survey guidelines for Australia's threatened mammals and reptiles (DSEWPC 2011a, DSEWPC 2011b).
- The 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (State of NSW and OEH 2018a)
- The NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (State of NSW and DPIE 2020).

2.5.3 Aquatic Survey

As the culvert section of the proposed work would be conducted within and adjacent to Ramrod Creek, an aquatic study was broadly performed in accordance with the publication titled *Aquatic Ecology in Environmental Impact Assessment* (Lincoln-Smith 2003). This approach conforms to Section 3.3 *General Requirements for Development* (page 26) of DPI's 2013 publication titled *Policy and guidelines for fish habitat conservation and management*.

The investigation involved traversing, where safe to do so, the sections of creek proximate to the study area, and a distance of up to 25 m upstream and downstream, respectively; with notes taken on the habitat present within the section of creek being 'disturbed', the structure of its bank, its riparian communities, its course, and the presence of any snags or other features important to the lifecycle requirements of those aquatic species present, or considered likely to occur.

In addition, information referred to included:

- A literature search of any relevant previous aquatic studies
- Discussions held with the relevant NSW Fisheries Conservation Manager
- Identification of known or expected aquatic species and their habitats, particularly those of conservation concern
- A review of existing information on the in-stream ecology of Ramrod Creek and consultation with the relevant NSW Fisheries Zone.

Based on a qualitative assessment of the water that was flowing along Ramrod Creek at the time of the field investigation, a consideration of the scope of work proposed at this site and the 'short-term' nature of the proposed road work [it is expected that, post-development, the site would generally reflect its pre-disturbance character], the work will not erect any permanent barriers to fish movement nor would it cause the isolation or fragmentation of any aquatic environments.

It was not considered that any targeted surveys (i.e., netting, trapping or electric fishing) targeting those aquatic species present, or considered likely to occur, were necessary.

2.6 Summary of survey effort and limitations

By the completion of the field investigation a total of about four person hours of active searches had been accumulated. Given the disturbed/modified nature, physical condition and size of the proposal area, this length of time is considered more than adequate when endeavouring to determine the diversity of native species present, their habitats and vegetation associations, and the conservation status of each of these.

Given the seasonal timing of the field investigation, some species are considered to be absent or not readily identifiable from the locality. As such, the presence of these animals was not targeted, though the occurrence of their necessary habitats (as document in the scientific literature) was noted, and if present, a precautionary approach adopted.

It is noted that it was not possible to physically access and inspect the internal portions of the culvert (for animals such as cave-dependent microbats) at the time of the survey due to the presence of a large volume of water within Ramrod Creek. Observations were made from the northern and southern banks on the downstream side of the existing culvert, these indicating the three culvert cells present are all open and unlikely to provide resources for cave-dependent microbats. The inspections did indicate the presence of Fairy Martin (*Petrochelidon ariel*) nests within the culvert, these all being attended to by this species (i.e., no abandoned nests were noted). Given the nature of the work proposed, combined with the observations made, it is not considered that this limitation will affect the integrity of the site assessment.

While not considered to compromise the scientific rigour of the field assessment, no specific surveys (i.e., nocturnal work) were carried out. In order to overcome this limitation:

- Database searches were conducted for threatened species, populations and ecological communities known to occur within the region
- The precautionary approach was adopted where necessary (i.e., suitable habitat for those threatened species known to occur, or that have been previously recorded within the surrounding locality, was identified).

Not all animals and plants can be fully accounted for within any given proposal area. The presence of threatened species is not static; it changes across time, often in response to longer term natural forces that can, at any time, be dramatically influenced by human-made disturbances.

No additional limitations, such as reduced site visibility, adverse weather conditions or access to achieving the objectives of the ecological survey were encountered.

This report is based upon data acquired from the current investigation; however, it should be recognised that the data gathered is indicative of the environmental conditions of the site at the time the field work was conducted.

With reference to TfNSW's *Tree and hollow replacement guidelines*, it is noted that Lesryk did not specifically investigate those plants to be removed from the roadworks footprint. To overcome this limitation, Lesryk relied on the AIATPP report prepared by Tree Survey Pty Ltd and which was provided to us by TfNSW's nominated representative (Appendix 4).

3 Existing environment

For reference, a photographic record of the area investigated is provided in Appendix 6.

The study area is located about 2.8 kilometres (km) south-west of Muswellbrook, and is accessible from Denman Road. The road verge within proximity to the culvert is generally 1.5-3 m wide, with some sections featuring guard rails.

The road verge, and those areas surrounding the culvert, consists of native and exotic grasses, weeds and shrubs that are 0-3 m in height. The area consists of a sparse midstory of isolated Swamp She-oaks (*Casuarina glauca*) that are approximately 7 m tall, with a medium to high-density understorey to 0.5 m. Given their height uniformity, spacing and location within the area investigated, the She-oaks all appear to have been planted. Several mature hollow-bearing trees were present beyond the boundary of the proposed work, primarily within an adjacent private semi-rural property [No. 250 Denman Rd]; however, within the study area, two mature hollow-bearing trees were present on the western embankment of Ramrod Creek, these expecting to be removed during the proposed works.

One waterway, Ramrod Creek, is present within the study area; the investigated culvert structure directing its water beneath Denman Road; the waterway discharging into the Hunter River, about 2.5 km west of the subject site. Upstream sections of Ramrod Creek, including the culvert outlet areas, are dominated by the presence of Cumbungi (*Typha orientalis*). The culvert site exhibited the effects of a recent flooding event at the time of the investigation.

The study area is located within a generally cleared, agricultural landscape; however, existing coal mining sites are present from about 2.5 km west (Bengalla Mine) and 3 km south (Mount Arthur Coal Mine) of the study area. Land uses proximate to the subject site include industrial properties immediately adjacent to the southern extent of the study area; Muswellbrook Sewer Treatment Works about 308 m to the north-east; and residential properties immediately west of Denman Road and the study area.

No conservation areas are present near to the study area. The closest is Manobalai Nature Reserve, present about 25 km to the west of the area investigated.

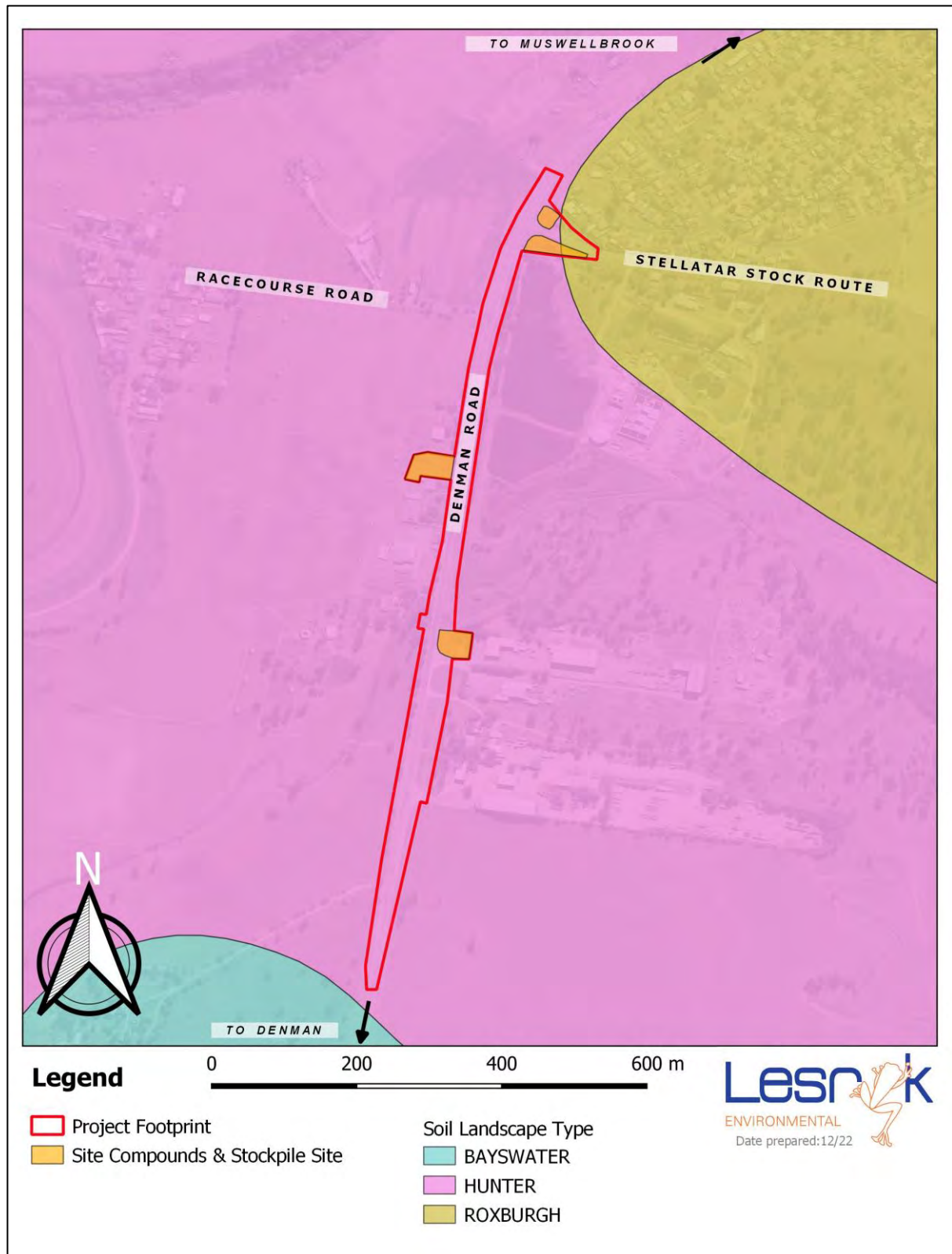
The Soil Landscapes of the Singleton 1:250,000 Sheet report (Kovac and Lawrie 1991) and mapping (State Government of NSW and DPE 2022) identifies the proposal area is located within the following soil landscapes (Figure 3-1):

- Hunter Soil Landscape
- Roxburgh Soil Landscape

The Hunter soil landscape covers the floodplains of the Hunter River and its tributaries. The geological unit is Quaternary alluvium, with the main soils all formed in alluvium; including Brown Clays and Black Earths on prior stream channels and on tributary flats, with Chernozems on prior stream channels adjacent to Dartbrook and Brays Hill soil landscapes and in many of the valleys such as Martindale and Widden. Alluvial Soils occur on levees and flats adjacent to the present river channel. Red Podzolic Soils and Lateritic Podzolic Soils are located on old terraces, with Non-calcic Brown Soils and Yellow Solodic Soils in some drainage lines. Minor stream bank erosion occurs on present watercourses, with minor sheet and gully erosion on adjacent terraces.

The geology of the Roxburgh Soil Landscape is Singleton Coal Measures with parent rocks being sandstone, shale, mudstone, conglomerate and coal. The soils consist of yellow podzolic soils occurring on upper to midslopes with Red Solodic Soils on more rounded hills. Lithosols occur on crests, and Brown Podzolic soils occur on slopes on conglomerate with associated flat pavements. Yellow Soloths have been recorded in some gullies (Kovac and Lawrie 1991).

Figure 3-1 Soil Landscape



Characteristic landform is level plains and river terraces of the Hunter River with elevations of 20 - 60 m; slopes are 0 – 3%; the width of the plains ranges from 200 – 3,200 m, and local relief is generally less than 10 m (Kovac and Lawrie 1991). The investigated area occurs at a height of about 142 m Above Sea Level, the natural topography generally being flat.

For reference, Table 3-1 identifies attributes of the investigated proposal area.

Table 3-1 Site attributes

Site attributes	
Estimated size (ha)	about 2.89 ha
ASL	142 m
Climate ¹	Mean summer high: 31.8 °C (January) Mean winter low: 3.4 °C (July) Average annual rainfall – 633.7 mm
Waterbody	Ramrod Creek
Critical habitat	No
IBRA Bioregion/Subregion	Sydney Basin / Hunter
Mitchell Landscape Unit	SB Hunter
Soil landscape	Hunter (Figure 3-1)

3.1 Native vegetation communities

With reference to the State Vegetation Type Map, the proposal area is identified within two Plant Community Types (PCT) (OEH 2022) (Figure 3-2):

- PCT 0 – Non-native vegetation
- PCT ID 4089 - Namoi-Upper Hunter River Red Gum Forest

The site investigation determined that the portions of the mapping that encompasses the proposed works area is inaccurate, the site investigated being ‘cleared’ and dominated by weed species (i.e. entire survey area conforms to PCT 0).

3.2 Threatened ecological communities

Figure 3-3 (though inaccurate) indicates the vegetation present is mapped as PCT 4089.

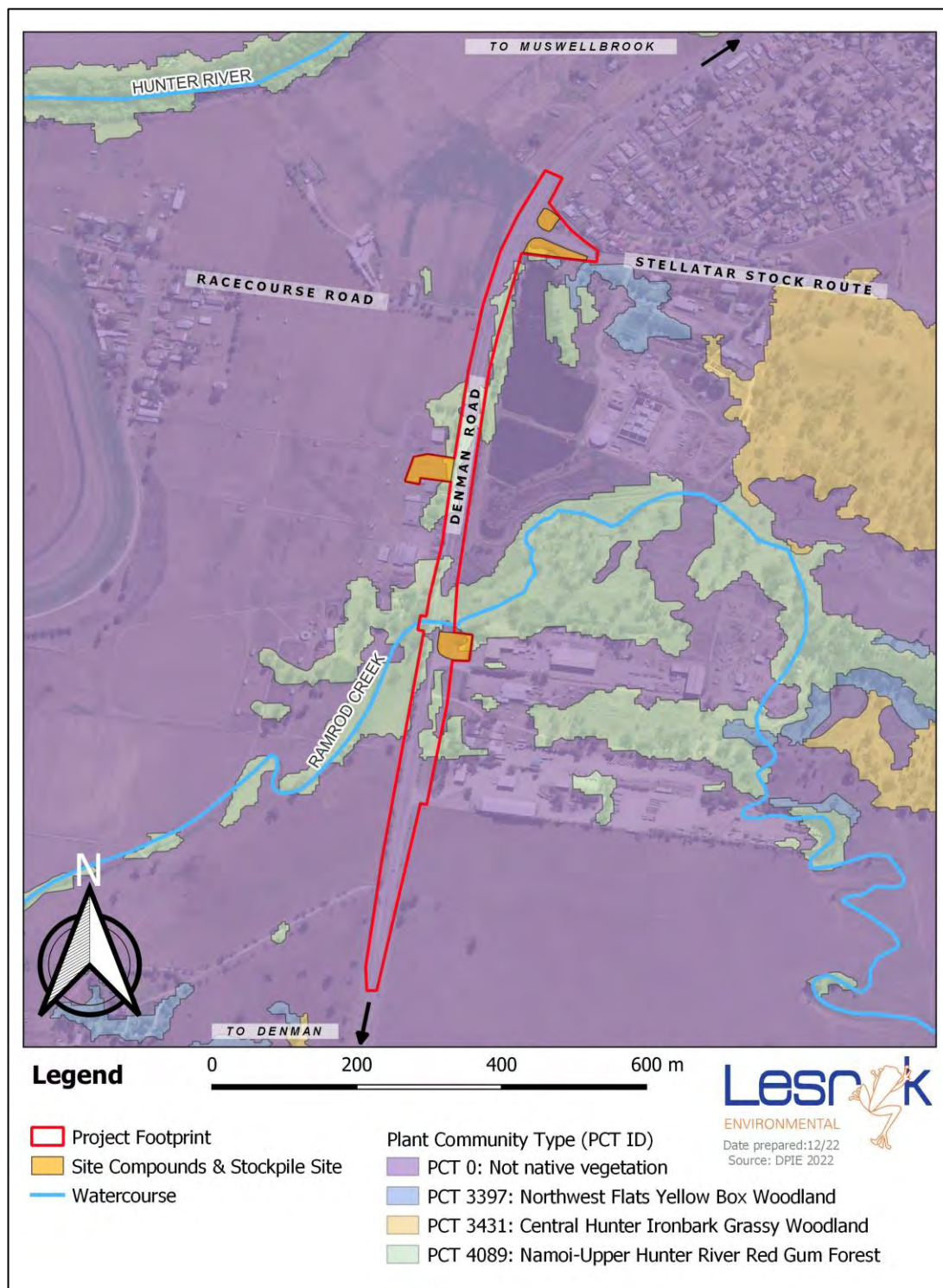
PCT 4089 is associated with the Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions (hereafter referred to as ‘Red Gum Woodland’), this being listed as an EEC under the BC Act.

The PCT within, and in proximity to, the subject site was found to be highly disturbed and cleared, and is not considered to conform to any of the descriptions provided for those native vegetation communities or EECs recorded in the surrounding region. Based on the observation of the area, the mapping is considered to be incorrect.

The site is considered to be ‘cleared’ and is not associated with a TEC listed under the EPBC or BC Acts.

¹ Scone Airport AWS (Station 061363) – being the nearest operating weather station to the area investigated (BoM 2022a)

Figure 3-2 Vegetation mapping

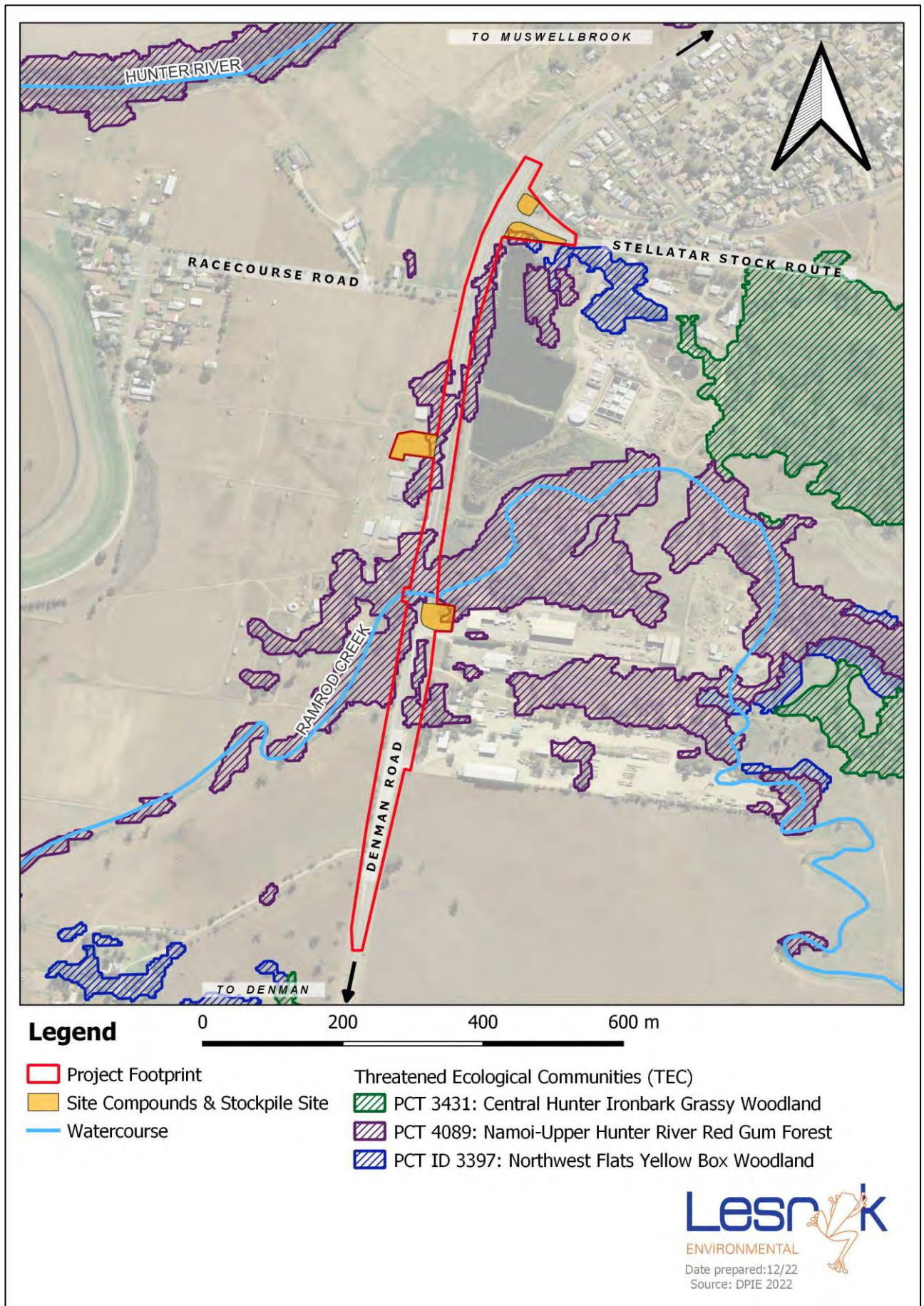


3.3 Groundwater dependent ecosystems

GDE are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater.

Consultation of the Bureau of Meteorology GDE Atlas (Bureau of Meteorology 2022b) did not identify any aquatic, terrestrial or subterranean GDE within the proposal area. It is acknowledged that, at the time of the desktop survey, the GDE Atlas was not displaying topographic or satellite imagery layers to aid in site imagery.

Figure 3-3 Threatened Ecological Communities



3.4 Threatened species

Prior to undertaking the field investigation, a review of the BioNet Atlas and PMST databases (DPE 2022a, DCCEE 2022a) was conducted, this identifying 11 threatened plants and/or their populations, and 43 threatened fauna species listed under the EPBC and/or BC Acts that have been previously recorded or are considered to have habitat within 10 km of the subject site (Appendix 5). Those species that have been previously recorded within 10 km of the proposal area as per the BioNet Atlas are presented in Figure 3-4 (note: some species records overlap therefore only one 'dot' is displayed).

Due to a lack of their necessary habitats within the area investigated, oceanic, estuarine and wetland species were not considered.

In the case of fauna, numerous highly mobile threatened species with large territorial requirements (e.g., bats, birds) may traverse or occupy the study area on occasions. Only those that have a documented association with those habitat components that were identified within the proposal area were considered for assessment under the EPBC and/or BC Acts.

The majority of the threatened species identified during the literature search as having the potential to occur in the proposal area were assessed to have only a low likelihood of occurrence, given the disturbed and heavily modified condition of the locality.

Given the proposal would include the removal of two hollow-bearing trees (refer to Section 5.1.2), and as targeted surveys for hollow-dependent species were not conducted, their presence is assumed based on the adoption of the precautionary approach. Considering the diameter of the hollows observed, it is likely that, if present, these may be occupied by microbats, as well as larger arboreal possums/birds.

Based on a precautionary approach, as they have been previously recorded and suitable habitat is present, the hollow-dependent microbats listed in Table 3-2 are considered to have a high likelihood of occurrence within the proposal area.

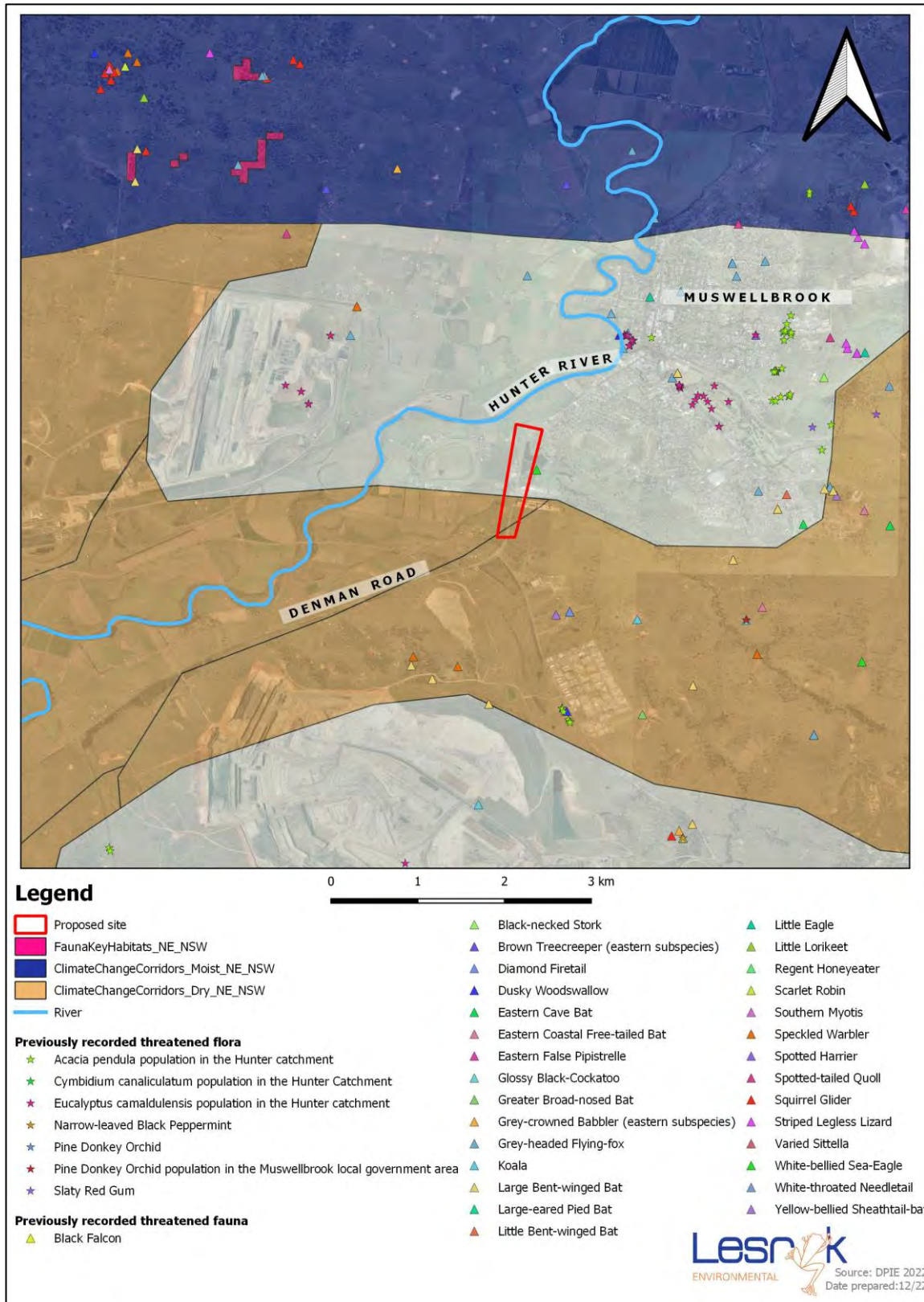
Table 3-2 Habitat assessment results

Scientific name	Common Name	Legislative status	Potential occurrence
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Vulnerable	High
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Vulnerable	High
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Vulnerable	High
<i>Mormopterus norfolkensis</i>	Eastern Coastal Free-tailed Bat	Vulnerable	High

An assessment referring to the criteria provided under Section 7.3 of the BC Act was conducted on hollow-dependent microbats; this concluding that the proposal would not have a significant impact on this group of animals. Preparation of any further assessment studies, such as a SIS (or BDAR), is not required.

It is noted that, at the time of the inspection, it was possible to physically access and inspect one of the hollows present in association with the Yellow Box (Tree 83). Inspections of the 'possum' size cavity did not indicate the presence of any sheltering animals, eggs or material that would suggest the presence of a nest/drey. Inspections of this hollow did not reveal any sheltering fauna occupying this site at the time of the survey.

Figure 3-4 Threatened species previously recorded within 10 km of the proposal area



3.5 Areas of outstanding biodiversity value (where applicable)

Reference to the DCCEEW's Register of Critical Habitat (DCCEEW 2022c) and DPE's Area of Outstanding Biodiversity Value (AOBV) register (DPE 2022b) (in conjunction with Part 3 of the Biodiversity Conservation Regulation 2017), and DPI's Register of critical habitat (DPI 2022c) per listings provided under the EPBC, BC and/or FM Acts, no gazetted areas of critical habitat or AOBV for any flora or fauna species, populations or communities occur within or near to the scope of work proposed.

3.6 Aquatic results

One waterway, Ramrod Creek, is present within the proposal area; this traversing beneath Denman Road via the existing three-cell concrete box culvert. With reference to the Strahler Stream Order Classification System (DPI 2022d), within the proposal area, Ramrod Creek is a 3rd order waterway. Third order streams are considered to be Class 3 waterways; this identified as (DPI 2022d):

Minimal fish habitat

Named or unnamed waterway with intermittent flow and potential refuge, breeding or feeding areas for some aquatic fauna (e.g., fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or recognised aquatic habitats.

Within the area investigated, Ramrod Creek is about 2-14 m wide; with larger expanses of water present either side of the culvert, before the creek line narrows up and downstream. The banks are heavily vegetated, inclining gradually to surrounding land, and are dominated by exotic weeds and grasses. To the east [upstream] of the culvert, dense stands of Cumbungi (*Typha orientalis*) to about 2 m in height are present. No other floating or emergent aquatic vegetation, including reed beds, was noted. Depressed instream and bank vegetation visible within the area survey was indicative of a recent flooding event. At the time of investigation, the creek was flowing, though its water quality was heavily turbid, negating visual assessment of its depth; with the exception of areas about 15 m up and downstream where a depth to 20 cm was noted. No woody debris or rocks were observed within proximity of the creek line.

No fish were observed (or indicated i.e., fish rise) within the length of creek surveyed.

Reference to the DPI Fisheries NSW Spatial Data Portal (DPI 2022b) identifies Ramrod Creek as Key Fish Habitat (KFH) [search: Central Rivers] (Figure 3-5).

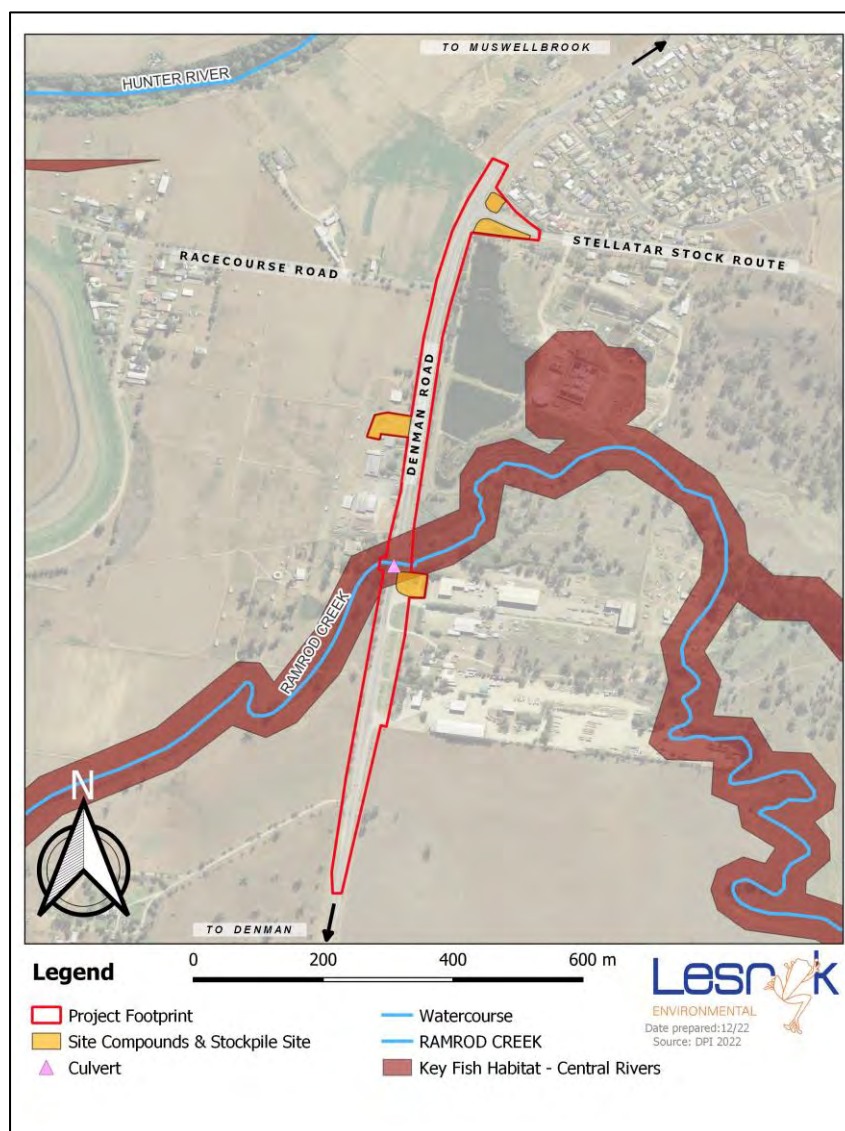
Post-works, this habitat will remain and there will be no net loss of Key Fish Habitat.

One of the objectives of the FM Act is to '... conserve key fish habitats...' (NSW Government 2022b). While the term 'key fish habitat' is not defined within the FM Act, DPI has identified KFH to include all marine and estuarine habitats up to highest astronomical tide level (that reached by 'king' tides) and most permanent and semipermanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank (DPI 2022f).

Extension of the culvert will not present a barrier to those native fish (such as Eels *Anguila* spp) that are potentially present within, and moving along, Ramrod Creek, nor will it isolate any fish habitat. Fish sheltering and breeding habitat will not be disturbed due to the conducting of the works.

Reference to the BioNet Atlas and PMST did not identify any previously recorded threatened fish species listed under the EPBC or FM Acts, or their predicted habitat, within 10 km of the proposal area (Appendix 5). Reference to the Fisheries NSW Spatial Data Portal indicates that no threatened fish have a mapped distribution within the proposal area (DPI 2022b).

Figure 3-5 Key Fish Habitat in relation to the proposal area



3.7 Wildlife connectivity corridors

Reference to SEED Dataset mapping does not identify the subject site as part of Fauna Key Habitats or Fauna Corridor for North East NSW (State Government of NSW and DPIE 2010a, 2010b).

The key habitats map layer is a regional representation displaying the likelihood of occurrence of key habitats for fauna consolidated at the regional scale. Regional corridors are primary landscape connections between larger important areas of habitat; generally substantial in width (> 500 m) and provide not only for dispersal of individual species but act as habitat in their own right for a range of species, and should be at least twice the width of the average home range area of the animal species identified as potential users of the corridor (DEC 2004b).

The area investigated, present along a section of Denman Road, is located within a previously cleared semi-rural to agricultural landscape, and is not part of a significant wildlife corridor. As mapped in Figure 3-4, fragmented connectivity exists along the riparian corridor of Ramrod Creek, between parcels of bushland within the surrounding region, and on to heavily vegetated land about 22 and 26 km west and east, respectively.

The presence of Denman Road (up to 11 m wide within the study area) currently presents an adverse impact on east-west movement patterns of those ground traversing species recorded or expected to occur within the investigated area.

Although two hollow-bearing trees (Trees 83 and 84) require removal to permit the proposed work, several trees exist beyond the limits of the proposed work that provide similar habitat value. Refer to Section 7.2 of this report for details in regards to the replacement of these hollows.

The proposed tree removal work would not isolate or further fragment any habitat areas, nor erect any additional barriers to the movement and dispersal patterns of flying species (i.e., birds, bats), gliding arboreal mammals, nor ground traversing species, that may be currently negotiating Denman Road at this location.

Given the scope of work proposed, ground traversing species currently negotiating this road network are considered to continue to do so post-work.

In the operational phase of the proposal, the upgraded culvert within the proposal area would be expected to indirectly provide opportunities for the movement of some fauna species, particularly animals such as rodents, reptiles and frogs that would be tolerant of negotiating this style of structure.

3.8 SEPP (Biodiversity and Conservation) 2021

Chapter 4 Koala Habitat Protection 2021

Muswellbrook LGA is identified under Schedule 2 - LGAs of the SEPP, and within the Central Coast Koala management area. This Policy seeks to encourage the proper conservation and management of areas that provide habitat for Koalas.

Chapter 4 'Koala habitat protection 2021' of the SEPP only applies to development applications assessed under Part 4 of EPA Act, not those considered under Part 5. That stated, it is TfNSW's practice to consider the SEPP criteria as part of the environmental assessment process.

No Koala Plan of Management exists for the locality. No evidence (i.e., sightings, calls, scats etc.) to suggest that the area investigated supported a resident Koala population were identified; though *Eucalyptus melliodora* and *Eucalyptus intertexta*, recorded within the proposal area, are listed under Schedule 3 'Koala Use Tree Species' of the SEPP. With reference to the BioNet Atlas (DPE 2022a), the nearest previously recorded Koala was identified about 2 km south-east of the proposal area (observed 2006).

In accordance with the following definitions provided under Chapter 4, Section 4.2 of the SEPP, the proposal area is not considered to constitute Core Koala habitat:

- a) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or
- b) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

The carrying out of the proposed work would not require the preparation of a Plan of Management for the conservation and management of areas of Koala habitat.

3.9 Matters of National Environmental Significance

By the completion of the field investigation, no TEC, threatened flora or fauna species listed under the EPBC Act had been recorded within, or near to, the proposal area.

The proposal does not require referral to the Federal Minister for the Environment as a controlled action.

Reference to the PMST did not identify any World or national heritage listed places, nor Wetlands of international importance, within, or near to, the proposal area.

4 Avoidance and minimisation

The key principles of TfNSW's Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011), and the associated impact on the natural and social environment, is that TfNSW should aim to:

- Avoid and minimise the impact first
- Mitigate the impact where avoidance is not possible
- Offset where residual impact cannot be avoided.

4.1 Application of avoid principles

The objective of the proposed road upgrades and culvert extension work, as part of upgrade work to the Denman Road vicinity to improve safety, is to accommodate the widening of the road shoulder and achieve current standards.

The proposed work would primarily take place within an existing disturbed/modified area adjacent to a section of the existing road corridor of Denman Road; as such, the potential to avoid impact to biodiversity is high.

While disturbance/removal of about 2.89 ha of predominantly exotic vegetation is unavoidable, inclusive of eleven trees, the amount and quality are considered to provide minimal habitat resources for those species recorded, or potentially occurring, given the extent of similar retained vegetation within the surrounding locality. TfNSW proposes to retain trees where possible, and to offset those plants removed.

Vegetation clearance and work limits would be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with Guide 2 of TfNSW's Biodiversity Guidelines (RTA 2011). Fencing etc. would be established at the outer limits of the drip line of retained trees present and areas marked as 'no-go zones', to avoid indirect impact.

4.2 Application of minimise principles

The proposed road upgrades and culvert extension work has been designed to minimise impacts on the ecological values of the subject site wherever possible.

Vegetation clearance would be limited to the minimum required to successfully complete the proposal; with the selection of equipment to also minimise clearance requirements.

Eleven trees will require removal, two of which are hollow-bearing. The removal of these plants will be offset through the transfer of funds into the Conservation fund, as per the required rates provided in TfNSW's 2022 publication: *Tree and hollow replacement guidelines*.

As the proposed work would require the removal of two hollow-bearing trees, an ecologist will be present on site during the removal of these to collect and relocate locally any sheltering fauna.

A temporary disruption to fish passage along Ramrod Creek would arise during the course of the project due to the establishment of a coffer dam. Considering the diversity of native fish that could be present in Ramrod Creek, and the predicted duration the coffer dam would be present, no long-term impacts on fish movements would arise. Post-work, fish would be able to move along Ramrod Creek, the works not isolating or fragmenting any aquatic habitats.

Temporary compound/stockpile sites would be located within existing cleared/disturbed sites; and would not require the removal of any additional mature vegetation.

5 Impact assessment

Potential impacts as a result of conducting the scope of work proposed include the disturbance/removal of 2.89 ha of native and exotic vegetation (i.e., shrubs, ground cover).

Vegetation will require clearing, this including eleven trees, two of which are hollow-bearing. These will be offset through the transfer of funds into the Conservation fund, as per the required rates provided in TfNSW's *Tree and hollow replacement guidelines*.

One waterway, Ramrod Creek, is present within the proposal area; this identified as KFH.

Further potential impact includes temporary noise and/or vibration levels, erosion, injury and/or mortality to fauna, edge effects, weed proliferation and introduction of pathogens.

Given the land use history of the proposal site, its levels of long-term modification and disturbance, no threatened flora or fauna species, or their populations, were recorded. Similar, none were considered to be present in the soil seed bank or at other times of the year. The habitats present would not be of value to the presence of a viable local population of threatened species.

No significant adverse impact is expected during the operational phase of the proposal.

Mitigation measures have been provided in Section 6 of this report.

The impact assessment for Division 5.1 of the EPA Act projects does not need to include a consideration of offset thresholds under the Biodiversity Offset Scheme.

5.1 Construction impacts

5.1.1 Removal of native vegetation

By the completion of the field survey a number of native and exotic species were recorded within the area investigated (Appendix 7). It is noted that Appendix 7 is not intended to be a comprehensive list of all species present within the area investigated, and only represents those plants that were recorded whilst conducting searches for:

- those native species and ecological communities of State and/or national conservation concern that are known, or expected to occur, in the locality
- weeds of significance that would require treatment.

None of the flora species recorded are listed or currently being considered for listing under the Schedules to the EPBC or BC Acts.

Based on a worst-case estimate it is expected that 2.89 ha of predominantly exotic vegetation would be disturbed/removed to permit the proposal (Table 5-1); inclusive of the clearance of eleven trees. Of these eleven trees to be removed, with reference to Appendix 4, and summarised below in Table 5-2, four trees (Trees 12, 14, 83 and 84) are located within the construction footprint, two of which are hollow-bearing, with a further seven (Trees 5, 6, 8, 9, 10, 11, 13) likely to require removal to accommodate earthworks. The trees requiring removal are presented in Figure 5-1.

In accordance with Section 2.4 of TfNSW's *Tree and hollow replacement guidelines*, where tree replacement cannot be accommodated locally [or only partially], payment must be made to Transport's Conservation Fund as per the rates set out in Table 5-3. Transfer of funds must occur prior to commencement of work. Based on the calculations, TfNSW will transfer \$8000 into the Conservation Fund.

Table 5-1 Impact on vegetation

Plant Community Type (PCT)	Status		Proposal area (ha)
	BC Act	EPBC Act	
PCT4085 - Namoi-Upper Hunter River Red Gum Forest	✓ As per field observations, the vegetation in the proposed works area does not meet the requirements of the EEC	-	N/A
Cleared	-	-	2.28 ha

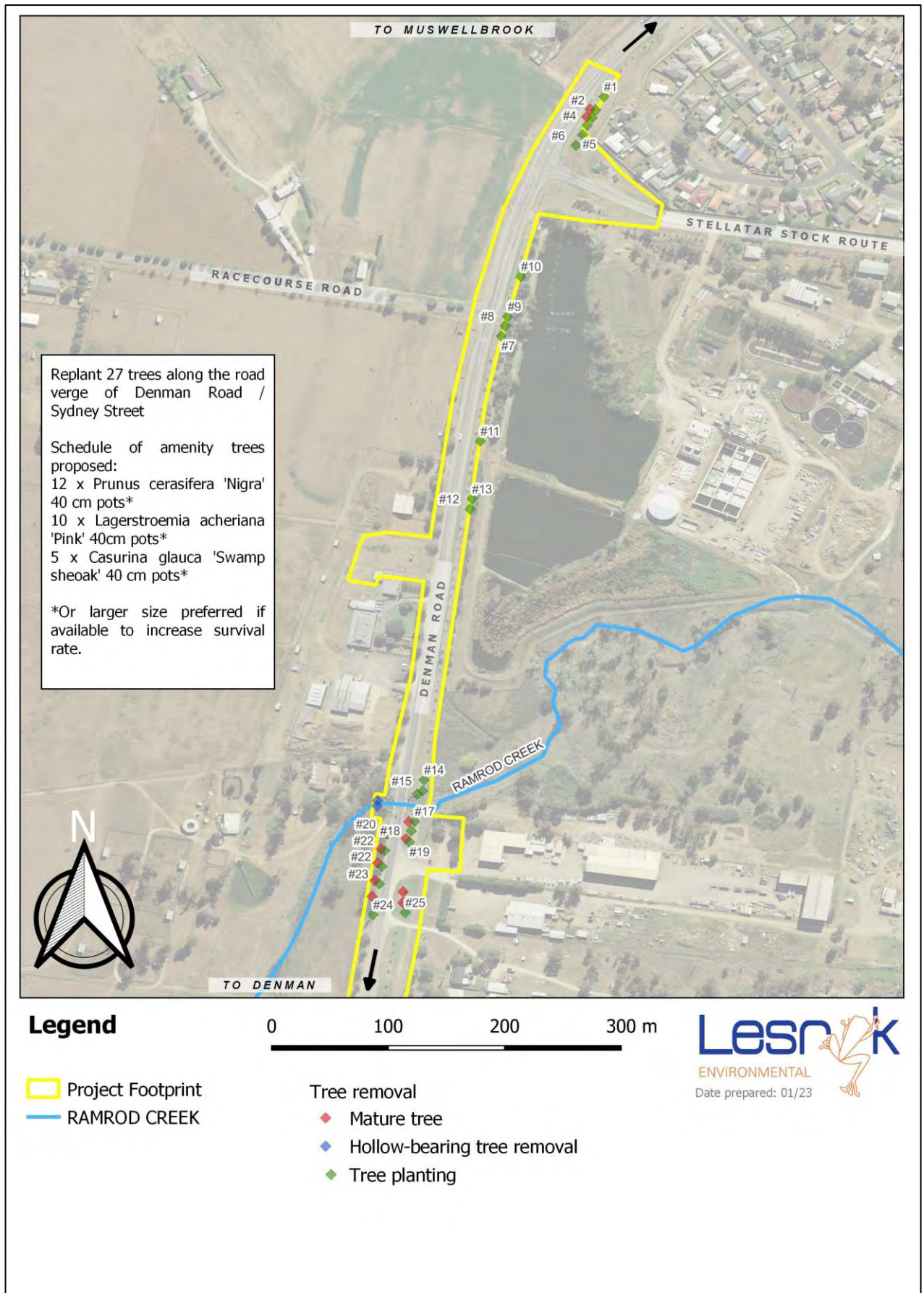
Table 5-2 Inventory of tree removal

Tree ID	Species	'Native' or 'Amenity' Tree	DBH (cm)	Tree size classification	Hollows	Contribution required per tree
Tree 5	<i>Prunus cerasifera</i>	Amenity	15	Small	No	\$125
Tree 6	<i>Eucalyptus melliodora</i>	Native	70	Large	No	\$1000
Tree 8	<i>Lagerstroemia indica</i>	Amenity	15	Small	No	\$125
Tree 9	<i>Casuarina glauca</i>	Native	25	Medium	No	\$500
Tree 10	<i>Casuarina glauca</i>	Native	50	Large	No	\$1000
Tree 11	<i>Casuarina glauca</i>	Native	55	Large	No	\$1000
Tree 12	<i>Lagerstroemia indica</i>	Amenity	10	Small	No	\$125
Tree 13	<i>Casuarina glauca</i>	Native	45	Medium	No	\$500
Tree 14	<i>Lagerstroemia indica</i>	Amenity	15	Small	No	\$125
Tree 83	<i>Eucalyptus melliodora</i>	Native	70	Large	Yes – multiple	\$1000 2 hollows \$500/hollow
Tree 84	<i>Eucalyptus melliodora</i>	Native	75	Large	Yes	\$1000 1 hollow \$500/hollow
Total off-set Fund contribution required						\$8000

Table 5-3 Conservation fund contribution

Tree size	Tree replacement requirement
Large tree (DBH 50 – 100 cm)	\$1000
Medium tree (DBH > 20 – 50 cm)	\$500
Small tree (DBH 5 – 20 cm)	\$125
Hollow	\$500

Figure 5-1 Proposed tree and hollow removals



Relevant to the proposal's impact on vegetation, the following KTP is considered:

- Clearing of native vegetation – Schedule 4 BC Act.

Given the extent of similar resources within, and beyond, the proposal area, and provided recommended mitigation measures are adopted, the loss of 2.89 ha of predominantly exotic vegetation is not considered to significantly contribute to, or increase the impact of, this KTP.

Clearing within the proposal area would be carried out in accordance with Guide 4 of the Biodiversity Guidelines (RTA 2011) to minimise disturbance to surrounding flora and fauna habitats.

Where possible, any felled trees will be relocated locally as opposed to being mulching. The relocation of the felled trees would aim at providing habitat for native species and their prey (as per DEC 2004 'Threatened Species Survey and Assessment: Guidelines for developments and activities' and TfNSW's 'Biodiversity guidelines: Protecting and managing biodiversity on RTA projects' (RTA 2011).

5.1.2 Removal of threatened fauna habitat

During the site investigation a number of common-to-abundant occurring native birds were observed or heard calling near the area investigated, including species such as the Rainbow Lorikeet (*Trichoglossus haematodus*), Fairy Martin (*Petrochelidon ariel*) and Superb Fairy-wren (*Malurus cyaneus*). Amphibians heard calling throughout the upstream area, between 5-15 m from the culvert's eastern entrance, included the Common Eastern Froglet (*Crinia signifera*) and Eastern Sign-bearing Froglet (*Crinia parinsignifera*).

None of the native species recorded are listed, or currently being considered for listing, under the EPBC, BC and/or FM Acts.

The native species recorded are protected, as defined by the BC Act, but considered to be common to abundant throughout the surrounding region. The species recorded would not be solely reliant upon those habitats present within, or near to, the subject site such that the removal or further disturbance of these would threaten the 'local' occurrence of these animals. The species recorded are all expected to be present within both the proposal area and surrounding locality post-work.

The BioNet Atlas and PMST identified several threatened cave-dependent microbats previously recorded, or having predicted habitat, within 10 km of the proposal area, listed as Vulnerable under either the EPBC or BC Acts (Appendix 5). Internal inspections of the three culvert cells present were not possible at the time of the field survey due to the volume of water in Ramrod Creek. The presence of this water, the open and well-lit nature of the culvert present (inspections being made from both the northern and southern banks on the downstream side of the culvert), is considered to negate the presence of this group of animals. The works would not remove any habitat that could be used on occasion by cave-dependent microbats. The works, being an extension of the culvert, may actually increase the habitat value of this site for this group of animals.

The concrete drainage pipe present downstream, to the north-west of the existing creek crossing, had cobwebs present across the outside of the pipe; the presence of these indicating that microbats are not using the structure [otherwise their movements would 'break'/remove the webs]. The pipe also exhibited heavy silt build-up, with urban refuse present. Given the character of this, it is considered that this is not suitable habitat for microbats.

As no microbats were observed, no evidence obtained and the inspected culvert considered unsuitable habitat, an assessment on cave-dependent threatened microbats that reference the criteria provided under the EPBC Act's Significant Impact Guidelines and/or Section 7.3 of the BC Act are not required.

Bird nests are present in all three of the investigated culvert cells and, although no occupation of these was observed, it is assumed that these were constructed by Fairy

Martins. Fairy Martins are protected, as defined by the BC Act, but considered to be common to abundant throughout the surrounding region. No further evidence of any nesting native birds, or the presence of sheltering native mammals (i.e., drey), was obtained within the area investigated.

With reference to the AIATPP, of the eleven trees that require removal to permit the proposed works, two are hollow-bearing trees, these present within proximity to the culvert. It is also acknowledged hollow-bearing trees are present beyond the limits of the works, none of which will be disturbed. TfNSW proposes to transfer funds into the Conservation fund at the required rates per the *Tree and hollow replacement guidelines*.

The results of the field inspection, noted the hollow-bearing trees as being 9-15 m tall, with numerous hollows (vertical/horizontal - 50-300 mm diameter), present on the trunks and limbs of the trees (Table 5-4, Figure 5-1). At the time of the inspection, it was possible to physically access and inspect one of the hollows present in association with Tree 83. Inspections of the 'possum' size cavity did not indicate the presence of any sheltering animals, eggs or material that would suggest the presence of a nest/drey. Inspections of this hollow did not reveal any sheltering fauna occupying this site at the time of the survey.

Table 5-4 Inventory of hollow removal

ID and species	Easting	Northing	Status	Height (m)	DBH (cm)	Tree size classification	Hollow diameter (mm)	No. of hollows	Position in tree
Tree 83 <i>Eucalyptus melliodora</i>	299561	6426159	Alive	9	70	Large	100-300	2	Trunk and limb
Tree 84 <i>Eucalyptus melliodora</i>	299557	6426160	Alive	14	75	Large	100	1	Limb

As no species-specific surveys were conducted to target those animals that could occupy the smaller 'microbat' sized hollows, and as they have been previously recorded and suitable habitat is present, it is considered necessary to adopt a precautionary approach to the potential presence of the hollow-dependent microbats identified in Appendix 5.

To consider the impact of the proposal on these potentially occurring fauna species, assessments referencing the criteria provided under Section 7.3 of the BC Act have been conducted on hollow-dependent microbats (Appendix 8). These concluded that the proposal would not have a significant impact on these species.

To minimise any impact associated with the removal of the two hollow-bearing trees, the following recommendations are presented:

- An ecologist or licensed wildlife carer must be on site during vegetation clearing/habitat removal in accordance with Biodiversity Guide 4: Clearing of vegetation and removal of bushrock (RTA 2011)
- Prior to the trees removal (if an excavator employed) these should be knocked several times to alert the sheltering fauna and provide an opportunity for these animals to disperse. The trees would not be felled till approval from the ecologist [or similar] is given
- If possible, all vegetation around the two hollow-bearing trees would be cleared 24 to 48 hours prior to the removal of the hollow-bearing trees. This approach isolates the hollow-bearing trees and reduces their habitat value (particularly for ground-traversing fauna that are exposed to predation)
- Hollow-bearing limbs etc. would be removed by chainsaw and lowered to the ground, the cut being about 100 mm below the bottom of the cavity

- Once on the ground the ecologist, or similar, would inspect the cavities for sheltering species
- Any fauna encountered would be handled in accordance with Biodiversity Guide 9: Fauna Handling (RTA 2011)
- Any animals recovered would be relocated locally
- Any injured animals would be taken to a local veterinarian for assessment.

'Loss of hollow-bearing trees' is a KTP listed under the BC Act. Given the extent of similar resources within the proposal area and beyond, and provided the recommended mitigation measures are adopted, the proposal is not considered to significantly contribute to, or increase the impact of, this KTP.

5.1.3 Aquatic impacts

The proposed road upgrades and culvert extension work within, or in proximity to, Ramrod Creek involves debris removal and construction of cast-in-place wingwalls, apron slabs, base slabs, lengthening of culvert cells.

If water is flowing at the time of the work, some temporary redirecting actions will be required to enable activities to be completed in a dry work area (i.e., coffer dam); however, the proposal would not involve:

- An overall reduction in water quality
- The permanent obstruction of fish passage
 - A temporary disruption to fish passage along Ramrod Creek would arise during the course of the project due to the establishment of a coffer dam. Considering the diversity of native fish that could be present in Ramrod Creek, and the predicted duration the coffer dam would be present, no long-term impacts on fish movements would arise. Post-work, fish would be able to move along Ramrod Creek, the works not isolating or fragmenting any aquatic habitats.
- The use of explosives and other dangerous substances.

The proposed work would not alter flooding regimes, nor change hydrology including excessive flow velocities, creek realignment or alteration to natural flow regimes.

Reference to the DPI's Fisheries NSW Spatial Data Portal identifies Ramrod Creek within the proposal area as KFH, per the DPI definition provided in Section 3.6 of this report; this considered to be to within the top of the bank of the waterway. To enable work in and around the existing culvert, an estimated disturbance footprint of 2.89 ha would be required, including the potential removal of exotic dominated riparian vegetation. No major areas of aquatic habitat are to be removed, modified or disturbed.

As the proposed culvert work would take place in association with Ramrod Creek, Part 7 Division 3 of the FM Act, 'Dredging and reclamation', as defined by the Act, is applicable to the proposal; this defined as:

Dredging work —

- a) any work that involves excavating water land²
- b) any work that involves moving material on water land or removing material from water land.

Reclamation work —

- a) using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim water land, or

² Water land is land submerged by water a) whether permanently or intermittently, b) whether forming an artificial or natural body of water

- b) depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge), or
- c) draining water from water land for the purpose of its reclamation.

Section 199 of the Act requires that the proponent must, before it carries out or authorises the carrying out of dredging work:

- a) give the Minister written notice of the proposed work, and
- b) consider any matters concerning the proposed work that are raised by the Minister within 28 days after the giving of the notice (or such other period as is agreed between the Minister and the public authority).

TfNSW (as the proponent) has entered into consultation with DPI Fisheries (Reference no. C22/399 [Appendix 9]). The DPI has no objection to the proposed work, provided the following provisions are adhered to:

1. A copy of this BAR is to be forwarded to DPI Fisheries prior to works commencing. Any triggers for the FM Act may require further consultation.
2. DPI Fisheries requests that a copy of the CEMP be forwarded to this office prior to works commencing. Dewatering activities may require a s.37 permit to allow the relocation of fish.
3. As no marine vegetation is to be harmed in this proposal a s.205 permit under Part 7 of the FM Act is not required.
4. Under s.219(5)(a) any work that is permitted under the FM Act turns off the requirement for a s.219 permit to block fish passage. Therefore, a s.219 permit is not required for this project.
5. Erosion and sediment mitigation devices are to be erected in a manner consistent with currently accepted Best Management Practice (i.e., Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004) to prevent the entry of sediment into the waterway prior to any earthworks being undertaken. These are to be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal.
6. Environmental safeguards are to be used during the works to ensure that there is no escape of turbid plumes into the adjacent aquatic environment.
7. Any material removed from the waterway that is to be temporarily deposited or stockpiles on land is to be located well away from the waterway and to be contained by appropriate sediment control devices.
8. DPI Fisheries (1800 043 536) and the Environment Protection Authority (131 555) is to be notified immediately if any fish kills occur in the vicinity of the works. In such cases, all works other than emergency response procedures are to cease until the issue is rectified and approval is given by DPI Fisheries and/or the Environment Protection authority for the works to proceed.

With reference to Section 3.6 of the report, no previously recorded threatened fish species, or their predicted habitat, was identified within 10 km of the proposal area. Given the extent of work proposed and the habitats to be affected, it is not considered necessary that any assessments (i.e., reference to the EPBC Act's Significant Impact Guidelines or Part 7A, Division 12, Subdivision 221ZV of the FM Act) in regards to State or Federally listed threatened fish be conducted.

The work proposed is not considered to result in any fish species, aquatic-associated animals or their populations becoming extinct in the locality. The work will not establish any permanent barriers to fish movements, nor isolate any of their habitat areas. Post-work, those fish (i.e., Eels [*Anguila* spp.]) that may traverse along Ramrod Creek within the proposal area would still be able to do so post-development.

During the proposed work, construction activities have the potential to impact the water quality of Ramrod Creek, such as through erosion, off-site sediment movement and input of

dirty water. Erosion and sediment control measures would be implemented and maintained in accordance with Managing Urban Stormwater: Soils and Construction guidelines (Landcom 2004). Construction of a coffer dam would provide a dry work area and prevent any materials/sediments entering the waterway. Stockpile sites would be managed in accordance with TfNSW's Stockpile Site Management Guideline (EMS-TG-10).

Mitigation measures provided within Section 6 of this report to protect aquatic habitat will be in accordance with Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011) and Section 3.3.2 Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013 (DPI (Fisheries NSW) 2013).

5.1.4 Removal of threatened flora

No threatened flora species listed under the EPBC or BC Acts were recorded or considered likely to occur within the area investigated; as such, as no threatened flora species are considered to be adversely impacted by the proposal.

5.1.5 Injury and mortality

Clearing to permit the proposal would involve the removal of up to about 2.89 ha of predominantly exotic vegetation. Given the proposal would be conducted within a previously disturbed/modified environment, there is minimal expectation that sheltering animals would be injured during the course of the proposed work.

During the construction phase of the proposal some urban adaptable, sheltering fauna species (i.e., frogs and ground-traversing mammals) could be present and be subject to injury. Mitigation measures such as checking beneath vehicles/machinery prior to their use have been provided to address this matter.

An ecologist or licensed wildlife carer must be on site during the removal of the two hollow-bearing trees.

Beyond current levels of impact due to the existing presence of Denman Road and the volume of traffic that typically uses this road network, the operation phase of the proposal is not expected to significantly increase injury or mortality of fauna within the proposal area. The proposal is not expected to significantly alter vehicle strikes on those fauna species recorded or potentially occurring than may be currently transpiring. The proposal would not have an adverse impact on the long-term viability of these species or their local populations.

5.2 Indirect/operational impacts

5.2.1 Wildlife connectivity and habitat fragmentation

Fragmented connectivity currently exists along the riparian corridor of Ramrod Creek, between parcels of bushland within the surrounding region, and on to heavily vegetated land about 22 and 26 km west and east, respectively. The presence of Denman Road (up to 11 m wide within the study area) currently presents an adverse impact on east-west movement patterns of those ground traversing species recorded or expected to occur within the investigated area.

Temporary measures incorporated as part of the proposed work (i.e., erosion and sediment controls, exclusion fencing) would be established in accordance with applicable guidelines to prevent direct or indirect impact on fauna.

The proposed road upgrades and culvert extension work., including the removal of about 2.89 ha of predominantly exotic vegetation, is not considered to isolate or further fragment any habitat areas or erect any additional barriers to the movement and dispersal patterns of fauna species currently negotiating the proposal area.

No direct or indirect impact to wildlife connectivity would occur as a result of the operational phase of the proposal. The proposed road upgrades and culvert extension work would be

expected to indirectly provide beneficial opportunities for the movement of specific fauna species beneath Denman Road, tolerant of negotiating culverts.

Species currently negotiating the existing road network and surrounding area are considered to continue to do so post-work.

5.2.2 Edge effects on adjacent native vegetation and habitat

Weeds are readily spread by existing dispersal factors such as wind, birds, water and the movement of vehicles along the road. Clearing and opening up of new vegetation edges can facilitate the recruitment of these species and provide opportunity for the establishment of other weed species. These weeds are often able to out-compete native flora and fauna species and reduce the habitat values of these areas. While this is the case, edge effects beyond those that are currently occurring along the section of Denman Road investigated are not expected to be exaggerated due to the carrying out of the proposed work.

5.2.3 Invasion and spread of weeds

Under the *Biosecurity Act 2015*, 'all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.'

Of the introduced plant species recorded, African Boxthorn (*Lycium ferocissimum*) is listed:

- As a Priority Weed in the Hunter region (which includes Muswellbrook LGA) (DPI 2022a)
- Under Schedule 3 of the NSW Biosecurity Regulation 2017
- As a WoNS (Weeds Australia 2022)³.

Where African Boxthorn occurs on-site, it must be controlled to result in its suppression. This should be done prior to the commencement of work to avoid further spread of this species.

5.2.4 Invasion and spread of pests

Though none were recorded during the investigation, introduced fauna species are expected to occur within the proposal area. Beyond any existing levels, the proposal is unlikely to introduce or increase the presence of pest species within the proposal area.

5.2.5 Invasion and spread of pathogens and disease

There is a risk that the proposal would introduce, spread or exacerbate the plant diseases caused by *Phytophthora cinnamomi*. This disease is most likely introduced or spread through the importation or movement of soil, water and landscaping materials, either directly or through incidental attachment to machinery.

Although there was no obvious evidence for the presence of *Phytophthora cinnamomi* in the vegetation of the proposal area, recommendations to disinfect personnel footwear and machinery prior to its use in construction activities have been presented.

³ The list of WoNS is part of a combined State and Commonwealth initiative to combat invasive species.

5.2.6 Changes to hydrology

The proposed road upgrades and culvert extension work would not result in any direct or indirect adverse impact on surface hydrology within the proposal area. In operation, the upgraded culvert would continue to perform at the current capacity within the proposal area, facilitating the upslope stormwater run-off from under Denman Road and is likely to improve the water quality within the vicinity. The proposed work is not expected to significantly impact Ramrod Creek beyond the limits of the work.

5.2.7 Noise, light and vibration

During construction, activities associated with the proposal may cause additional noise and vibration; however, given the presence of the existing road network, and proximate industrial/extractive industry areas, it is not considered that the proposal would result in adverse changes to existing levels of noise, vibration and/or light from this existing source such that there would be a significant impact to native fauna species.

The proposed work impact is considered to be temporary and short-term. The Draft Construction Noise Guideline (EPA 2020) would be referenced, as would compliance of all vehicles and machinery with industry noise guidelines.

5.2.8 Groundwater dependent ecosystems

In reference to the DPI's (Office of Water) Risk Assessment guidelines for GDE (Serov et al. 2012), the proposed work would not have any adverse direct or indirect impact on a water source or aquifer structure, it would not involve groundwater extraction, and, with the adoption of mitigation measures, would not contribute to the off-site movement of sediment.

5.3 Cumulative impacts

Based on a worst-case estimate, it is expected that a total construction activity disturbance footprint of about 2.89 ha would be required to permit the proposal. This is inclusive of the removal of eleven trees, two of which are hollow-bearing; the movement of personnel and machinery, access to the site and use of temporary compound/stockpile sites.

Through the proposed road upgrades and culvert extension work, the cumulative beneficial impacts would include improved environmental quality, site drainage and transport conditions and service. The widening of the Denman Road culvert at Ramrod Creek would coincide with existing upgrade work within the vicinity.

The proposal is not expected to have a cumulative impact on any existing or planned developments within the surrounding locality.

The proposed work is not considered to contribute to an adverse cumulative ecological impact in a local and regional context; nor is it considered to further contribute to the decline of any threatened species, populations or ecological communities within the locality.

5.4 Assessments of significance

By the completion of the investigation, the removal of two hollow-bearing trees may impact species of threatened hollow-dependant microbats that could be sheltering in these plants. Assessments referencing the criteria provided under Section 7.3 of the BC Act (these commonly referred to as the 5-part test) have been conducted (Appendix 8).

Table 5-5 provides a summary of the outcome of the 5-part test, this concluding that the activity was unlikely to result in a significant impact on hollow-dependant microbats.

Table 5-5 Summary of significance assessments

Threatened species, or communities	Significance assessment question (per s.7.2 BC Act)					Likely significant impact?
	a	b	c	d	e	
Threatened hollow-dependent microbats	N	X	N	N	N	No

Notes: N= No (no or positive impact), X= not applicable

6 Mitigation

Table 6-1 provides a number of mitigation measures that aim to ensure that the proposed work carried out does not have an adverse impact on those environments that occur within or near to the proposal area.

Where applicable, safeguards are made with reference to TfNSW's *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).

Table 6-1 Mitigation measures

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Removal and/or disturbance of native vegetation	Native vegetation removal will be minimised through detailed design.	Detailed design	Effective	
	Vegetation clearance limits would be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with <i>Guide 2: Exclusion Zones</i> (RTA 2011). Fencing etc. would be established at the outer limits of the drip line of any retained trees and the areas marked as 'no-go zones' to avoid direct impact.	Prior to construction	Effective	
	Pre-clearing surveys will be conducted in accordance with <i>Guide 1: Pre-clearing process</i> (RTA 2011).	Prior to construction	Effective	
	Vegetation removal will be conducted in accordance with <i>Guide 4: Clearing of vegetation and removal of bushrock</i> (RTA 2011). Clearing of native vegetation would be limited to the minimum required to successfully permit the proposal.	During construction	Effective	There would be a residual impact from the loss of about 2.89 ha of native/exotic vegetation, including 11 trees.
	Removed native and non-seed-bearing exotic vegetation would be mulched or re-used on-site.	During/post construction	Effective	

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Removal of threatened species habitat and habitat features	Habitat removal will be minimised through detailed design.	Detailed design	Effective	
	Habitat removal will be conducted in accordance with <i>Guide 4</i> (RTA 2011).	During construction	Effective	Loss of two hollow-bearing trees.
Removal of threatened plants	An ecologist or similar qualified person is to supervise the clearing of the hollow-bearing trees present, in accordance with <i>Guide 4</i> (RTA 2011). Hollow-bearing limbs etc. would be removed by chainsaw and lowered to the ground, the cut being about 100 mm below the bottom of the cavity. Once on the ground the ecologist, or similar, would inspect the cavities for sheltering species.	Prior to construction	Proven	
	Habitat will be relocated in accordance with <i>Guide 5: Re-use of woody debris and bushrock</i> (RTA 2011) to minimise loss or damage to native fauna habitats.	During construction	Proven	
	The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	During construction	Proven	
Injury and mortality of fauna	The presence of fauna on-site pre-work would be in accordance with <i>Guide 1: Pre-clearing process</i> (RTA 2011).	Prior to construction	Effective	
	Inspections for the presence of any sheltering fauna would be carried out beneath vehicles/machinery prior to use.	During construction	Effective	

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
	<p>Fauna will be managed in accordance with <i>Guide 9: Fauna handling</i> (RTA 2011).</p> <p>Any sheltering native species would be collected and relocated locally (nocturnal species to be released on dusk).</p> <p>If injured, native wildlife would be taken to a local veterinarian or wildlife carer for treatment.</p> <p>Exotic injured wildlife would be taken to a local veterinarian for assessment.</p>	During construction	Effective	
	The unexpected species find procedure is to be followed (RTA 2011).	During construction	Proven	
Fragmentation of identified habitat corridors	Connectivity measures will be implemented in accordance with the <i>Wildlife Connectivity Guidelines for Road Projects</i> (RTA 2011).	Detailed design, during construction and post construction	Effective	
Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with <i>Guide 2: Exclusion zones</i> (RTA 2011).	During construction	Effective	
Invasion and spread of weeds	<p>Weed species will be managed in accordance with <i>Guide 6: Weed management</i> (RTA 2011).</p> <p>In accordance with the NSW <i>Biosecurity Act 2015</i>, the African Boxthorn (<i>Lycium ferocissimum</i>) identified on site would be controlled, thereby resulting in its suppression.</p>	Prior/during construction	Effective	
Invasion and spread of pests	If applicable, pest species would be managed within the proposal site.	During construction	Effective	

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Invasion and spread of pathogens and disease	<p>Pathogens will be managed in accordance with <i>Guide 2: Exclusion zones</i> and <i>Guide 7: Pathogen management</i> (RTA 2011), including:</p> <ul style="list-style-type: none"> ○ Restrict vehicles to designated tracks, trails and parking areas. ○ Provide boot wash down facility. <p>Personnel and equipment/machinery to be disinfected with cleaning products containing benzalkonium chloride or 70 per cent methylated spirits in 30 per cent water.</p>	During construction	Effective	
Aquatic impact	<p>TfNSW [as the proponent] has entered into consultation with the DPI [Fisheries] (Reference no. C22/399) (Appendix 9), in accordance with s.199 of the FM Act, relating to proposed work conducted within, and in proximity to, Ramrod Creek within the proposal area.</p> <p>Prior to development commencing, TfNSW must forward a copy of this BAR and the CEMP to DPI Fisheries.</p> <p>DPI Fisheries has provided provisions for the proposal (Appendix 9); these addressed within these Aquatic impact mitigation measures.</p>	Prior to construction	Proven	
	<p>Aquatic habitat will be protected in accordance with <i>Guide 10: Aquatic habitats and riparian zones</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) and Section 3.3.2 <i>Standard precautions and mitigation measures</i> of the <i>Policy and guidelines for fish habitat conservation and management Update 2013</i> (DPI (Fisheries NSW) 2013).</p>	During construction	Effective	

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
	<p>An Erosion and Sediment Control Plan would be developed to limit soil erosion and sediment transfer off-site, with erosion and sediment controls to be implemented and maintained [for the duration of the work and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal] in accordance with Managing Urban Stormwater: Soils and Construction guidelines (Landcom 2004).</p> <p>Environmental safeguards are to be used during the work to ensure that there is no escape of turbid plumes into the adjacent aquatic environment.</p>	Prior/during construction	Effective	
	<p>If required, refuelling of machinery is to occur within an impervious bunded area located more than 50 m from any drainage line to prevent the escape of substances into the surrounding environment.</p> <p>An emergency spill kit must be kept on site at all times. The kit must be commensurate with the type and quantity of hazardous material used/stored on site.</p>	During construction	Effective	
	Any material removed from the waterway that is to be temporarily deposited or stockpiles on land is to be located well away from the waterway and to be contained by appropriate sediment control devices.	During construction	Effective	
	DPI Fisheries (1800 043 536) and the Environment Protection Authority (131 555) is to be notified immediately if any fish kills occur in the vicinity of the works. In such cases, all works other than emergency response procedures are to cease until the issue is rectified and approval is given by DPI Fisheries and/or the Environment Protection authority for the works to proceed.	During construction	Effective	

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Noise, light and vibration	Noise and vibration impact will be minimised through detailed design.	Detailed design	Effective	
	<p>Construction activities would be limited to the period provided in the Draft Construction Noise Guideline (EPA 2020):</p> <ul style="list-style-type: none"> o 7.00 am to 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm on Saturday. <p>No work on Sundays or public holidays.</p>	During construction	Effective	
General	An ESCP would be prepared for the proposal and would be in line with the publication <i>Managing Urban Stormwater: Soils & Construction Guidelines</i> (Landcom 2004).	Detailed design	Effective	
	A Construction Environmental Management Plan (CEMP) would be prepared for the proposal.	Prior to construction	Effective	
	If required, the temporary compound/stockpile site would be located within the existing disturbed/cleared area.	During construction	Effective	
	Spill kits commensurate with the type and quantity of hazardous material used must be available on-site.	During construction	Effective	

7 Offset strategy

7.1 Quantification of offset or revegetation requirements

TfNSW is committed to offsetting impacts associated with a proposal in line with its biodiversity offsetting guidelines (Roads and Maritime 2016) and in general accordance with the OEH principles for the use of biodiversity offsets in NSW.

The Guideline for Biodiversity Offsets V2.0 (Roads and Maritime 2016) provides offset thresholds that are appropriate and proportional for the scale of EP&A Act Division 5.1 assessments, and the activity's expected impact on biodiversity. Table 1, within Section 4.2 of the biodiversity offsetting guidelines, outlines the offsetting thresholds for REFs.

The thresholds relevant to this proposal are outlined within Table 7-1.

The proposed works would trigger thresholds set out by No Net Loss Guidelines (TfNSW 2022) listed in Table 7-1 (refer to Section 7.2 of this report).

Table 7-1 Offset thresholds (TfNSW No Net Loss Guidelines)

Impact	Threshold	Triggered
Works involving clearing of a CEEC	Where there is any clearing of an CEEC in 'moderate to good' condition	No
Works involving clearing of an EEC	Where clearing of an EEC \geq 2 ha in 'moderate to good' condition	No. About 2.89 ha of vegetation would be impacted; this not considered an EEC.
Works involving clearing of VEC	Where clearing of VEC \geq 5 ha in 'moderate to good' condition	N/A
Works involving clearing of any habitat for a known species credit fauna species or clearing of breeding habitat (as defined by the TBDC) for dual-credit fauna species (excluding exotic and planted vegetation that cannot be assigned to a plant community type)	Where clearing \geq 1 ha in 'moderate to good' condition	No
Works involving removal of known threatened flora species and their habitat	Where loss of individuals is \geq 10 or where clearing of habitat is \geq 1 ha	No
Type 1 or Type 2 key fish habitats	Where there is a net loss of habitat	No
Any residual biodiversity impact that doesn't require offsets in accordance with the No Net Loss Guideline is to be assessed against the requirements of the Tree and Hollow Replacement Guideline.	Any clearing of hollows and/or trees \geq 5cm DBH	Yes (refer to Table 7-2 below)

Table 7-2 Offset thresholds

Description of activity or impact	Consider offsets or supplementary measures	Subject species/Subject EEC meeting threshold
Activities in accordance with Roads and Maritime Services Environmental assessment procedure: Routine and Minor Works (RTA 2011)	No	N/A
Works on cleared land, plantations, exotic vegetation where there are no threatened species or habitat present	No	N/A
Works involving clearing of vegetation planted as part of a road corridor landscaping program (this includes where threatened species or species comprising listed ecological communities have been used for landscaping purposes)	Yes	Clearing of eleven native trees ≥5cm DBH, two of which are hollow-bearing (refer to Table 7-3 below)
Works involving clearing of national or NSW listed critically endangered ecological communities (CEEC)	Where there is any clearing of an CEEC in moderate to good condition	No. About 2.89 ha of vegetation would be affected; this not considered an EEC.
Works involving clearing of nationally listed TEC or nationally listed threatened species habitat	Where clearing > 1 ha of a TEC or habitat in moderate to good condition	N/A. No nationally listed TEC.
Works involving clearing of NSW endangered or vulnerable ecological community	Where clearing > 5 ha or where the ecological community is subject to an SIS	No. About 2.89 ha of vegetation would be affected; this not considered an EEC.
Works involving clearing of NSW listed threatened species habitat where the species is a species credit species as defined in the OEH Threatened Species Profile Database	Where clearing > 1 ha or where the species is the subject of an SIS	N/A
Works involving clearing of NSW listed threatened species habitat and the species is an ecosystem credit species as defined in OEH's Threatened Species Profile Database	Where clearing > 5 ha or where the species is the subject of an SIS	N/A
Type 1 or Type 2 key fish habitats (as defined by NSW Fisheries)	Where there is any net loss of habitat	No

Table 7-3 Assessment of vegetation impacts against thresholds

Veg. zone	Plant community type (PCT)	Condition	TEC	Impact area (ha or m ²) ¹	Threshold triggered?
Proposal Area	PCT 0	N/A	Not considered to meet the requirements of PCT 4089	2.89 ha	Tree replacement is required (refer to Section 7.2 below).

7.2 Biodiversity offset strategy

In line with TfNSW obligations, as part of the *Tree and hollow replacement guidelines*, referral has been made to the AIATPP report prepared for the project by Tree Survey Pty Ltd (Appendix 4). Reference to this publication identified that eleven trees will require removal to permit the road works, two of which are hollow-bearing; these comprised of:

- four small plants
- two medium plants
- five large plants.

Based on instructions received from TfNSW, Lesryk did not undertake any specific site inspections in regards to this matter.

To off-set the removal of these trees, TfNSW will transfer funds into the TfNSW Conservation fund at the required rates per the *Tree and hollow replacement guidelines*. Reference to these guidelines indicates that an amount of \$8000 would need to be transferred to the fund to off-set the clearing of eleven trees, two of which are hollow-bearing.

Additionally, Transport for NSW has proposed to plant 27 amenity trees along the road verge of Denman Road and Sydney Street to address the visual impact of the removal of the amenity trees required to permit the proposal. Replacement plantings for removed trees will be provided in consultation with Council and in accordance with the project's landscaping plan (Appendix 3).

8 Conclusion

By the completion of the Biodiversity Assessment, no threatened flora or fauna species, or their populations, listed or currently being considered for listing under the EPBC, BC or FM Acts were recorded; however, as they have been previously recorded and suitable habitat is expected to be removed (i.e., two hollow-bearing trees), it was considered necessary to adopt a precautionary approach to the potential occurrence of threatened hollow-dependent microbats. An assessment referencing Section 7.3 of the BC Act was conducted (Appendix 8); this concluding that the proposed work would not have a significant impact on the potential presence of any hollow-dependant threatened microbats. The preparation of a SIS is not required.

Mapped PCT4089 [identified as being present within both the proposal site and locality] is associated with the Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC; however, the on-site investigation determined that the mapping for the study area was incorrect. As such, no threatened ecological community was recorded within, or near to, the proposed road works area.

Based on a worst-case estimate, the proposal would require the disturbance footprint of about 2.89 ha. As part of the proposed road works, eleven trees would be cleared, two of which are hollow-bearing trees. To off-set this loss, TfNSW is to transfer \$8000.00 into the Conservation fund at the required rates per TfNSW's 2022 publication: *Tree and hollow replacement guidelines*. Additionally, TfNSW has proposed to plant 27 amenity trees along the road verge of Denman Road and Sydney Street to address the visual impact of the removal of the amenity trees required to permit the proposal.

Within the proposal area, Ramrod Creek is identified as KFH. The proposal would not have a significant impact on any threatened aquatic species, their populations, ecological communities or habitats; as such, an assessment with reference to Part 7A, Division 12, Subdivision 221ZV of the FM Act, is not required.

In accordance with s.199 of the FM Act, regarding proposed 'dredging and reclamation' work to be conducted within, or in proximity to, Ramrod Creek within the proposal area, TfNSW has entered into consultation with DPI Fisheries. DPI Fisheries has no objection to the proposed work, provided provisions detailed within Appendix 9 are adhered to.

With reference to Chapter 4 of SEPP (Biodiversity and Conservation) 2021, the proposal area is not considered to constitute Core Koala Habitat. The preparation of a Koala Plan of Management is not required.

Mitigation measures have been recommended in Section 6, to reduce any ecological impact as a result of the proposed work. Two primary measures include:

- Minimising impact through detailed design.
- Adhering to TfNSW's *Biodiversity Guidelines* (RTA 2011).

In addition, the following key mitigation measures have been provided:

- Limit vegetation removal to the minimum required to successfully permit the proposal.
- A licenced Ecologist to be present on-site to supervise the clearing of the two hollow-bearing trees.
- Retained trees to be clearly identified on-site prior to the commencement of work to ensure they are not indirectly impacted or cleared.
- Prepare an Erosion and Sediment Control Plan to minimise soil erosion and sediment transfer off-site.
- Adhere to provisions stipulated by DPI Fisheries.
- TfNSW to transfer \$8000.00 into the Conservation fund.
- TfNSW to plant 27 amenity trees along the road verge of Denman Road and Sydney Street to address the visual impact of the removal of the amenity trees required to permit the proposal.

With adherence to those recommendations provided in this report, no ecological constraints to the proposal proceeding as planned were identified or considered likely to occur.

The adoption of the mitigation measures provided would ensure that the proposal is carried out in an ecologically sustainable manner.

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Appendix 1 – Concept designs - Road and pavement upgrades

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Appendix 2 - Engineer Drawing Plans (Focus Bridge Engineering)

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Appendix 3 – Landscaping Plan

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Appendix 4 – Arboricultural Impact Assessment (AIA) & Tree Protection Plan (TPP) (Tree Survey Pty Ltd)

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Appendix 5 – Likelihood of assessment table

Key

V - vulnerable

E - endangered

CE - critically endangered

M - migratory

A State or nationally listed threatened species is considered to have a:

- **High** likelihood of occurrence if it has been recorded within 10 km of the study area and there is either suitable habitat present or the potential for the species to fly over the site (while species may fly over, it is acknowledged that for some species no suitable habitat will be present within the study area).
 - It is noted that, considering their habitat requirements and lifecycle needs, species which may fly over the site, such as the Grey-headed Flying-fox, but which would not rely or occur as a locally viable population in the subject site, are considered to have a Low likelihood of occurrence.
- **Moderate** likelihood of occurrence if they have a predicted occurrence (via the EPBC Act Protected Matters Search Tool or BioNet Atlas geographic search) and there is either suitable habitat present or the potential for the species to fly over the site (while species may fly over, it is acknowledged that for some species no suitable habitat will be present within the study area).
- **Low** likelihood of occurrence if suitable habitat for a species is not present regardless of whether they have been recorded within 10 km, or have a predicted occurrence.

Note: Species underlined are those which only the EPBC PMST predicted as having habitat in the search area. All other species have been recorded within 10 km of the study area.

Note: As these habitats are not present, no pelagic, estuarine or wetland species have been included in the following table.

Given that the proposed work is not located within the Commonwealth marine area, this being from 3 to 200 nautical miles from the coast, no species listed as marine under the EPBC Act have been considered; nor has the marine status of any species been acknowledged.

* - habitat requirements were generally extracted from DCCEEW (2022a), DPE (2022a), Harden (1992-2002), Frith (2007), Churchill (2008), Cogger (2014) and Van Dyck and Strahan (2008) with other references used being identified in the bibliography.

Common Name	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
PLANTS						
<i>Acacia pendula</i> population in the Hunter catchment		E	Within the Hunter catchment the species typically occurs on heavy soils, sometimes on the margins of small floodplains, but also in more undulating locations.	Low. Targeted not recorded.	OEH (36)	No
<i>Cymbidium canaliculatum</i> population in the Hunter Catchment		E	Typically grows in the hollows, fissures, trunks and forks of trees in dry sclerophyll forest or woodland, where its host trees typically occur on Permian Sediments of the Hunter Valley floor. It usually occurs singly or as a single clump, which can form large colonies on trees, between two and six metres from	Low. Targeted not recorded.	OEH (8)	No

Common Name	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
			the ground. Within the Hunter Catchment, <i>Cymbidium canaliculatum</i> is most commonly found in <i>Eucalyptus albens</i> (White Box) dominated woodlands (including those dominated by the intergrade <i>E. albens-moluccana</i>), much of which may constitute the endangered ecological community (EEC) 'White Box Yellow Box Blakely's Red Gum Woodland'. It has been found, less commonly, to grow on <i>E. dawsonii</i> (Slaty Box), <i>E. crebra</i> (Narrow-leaved Ironbark), <i>E. moluccana</i> (Grey Box), <i>Angophora floribunda</i> (Rough-barked Apple), <i>Acacia salicina</i> (Cooba) and on some other species, including dead stags. It is also known to use man-made structures, such as fence posts and wooden bridges as its host.			
Pine Donkey Orchid (<i>Diuris tricolor</i>) population in the Muswellbrook LGA		E	Found in sclerophyll woodland and derived grassland on flats or small rises, on a range of substrates including sandy or loamy soils.	Low. Targeted not recorded.	OEH (247)	No
Pine Donkey Orchid <i>Diuris tricolor</i>		V	Disturbance regimes are not known, although the species is usually recorded from disturbed habitats.	Low. Targeted not recorded.	OEH (247)	No
<i>Eucalyptus camaldulensis</i> population in the Hunter catchment		E	Most of the occurrences are on private land and there are no known occurrences in conservation reserves.	Low. Targeted not recorded.	OEH (38)	No
Slaty Red Gum <i>Eucalyptus glaucina</i>	V	V	Grows in grassy woodland and dry eucalypt forest and on deep, moderately fertile and well-watered soils.	Low. Targeted not recorded.	OEH (2) PMST	No
Narrow-leaved Black Peppermint <i>Eucalyptus nicholii</i>	V	V	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	Low. Targeted not recorded.	OEH (1)	No
<i>Euphrasia arguta</i>	CE		Historic records of the species noted the following habitats: 'in the open forest country around Bathurst in sub humid places', 'on the grassy country near Bathurst', and 'in meadows near rivers'. Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey; here, plants were most dense in an open disturbed area and along the roadside, indicating the species had regenerated following disturbance.	Low. Targeted not recorded.	PMST	No

Common Name	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
<u>Rufous Pomaderris, Brown Pomaderris</u> <i>Pomaderris brunnea</i>	V		Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Low. Targeted not recorded.	PMST	No
<u>a leek-orchid</u> <i>Prasophyllum</i> sp. <u>Wybong</u>	CE		Known to occur in open eucalypt woodland and grassland	Low. Targeted not recorded.	PMST	No
<u>Austral Toadflax</u> <i>Thesium australe</i>	V	V	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Low	PMST	No
MAMMALS						
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	E	V	The Spotted-tailed Quoll occurs within a variety of habitat types including wet and dry sclerophyll forests through to rainforests. The quoll is nocturnal and shelters in tree hollows, dense undergrowth, hollow logs or under rock outcrops. Home range sizes for this species are known to be considerably large with males travelling up to 15 km ² /night, and females between 3-4 km ² /night. The quoll preys on a wide variety of terrestrial and arboreal vertebrates, including rabbits, brush-tail and ringtail possums.	Low	OEH (4) PMST	No
Koala <i>Phascolarctos cinereus</i>	V	V	Open eucalypt forest and woodland, containing a variety of 'preferred' food tree species.	Low	OEH (4) PMST	No
<u>Brush-tailed Rock-wallaby</u> <i>Petrogale penicillata</i>	V	E	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	Low	PMST	No
Brush-tailed Phascogale <i>Phascogale tapoatafa</i>		V	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest.	Low	OEH (1)	No
<u>Yellow-bellied Glider</u> <i>Petaurus australis</i>		V	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	Low	PMST	No
Squirrel Glider <i>Petaurus norfolcensis</i>		V	Inhabits woodlands and dry sclerophyll forests, usually in diverse stands of shrubs and trees. Shelters and breeds in tree hollows, and is primarily an insectivorous animal but, has also been known to ingest plant exudates.	Low	OEH (11)	No
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Low	OEH (29) PMST	No
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>		V	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though	High (based on adoption)	OEH (5)	No

Common Name	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
			it is most commonly found in tall wet forest. Usually roosts in tree hollows but also in buildings.	precautionary approach)		
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>		V	Prefers moist habitats, with trees taller than 20 m. Generally, roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	High (based on adoption precautionary approach)	OEH (4)	No
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Cave-roosting bat that forages in timbered woodland and dry sclerophyll forest.	Low	OEH (3) PMST	No
<u>Corben's Long-eared Bat,</u> <u><i>Nyctophilus corbeni</i></u>	V	V	Inhabits a variety of vegetation types, including mallee, bulloke <i>Allocasuarina leuhmanni</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland.	Low	PMST	No
Yellow-bellied Sheathtail-bat <i>Saccolaimus flaviventris</i>		V	Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	High (based on adoption precautionary approach)	OEH (6)	No
Southern Myotis <i>Myotis macropus</i>		V	Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Low	OEH (4)	No
Eastern Cave Bat <i>Vespadelus troughtoni</i>		V	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings.	Low	OEH (9)	No
Little Bent-winged Bat <i>Miniopterus australis</i>		V	Generally found in well-timbered areas. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day.	Low	OEH (4)	No
Large Bent-winged Bat <i>Miniopterus orianae oceanensis</i>		V	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Low	OEH (17)	No
Eastern Coastal Free-tailed Bat		V	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great	High (based on adoption	OEH (7)	No

Common Name	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
<i>Mormopterus norfolkensis</i>			Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	precautionary approach)		
BIRDS						
Black-necked Stork <i>Ephippiorhynchus asiaticus</i>		E	The Black-necked Stork is a freshwater forager which feeds mainly on fish, as well as reptiles, frogs, crabs, rodents and carrion. It is distributed along the north and east coasts of Australia and frequents lakes, swamps, freshwater pools and mangroves.	Low	OEH (1)	No
Magpie Goose <i>Anseranas semipalmata</i>		V	Since the 1980s there have been an increasing number of records in central and northern NSW. Vagrants can follow food sources to south-eastern NSW. Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges.	Low	OEH (1)	No
Spotted Harrier <i>Circus assimilis</i>		V	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Low	OEH (1)	No
White-throated Needletail <i>Hirundapus caudacutus</i>	V, M		Almost exclusively aerial. Takes insects on wing over a range of habitat types. Recorded most often above wooded areas, including open forest and rainforest.	Low	OEH (4) PMST	No
White-bellied Sea-eagle <i>Haliaeetus leucogaster</i>		V	Found throughout coastal Australia and large lowland rivers and lakes. Feeds on fish, tortoises, rabbits and nestlings. Breeding usually occurs from May through to October with nest constructed in inland water systems being located in tall live or dead trees of which River Red Gums, Forest Red Gum and Southern Mahogany are commonly used.	Low	OEH (4)	No
Little Eagle <i>Hieraaetus morphnoides</i>		V	Occupies open eucalypt forest, woodland or open woodland. Sheoak or <i>Acacia</i> woodlands and riparian woodlands of interior NSW are also used.	Low	OEH (5)	No
Black Falcon <i>Falco subniger</i>		V	Found along tree-lined watercourses and in isolated stands of trees, mainly in arid and semi-arid areas.	Low	OEH (1)	No
Grey Falcon <i>Falco hypoleucos</i>	V	E	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of	Low	PMST	No

Common Name	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
			arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.			
<u>Red Goshawk</u> <i>Erythrotriorchis radiatus</i>	V	CE	Very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens. In NSW, preferred habitats include mixed subtropical rainforest, <i>Melaleuca</i> swamp forest and riparian <i>Eucalyptus</i> forest of coastal rivers.	Low	PMST	No
<u>Australasian Bittern</u> <i>Botaurus poiciloptilus</i>	E	E	Shallow, vegetated freshwater or brackish swamps, usually dominated by tall, dense reed beds of <i>Typha</i> sp, <i>Juncus</i> sp and <i>Phragmites</i> sp. Nests on platforms of reeds and rushes, usually built over water in dense cover. Feeds on aquatic invertebrates, small fish and frogs, usually caught in shallow water or wet mud.	Low	PMST	No
<u>Australian Painted Snipe</u> <i>Rostratula australis</i>	E	E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Low	PMST	No
<u>Glossy Black-cockatoo</u> <i>Calyptorhynchus lathami</i>	V	V	Inhabits eucalypt woodland and feeds almost exclusively on Casuarina fruits.	Low	OEH (1) PMST	No
<u>Little Lorikeet</u> <i>Glossopsitta pusilla</i>		V	Forages primarily in the open Eucalypt forest and woodland canopies, particularly along water courses; occasionally in Angophoras, Melaleucas and other tree species, also riparian habitats are used.	Low	OEH (4)	No
<u>Swift Parrot</u> <i>Lathamus discolor</i>	CE	E	Eucalypt forests. When over-wintering on the mainland, this species is dependent on winter-flowering eucalypt species.	Low	PMST	No
<u>Brown Treecreeper (eastern subspecies)</u> <i>Climacteris picumnus victoriae</i>		V	The western boundary of the range of <i>Climacteris picumnus victoriae</i> runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper <i>Climacteris picumnus picumnus</i> which then occupies the remaining parts of the state. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked	Low	OEH (5)	No

Common Name	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
			eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species.			
Speckled Warbler <i>Chthonicola sagittata</i>		V	Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Found in wet forested areas and heathland in eastern Victoria and south-eastern New South Wales. Forages on the ground, turning over leaf litter using strong legs.	Low	OEH (13)	No
Regent Honeyeater <i>Anthochaera phrygia</i>	CE	CE	Inhabits dry open forest and woodland. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Low	OEH (1) PMST	No
<u>Painted Honeyeater</u> <i>Grantiella picta</i>	V	V	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> .	Low	PMST	No
Grey-crowned Babbler (eastern subspecies) <i>Pomatostomus temporalis temporalis</i>		V	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions.	Low	OEH (4)	No
Varied Sittella <i>Daphoenositta chrysoptera</i>		V	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and <i>Acacia</i> woodland.	Low	OEH (1)	No
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>		V	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris.	Low	OEH (6)	No
Diamond Firetail <i>Stagonopleura guttata</i>		V	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum <i>Eucalyptus pauciflora</i> Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	Low	OEH (2)	No
AMPHIBIANS						

Common Name	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
<u>Green and Golden Bell Frog</u> <i>Litoria aurea</i>	V	E	Inhabits a variety of environments, including disturbed sites, ephemeral ponds, wetlands, marshes, dams and stream-sides, particularly those that contain one or more of the following aquatic plants: bullrush (<i>Typha</i> spp.), spikerush (<i>Eleocharis</i> spp.), <i>Juncus kraussii</i> , <i>Schoenoplectus littoralis</i> and <i>Sporobolus virginicus</i> .	Low	PMST	No
<u>Booroolong Frog</u> <i>Litoria booroolongensis</i>	E	E	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses.	Low	PMST	No
REPTILES						
<u>Striped Legless Lizard</u> <i>Delma impar</i>	V	V	Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass <i>Themeda australis</i> , spear-grasses <i>Austrostipa</i> spp. and poa tussocks <i>Poa</i> spp., and occasionally wallaby grasses <i>Austrodanthonia</i> spp.	Low	OEH (12) PMST	No
<u>Pink-tailed Worm-lizard, Pink-tailed Legless Lizard</u> <i>Aprasia parapulchella</i>	V	V	Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks.	Low	PMST	No

Appendix 6 – Photographic record of area investigated



Character of Denman Road and bridge (no. B01537) atop culvert, over Ramrod Creek. Photograph taken facing south.



Character of western side, and area of extension, of existing three-cell culvert, and Ramrod Creek. Photograph taken looking south-east through the area of disturbance.



Character of vegetation, including Typha (*Typha orientalis*), within proximity to the culvert outlet (western end of culvert). Photograph taken facing north.



Character of sediment build-up in associated drainage pipe.



Character of eastern side of the culvert and surrounding vegetation. Photograph taken looking west through the area of disturbance.



Character of eastern side, and area of extension, of existing three-cell culvert, and Ramrod Creek. Photograph taken looking south through the area of disturbance.



Character of eastern side, and area of extension, of existing three-cell culvert, and Ramrod Creek. Photograph taken looking north through the area of disturbance.



Surrounding vegetation present at the western end of culvert, including hollow-bearing Eucalyptus. Photograph taken facing south-west.



Character of Ramrod Creek. Photograph taken facing upstream.



Presence of Fairy Martin nests within culvert cells.



Character of temporary stockpile site. Photograph taken facing south-west.

Appendix 7 – Flora recorded

Family	Scientific name	Common name
Apiaceae	<i>Foeniculum vulgare</i> *	Fennel
Asteraceae	<i>Sonchus asper</i> *	Prickly Sowthistle
	<i>Cirsium vulgare</i> *	Scotch Thistle
Brassicaceae	<i>Brassica juncea</i> *	Indian Mustard
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Myrtaceae	<i>Eucalyptus melliodora</i>	Yellow Box
	<i>Eucalyptus intertexta</i>	Western Red Box
Malvaceae	<i>Modiola caroliniana</i> *	Carolina Mallow
	<i>Sida rhombifolia</i> *	Paddy's Lucerne
Casuarinaceae	<i>Casuarina cunninghamiana</i>	River She-Oak
Juncaceae	<i>Juncas effusus</i>	Common Rush
	<i>Juncas acutus</i> *	Sharp Rush
Poaceae	<i>Pennisetum clandestinum</i> *	Kikuyu
	<i>Ehrharta erecta</i> *	Panic Veldt Grass
	<i>Poa annua</i> *	Winter Grass
	<i>Austrostipa verticillata</i>	Slender Bamboo Grass
	<i>Chloris gayana</i> *	Rhodes grass
	<i>Cynodon dactylon</i>	Couch
	<i>Bromus catharticus</i> *	Prairie Grass
Plantaginaceae	<i>Veronica persica</i> *	Persian speedwell
	<i>Plantago sp.</i>	Plantain
Polygonaceae	<i>Rumex crispus</i> *	Curly Dock
	<i>Persicaria sp.</i>	Knotweed
Rosaceae	<i>Rosa banksiae</i> *	Lady bank's rose
Rubiaceae	<i>Galium aparine</i> *	Sticky Willy
Solanaeae	<i>Lycium ferocissimum</i> *	African boxthorn
	<i>Solanum nigrum</i> *	Blackberry Nightshade
Typhaceae	<i>Typha Orientalist</i>	Broadleaf Cumbungi
Verbenaceae	<i>Verbena bonariensis</i> *	Purpletop

Appendix 8 – Ecological Assessments

1. State – *Biodiversity Conservation Act 2016*

1.(a) Hollow-dependent Yangochiroptera ('microbats') – Five-part test

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Greater Broad-nosed Bat, Eastern False Pipistrelle, Yellow-bellied Sheath-tail-bat and Eastern Coastal Free-tailed Bat have been previously recorded within 10 km of the study area.

Two hollow-bearing trees (Tree IDs 83 & 84 as per the Arboricultural Impact Assessment) observed within the impact footprint of the proposal area are expected to require removal to permit the proposed road upgrades and culvert extension work. Given the extent of similar resources and suitable habitat being retained within both the study area and surrounding Muswellbrook area, it is not considered that the proposal would have an adverse effect on the lifecycle on those threatened hollow-dependent microbats that could potentially occur, such that the viability of local populations of these animals would be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable to threatened species.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The proposal will require the removal of 2.89 ha of vegetation, this including two hollow-bearing trees; however, similar habitat will be retained in the surrounding area.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

Hollow-dependent microbats can easily negotiate open areas and have been recorded flying over open spaces (author's field notes); as such, the loss of some native vegetation, this including two hollow-bearing trees, is not expected to adversely impact the dispersal or movement patterns of those potentially occurring hollow-dependent microbats; these species being able to easily negotiate/traverse the study area post disturbance. Suitable habitat for these species would be retained beyond the limits of disturbance; as such, the proposal would not cause any further fragmentation of, or isolation to, any areas of habitat used by hollow-dependent microbats.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The proposal is not considered to remove, modify, fragment or isolate a significant amount of vegetation such that the long-term survival of hollow-dependent microbats would be jeopardised. Whilst two hollow-bearing trees would require removal, the habitats within the study area extend well beyond the limits of the proposal where similar resources are present. Given that no major components of these species' habitat are to be further isolated or fragmented, it is not considered

that the proposal would have an impact on any potentially occurring hollow-dependent microbats such that the long-term survival of these species in the locality would be adversely affected.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No declared AOBV would be directly or indirectly affected by the proposal. The study area is not listed as a declared AOBV under Part 3 of the BC Regulation 2017.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Currently 35 KTP for mainland NSW are listed under Schedule 4 of the BC Act. Of these, the 'clearing of native vegetation' and 'loss of hollow-bearing trees' would be applicable to the proposal. While it is acknowledged that the proposed work will result in the removal of some native vegetation, including two hollow-bearing trees, it is not considered that this clearance would significantly contribute to these KTP such that the lifecycle requirements of any potentially occurring hollow-dependent microbats would be compromised.

Expected impact on hollow-dependent microbats

The conducting of the proposal would not disturb, remove, modify or fragment any habitats critical to the lifecycle requirements of any species of hollow-dependent microbats. Given the extent of suitable habitat being retained beyond the limits of the proposed work, the removal of some vegetation, including two hollow-bearing trees, is not considered to have a significant impact on any potentially occurring hollow-dependent microbats or their habitat. As such, the preparation of a SIS that further considers the impact of the proposed work on hollow-dependent microbats is not required.

Appendix 9 – DPI Fisheries consultation

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Appendix E

Arboricultural Impact Assessment



TREE SURVEY


ARBORICULTURAL IMPACT ASSESSMENT & TREE PROTECTION PLAN

**Pavement Rehabilitation
Denman Road, Muswellbrook**
Version 5

Prepared for:
Transport for NSW

15 November 2022

Document information

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Abbreviations

Abbreviation	Description
AQF	Australian Qualifications Framework
AS	Australian Standards
DBH	Diameter at Breast Height
Id	Identification
m	Metre
mm	Millimetre
NDE	Non-Destructive Excavation
NO	Number
NSW	New South Wales
sp.	Species
SRZ	Structural Root Zone
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment

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1 Background

1.1 Introduction

Tree Survey was commissioned by Transport for NSW to prepare an Arboricultural Impact Assessment (AIA) and Tree Protection Plan (TPP) for the proposed pavement rehabilitation of Denman Road, Muswellbrook.

The purpose of this report is to:

- Identify the trees within and adjacent to the proposed disturbance footprint.
- Assess the potential impacts of the development on the subject trees.
- Evaluate the significance of the subject trees and assess their suitability for retention.

1.2 The proposal

The key features of the proposal are summarised as follows:

- Proposed road, path, culvert extension and drainage upgrade.

1.3 Documents and plans referenced

The conclusions and recommendations of this report are based on the Australian Standard, AS 4970-2009, Protection of Trees on Development Sites, the findings from the site inspections, and analysis of the documents/plans listed in **Table 1**.

Table 1: Documents and plans

Document	Author	Version	Date
Civil Plan	Transport for NSW	3	-
Detail Survey (DWG file)	Provided by TfNSW	-	-

1.4 The subject trees

A total of **88** trees were assessed and included in this report. The subject trees were assessed in accordance with a visual tree assessment (VTA) as formulated by Mattheck & Breloer (1994), and practices consistent with modern arboriculture. The following limitations apply to this methodology:

- Trees were inspected from ground level, without the use of any invasive or diagnostic tools and testing. Trees within adjacent properties or restricted areas were not subject to a complete visual inspection (i.e., defects and abnormalities may be present but not recorded).
- Diameter at breast height (DBH) has been accurately measured using a diameter tape (where access to the trees was available). Tree height and canopy spread were estimated unless otherwise stated.
- Tree protection zones have been calculated in accordance with Australian Standard, AS 4970-2009, Protection of Trees on Development Sites using the DBH measurements.

A tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Arboriculturalists (IACA) Significance of a Tree, Assessment Rating System (see **Appendices**). Further information, observations, and measurements specific to each of the subject trees can be found in **Chapter 3**.

2 Arboricultural Impact Assessment (AIA)

2.1 Impact assessment

There are two types of zones (as defined by AS 4970-2009) that need to be considered when undertaking an arboricultural impact assessment:

- **Tree protection zone (TPZ):** The TPZ is the optimal combination of crown and root area (as defined by AS 4970-2009) that requires protection during the construction process so that the tree can remain viable. The TPZ is calculated by measuring the diameter at breast height (DBH) and multiplying it by twelve (12). The resulting value is applied as a radial measurement from the centre of the trunk to delineate the TPZ.
- **Structural root zone (SRZ):** The SRZ is the area of the root system used for stability, mechanical support, and anchorage of the tree.

Encroachment within the TPZ is acceptable, providing that the arborist can demonstrate that the tree will remain viable. There are three (3) levels of encroachment (as defined by AS 4970-2009):

- **Nil encroachment (0%):** No encroachment within the TPZ.
- **Minor encroachment (<10%):** The encroachment is less than 10% of the TPZ.
- **Major encroachment (>10%):** The encroachment is greater than 10% of the TPZ.

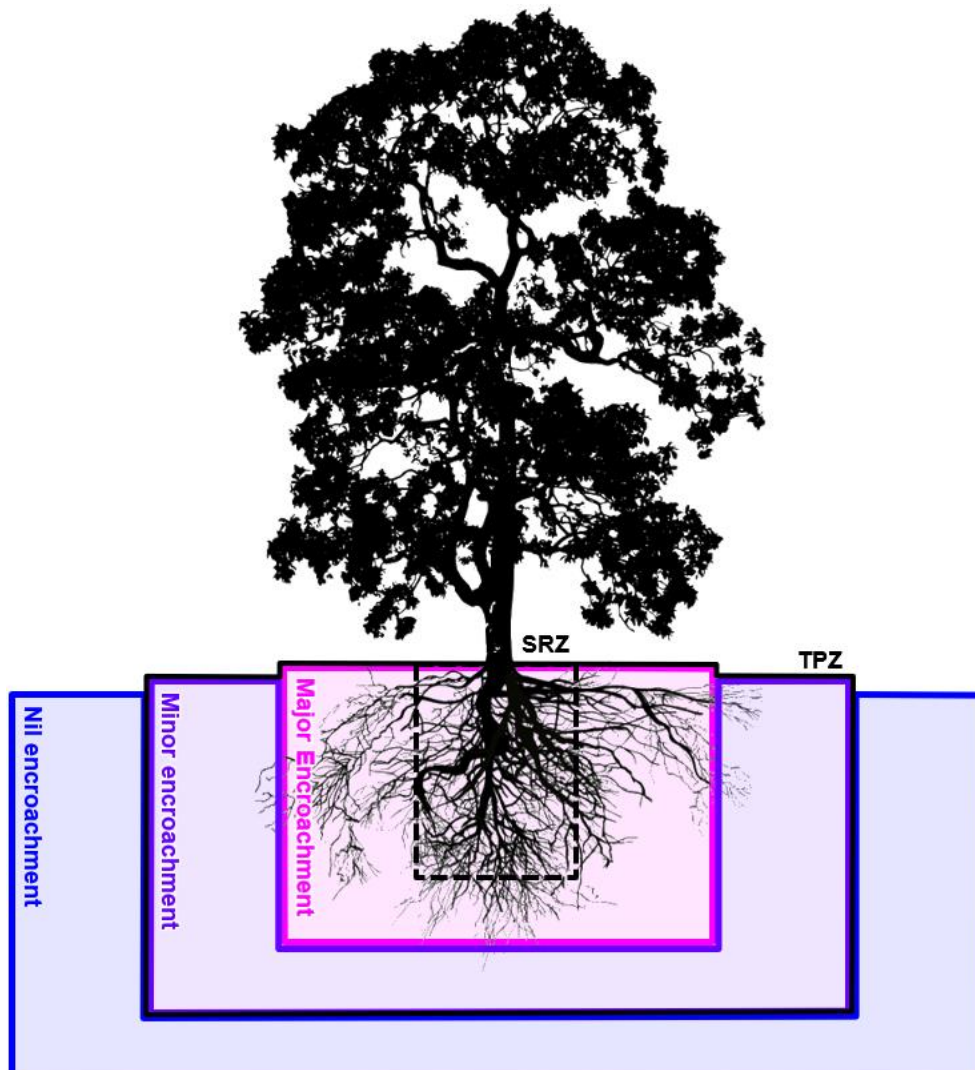


Figure 1: Three (3) levels of encroachment

2.2 Mitigating the impacts

Encroachment within the TPZ should be compensated with a range of mitigation measures to ensure that impacts to the subject tree(s) are reduced or restricted wherever possible. Mitigation should be increased relative to the level of encroachment within the TPZ to ensure the subject tree(s) remain viable. The table below outlines requirements under AS 4970-2009, and mitigation measures required within each category of encroachment. These mitigation measures will only apply if trees are proposed to be retained.

Table 2: Mitigation measures

Encroachment	Mitigation Measures
<p>Nil encroachment (0%)</p>	<ul style="list-style-type: none"> • N/A
<p>Minor encroachment (<10%)</p>	<ul style="list-style-type: none"> • The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. • Detailed root investigations should not be required. • Tree protection must be installed.
<p>Major encroachment (>10%)</p>	<ul style="list-style-type: none"> • The project arborist must demonstrate the tree(s) would remain viable. • Root investigation by non-destructive methods may be required for any trees proposed for retention. • Consideration of relevant factors, including root location and distribution, tree species, condition, site constraints, and design factors. • The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. • The project arborist will be required to supervise any work within the TPZ. • Tree protection must be installed.

3 Results

Table 3 shows the results of the arboricultural assessment. Key points are:

3.1 Encroachment within the TPZ

A summary of trees impacted directly by the proposed construction footprint is outlined below:

- **Nil encroachment (0%):** A total of **65** trees are located outside the construction footprint.
- **Minor encroachment (<10%):** A total of **7** trees will be subject to minor encroachment.
- **Major encroachment (>10%):** A total of **16** trees will be subject to major encroachment.

3.2 Tree removal and retention

A summary of the total proposed tree removals is outlined below :

- **Retain:** A total of **79** trees are proposed for retention.
- **Remove:** A total of **4** trees are proposed for removal.
- **TBC:** A total of **5** trees (Trees 6, 9, 10, 11, 13) have been assessed for retention, but are now likely to be removed to accommodate earthworks. Further investigations are to be carried out during construction to confirm the retention or removal of these trees.

Table 3: Results of the arboricultural assessment

Id.	Botanical name	Height (metres)	Spread (metres diameter)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (millimetres diameter)	DBH 2 (millimetres diameter)	DBH 3 (millimetres diameter)	DBH Combined (millimetres diameter)	DRB (millimetres diameter)	TPZ (metres radius)	SRZ (metres radius)	Encroachment	% Encroachment within TPZ	Other notes	Proposal
1	<i>Casuarina glauca</i>	8	6	Good	Fair	Mature	Medium	Medium	Medium	200	250	350	470	550	5.6	2.6	Nil	0%	-	Retain
2	<i>Casuarina glauca</i>	9	5	Good	Fair	Mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
3	<i>Casuarina glauca</i>	7	8	Good	Good	Mature	Medium	Medium	Medium	400	-	-	400	450	4.8	2.4	Nil	0%	-	Retain
4	<i>Casuarina glauca</i>	6	5	Good	Fair	Semi-mature	Low	Medium	Low	250	-	-	250	300	3.0	2.0	Nil	0%	-	Retain
5	<i>Prunus cerasifera</i>	3	2	Fair	Fair	Juvenile	Low	Medium	Low	150	-	-	150	150	2.0	1.5	Nil	0%	-	Retain
6	<i>Eucalyptus melliodora</i>	10	12	Fair	Good	Mature	High	Medium	High	700	-	-	700	750	8.4	2.9	Major	18%	Trees likely will need to be removed due to earthworks	TBC
7	<i>Eucalyptus melliodora</i>	12	14	Good	Fair	Mature	High	Medium	High	900	-	-	900	1000	10.8	3.3	Minor	9%	Cavity (>10cm).	Retain
8	<i>Lagerstroemia indica</i>	3	4	Good	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.5	Nil	0%	-	Retain
9	<i>Casuarina glauca</i>	8	4	Good	Fair	Semi-mature	Low	Medium	Medium	250	-	-	250	300	3.0	2.0	Nil	0%	Trees likely will need to be removed due to earthworks	TBC
10	<i>Casuarina glauca</i>	9	12	Good	Good	Mature	Medium	Medium	Medium	500	-	-	500	550	6.0	2.6	Major	13%	Trees likely will need to be removed due to earthworks	TBC
11	<i>Casuarina glauca</i>	10	10	Good	Fair	Mature	Medium	Medium	Medium	550	-	-	550	600	6.6	2.7	Major	21%	Trees likely will need to be removed due to earthworks	TBC
12	<i>Lagerstroemia indica</i>	3	4	Fair	Fair	Semi-mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Major	100%	This is required to be removed for site compound	Remove
13	<i>Casuarina glauca</i>	10	10	Fair	Fair	Mature	Medium	Medium	Medium	450	-	-	450	500	5.4	2.5	Major	12%	Trees likely will need to be removed due to earthworks	TBC
14	<i>Lagerstroemia indica</i>	3	4	Good	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Major	100%	This is required to be removed for site compound	Remove
15	<i>Prunus cerasifera</i>	3	4	Fair	Fair	Mature	Low	Short	Low	150	100	100	210	250	2.5	1.8	Nil	0%	-	Retain
16	<i>Platanus x acerifolia</i>	9	8	Good	Fair	Mature	Medium	Medium	Medium	500	-	-	500	550	6.0	2.6	Minor	5%	-	Retain
17	<i>Prunus cerasifera</i>	4	4	Fair	Fair	Mature	Low	Short	Low	150	100	100	210	250	2.5	1.8	Nil	0%	-	Retain
18	<i>Lagerstroemia indica</i>	3	4	Good	Good	Mature	Low	Medium	Low	150	-	-	150	150	2.0	1.5	Nil	0%	-	Retain
19	<i>Platanus x acerifolia</i>	9	12	Good	Good	Mature	Medium	Medium	Medium	550	-	-	550	650	6.6	2.8	Minor	9%	Epicormic regrowth. Previous failure.	Retain
20	<i>Lagerstroemia indica</i>	4	4	Good	Good	Mature	Low	Medium	Low	150	-	-	150	150	2.0	1.5	Nil	0%	-	Retain
21	<i>Lagerstroemia indica</i>	4	4	Good	Good	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
22	<i>Platanus x acerifolia</i>	10	12	Good	Good	Mature	Medium	Medium	Medium	650	-	-	650	750	7.8	2.9	Major	24%	-	Retain
23	<i>Prunus cerasifera</i>	3	4	Fair	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
24	<i>Lagerstroemia indica</i>	3	5	Good	Good	Mature	Low	Medium	Low	150	-	-	150	150	2.0	1.5	Nil	0%	-	Retain
25	<i>Prunus cerasifera</i>	3	4	Good	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
26	<i>Lagerstroemia indica</i>	3	4	Fair	Fair	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
27	<i>Platanus x acerifolia</i>	10	12	Good	Fair	Mature	Medium	Medium	Medium	700	-	-	700	750	8.4	2.9	Major	36%	Epicormic regrowth.	Retain
28	<i>Prunus cerasifera</i>	4	4	Good	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
29	<i>Lagerstroemia indica</i>	4	5	Good	Good	Mature	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
30	<i>Prunus cerasifera</i>	4	4	Good	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
31	<i>Platanus x acerifolia</i>	8	12	Good	Fair	Mature	Medium	Medium	Medium	600	-	-	600	650	7.2	2.8	Major	40%	-	Retain
32	<i>Lagerstroemia indica</i>	3	3	Fair	Fair	Semi-mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
33	<i>Platanus x acerifolia</i>	12	12	Good	Fair	Mature	Medium	Medium	Medium	500	-	-	500	550	6.0	2.6	Major	29%	-	Retain
34	<i>Prunus cerasifera</i>	3	3	Fair	Fair	Mature	Low	Short	Low	100	100	-	140	150	2.0	1.5	Nil	0%	-	Retain
35	<i>Lagerstroemia indica</i>	3	4	Good	Fair	Mature	Low	Medium	Low	150	-	-	150	150	2.0	1.5	Nil	0%	-	Retain
36	<i>Platanus x acerifolia</i>	9	8	Good	Fair	Mature	Medium	Medium	Medium	600	-	-	600	650	7.2	2.8	Major	28%	-	Retain

Id.	Botanical name	Height (metres)	Spread (metres diameter)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (millimetres diameter)	DBH 2 (millimetres diameter)	DBH 3 (millimetres diameter)	DBH Combined (millimetres diameter)	DRB (millimetres diameter)	TPZ (metres radius)	SRZ (metres radius)	Encroachment	% Encroachment within TPZ	Other notes	Proposal
37	<i>Prunus cerasifera</i>	3	3	Good	Fair	Mature	Low	Short	Low	100	100	-	140	150	2.0	1.5	Nil	0%	-	Retain
38	<i>Lagerstroemia indica</i>	2	3	Good	Fair	Semi-mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	Nil	0%	-	Retain
39	<i>Prunus cerasifera</i>	4	4	Good	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
40	<i>Platanus x acerifolia</i>	10	8	Good	Good	Mature	Medium	Medium	Medium	550	-	-	550	600	6.6	2.7	Major	30%	-	Retain
41	<i>Lagerstroemia indica</i>	4	4	Good	Fair	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
42	<i>Prunus cerasifera</i>	4	4	Good	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
43	<i>Lagerstroemia indica</i>	2	2	Poor	Poor	Juvenile	Low	Short	Low	100	-	-	100	100	2.0	1.5	Nil	0%	Tree is in severe decline.	Retain
44	<i>Prunus cerasifera</i>	4	4	Fair	Fair	Mature	Low	Short	Low	100	100	-	140	150	2.0	1.5	Nil	0%	-	Retain
45	<i>Platanus x acerifolia</i>	7	10	Good	Poor	Mature	Medium	Medium	Medium	650	-	-	650	700	7.8	2.8	Major	15%	Trunk decay.	Retain
46	<i>Lagerstroemia indica</i>	4	3	Fair	Fair	Mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	Nil	0%	Epicormic regrowth.	Retain
47	<i>Platanus x acerifolia</i>	6	10	Fair	Fair	Mature	Medium	Medium	Medium	600	-	-	600	650	7.2	2.8	Major	13%	Deadwood (>10cm).	Retain
48	<i>Prunus cerasifera</i>	4	4	Fair	Fair	Mature	Low	Short	Low	100	100	-	140	150	2.0	1.5	Nil	0%	-	Retain
49	<i>Grevillea robusta</i>	8	14	Good	Fair	Mature	Medium	Medium	Medium	750	-	-	750	850	9.0	3.1	Minor	5%	Tree on private property. DBH estimated.	Retain
50	<i>Lagerstroemia indica</i>	4	3	Fair	Fair	Mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	Nil	0%	-	Retain
51	<i>Platanus x acerifolia</i>	6	10	Fair	Fair	Mature	Medium	Medium	Medium	300	300	400	580	650	7.0	2.8	Minor	9%	-	Retain
52	<i>Platanus x acerifolia</i>	6	6	Good	Fair	Semi-mature	Medium	Medium	Medium	300	-	-	300	350	3.6	2.1	Nil	0%	-	Retain
53	<i>Corymbia maculata</i>	8	4	Poor	Fair	Mature	Low	Short	Low	300	-	-	300	350	3.6	2.1	Nil	0%	Severe canopy dieback. Tree is in severe decline.	Retain
54	<i>Prunus cerasifera</i>	3	3	Good	Fair	Mature	Low	Short	Low	100	100	-	140	150	2.0	1.5	Nil	0%	-	Retain
55	<i>Corymbia maculata</i>	12	6	Good	Fair	Mature	Medium	Medium	Medium	450	-	-	450	500	5.4	2.5	Nil	0%	-	Retain
56	<i>Lagerstroemia indica</i>	4	4	Fair	Fair	Mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	Nil	0%	Epicormic regrowth.	Retain
57	<i>Corymbia citriodora</i>	12	8	Good	Fair	Mature	Medium	Medium	Medium	400	-	-	400	450	4.8	2.4	Nil	0%	-	Retain
58	<i>Prunus cerasifera</i>	4	4	Good	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
59	<i>Lagerstroemia indica</i>	4	4	Good	Fair	Mature	Low	Medium	Low	150	-	-	150	150	2.0	1.5	Nil	0%	-	Retain
60	<i>Corymbia citriodora</i>	12	7	Fair	Fair	Mature	Medium	Medium	Medium	500	-	-	500	550	6.0	2.6	Minor	1%	Deadwood (>10cm).	Retain
61	<i>Prunus cerasifera</i>	4	4	Good	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
62	<i>Platanus acerifolia</i>	7	10	Good	Fair	Mature	Medium	Medium	Medium	350	450	-	570	650	6.8	2.8	Minor	7%	-	Retain
63	<i>Lagerstroemia indica</i>	3	4	Good	Fair	Mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	Nil	0%	-	Retain
64	<i>Eucalyptus microcorys</i>	7	6	Good	Fair	Mature	Medium	Medium	Medium	450	-	-	450	500	5.4	2.5	Nil	0%	-	Retain
65	<i>Prunus cerasifera</i>	3	3	Fair	Fair	Mature	Low	Short	Low	100	100	-	140	150	2.0	1.5	Nil	0%	-	Retain
66	<i>Platanus x acerifolia</i>	4	5	Fair	Poor	Semi-mature	Low	Short	Low	250	200	-	320	400	3.8	2.3	Nil	0%	Epicormic regrowth. Included bark junction. Trunk decay.	Retain
67	<i>Eucalyptus microcorys</i>	5	5	Fair	Fair	Semi-mature	Low	Medium	Low	200	200	-	280	300	3.4	2.0	Nil	0%	-	Retain
68	<i>Lagerstroemia indica</i>	3	3	Good	Fair	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
69	<i>Lagerstroemia indica</i>	4	3	Good	Fair	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
70	<i>Lagerstroemia indica</i>	3	3	Good	Fair	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	Epicormic regrowth.	Retain
71	<i>Eucalyptus microcorys</i>	6	6	Good	Fair	Mature	Medium	Medium	Medium	400	-	-	400	450	4.8	2.4	Nil	0%	-	Retain
72	<i>Lagerstroemia indica</i>	3	4	Good	Fair	Mature	Low	Medium	Low	100	100	-	140	150	2.0	1.5	Nil	0%	-	Retain
73	<i>Prunus cerasifera</i>	3	4	Good	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain

Id.	Botanical name	Height (metres)	Spread (metres diameter)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (millimetres diameter)	DBH 2 (millimetres diameter)	DBH 3 (millimetres diameter)	DBH Combined (millimetres diameter)	DRB (millimetres diameter)	TPZ (metres radius)	SRZ (metres radius)	Encroachment	% Encroachment within TPZ	Other notes	Proposal
74	<i>Lagerstroemia indica</i>	3	3	Good	Fair	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
75	<i>Eucalyptus microcorys</i>	5	5	Good	Fair	Semi-mature	Medium	Medium	Medium	250	-	-	250	300	3.0	2.0	Nil	0%	-	Retain
76	<i>Prunus cerasifera</i>	4	4	Good	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
77	<i>Lagerstroemia indica</i>	3	3	Good	Fair	Mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	Nil	0%	Epicormic regrowth.	Retain
78	<i>Lagerstroemia indica</i>	4	3	Good	Fair	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
79	<i>Prunus cerasifera</i>	4	3	Fair	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
80	<i>Lagerstroemia indica</i>	3	3	Fair	Fair	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
81	<i>Lagerstroemia indica</i>	2	2	Good	Fair	Semi-mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	Nil	0%	-	Retain
82	<i>Prunus cerasifera</i>	4	3	Good	Fair	Mature	Low	Short	Low	100	100	100	170	200	2.0	1.7	Nil	0%	-	Retain
83	<i>Eucalyptus melliodora</i>	9	12	Good	Fair	Mature	High	Medium	High	700	-	-	700	800	8.4	3.0	Major	32%	Cavity (>20cm). Cavity (>30cm).	Remove
84	<i>Eucalyptus melliodora</i>	14	7	Good	Good	Mature	High	Medium	High	750	-	-	750	850	9.0	3.1	Major	35%	-	Remove
85	<i>Prunus cerasifera</i>	3	2	Fair	Fair	Juvenile	Low	Short	Low	100	-	-	100	100	2.0	1.5	Nil	0%	-	Retain
86	<i>Prunus cerasifera</i>	2	2	Fair	Fair	Juvenile	Low	Short	Low	100	-	-	100	100	2.0	1.5	Nil	0%	-	Retain
87	<i>Lagerstroemia indica</i>	2	2	Fair	Fair	Semi-mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	Nil	0%	-	Retain
88	<i>Prunus cerasifera</i>	2	2	Good	Fair	Juvenile	Low	Short	Low	100	-	-	100	100	2.0	1.5	Nil	0%	-	Retain

4 Discussion

4.1 Nil encroachment

A total of **65** trees will be subject to no encroachment within the TPZ:

- **Retain:** A total of **65** trees are located outside of the proposed construction footprint. No impacts on these trees are foreseeable under the current proposal.
- **Remove:** No trees within the category of “nil encroachment” are proposed for removal.

4.2 Minor encroachment

A total of **7** trees will be subject to a minor encroachment of less than 10% within the TPZ:

- **Retain:** A total of **7** trees will be subject to a minor encroachment of less than 10% within the TPZ. The encroachment will not impact the SRZ and is highly unlikely to impact the overall health or condition of these trees. Under the current proposal, these trees can be successfully retained.
- **Remove:** No trees within the category of “minor encroachment” are proposed for removal.

4.3 Major encroachment

A total of **16** trees will be subject to a major encroachment of greater than 10% within the TPZ:

- **Retain:** A total of **12** trees will be subject to a major encroachment within the TPZ. The encroachments primarily intersect the TPZ in areas of the existing roadway, road shoulder, and hard surfaces. These areas are not conducive to root growth. These encroachments are considered low impact and are unlikely to affect the overall health or condition of the subject trees. Several site-specific mitigations for these encroachments have been outlined in the Tree Protection Plan. Under the current proposal, these trees can be successfully retained.
- **Remove:** A total of **4** trees (Tree 12, 14, 83, 84) are located within the construction footprint. These trees are required to be removed.



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Legend

The subject trees

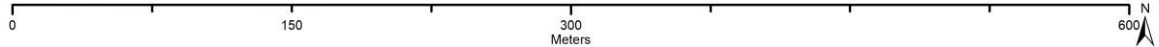
- Nil encroachment
- Minor encroachment
- Major encroachment

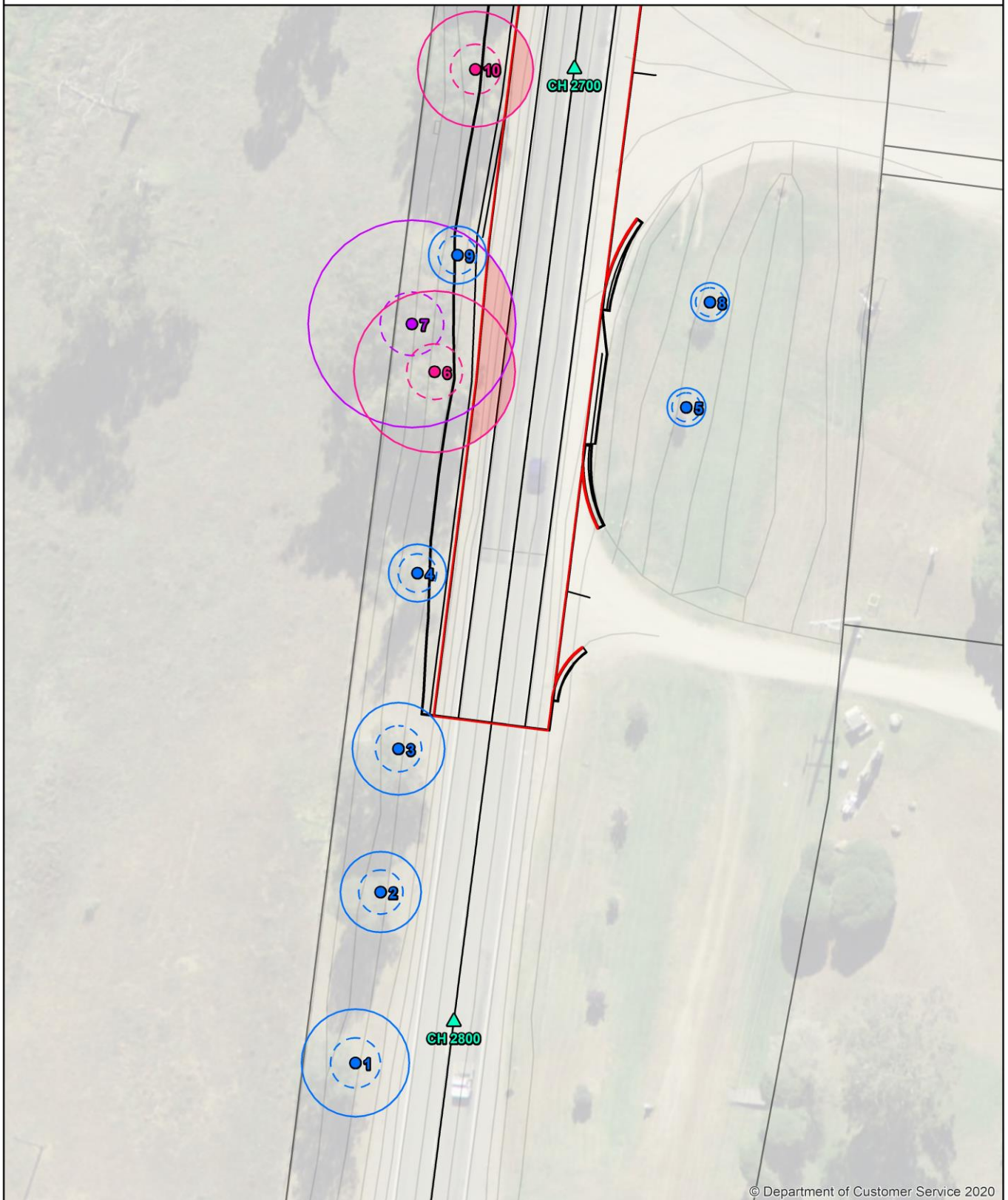
Protection zones

- ▭ TPZ (continuous line)
- - - SRZ (dashed line)

Other items

- ▭ Impact footprint
- ▭ Encroachment within the TPZ
- Site layout
- Site survey
- ▲ Chainage





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Legend

The subject trees

- Nil encroachment
- Minor encroachment
- Major encroachment

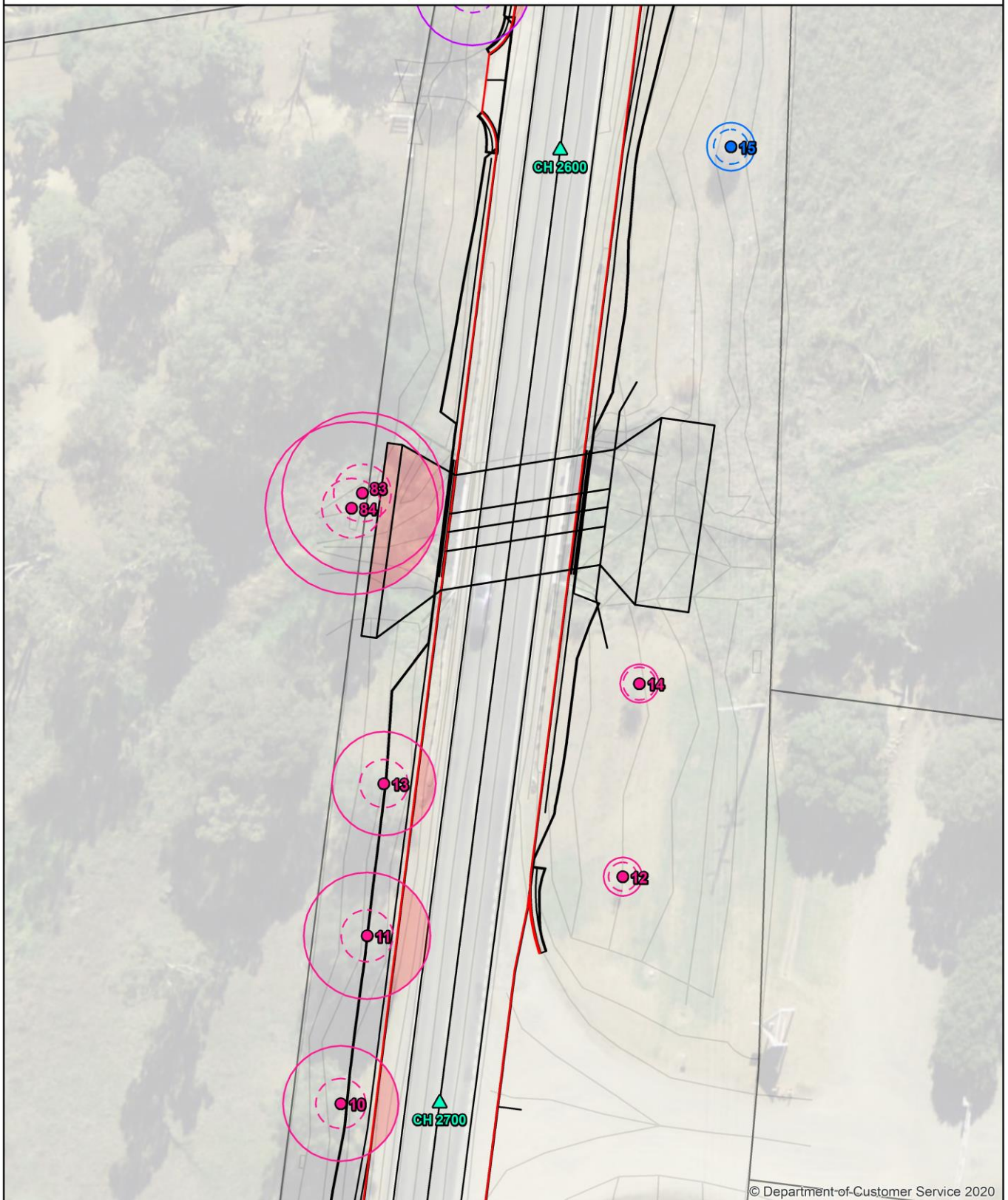
Protection zones

- ▭ TPZ (continuous line)
- - - SRZ (dashed line)

Other items

- ▭ Impact footprint
- ▭ Encroachment within the TPZ
- Site layout
- Site survey
- ▲ Chainage





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Legend

The subject trees

- Nil encroachment
- Minor encroachment
- Major encroachment

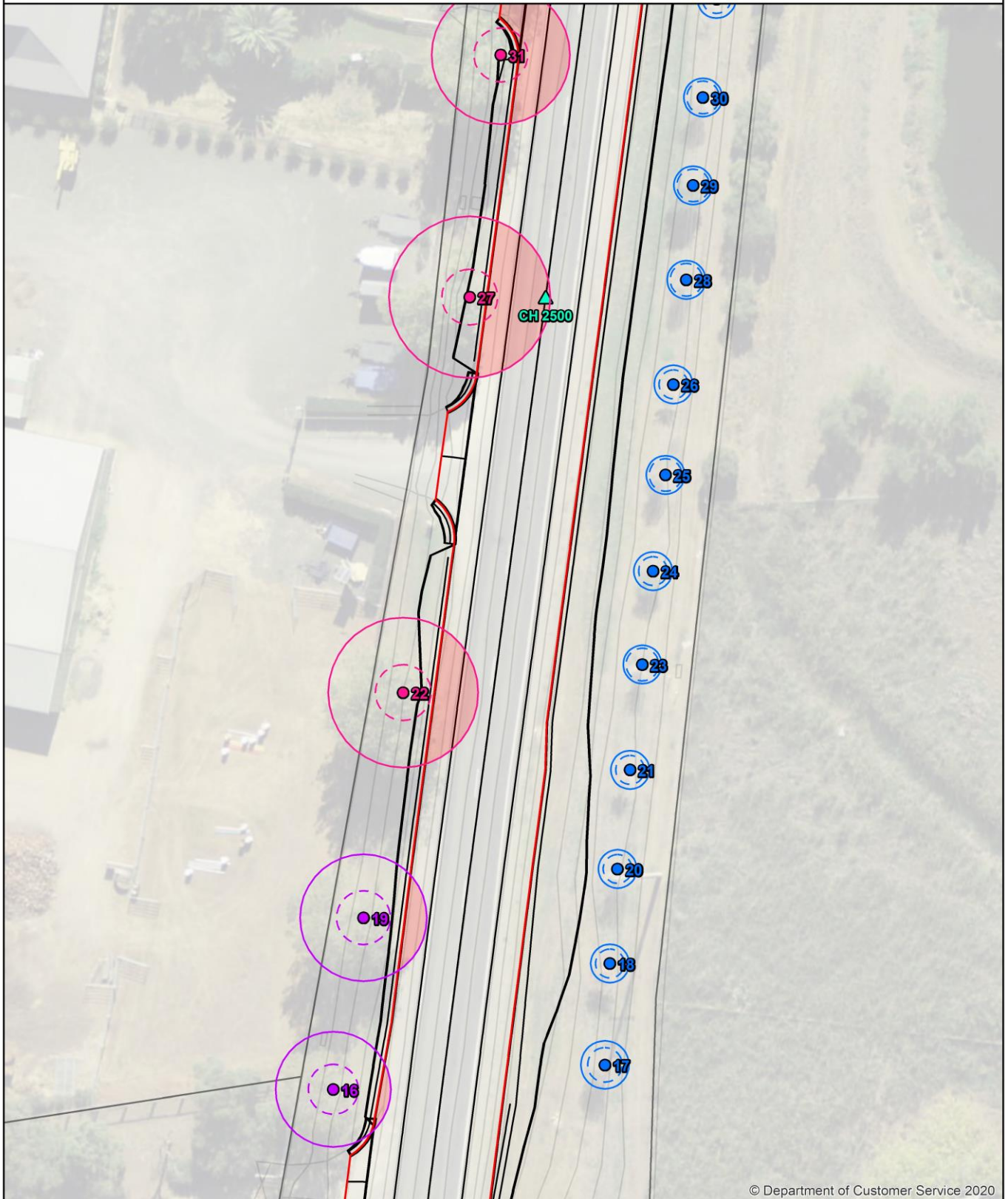
Protection zones

- TPZ (continuous line)
- - - SRZ (dashed line)

Other items

- Impact footprint
- Encroachment within the TPZ
- Site layout
- Site survey
- ▲ Chainage





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Legend

The subject trees

- Nil encroachment
- Minor encroachment
- Major encroachment

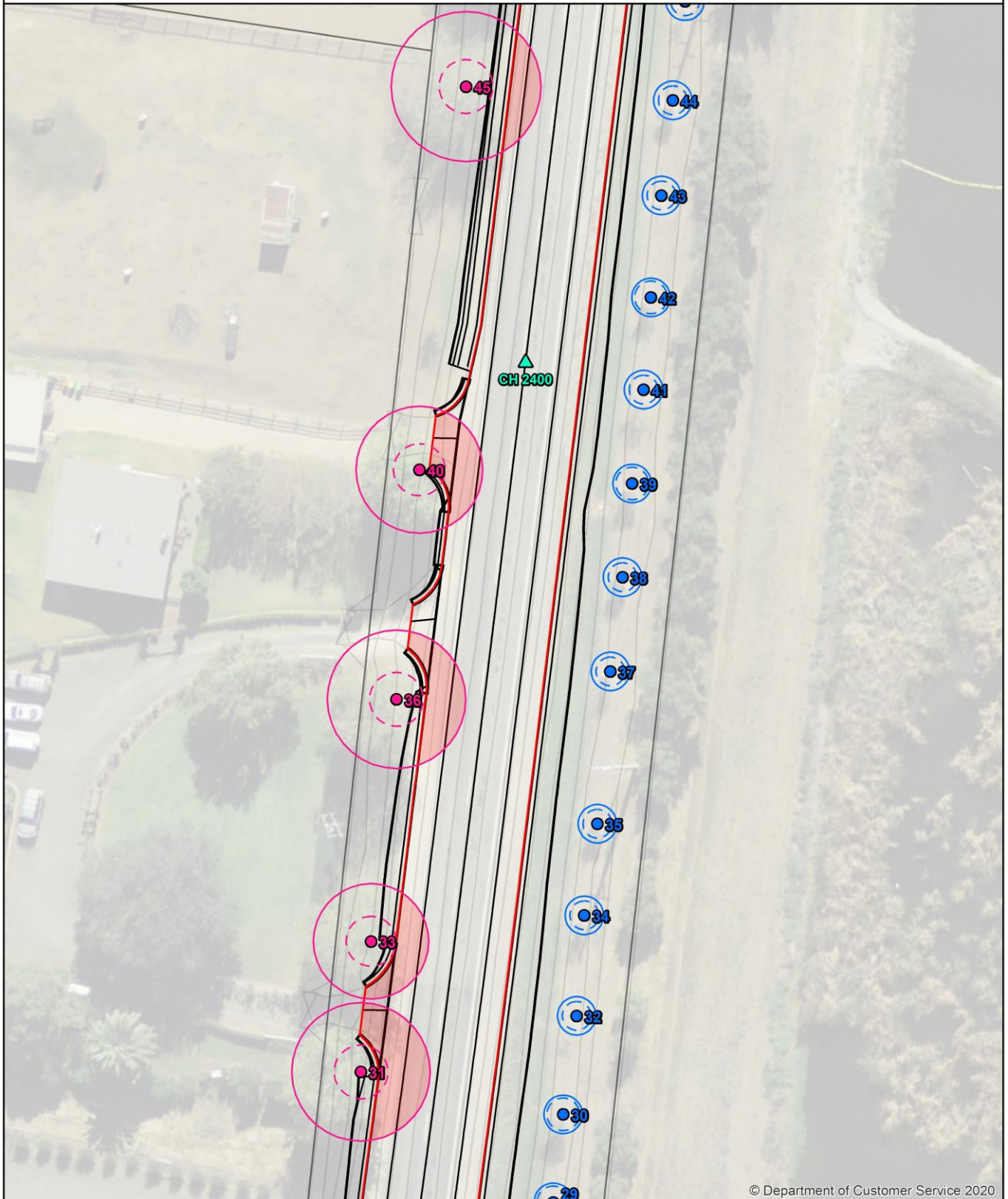
Protection zones

- ▭ TPZ (continuous line)
- - - SRZ (dashed line)

Other items

- ▭ Impact footprint
- ▭ Encroachment within the TPZ
- Site layout
- Site survey
- ▲ Chainage





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Legend

The subject trees

- Nil encroachment
- Minor encroachment
- Major encroachment

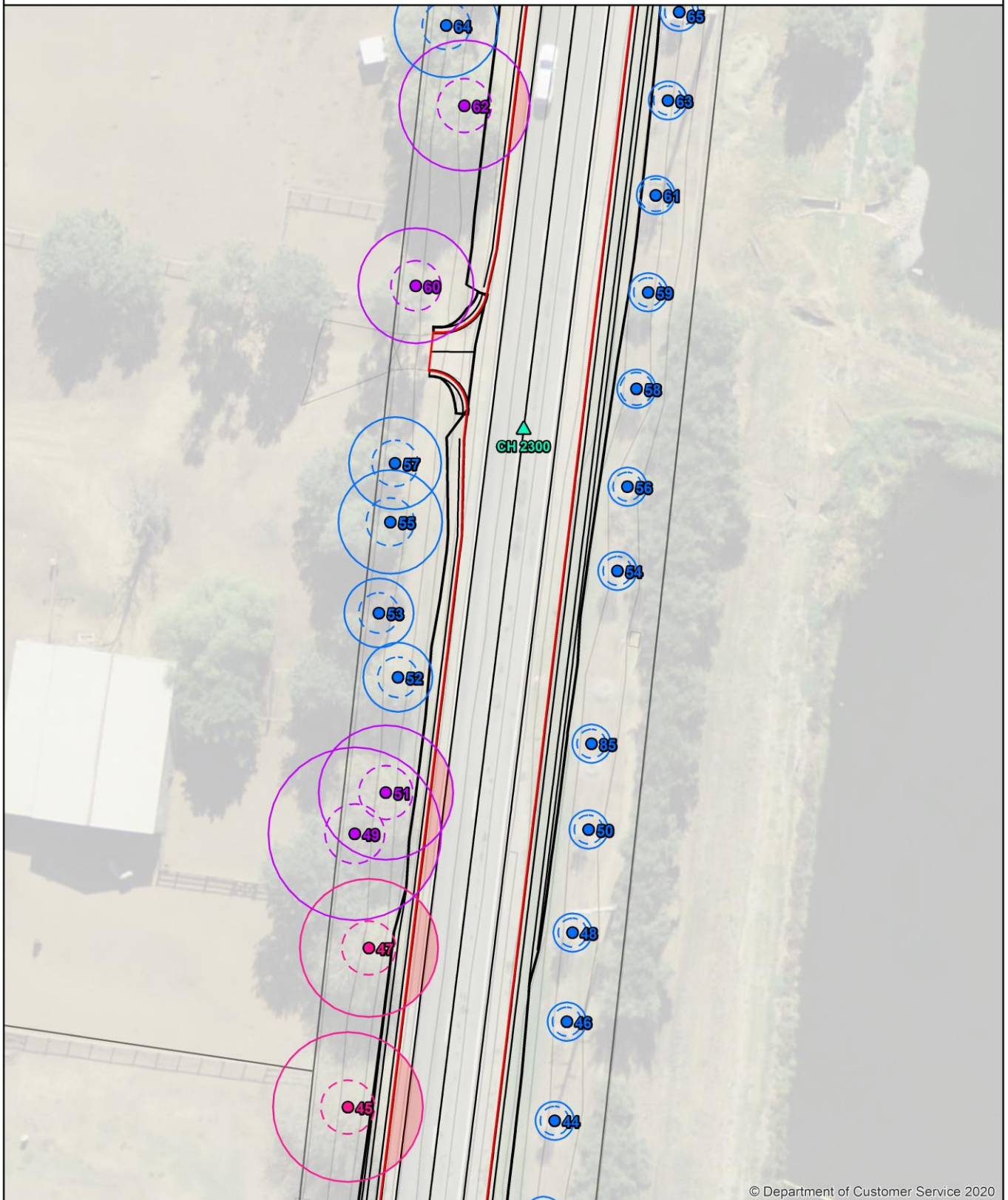
Protection zones

- ▭ TPZ (continuous line)
- - - SRZ (dashed line)

Other items

- ▭ Impact footprint
- ▭ Encroachment within the TPZ
- Site layout
- Site survey
- ▲ Chainage





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Legend

The subject trees

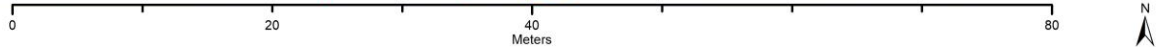
- Nil encroachment
- Minor encroachment
- Major encroachment

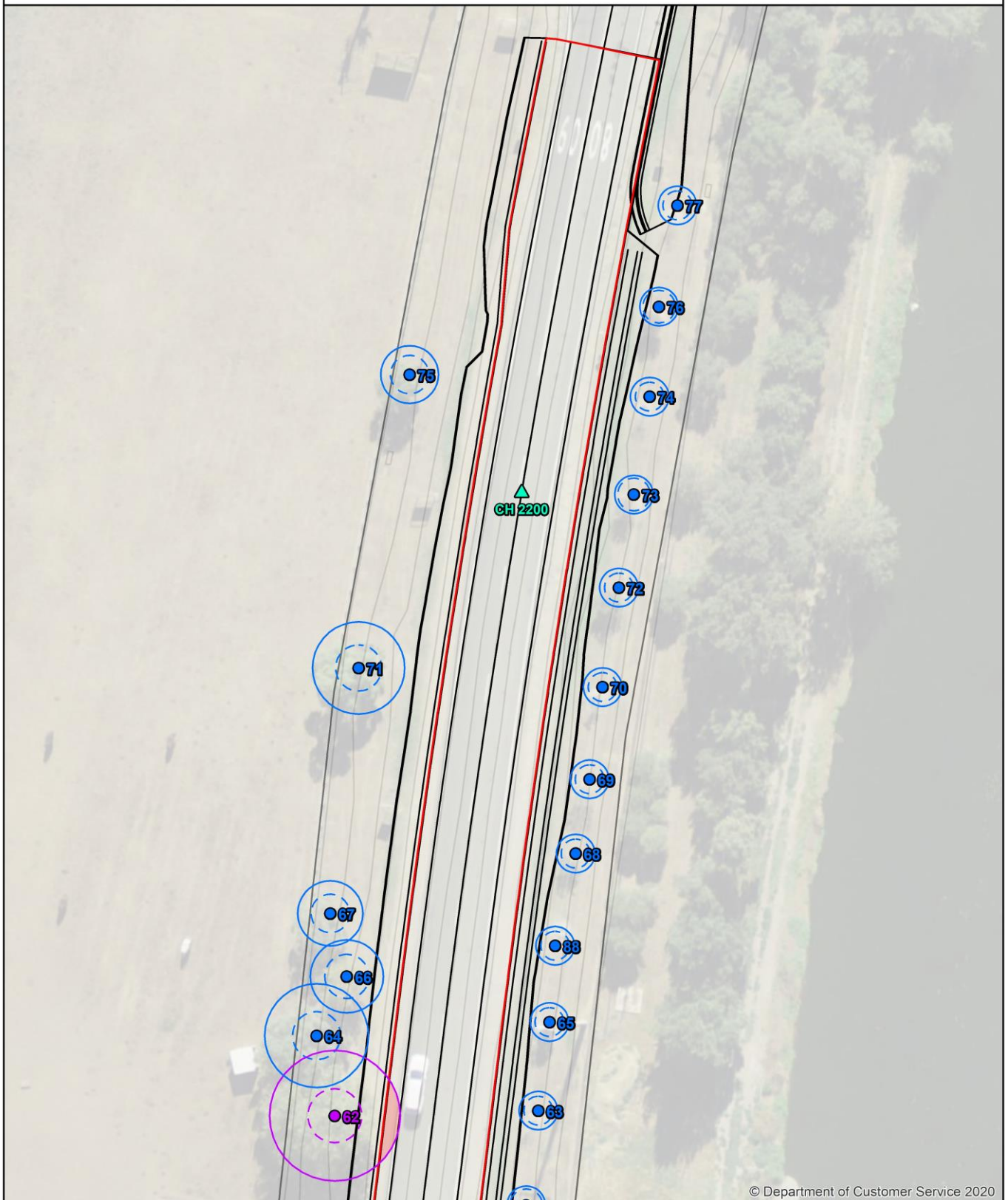
Protection zones

- ▭ TPZ (continuous line)
- - - SRZ (dashed line)

Other items

- ▭ Impact footprint
- ▭ Encroachment within the TPZ
- Site layout
- Site survey
- ▲ Chainage





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Legend

The subject trees

- Nil encroachment
- Minor encroachment
- Major encroachment

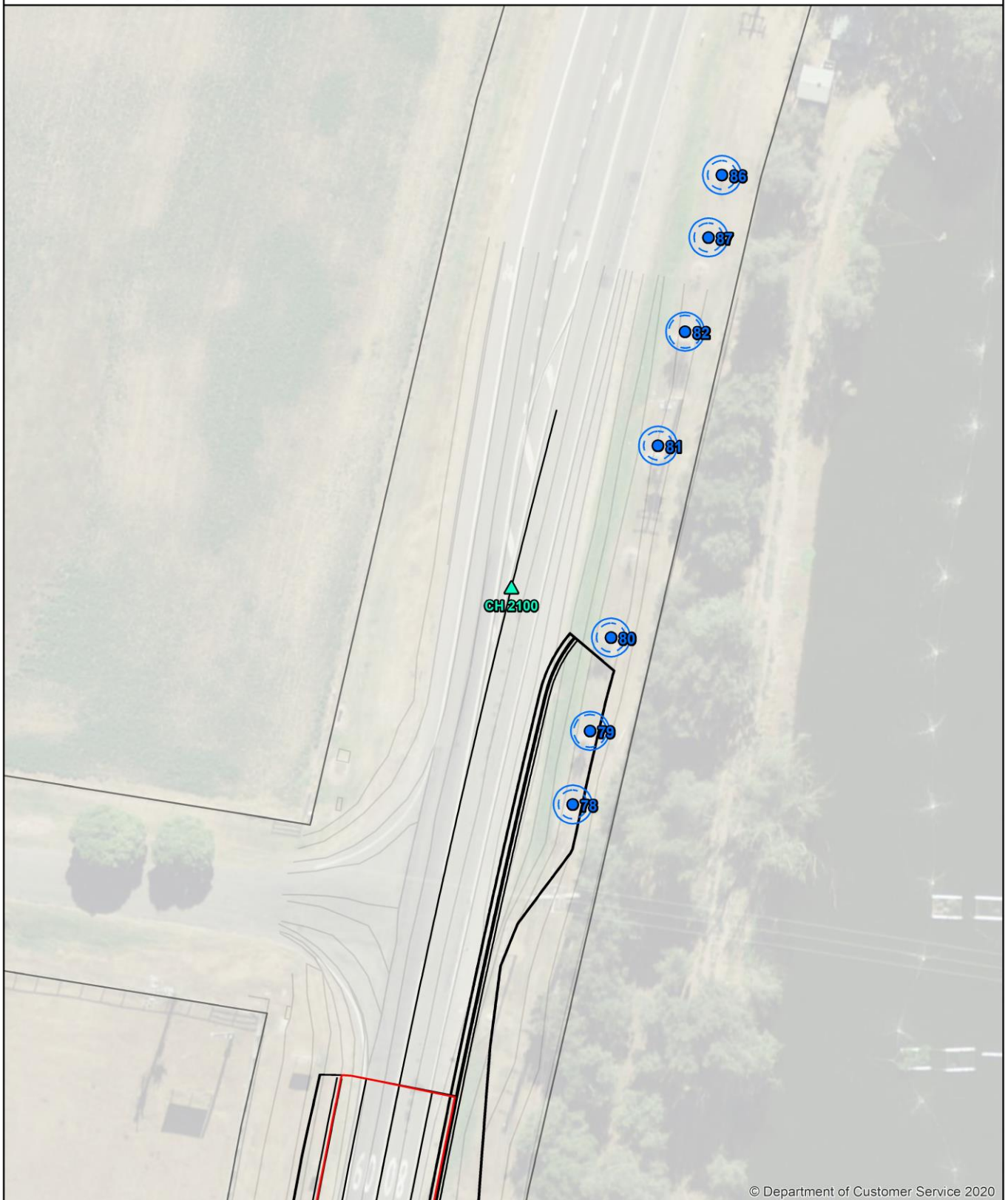
Protection zones

- ▭ TPZ (continuous line)
- - - SRZ (dashed line)

Other items

- ▭ Impact footprint
- ▭ Encroachment within the TPZ
- Site layout
- Site survey
- ▲ Chainage





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Legend

The subject trees

- Nil encroachment
- Minor encroachment
- Major encroachment

Protection zones

- ▭ TPZ (continuous line)
- - - SRZ (dashed line)

Other items

- ▭ Impact footprint
- ▭ Encroachment within the TPZ
- Site layout
- Site survey
- ▲ Chainage



5 Tree Protection Plan (TPP)

5.1 Tree removal and retention

A summary of the total proposed tree removals is outlined below :

- **Retain:** A total of **79** trees are proposed for retention.
- **Remove:** A total of **4** trees are proposed for removal.
- **TBC:** A total of **5** trees (Trees 6, 9, 10, 11, 13) have been assessed for retention, but are now likely to be removed to accommodate earthworks. Further investigations are to be carried out during construction to confirm the retention or removal of these trees.

5.2 Tree pruning

Minor vegetation trimming may be required to accommodate construction clearances. Standard pruning specifications are outlined below:

- Pruning must not exceed 10% of the overall canopy volume.
- No limbs greater than 100mm in diameter are to be removed.
- The final pruning cut shall be at the branch collar or growth point in accordance with the Australian Standard AS 4373-2007, Pruning of Amenity Trees.
- All tree pruning work is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture, in accordance with Australian Standard AS 4373-2007, Pruning of Amenity Trees, and the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998).

If proposed vegetation trimming does not meet the specifications outlined above, the project arborist must undertake an assessment of impacts on a case-by-case basis.

5.3 Key tree protection mitigations

A summary of tree protection mitigation required for this project is outlined below.

- **Tree protection:** Tree protection will be required in the form of fencing or trunk protection (whichever is more appropriate for the site and works). Further details are included in this chapter.
- **Supervision:** Excavations and works within the tree protection zone of key trees are to be supervised by the project arborist (as shown in the Tree Protection Plan).
- **Certification:** The project arborist will be required to certify that the works have been carried out in accordance with this tree protection plan.

Further details and specifications for tree protection are detailed within this chapter.

5.4 Tree protection fencing

Tree protection fencing must be established at the locations shown in the tree protection plan. Existing fencing, site hoarding, or structures (such as a wall or building) may be used as tree protection fencing, providing the TPZ remains isolated from the construction footprint. Tree protection fencing must be installed prior to site establishment and remain intact until the completion of works. Once erected, protective fencing must not be removed or altered without the approval of the project arborist. Specifications for the tree protection fencing are as follows:

- Temporary mesh panel fencing (minimum height of 1.8m).
- Installed prior to site establishment and remain intact until the completion of works.
- Protective fencing must not be removed or altered without the approval of the project arborist.
- Prominently signposted with 300mm x 450mm boards stating, "NO ACCESS - TREE PROTECTION ZONE."
- Certified and inspected by the project arborist.



If tree protection fencing is not practical due to site constraints, tree protection delineation must be installed as an alternative. Specifications for tree protection barriers are as follows:

- Star pickets spaced at 2m intervals,
- Connected by a continuous high-visibility barrier/hazard mesh or flagging rope.
- Maintained at a minimum height of 1m.

Where approved works are required within the TPZ, fencing may be setback to provide construction access. Trunk, branch, and ground protection shall be installed and must comply with Australian Standard, AS 4970-2009, Protection of Trees on Development Sites. Any additional construction activities within the TPZ of the subject trees must be assessed and approved by the project arborist.

5.5 Restricted activities within the TPZ

The TPZ is an area that is isolated from the work zone to ensure no disturbance or encroachment occurs in this zone. Activities generally excluded from the TPZ (unless otherwise approved under the development consent) include, but are not limited to:

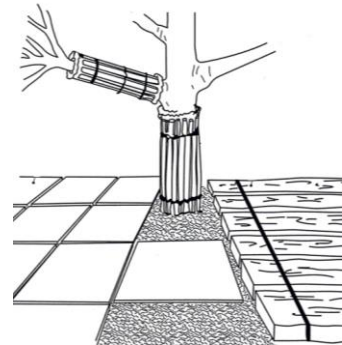
- Machine excavation and trenching.
- Ripping or cultivation of the soil.
- Storage of building materials, waste, and waste receptacles.
- Disposal of waste materials and chemicals including paint, solvents, cement slurry, fuel, oil, and other toxic liquids.
- Movement and storage of plant, equipment, and vehicles.
- Soil level changes, including the placement of fill material.
- Mechanical removal of vegetation.
- Affixing of signage or hoardings to trees.
- Other physical damage to the trunk or root system.
- Any other activity that is likely to cause damage to the tree.

5.6 Trunk protection

Where the provision of tree protection fencing is impractical or must be temporarily removed, trunk protection shall be installed to avoid accidental mechanical damage.

Specifications for trunk protection are as follows:

- A thick layer of carpet underfelt, geotextile fabric, or similar wrapped around the trunk to a minimum height of 2m.
- 1.8m lengths of softwood timbers aligned vertically and spaced evenly around the trunk (with a small gap of approximately 50mm between the timbers).
- The timbers must be secured using galvanised hoop strap (aluminium strapping).



The timbers shall be wrapped around the trunk but not fixed to the tree, as this will cause injury/damage to the tree.

5.7 Ground protection

If temporary access for vehicle, plant, or machinery is required within the TPZ ground protection shall be installed. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Where possible, areas of the existing pavement shall be used as ground protection.

Specifications for light traffic access (<3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- A layer of mulch or crushed rock (at a minimum depth of 100mm)

Specifications for heavy traffic access (>3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- A layer of lightly compacted road base (at a minimum depth of 200mm)
- Geotextile fabric shall extend a minimum of 300mm beyond the edge of the road base.

Pedestrian, vehicular, and machinery access within the TPZ shall be restricted solely to areas where ground protection has been installed.

5.8 Demolition

The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top-down, pull back' method.

5.9 Excavations

The project arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. All excavations (including root investigations) within the TPZ of **Tree 6, 7, 10, 11, 13, 16, 19, 22, 27, 31, 33, 36, 40, 45, 47, 49, 51, and 62** must be carried out using tree-sensitive methods under the supervision of the project arborist (see Tree Protection Plan). These methods may include:

- **Manual excavation:** Use of hand tools such as spades, trowels, and brushes.
- **Air spade:** Use of a pressurised air device that blows the soil away and leaves roots intact.
- **Hydro-vacuum excavation:** Use of pressurised water to remove soil from around roots.

The recommended techniques for common types of excavations have been outlined below:

- **Continuous strip footings:** Manual excavation, air spade, or hydro-vacuum is utilised excavation lines within the TPZ prior to the commencement of mechanical excavation. Excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bedrock or heavy clay, if agreed by the project arborist). Any conflicting roots shall be pruned using clean, sharp secateurs or a pruning saw to ensure a clean cut, free from tears. All root pruning must be documented and carried out by the project arborist. After all root pruning is completed, machine excavation is permitted within the footprint of the structure.
- **Post or pier footings:** Manual excavation, air spade, or hydro-vacuum is utilised at the location of pier footings within the TPZ. Any conflicting roots shall be pruned using clean, sharp secateurs or a pruning saw to ensure a clean cut, free from tears. All root pruning must be documented and carried out by the project arborist. After all root pruning is completed, machine excavation is permitted within the footprint of the structure.

No over-excavation, battering, or benching shall be undertaken beyond the footprint of any structure unless approved by the project arborist.

5.10 Underground services

Where possible, underground services should be routed outside of the TPZ. If underground services need to be installed within the TPZ, they must be installed using tree-sensitive excavation methods under the supervision of the project arborist. Alternatively, boring methods such as horizontal directional drilling (HDD) may be used for underground service installation, providing the installation is at a minimum depth of 800mm below grade. Excavations for entry/exit pits must be located outside the TPZ.

5.11 Root pruning

Any conflicting roots (<50mm in diameter) identified during the supervised excavations shall be pruned using clean, sharp secateurs or a pruning saw to ensure a clean cut, free from tears. All root pruning must be documented and carried out by the project arborist.

5.12 Site inspections

In accordance with the *Australian Standard, AS 4970-2009, Protection of Trees on Development Sites*, inspections must be conducted by the project arborist at the following key project stages:

- Prior to any work commencing on-site (including demolition, earthworks, or site clearing) and following the installation of tree protection.
- During any excavations, building works, and any other activities carried out within the TPZ of any tree to be retained & protected.
- A minimum of once per 8 weeks (every 2 months) during the construction phase for trees with a major encroachment within the TPZ.
- After all major construction has ceased, following the removal of tree protection.

It shall be the responsibility of the project manager to notify the project arborist prior to any works within the TPZ of any protected tree at a minimum of 48 hours' notice. To ensure the tree protection plan is implemented, hold points have been specified in the schedule of work (**Table 4**).

Table 4: Schedule of work

Construction stage	Hold point	Description
Pre-construction	1	Prior to demolition and/or site establishment, indicate clearly (with spray paint on trunks) trees marked for removal only.
	2	Tree protection (for trees that will be retained) shall be installed prior to demolition and site establishment. This may include the mulching of areas within the TPZ. The project arborist shall inspect and certify tree protection.
During Construction	3	Scheduled inspection of trees by the project arborist should be undertaken every 8 weeks (2 months) during the construction period.
	4	Project arborist to supervise and document all works carried out within the TPZ of trees to be retained.
	5	Inspection of trees by project arborist after all major construction has ceased, following the removal of tree protection measures.
Post Construction	6	Final inspection of trees by project arborist.



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Legend

The subject trees

- Retain
- Remove

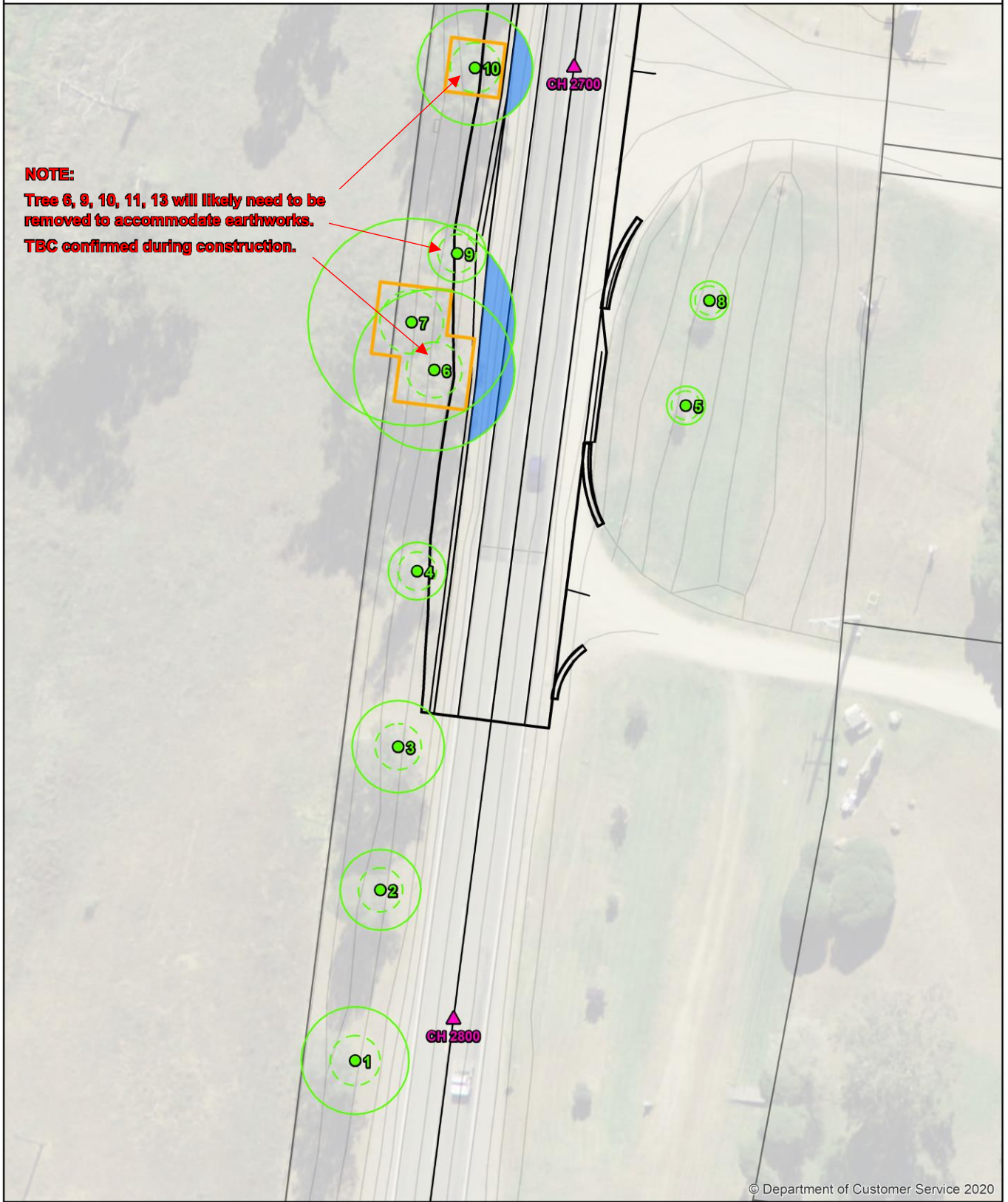
Protection zones

- TPZ (continuous line)
- SRZ (dashed line)

Tree protection measures

- Tree protection fence
- Arborist to supervise works within the TPZ





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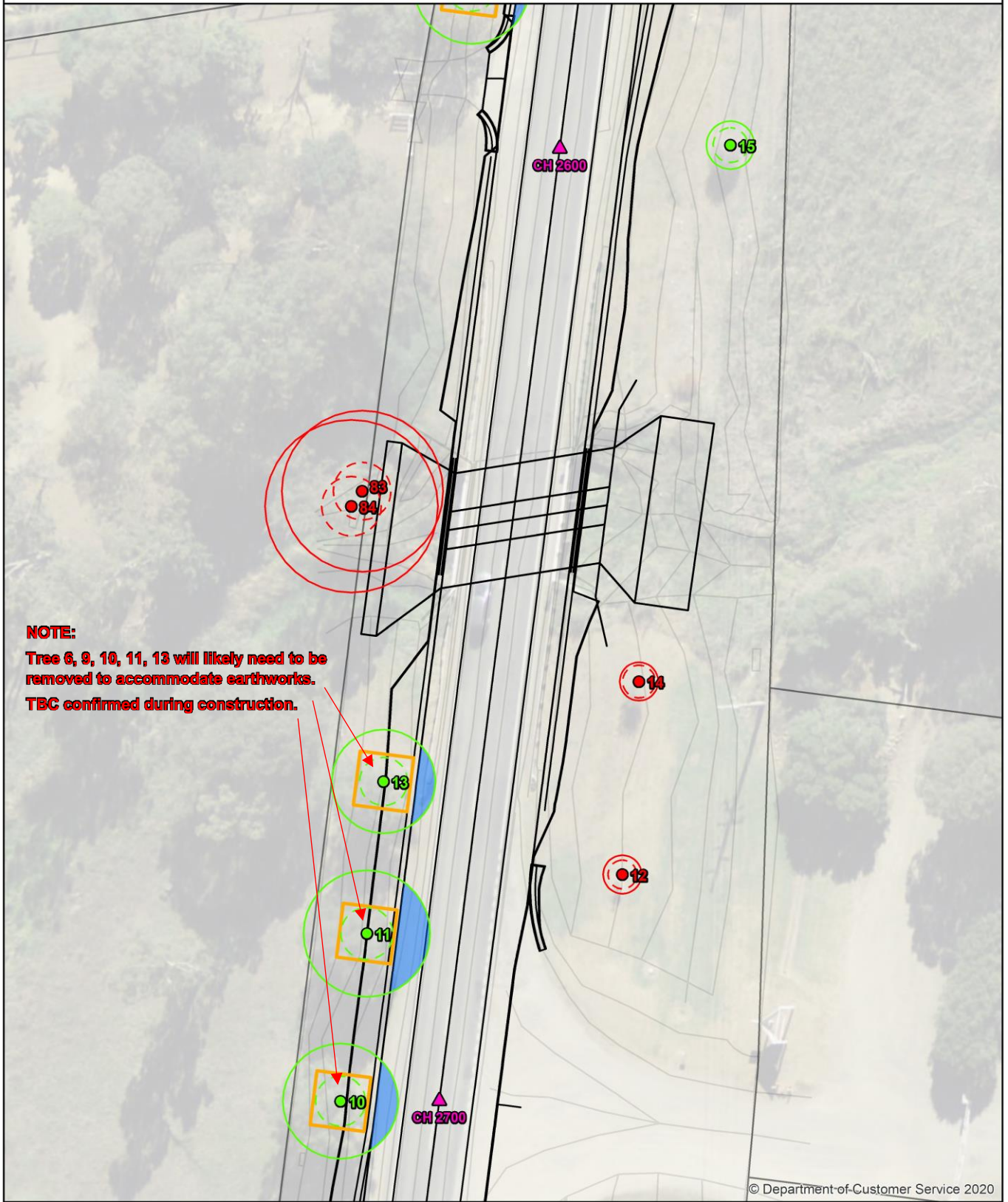
Legend

The subject trees
 ● Retain
 ● Remove

Protection zones
 [] TPZ (continuous line)
 [] SRZ (dashed line)

Tree protection measures
 [] Tree protection fence
 [] Arborist to supervise works within the TPZ



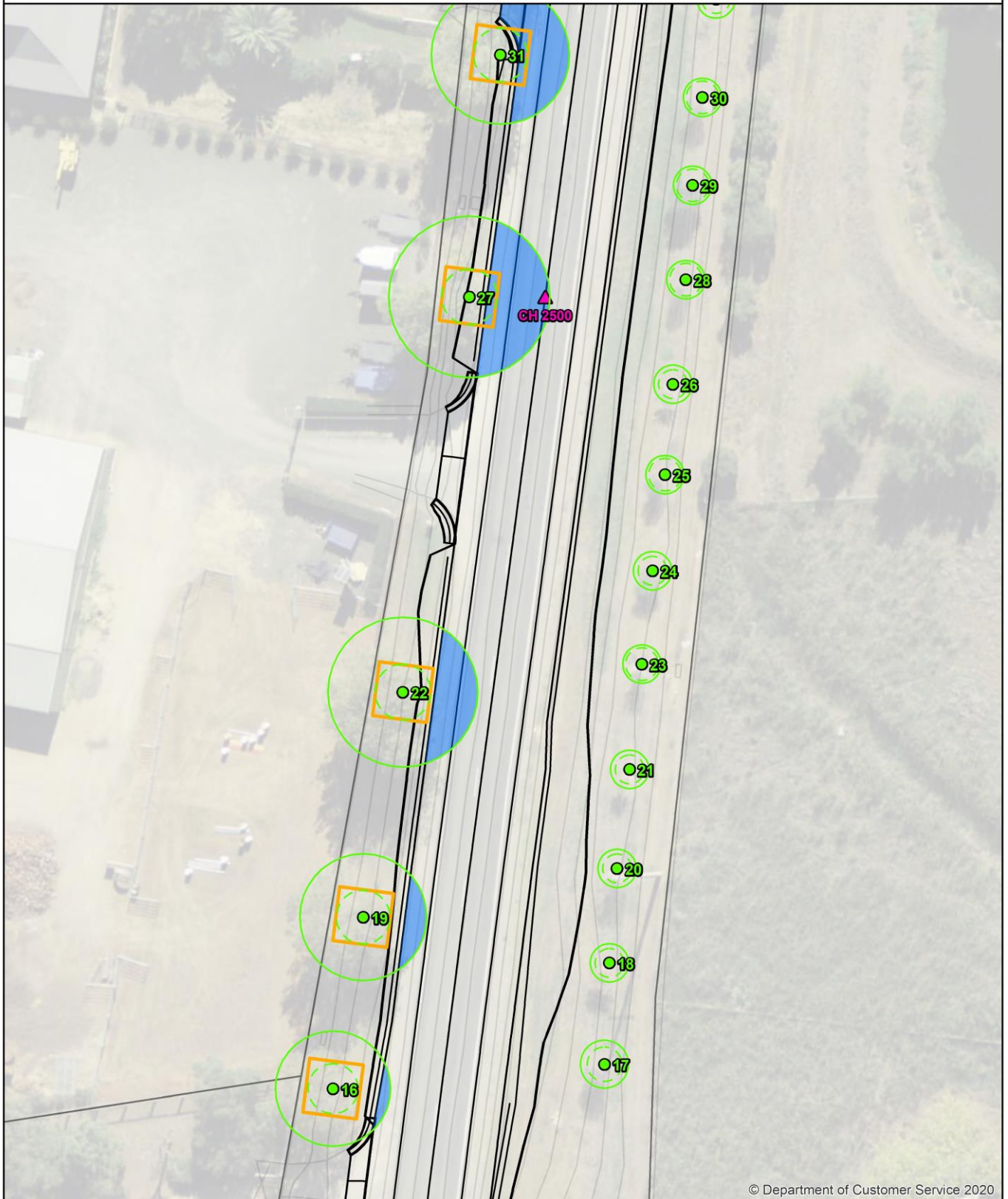


NOTE:
 Trees 6, 9, 10, 11, 13 will likely need to be removed to accommodate earthworks.
 TBC confirmed during construction.

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Legend		
The subject trees	Protection zones	Tree protection measures
● Retain	▭ TPZ (continuous line)	— Tree protection fence
● Remove	- - - SRZ (dashed line)	■ Arborist to supervise works within the TPZ





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Legend

The subject trees

- Retain
- Remove

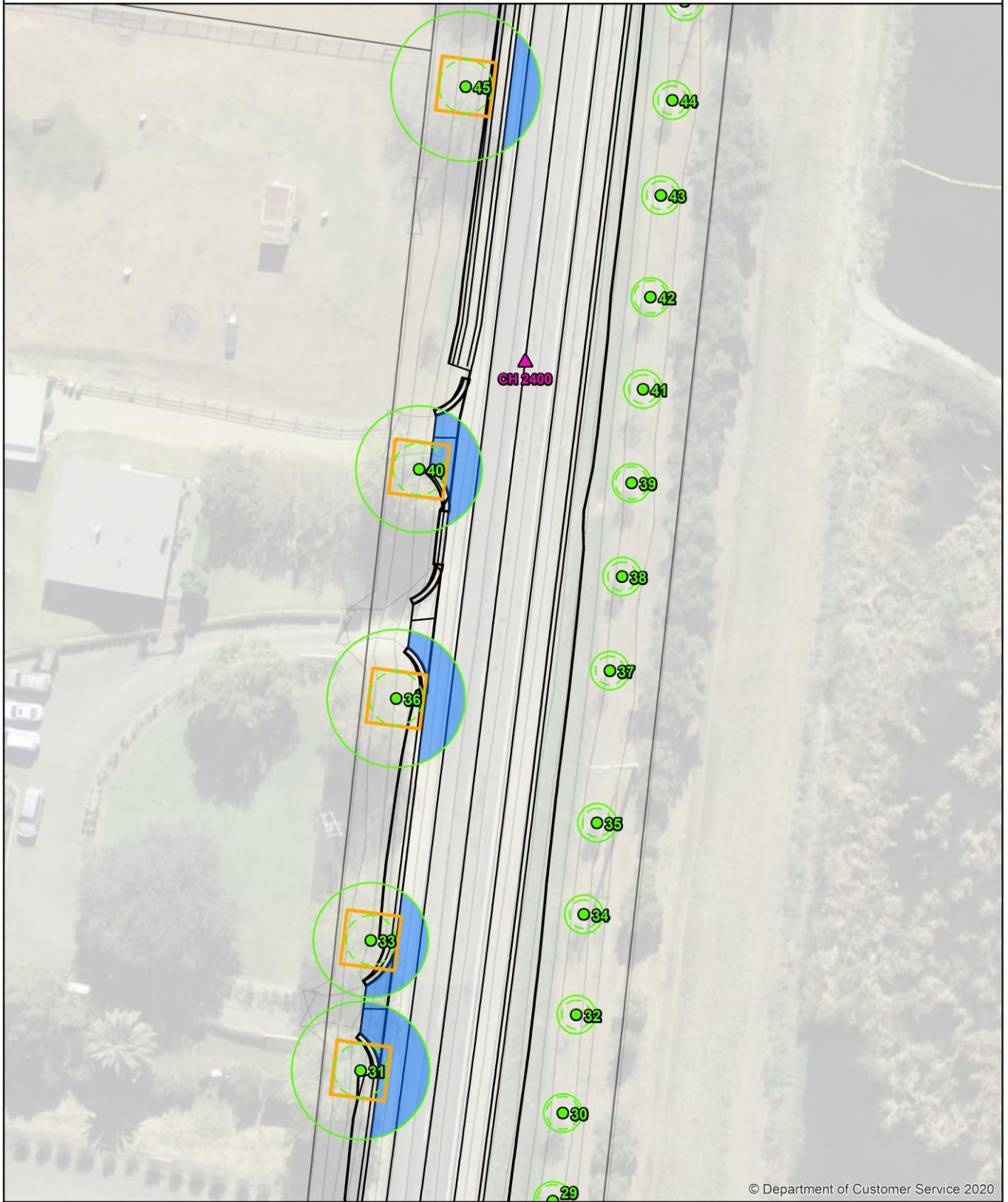
Protection zones

- ▭ TPZ (continuous line)
- - - SRZ (dashed line)

Tree protection measures

- Tree protection fence
- Arborist to supervise works within the TPZ





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Legend

The subject trees

- Retain
- Remove

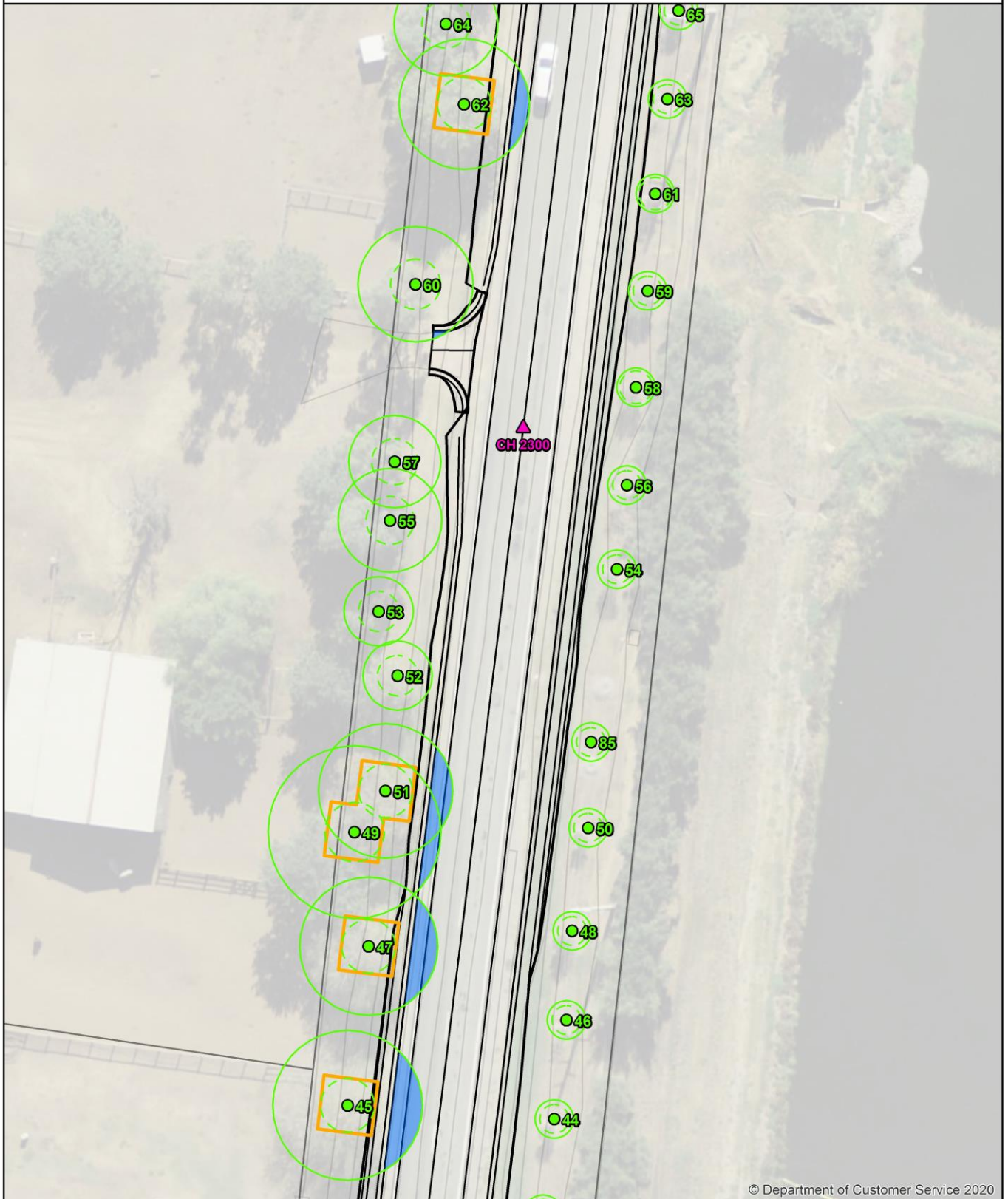
Protection zones

- ▭ TPZ (continuous line)
- - - SRZ (dashed line)

Tree protection measures

- Tree protection fence
- Arborist to supervise works within the TPZ





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Legend

The subject trees

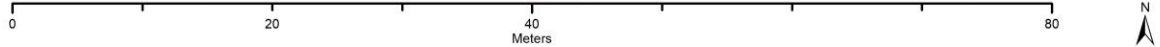
- Retain
- Remove

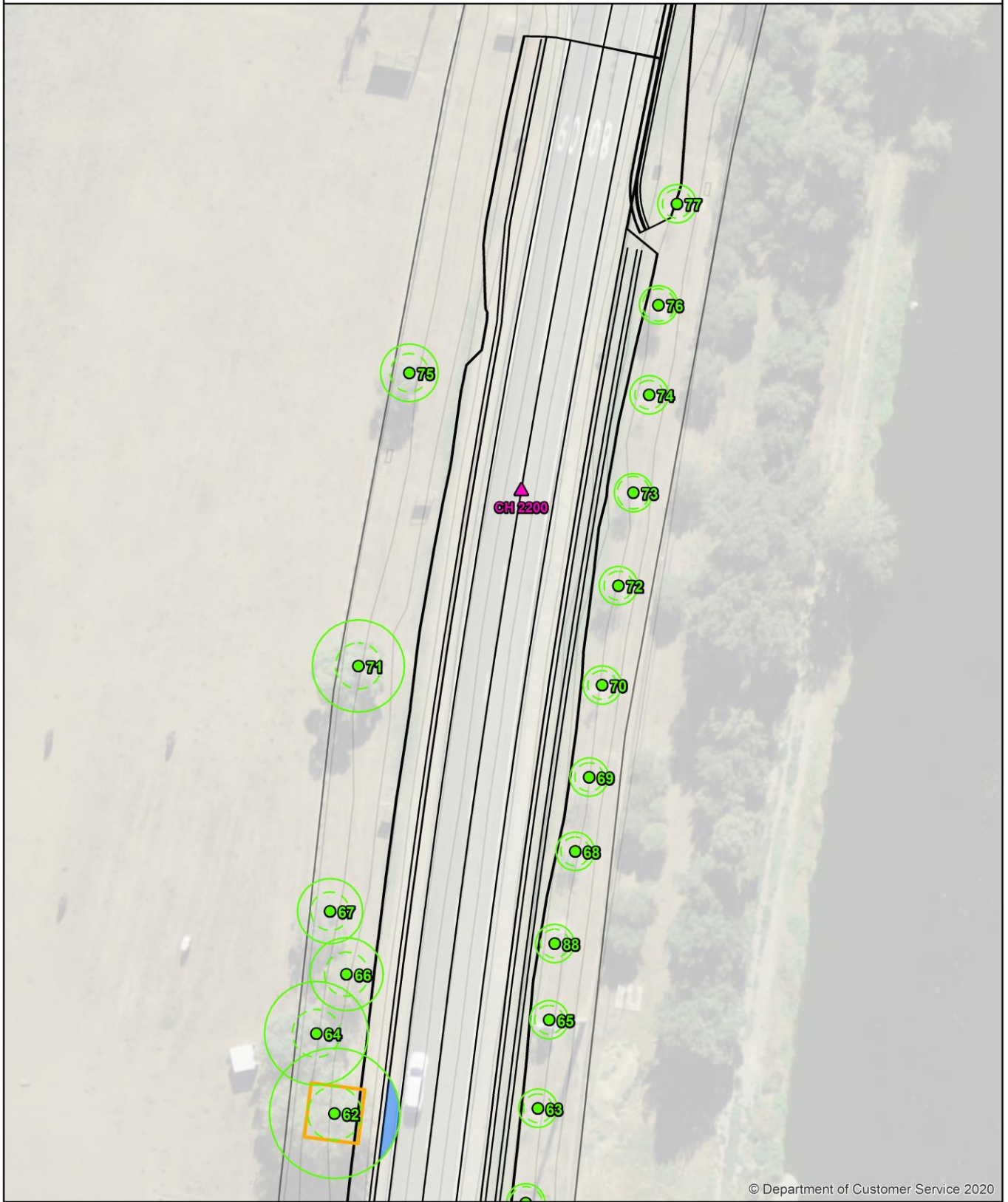
Protection zones

- ▭ TPZ (continuous line)
- - - SRZ (dashed line)

Tree protection measures

- ▭ Tree protection fence
- ▭ Arborist to supervise works within the TPZ





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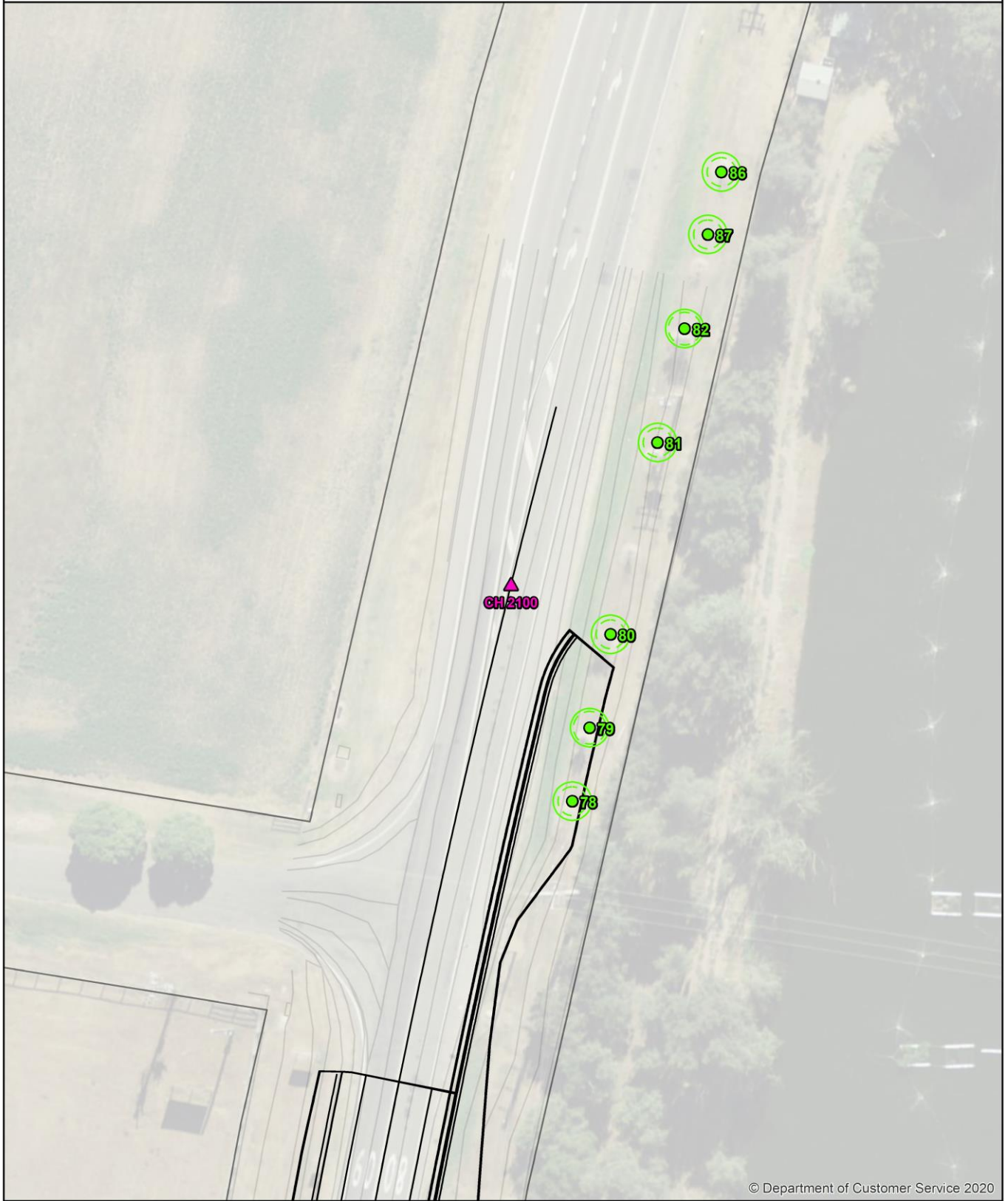
Legend

The subject trees
 ● Retain
 ● Remove

Protection zones
 □ TPZ (continuous line)
 - - - SRZ (dashed line)

Tree protection measures
 — Tree protection fence
 ■ Arborist to supervise works within the TPZ





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Legend

- The subject trees**
- Retain
 - Remove

- Protection zones**
- ▭ TPZ (continuous line)
 - - - SRZ (dashed line)

- Tree protection measures**
- Tree protection fence
 - Arborist to supervise works within the TPZ



6 References

Australian Standard, AS 4970-2009, Protection of Trees on Development Sites

Australian Standard, AS 4373-2007, Pruning of Amenity Trees.

Costello, L., Watson, G. and Smiley, E., 2017. Root Management. International Society of Arboriculture.

IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au

Mattheck, C. (2007). Updated field guide for visual tree assessment. Karlsruhe: Forschungszentrum Karlsruhe.

Mattheck, C., Bethge, K. and Weber, K. (2015). The body language of trees. Karlsruhe: Karlsruher Institut für Technologie.

Mattheck, C., Lonsdale, D. and Breloer, H. (1994). The body language of trees. London: H.M.S.O.

Roberts, J., Jackson, N. and Smith, D. (2006). Tree roots in the built environment.

Appendix I - STARS© assessment matrix

The retention value of a tree or group of trees is determined using a combination of environmental, cultural, physical, and social values.

- **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affecting the proposed building/works, and all other alternatives have been considered and exhausted.
- **High:** These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by Australian Standard, AS4970-2009 Protection of trees on development sites.

This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Arboriculturalists (IACA) Significance of a Tree, Assessment Rating System (STARS). The system uses a scale of High, Medium, and Low significance in the landscape. Once the landscape significance of a tree has been defined, the retention value can be determined. Each tree must meet a minimum of three (3) assessment criteria to be classified within a category.

Tree Significance - Assessment Criteria		
Low Significance	Medium Significance	High Significance
<p>The tree is in fair-poor condition and good or low vigour.</p> <p>The tree has form atypical of the species</p> <p>The tree is not visible or is partly visible from the surrounding properties or obstructed by other vegetation or buildings</p> <p>The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area</p> <p>The tree is a young specimen which may or may not have reached dimensions to be protected by local Tree Preservation Orders or similar protection mechanisms and can easily be replaced with a suitable specimen</p> <p>The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ – tree is inappropriate to the site conditions</p> <p>The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms</p> <p>The tree has a wound or defect that has the potential to become structurally unsound.</p>	<p>The tree is in fair to good condition</p> <p>The tree has form typical or atypical of the species</p> <p>The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area</p> <p>The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street</p> <p>The tree provides a fair contribution to the visual character and amenity of the local area</p> <p>The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ</p>	<p>The tree is in good condition and good vigour</p> <p>The tree has a form typical for the species</p> <p>The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age.</p> <p>The tree is listed as a heritage item, threatened species or part of an endangered ecological community or listed on council's significant tree register</p> <p>The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity.</p> <p>The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group, or has commemorative values.</p> <p>The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ – tree is appropriate to the site conditions.</p>
Environmental Pest / Noxious Weed		
<p>The tree is an environmental pest species due to its invasiveness or poisonous/allergenic properties.</p> <p>The tree is a declared noxious weed by legislation</p>		
Hazardous / Irreversible Decline		
<p>The tree is structurally unsound and/or unstable and is considered potentially dangerous.</p> <p>The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.</p>		

Useful Life Expectancy - Assessment Criteria

Remove	Short	Medium	Long
<p>Trees with a high level of risk that would need removing within the next 5 years.</p> <p>Dead trees.</p> <p>Trees that should be removed within the next 5 years.</p> <p>Dying or suppressed or declining trees through disease or inhospitable conditions.</p> <p>Dangerous trees through instability or recent loss of adjacent trees.</p> <p>Dangerous trees through structural defects, including cavities, decay, included bark, wounds, or poor form.</p> <p>Damaged trees that considered unsafe to retain.</p> <p>Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.</p> <p>Trees that will become dangerous after removal of other trees for the reasons.</p>	<p>Trees that appear to be retainable with an acceptable level of risk for 5-15 years.</p> <p>Trees that may only live between 5 and 15 more years.</p> <p>Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals.</p> <p>Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons.</p> <p>Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.</p>	<p>Trees that appear to be retainable with an acceptable level of risk for 15-40 years.</p> <p>Trees that may only live between 15 and 40 more years.</p> <p>Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals.</p> <p>Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons.</p> <p>Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.</p>	<p>Trees that appear to be retainable with an acceptable level of risk for more than 40 years.</p> <p>Structurally sound trees located in positions that can accommodate future growth.</p> <p>Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery.</p> <p>Trees of special significance for historical, commemorative, or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.</p>

		Tree Significance				
		High Significance	Medium Significance	Low Significance	Environmental Pest / Noxious Weed	Hazardous / Irreversible Decline
Useful Life Expectancy	Long >40 years					
	Medium 15-40 years					
	Short <1-15 years					
Dead						

Legend for Matrix Assessment	
	Priority for retention (High): These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 Protection of trees on development sites. Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.
	Consider for retention (Medium): These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with the removal considered only if adversely affecting the proposed building/works, and all other alternatives have been considered and exhausted.
	Consider for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.

Reference

IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS)
 Institute of Australian Consulting Arboriculturists
 Australia, www.iaca.org.au



Appendix F

Construction noise estimates

Distanced Based Assessment (Construction Scenario)

Please pick from drop-down list in orange cells

Noise area category		R2
RBL or LA90 Background level (dB(A))	Day	45
	Evening	40
	Night	35
LAeq(15minute) Noise Management Level (dB(A))	Day	55
	Day (OOHW)	50
	Evening	45
Night	40	
Scenario	Compound operation	
Is there line of sight to receiver?	Yes	

Steps for Screening Assessment:

- Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.
 - Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
 - Select the scenario. If not found in drop-down list, refer to 'Source List' and select a representative scenario with similar plant combination.
 - Is there line of sight to receiver? Select the appropriate scenario from the drop down list.
- Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier and any gaps would compromise the acoustic integrity of the solid barrier.
- Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period. Consider background noise measurements to check assumption in Step #2 if:
 - there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or
 - there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.
 Note that consideration need to be given to the construction staging plan when determining impact duration.
 - Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver
 - Where night works are involved, identify sleep disturbance affected distance.
 - Document the outcomes of these steps.

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Residential receiver		LAeq(15minute) noise level above background (LA90)												LAeq(15minute) 75 dB(A) or greater (Highly affected)			Sleep disturbance L _{max} 65 dB(A)					
		5 to 10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)											
		Noticeable			Clearly audible			Moderately intrusive			Highly intrusive											
Affected distance (m)		Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Affected distance (m)					
Undeveloped green fields, rural areas with isolated dwellings	Day	170			N			65			N, PC, RO			20			75					
	Day (OOHW)	250			N, R1, DR			65			N, R1, DR, PC, SN			20			75					
	Evening	360			N, R1, DR			60			N, R1, DR, PC, SN			20			75					
	Night	525			N	525	40	N, R2, DR			360			45			55	AA, N, PC, SN, R2, DR	65	65	20	75
	Highly Affected	20															20	75				
Developed settlements (urban and suburban)	Day	200			N			75			N, PC, RO			25			75					
	Day (OOHW)	305			N, R1, DR			75			N, R1, DR, PC, SN			25			75					
	Evening	460			N, R1, DR			60			N, R1, DR, PC, SN			40			70					
	Night	685			N	685	40	N, R2, DR			460			45			55	AA, N, PC, SN, R2, DR	75	65	25	75
	Highly Affected	25															25	75				
Propagation across a valley / over water	Day	250			N			90			N, PC, RO			25			75					
	Day (OOHW)	405			N, R1, DR			90			N, R1, DR, PC, SN			25			75					
	Evening	630			N, R1, DR			60			N, R1, DR, PC, SN			50			70					
	Night	955			N	955	40	N, R2, DR			630			45			55	AA, N, PC, SN, R2, DR	90	65	25	75
	Highly Affected	25															25	75				

Non-residential receiver		LAeq(15minute) noise level above NML										LAeq(15minute) 75 dB(A) or greater (Highly affected)		
Undeveloped green fields, rural areas with isolated dwellings		Standard hours			<10 dB(A)			10 to 20 dB(A)			> 25 dB(A)			
Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	170						N	65	65	N, PC, RO	20	75
Hospital wards and operating theatres	Day	65	65						N	65	65	N, PC, RO	20	75
Place of worship	Day	55	170						N	65	65	N, PC, RO	20	75
Active recreation	Day	65	65						N	35	70	N, PC, RO	20	75
Passive recreation	Day	60	115						N	35	70	N, PC, RO	20	75
Industrial premise	Day	75	20						N	35	70	N, PC, RO	20	75
Offices, retail outlets	Day	70	35						N	35	70	N, PC, RO	20	75

Non-residential receiver		LAeq(15minute) noise level above NML														
Hospital wards and operating theatres		OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))		
Hospital wards and operating theatres	Evening	65	65						N, R1, DR	35	70	N, R1, DR	11	80		
	Night	65	65	N	65	65			N, R2, NR	35	70	N, PC, SN, R2, DR	11	80		
Place of worship	Evening	55	170						N, R1, DR	115	60	N, R1, DR	35	70		
	Night	55	170	N	170	55			N, R2, NR	115	60	N, PC, SN, R2, DR	35	70		
Active recreation	Evening	65	65						N, R1, DR	35	70	N, R1, DR	11	80		
	Evening	60	115						N, R1, DR	65	65	N, R1, DR	20	75		
Industrial premise	Evening	75	20						N, R1, DR	11	80	N, R1, DR	4	90		
	Night	75	20	N	20	75			N, R2, NR	11	80	N, PC, SN, R2, DR	4	90		
Offices, retail outlets	Evening	70	35						N, R1, DR	20	75	N, R1, DR	6	85		
	Night	70	35	N	35	70			N, R2, NR	20	75	N, PC, SN, R2, DR	6	85		

Non-residential receiver		LAeq(15minute) noise level above NML										LAeq(15minute) 75 dB(A) or greater (Highly affected)		
Developed settlements (urban and suburban)		Standard hours			<10 dB(A)			10 to 20 dB(A)			> 25 dB(A)			
Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	200						N	75	65	N, PC, RO	25	75
Hospital wards and operating theatres	Day	65	75						N	75	65	N, PC, RO	25	75
Place of worship	Day	55	200						N	75	65	N, PC, RO	25	75
Active recreation	Day	65	75						N	40	70	N, PC, RO	25	75
Passive recreation	Day	60	130						N	40	70	N, PC, RO	25	75
Industrial premise	Day	75	25						N	40	70	N, PC, RO	25	75
Offices, retail outlets	Day	70	40						N	40	70	N, PC, RO	25	75

Non-residential receiver		LAeq(15minute) noise level above NML														
Hospital wards and operating theatres		OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))		
Hospital wards and operating theatres	Evening	65	75						N, R1, DR	40	70	N, R1, DR	14	80		

Hospital wards and operating theatres		Night	65	75	N	75	65	N, R2, NR	40	70	N, PC, SN, R2, DR	14	80	AA, N, PC, SN, R2, DR	4	90
Place of worship	Evening	55	200					N, R1, DR	130	60	N, R1, DR	40	70	N, R1, DR, PC, SN	14	80
	Night	55	200	N	200	55		N, R2, NR	130	60	N, PC, SN, R2, DR	40	70	AA, N, PC, SN, R2, DR	14	80
Active recreation	Evening	65	75					N, R1, DR	40	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90
	Evening	60	130					N, R1, DR	75	65	N, R1, DR	25	75	N, R1, DR, PC, SN	8	85
Industrial premise	Evening	75	25					N, R1, DR	14	80	N, R1, DR	4	90	N, R1, DR, PC, SN	1	100
	Night	75	25	N	25	75		N, R2, NR	14	80	N, PC, SN, R2, DR	4	90	AA, N, PC, SN, R2, DR	1	100
Offices, retail outlets	Evening	70	40					N, R1, DR	25	75	N, R1, DR	8	85	N, R1, DR, PC, SN	3	95
	Night	70	40	N	40	70		N, R2, NR	25	75	N, PC, SN, R2, DR	8	85	AA, N, PC, SN, R2, DR	3	95

Non-residential receiver Propagation across a valley / over water		LAeq(15minute) noise level above NML											
		Standard hours			<10 dB(A)			10 to 20 dB(A)			LAeq(15minute) 75 dB(A) or greater (Highly affected)		
Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))		
Classroom at schools and other educational institutions	Day	55	250				N	75	65	N, PC, RO	25	75	
Hospital wards and operating theatres	Day	65	90						N, PC, RO	25	75		
Place of worship	Day	55	250				N	75	65	N, PC, RO	25	75	
Active recreation	Day	65	90						N, PC, RO	25	75		
Passive recreation	Day	60	155				N	40	70	N, PC, RO	25	75	
Industrial premise	Day	75	25						N, PC, RO	25	75		
Offices, retail outlets	Day	70	50						N, PC, RO	25	75		

		LAeq(15minute) noise level above NML														
		OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))		
Hospital wards and operating theatres	Evening	65	90				N, R1, DR	50	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90	
	Night	65	90	N	90	65	N, R2, NR	50	70	N, PC, SN, R2, DR	14	80	AA, N, PC, SN, R2, DR	4	90	
Place of worship	Evening	55	250				N, R1, DR	155	60	N, R1, DR	40	70	N, R1, DR, PC, SN	14	80	
	Night	55	250	N	250	55	N, R2, NR	155	60	N, PC, SN, R2, DR	40	70	AA, N, PC, SN, R2, DR	14	80	
Active recreation	Evening	65	90				N, R1, DR	50	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90	
	Evening	60	155				N, R1, DR	90	65	N, R1, DR	25	75	N, R1, DR, PC, SN	8	85	
Passive recreation	Evening	75	25				N, R1, DR	15	80	N, R1, DR	4	90	N, R1, DR, PC, SN	1	100	
	Night	75	25	N	25	75	N, R2, NR	15	80	N, PC, SN, R2, DR	4	90	AA, N, PC, SN, R2, DR	1	100	
Industrial premise	Evening	70	50				N, R1, DR	25	75	N, R1, DR	8	85	N, R1, DR, PC, SN	3	95	
	Night	70	50	N	50	70	N, R2, NR	25	75	N, PC, SN, R2, DR	8	85	AA, N, PC, SN, R2, DR	3	95	

Distanced Based Assessment (Construction Scenario)

Steps for Screening Assessment:

- Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.
- Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
- Select the scenario. If not found in drop-down list, refer to 'Source List' and select a representative scenario with similar plant combination.
- Is there line of sight to receiver? Select the appropriate scenario from the drop down list.

Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier and any gaps would compromise the acoustic integrity of the solid barrier.

6. Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period. Consider background noise measurements to check assumption in Step #2 if:

- (a) there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or
- (b) there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.

Note that consideration need to be given to the construction staging plan when determining impact duration.

7. Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver

8. Where night works are involved, identify sleep disturbance affected distance.

9. Document the outcomes of these steps.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction Noise Estimator should be investigated on a project-by-project basis. Please

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Please pick from drop-down list in orange cells

Noise area category		R2
RBL or LAeq	Day	45
Background level (dB(A))	Evening	40
	Night	35
	Highly Affected	60
LAeq(15minute) Noise Management Level (dB(A))	Day	55
	Day (OOHW)	50
	Evening	45
	Night	40
Scenario	Bulk earthworks	
Is there line of sight to receiver?	Yes	

Residential receiver

	Affected distance (m)	LAeq(15minute) noise level above background (LAeq)												LAeq(15minute) 75 dB(A) or greater (Highly affected)			Sleep disturbance Lmax 65 dB(A)		
		5 to 10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)								
		Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))						
Undeveloped green fields, rural areas with isolated dwellings	Day	335																	
	Day (OOHW)	485																	
	Evening	700																	
	Night	1010	N	1010	40	N, R1, DR	335	55	N, R1, DR	155	65	N, PC, RO	60	75	N, PC, RO	60	75		
Highly Affected	60																		230
Developed settlements (urban and suburban)	Day	425																	
	Day (OOHW)	635																	
	Evening	935																	
	Night	1355	N	1355	40	N, R1, DR	425	55	N, R1, DR	180	65	N, PC, RO	70	75	N, PC, RO	70	75		
Highly Affected	70																		280
Propagation across a valley / over water	Day	575																	
	Day (OOHW)	880																	
	Evening	1310																	
	Night	1900	N	1900	40	N, R1, DR	575	55	N, R1, DR	230	65	N, PC, RO	70	75	N, PC, RO	70	75		
Highly Affected	70																		370

Non-residential receiver

	Standard hours	Affected distance (m)	LAeq(15minute) noise level above NML						LAeq(15minute) 75 dB(A) or greater (Highly affected)				
			<10 dB(A)			10 to 20 dB(A)							
			Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))		
Classroom at schools and other educational institutions	Day	55	335										
Hospital wards and operating theatres	Day	65	155										
Place of worship	Day	55	335										
Active recreation	Day	65	155										
Passive recreation	Day	60	230										
Industrial premise	Day	75	60										
Offices, retail outlets	Day	70	105										

	OOHW	Affected distance (m)	LAeq(15minute) noise level above NML											
			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
			Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	155											
	Night	65	155	N	155	65	N, R1, DR	105	70	N, R1, DR	34	80	N, R1, DR, PC, SN	11
Place of worship	Evening	55	335											
	Night	55	335	N	335	55	N, R1, DR	230	60	N, R1, DR	105	70	AA, N, PC, SN, R2, DR	34
Active recreation	Evening	65	155											
	Night	65	155											
Passive recreation	Evening	60	230											
	Night	60	230											
Industrial premise	Evening	75	60											
	Night	75	60	N	60	75	N, R1, DR	34	80	N, R1, DR	11	90	AA, N, PC, SN, R2, DR	3
Offices, retail outlets	Evening	70	105											
	Night	70	105	N	105	70	N, R1, DR	60	75	N, R1, DR	19	85	AA, N, PC, SN, R2, DR	6

20

Non-residential receiver

	Standard hours	Affected distance (m)	LAeq(15minute) noise level above NML						LAeq(15minute) 75 dB(A) or greater (Highly affected)				
			<10 dB(A)			10 to 20 dB(A)							
			Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))		
Classroom at schools and other educational institutions	Day	55	425										
Hospital wards and operating theatres	Day	65	180										
Place of worship	Day	55	425										
Active recreation	Day	65	180										
Passive recreation	Day	60	280										
Industrial premise	Day	75	70										
Offices, retail outlets	Day	70	115										

	OOHW	Affected distance (m)	LAeq(15minute) noise level above NML											
			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
			Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	180											
	Night	65	180	N	180	65	N, R1, DR	115	70	N, R1, DR	39	80	N, R1, DR, PC, SN	12
Place of worship	Evening	55	425											
	Night	55	425	N	425	55	N, R1, DR	280	60	N, R1, DR	115	70	AA, N, PC, SN, R2, DR	39
Active recreation	Evening	65	180											
	Night	65	180											
Passive recreation	Evening	60	280											
	Night	60	280											
Industrial premise	Evening	75	70											
	Night	75	70	N	70	75	N, R1, DR	39	80	N, R1, DR	12	90	AA, N, PC, SN, R2, DR	4
Offices, retail outlets	Evening	70	115											
	Night	70	115	N	115	70	N, R1, DR	70	75	N, R1, DR	22	85	AA, N, PC, SN, R2, DR	7

Distanced Based Assessment (Construction Scenario)

Steps for Screening Assessment:

- Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.
- Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
- Select the scenario. If not found in drop-down list, refer to 'Source List' and select a representative scenario with similar plant combination.
- Is there line of sight to receiver? Select the appropriate scenario from the drop down list.

Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier and any gaps would compromise the acoustic integrity of the solid barrier.

6. Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period. Consider background noise measurements to check assumption in Step #2 if:

- (a) there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or
- (b) there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.

Note that consideration need to be given to the construction staging plan when determining impact duration.

7. Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver

8. Where night works are involved, identify sleep disturbance affected distance.

9. Document the outcomes of these steps.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction Noise Estimator should be investigated on a project-by-project basis. Please

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Please pick from drop-down list in orange cells

Noise area category		R2
RBL or LAeq Background level (dB(A))	Day	45
	Evening	40
	Night	35
LAeq(15minute) Noise Management Level (dB(A))	Day	55
	Day (OOHW)	50
	Evening	45
Night	40	
Scenario	Profiling	
Is there line of sight to receiver?	Yes	

Residential receiver		LAeq(15minute) noise level above background (LAeq)												LAeq(15minute) 75 dB(A) or greater (Highly affected)			Sleep disturbance Lmax 65 dB(A)		
		5 to 10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)								
		Noticeable			Clearly audible			Moderately intrusive			Highly intrusive			Measures	Within distance (m)	Mitigation level (dB(A))		Affected distance (m)	
Undeveloped green fields, rural areas with isolated dwellings	Day	215																	
	Day (OOHW)	310																	
	Evening	450																	
	Night	650	N	650	40	N, R2, DR	450	45	N, PC, SN, R2, DR	215	55	AA, N, PC, SN, R2, DR	95	65	N, PC, RO	25	75		155
	Highly Affected	25																	
Developed settlements (urban and suburban)	Day	255																	
	Day (OOHW)	390																	
	Evening	585																	
	Night	865	N	865	40	N, R2, DR	585	45	N, PC, SN, R2, DR	255	55	AA, N, PC, SN, R2, DR	105	65	N, PC, RO	30	75		180
	Highly Affected	30																	
Propagation across a valley / over water	Day	335																	
	Day (OOHW)	530																	
	Evening	810																	
	Night	1215	N	1215	40	N, R2, DR	810	45	N, PC, SN, R2, DR	335	55	AA, N, PC, SN, R2, DR	125	65	N, PC, RO	30	75		230
	Highly Affected	30																	

Non-residential receiver Undeveloped green fields, rural areas with isolated dwellings		LAeq(15minute) noise level above NML											
		Standard hours			<10 dB(A)			10 to 20 dB(A)			LAeq(15minute) 75 dB(A) or greater (Highly affected)		
		Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	215										
Hospital wards and operating theatres	Day	65	95										
Place of worship	Day	55	215										
Active recreation	Day	65	95										
Passive recreation	Day	60	145										
Industrial premise	Day	75	25										
Offices, retail outlets	Day	70	50										

Non-residential receiver Developed settlements (urban and suburban)		LAeq(15minute) noise level above NML														
		OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
		Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	95				N, R1, DR	50	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90	
	Night	65	95	N	95	65	N, R2, NR	50	70	N, PC, SN, R2, DR	14	80	AA, N, PC, SN, R2, DR	4	90	
Place of worship	Evening	55	215				N, R1, DR	145	60	N, R1, DR	50	70	N, R1, DR, PC, SN	14	80	
	Night	55	215	N	215	55	N, R2, NR	145	60	N, PC, SN, R2, DR	50	70	AA, N, PC, SN, R2, DR	14	80	
Active recreation	Evening	65	95				N, R1, DR	50	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90	
	Night	65	95				N, R1, DR	95	65	N, R1, DR	25	75	N, R1, DR, PC, SN	8	85	
Passive recreation	Evening	75	25				N, R1, DR	14	80	N, R1, DR	4	90	N, R1, DR, PC, SN	1	100	
	Night	75	25	N	25	75	N, R2, NR	14	80	N, PC, SN, R2, DR	4	90	AA, N, PC, SN, R2, DR	1	100	
Industrial premise	Evening	70	50				N, R1, DR	25	75	N, R1, DR	8	85	N, R1, DR, PC, SN	3	95	
	Night	70	50	N	50	70	N, R2, NR	25	75	N, PC, SN, R2, DR	8	85	AA, N, PC, SN, R2, DR	3	95	

Non-residential receiver Developed settlements (urban and suburban)		LAeq(15minute) noise level above NML											
		Standard hours			<10 dB(A)			10 to 20 dB(A)			LAeq(15minute) 75 dB(A) or greater (Highly affected)		
		Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	255										
Hospital wards and operating theatres	Day	65	105										
Place of worship	Day	55	255										
Active recreation	Day	65	105										
Passive recreation	Day	60	165										
Industrial premise	Day	75	30										
Offices, retail outlets	Day	70	60										

Non-residential receiver Developed settlements (urban and suburban)		LAeq(15minute) noise level above NML														
		OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
		Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	105				N, R1, DR	60	70	N, R1, DR	17	80	N, R1, DR, PC, SN	5	90	
	Night	65	105	N	105	65	N, R2, NR	60	70	N, PC, SN, R2, DR	17	80	AA, N, PC, SN, R2, DR	5	90	
Place of worship	Evening	55	255				N, R1, DR	165	60	N, R1, DR	60	70	N, R1, DR, PC, SN	17	80	
	Night	55	255	N	255	55	N, R2, NR	165	60	N, PC, SN, R2, DR	60	70	AA, N, PC, SN, R2, DR	17	80	
Active recreation	Evening	65	105				N, R1, DR	60	70	N, R1, DR	17	80	N, R1, DR, PC, SN	5	90	
	Night	65	105				N, R1, DR	105	65	N, R1, DR	30	75	N, R1, DR, PC, SN	9	85	
Passive recreation	Evening	60	165				N, R1, DR	17	80	N, R1, DR	5	90	N, R1, DR, PC, SN	2	100	
	Night	75	30	N	30	75	N, R2, NR	17	80	N, PC, SN, R2, DR	5	90	AA, N, PC, SN, R2, DR	2	100	
Industrial premise	Evening	70	60				N, R1, DR	30	75	N, R1, DR	9	85	N, R1, DR, PC, SN	3	95	
	Night	70	60	N	60	70	N, R2, NR	30	75	N, PC, SN, R2, DR	9	85	AA, N, PC, SN, R2, DR	3	95	

Appendix G

Hydraulic assessment

MR209 Denman Road - Muswellbrook
Pavement Rehabilitation – Muswellbrook LGA –
Proposed Culvert Widening



Draft -March 2022

Summary

Option 3 is recommended for the proposed widening of the culvert which is a minimum raise of the road level together with the level of the culvert obvert matching the existing. A chamfering of the culvert obvert and the internal legs is recommended.

There is no flood impact to upstream development for Option 3.

The table below shows the flood level and velocity for Option 3.

Hydraulic Summary for Option 3			
AEP	ARI	Level (RL)	Velocity (m/sec)
5%	1 in 20	141.26	5.48
1%	1 in 100	142.10	4.69
0.05%	Approx. 1 in 2000	143.60	4.00

To minimize the obstruction of waterway area the post and rail traffic barrier is recommended.

MR209 Denman Road – Pavement Rehabilitation – Muswellbrook LGA – Proposed Culvert Widening

1 Introduction

It is proposed to widen the culvert as part of pavement widening on MR209 Denman Road, 2.5km South of Muswellbrook. The initial proposed widening of the culvert was a combination of structural stiffening of the culvert obvert inlet and outlet and minor adjustment the of the road vertical alignment

2 Existing Culvert

Figure 1 - Existing Culvert Configurations



Culvert Details	
Number of Cell	3
Length (m)	10.9
Span (m)	4
Height (m)	4
Invert Level Inlet (RL)	137.48
Invert Level Outlet (RL)	137.31

3 Hydraulic Investigation

Three hydraulic options have been investigated and each option is described below.

- Option 1 Lower the culvert invert by providing a concreted stiffening at the inlet and outlet and raising the road vertical alignment by 92mm at the culvert of the road centreline
- Option 2 Matching the existing culvert at inlet and outlet and raising the road vertical alignment by 57mm at the culvert of the road centreline.
- Option 3 Combine Option 2 with chamfering the obvert of the culvert and the internal legs to minimise energy loss

Figure 2 – Initial Proposal of Culvert Extension for Both Upstream and Downstream

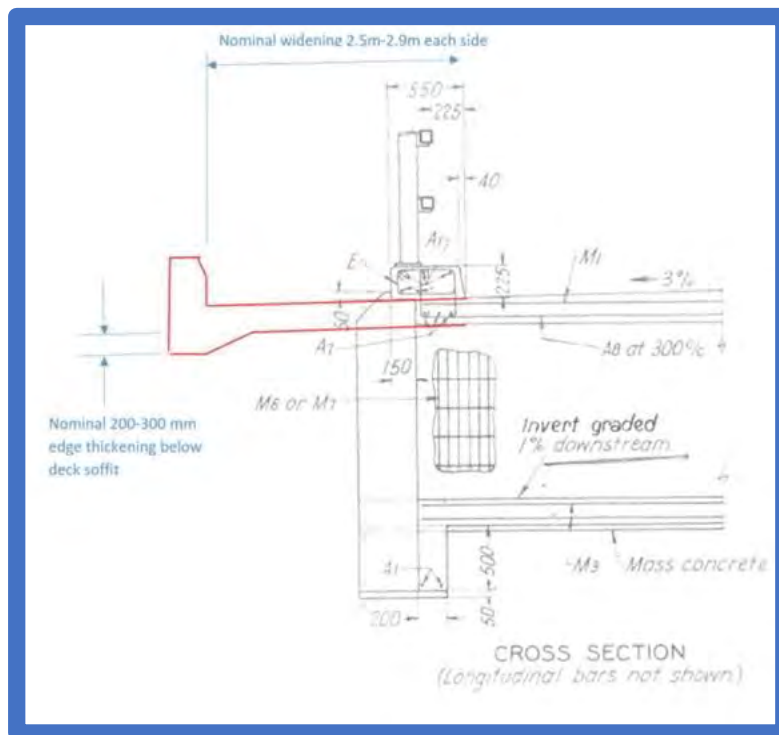


Figure 3- Option 1 -Proposed Raising the Road Vertical Alignment

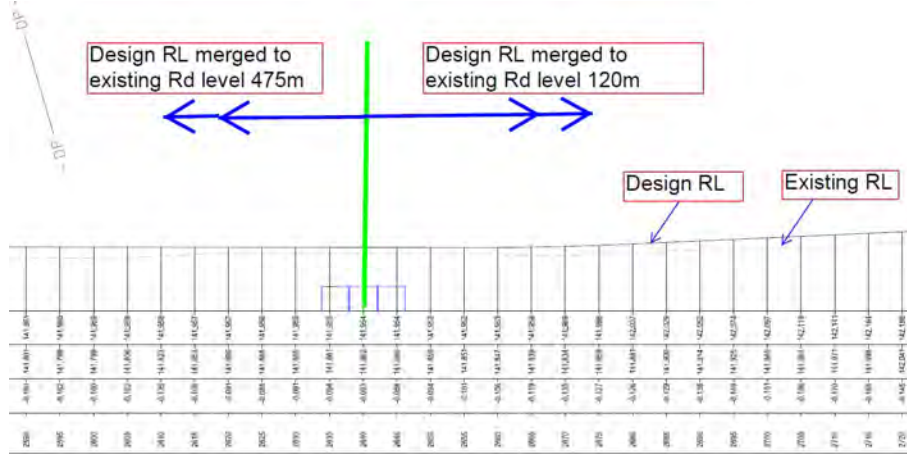


Figure 4 -Option 2 – Removing the concrete stiffening and matching the existing culvert obvert

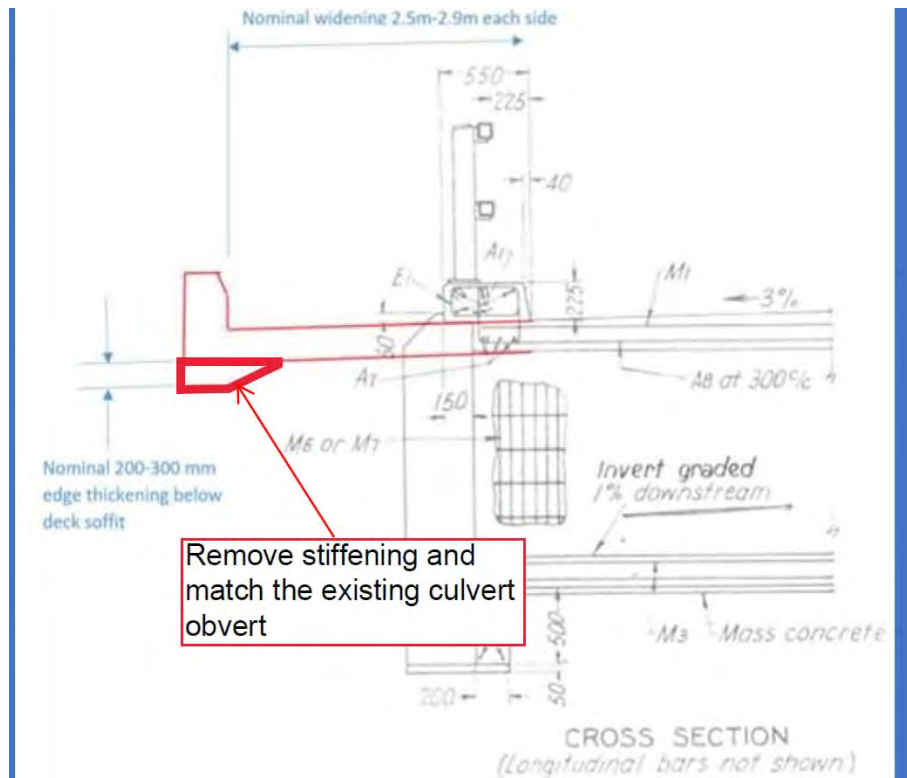
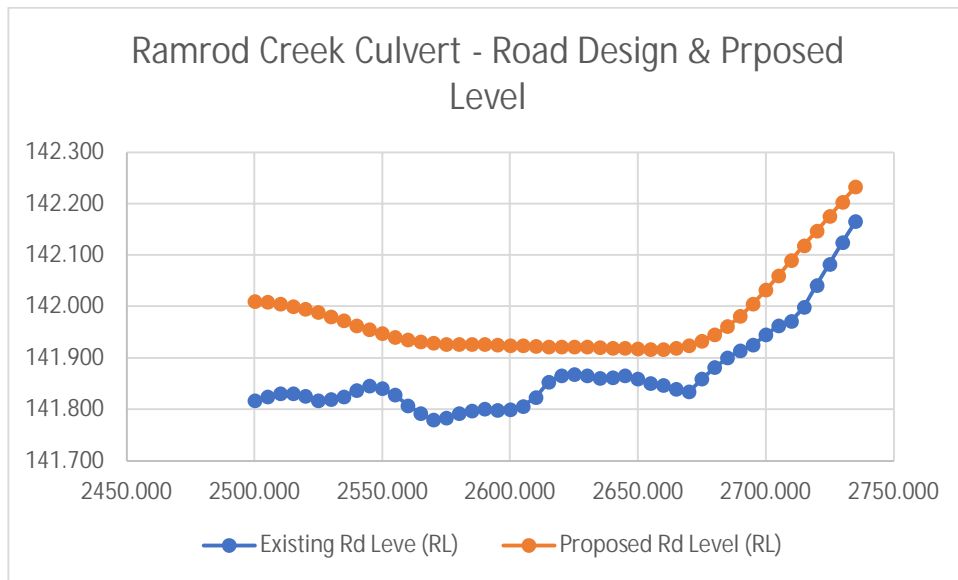


Figure 5 – Option 2 Proposed Road Vertical slightly less than Option 1



4 Summary of Results

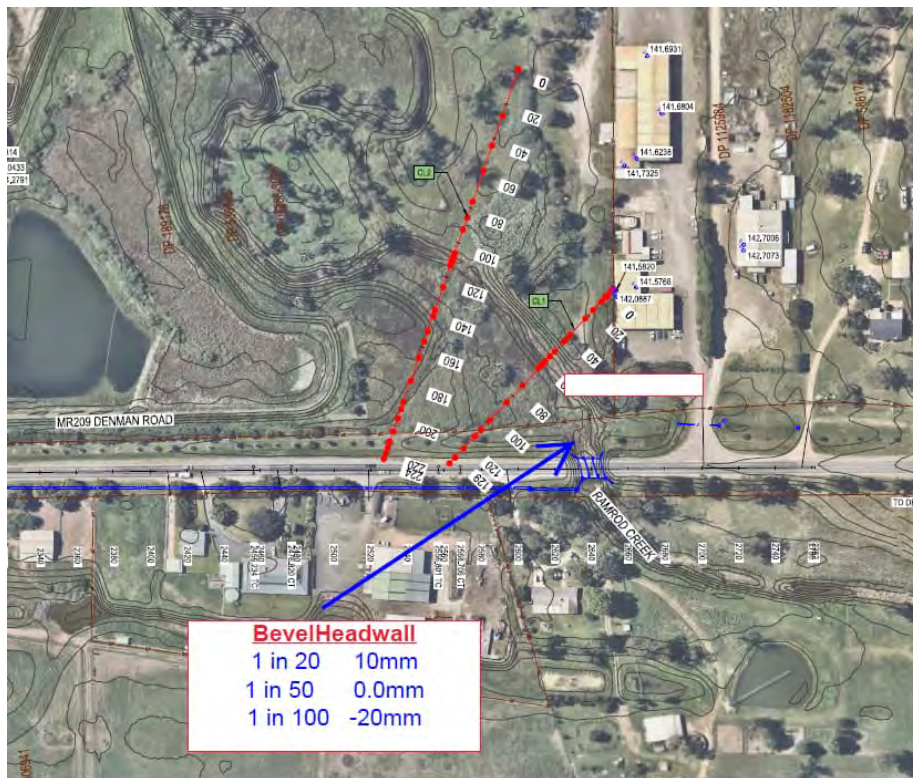
Figure 6 Option 1 – Flood Impact

1% AEP Flood Impact (1 in 100 ARI Year Flood)			
Option 1	Immediately upstream of culvert	63m upstream of culvert	133m upstream of culvert
Raise the road alignment (November 2021) and lower the culvert obvert 300mm	170mm	160mm	150mm

Figure 7 Option 2 – Flood Impact



Figure 8 Option 3 – A Combination of Options 2 and 3



Options 1 and 2 would produce flood impact to upstream development up to 170mm for the 1 in 100 year ARI flood. The 50 and 100 ARI floods would overtop the road.

Option 3 shows a reduction in flood level for the 50 and 100 year ARI floods.

A summary of the hydraulic results for Option 3 is given below.

Hydraulic Summary for Option 3			
AEP	ARI	Level (RL)	Velocity (m/sec)
5%	1 in 20	141.26	5.48
1%	1 in 100	142.10	4.69
0.05%	Approx. 1 in 2000	143.60	4.00

5 Scour Protection

Scour protection is required at inlet and outlet of the culvert. Detail design for scour protection is to be confirmed during the details design of the culvert.

6 Recommendation

Option 3 is recommended for the proposed widening of the culvert. Chamfer of the culvert obvert and legs is recommended to achieve a minimum energy loss at the inlet and increase the hydraulic capacity. To minimize the obstruction of waterway area the post and rail traffic barrier is recommended (see attachment).

Attachments

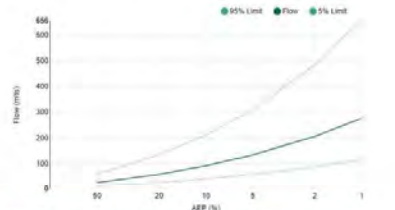
- 1 Catchment Runoff**
- 2 HEC-RAS Results**
- 3 Photo of Chamfering the pipe culvert**
- 4 Traffic Barrier**

1 Catchment Runoff

Catchment Area and Discharges



Results | Regional Flood Frequency Estimation Model



**The catchment has unusual shape. Results have lower accuracy and may not be directly applicable in practice.*

AEP (%)	Discharge (m ³ /s)	Lower Confidence Limit (5%) (m ³ /s)	Upper Confidence Limit (95%) (m ³ /s)
90	23.1	10.3	60.5
20	56.3	25.1	135
10	91.7	39.8	211
5	134	57.9	310
2	206	80.0	454
1	276	116	656

Input Data

Date/Time

Catchment Name

Latitude (Outlet)

Longitude (Outlet)

Latitude (Centroid)

Longitude (Centroid)

Catchment Area (km²)

Distance to Nearest Gauged Catchment (km)

50% AEP 6 Hour Rainfall Intensity (mm/h)

2% AEP 6 Hour Rainfall Intensity (mm/h)

Rainfall Intensity Source (User/Auto)

Region

Region Version

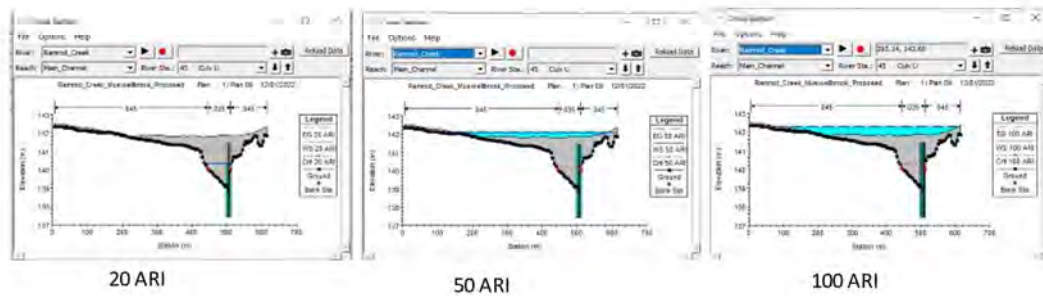
Region Source (User/Auto)

SHAPE factor

2 Hydraulic Model for Existing and Proposed

Hydraulic For Existing Conditions

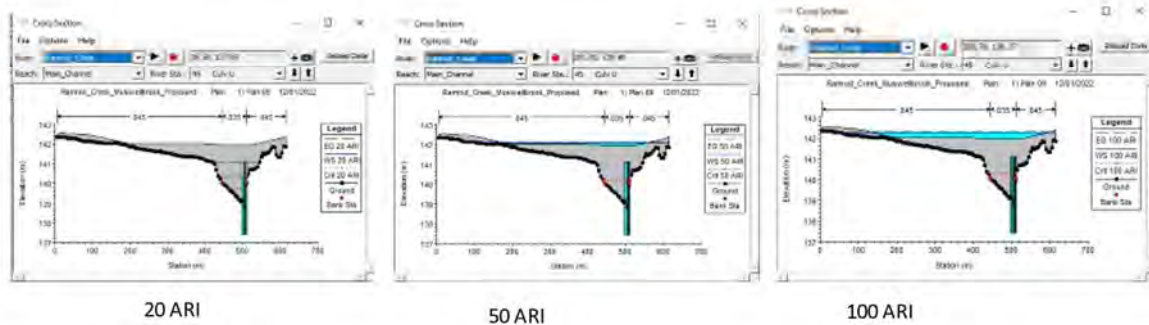
Existing Flood Immunity between 20 – 50 ARI
50 and 100 ARI overtopped the road



OFFICIAL

Hydraulic For Proposed Conditions- 300mm lowering the culvert obvert

Flood Immunity between 20 – 50 ARI
50 and 100 ARI overtopped the road



OFFICIAL

Appendix H

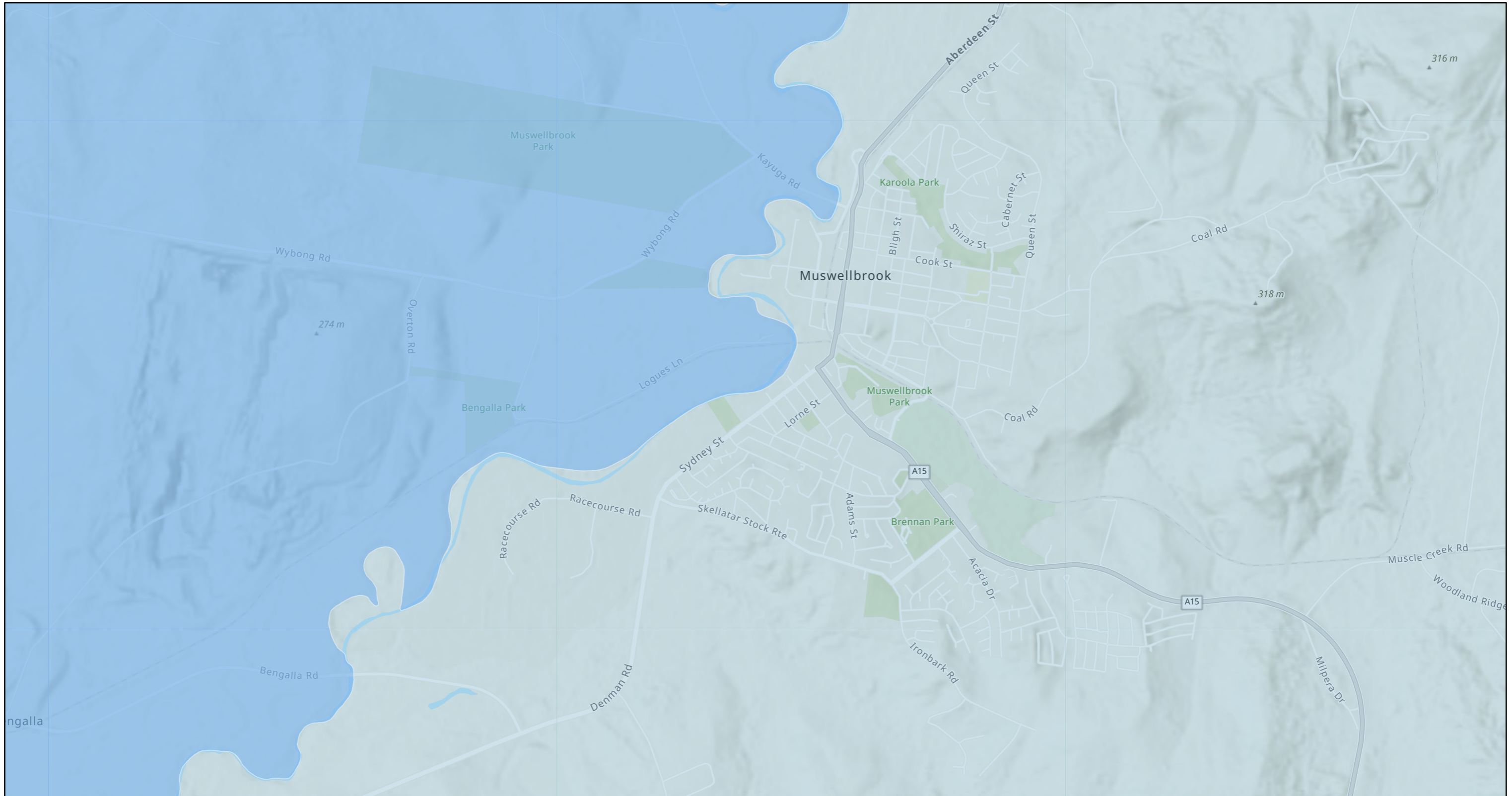
Database searches

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Licensed Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth Report generated on 19/05/2022 11:11 AM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Common status	Records	Info
Animalia	Reptilia	Pygopodidae	2159	<i>Delma impar</i>		Striped Legless Lizard	V,P	V	10	<input type="checkbox"/>
Animalia	Aves	Anseranidae	0199	<i>Anseranas semipalmata</i>		Magpie Goose	V,P		1	<input type="checkbox"/>
Animalia	Aves	Anatidae	0214	<i>Stictonetta naevosa</i>		Freckled Duck	V,P		16	<input type="checkbox"/>
Animalia	Aves	Apodidae	0334	<i>Hirundapus caudacutus</i>		White-throated Needletail	P	V,C,J,K	5	<input type="checkbox"/>
Animalia	Aves	Ciconiidae	0183	<i>Ephippiorhynchus asiaticus</i>		Black-necked Stork	E1,P		1	<input type="checkbox"/>
Animalia	Aves	Accipitridae	0218	<i>Circus assimilis</i>		Spotted Harrier	V,P		4	<input type="checkbox"/>
Animalia	Aves	Accipitridae	0226	<i>Haliaeetus leucogaster</i>		White-bellied Sea-Eagle	V,P		4	<input type="checkbox"/>
Animalia	Aves	Accipitridae	0225	<i>Hieraetus morphnoides</i>		Little Eagle	V,P		10	<input type="checkbox"/>
Animalia	Aves	Falconidae	0238	<i>Falco subniger</i>		Black Falcon	V,P		3	<input type="checkbox"/>
Animalia	Aves	Burhinidae	0174	<i>Burhinus grallarius</i>		Bush Stone-curlew	E1,P		1	<input type="checkbox"/>
Animalia	Aves	Cacatuidae	0265	^^ <i>Calyptorhynchus lathamii</i>		Glossy Black-Cockatoo	V,P,2		1	<input type="checkbox"/>
Animalia	Aves	Psittacidae	0260	<i>Glossopsitta pusilla</i>		Little Lorikeet	V,P		12	<input type="checkbox"/>
Animalia	Aves	Climacteridae	8127	<i>Climacteris picumnus victoriae</i>		Brown Treecreeper (eastern subspecies)	V,P		39	<input type="checkbox"/>
Animalia	Aves	Acanthizidae	0504	<i>Chthonicola sagittata</i>		Speckled Warbler	V,P		37	<input type="checkbox"/>
Animalia	Aves	Meliphagidae	0603	<i>Anthochaera phrygia</i>		Regent Honeyeater	E4A,P	CE	1	<input type="checkbox"/>
Animalia	Aves	Pomatostomidae	8388	<i>Pomatostomus temporalis temporalis</i>		Grey-crowned Babbler (eastern subspecies)	V,P		20	<input type="checkbox"/>
Animalia	Aves	Neosittidae	0549	<i>Daphoenositta chrysoptera</i>		Varied Sittella	V,P		2	<input type="checkbox"/>
Animalia	Aves	Artamidae	8519	<i>Artamus cyanopterus cyanopterus</i>		Dusky Woodswallow	V,P		16	<input type="checkbox"/>
Animalia	Aves	Petroicidae	0380	<i>Petroica boodang</i>		Scarlet Robin	V,P		3	<input type="checkbox"/>
Animalia	Aves	Estrildidae	0652	<i>Stagonopleura guttata</i>		Diamond Firetail	V,P		12	<input type="checkbox"/>

Animalia	Mammalia	Dasyuridae	1008	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V,P	E	4	<input type="checkbox"/>
Animalia	Mammalia	Dasyuridae	1017	<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V,P		1	<input type="checkbox"/>
Animalia	Mammalia	Phascolarctidae	1162	<i>Phascolarctos cinereus</i>	Koala	V,P	E	4	<input type="checkbox"/>
Animalia	Mammalia	Petauridae	1137	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P		27	<input type="checkbox"/>
Animalia	Mammalia	Pteropodidae	1280	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V,P	V	33	<input type="checkbox"/>
Animalia	Mammalia	Emballonuridae	1321	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V,P		10	<input type="checkbox"/>
Animalia	Mammalia	Molossidae	1329	<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V,P		8	<input type="checkbox"/>
Animalia	Mammalia	Vespertilionidae	1353	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V,P	V	3	<input type="checkbox"/>
Animalia	Mammalia	Vespertilionidae	1372	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V,P		4	<input type="checkbox"/>
Animalia	Mammalia	Vespertilionidae	1357	<i>Myotis macropus</i>	Southern Myotis	V,P		9	<input type="checkbox"/>
Animalia	Mammalia	Vespertilionidae	1361	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V,P		6	<input type="checkbox"/>
Animalia	Mammalia	Vespertilionidae	1025	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V,P		9	<input type="checkbox"/>
Animalia	Mammalia	Miniopteridae	1346	<i>Miniopterus australis</i>	Little Bent-winged Bat	V,P		4	<input type="checkbox"/>
Animalia	Mammalia	Miniopteridae	3330	<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V,P		22	<input type="checkbox"/>
Plantae	Flora	Fabaceae (Mimosoidae)	3848	<i>Acacia pendula</i>	Acacia pendula population in the Hunter catchment	E2		38	<input type="checkbox"/>
Plantae	Flora	Myrtaceae	6360	<i>Eucalyptus camaldulensis</i>	Eucalyptus camaldulensis population in the Hunter catchment	E2		38	<input type="checkbox"/>
Plantae	Flora	Myrtaceae	4096	<i>Eucalyptus glaucina</i>	Slaty Red Gum	V	V	2	<input type="checkbox"/>
Plantae	Flora	Myrtaceae	4134	<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V	1	<input type="checkbox"/>
Plantae	Flora	Orchidaceae	6399	<i>Cymbidium canaliculatum</i>	Cymbidium canaliculatum population in the Hunter Catchment	E2,P,2		12	<input type="checkbox"/>
Plantae	Flora	Orchidaceae	4457	<i>Diuris tricolor</i>	Pine Donkey Orchid population in the Muswellbrook local government area	E2,V,P,2		324	<input type="checkbox"/>
Plantae	Flora	Orchidaceae	4457	<i>Diuris tricolor</i>	Pine Donkey Orchid	V,P,2		324	<input type="checkbox"/>

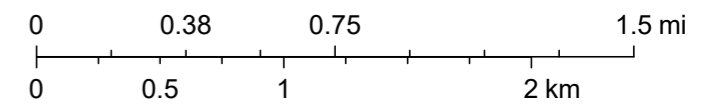
Native TitleVision Web Map



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- Applications (RNTC)
- Applications (Schedule)

1:36,112



Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Search Results

34 results found.

Balmoral 310 Denman Rd	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Barber Shop (former) 7 Sydney St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Birralee 33 Brentwood St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Brighton Villa 12 Hunters Tee	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Eatons Hotel 180-188 Bridge St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Eatons Hotel Group 164-188 Bridge St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Edinglassie 710 Denman Rd	Muswellbrook, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Hennor and Garden 3 Lorne St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
House 178 Bridge St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
House - St Vincent De Paul Shop 174-176 Bridge St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

House and Former Shop 164-166 Bridge St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Hunter River Road Bridge Kayuga Rd	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Loxton House 142-144 Bridge St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Masonic Hall 75 Bridge St	Muswellbrook, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Muswellbrook Post Office 7 Bridge St	Muswellbrook, NSW, Australia	(Listed place) Commonwealth Heritage List
Overdene 79 Bengalla Rd	Bengalla via Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Police Station William St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Presbyterian Church (original building) Hill St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Presbyterian Manse (former) 106 Hill St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Railway Cottage and Adjacent Fig Tree 27 Brook St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Railway Hotel 10-14 Market St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Railway Station Market St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Royal Hotel (former) 1 Sydney St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Shop (former) 172 Bridge St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Skellatar Tindale St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St Albans Anglican Church & Grounds Brook St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St Albans Precinct Brook St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St Albans Rectory Brook St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St Albans Sunday School 15 HuntersTce	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St James Catholic Church 4 Brook St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St Johns Presbyterian Church Hill St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St Johns Presbyterian Church Precinct Hill St	Muswellbrook, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

[Trinity Uniting Church](#) 110 Bridge St

Muswellbrook, NSW, [\(Indicative Place\)](#)
Australia
Register of the
National Estate
(Non-statutory
archive)

[Weidmann Cottage \(former\)](#) 132-134 Bridge St

Muswellbrook, NSW, [\(Registered\)](#)
Australia
Register of the
National Estate
(Non-statutory
archive)

Report Produced: Wed May 18 07:51:16 2022





Item Name	Location	LGA	SHR Id	Item Type	Record Owner
Armitage House	2 Armitage Avenue MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Atherstone	5 Sowerby Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Atherstone	5 Sowerby Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Balmoral	Denman Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Balmoral	310 Denman Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Barber Shop	5 Sydney Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Beer Homestead	721 Edderton Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Belmont	721 Edderton Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Billiards Building	36-40 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Birralee	33 Brentwood Street (Cnr Brecht Street) MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Birralee	Brecht Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Blunt's Butter Factory	179 Overton Road BENGALLA NSW 2333	Muswellbrook		Archaeological-Terrestrial	LGOV
Brighton Villa	12 Hunter Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ

Brighton Villa	12 Hunter Terrace MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Business Heritage Conservation Area	MUSWELLBRO OK NSW 2333	Muswellbrook		Conservation Area	LGOV
Campbell & Co Store, Former	54 MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Campbell's Corner	60 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Eatons Group	164-166,172, 174, 178, 180 and 188 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	GAZ
Eatons Group - house	178 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Eatons Group - shop	172 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Eatons Group - St Vincent de Paul Society building	174-176 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Eatons Hotel	182-184 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Eatons Hotel & St Vincent De Paul Group	178, 180-188 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook	00331	Built	HNSW
Edderton Homestead	Edderton Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Edinglassie	710 Denman Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Edinglassie	710 Denman Road MUSWELLBRO OK NSW 2333	Muswellbrook	00170	Landscape	HNSW
Edward Higgens Building	30-32 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Farrells Auto One	5 Maitland Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV

Fitzgerald /Olympic Park Gates	Wilkinson Avenue MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Former barber shop	7 Sydney Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Former butter factory	14-15 Aberdeen Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Former Campbell's and Co store	52 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Former hospital	37 Sowerby Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Former picture theatre	17 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Former Presbyterian manse	106 Hill Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Former Royal Hotel	1 Sydney Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Former St John's Presbyterian Church PREVIOUS/OTHER NAME St Johns Presb	Hill Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Gelston	409 Sandy Creek Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Hennor	18-20 Maitland Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Hennor	Maitland Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Hospital, Former	37 Sowerby Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
House	5 Midanga Avenue MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
House	9-11 Hunter Terrace MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Item	27 Brovic Street MUSWELLBRO OK NSW 2333	Muswellbrook		Unknown	GAZ

Item	15 Hunter Terrace MUSWELLBRO OK NSW 2333	Muswellbrook		Unknown	GAZ
Kayuga Bridge	Kayuga Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Kayuga Bridge over Hunter River	Kayuga Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
Kerb and Guttering - Brook Street	Brook Street (Bridge Street to railway line) MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Kerb and Guttering - Sydney Street	Sydney Street (Maitland Street to Haydon Street) MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Kildonan	208 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Koobahla Villa	Cook Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Koombahla Villa	23 Cook Street (Cnr Carl Street) MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Lime Kiln - E.I.E.I.O	540 Sandy Creek Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Loxton House	140-142 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Loxton House	142-144 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook	00185	Built	HNSW
Masonic Hall	MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Masonic Lodge	75 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Minch's Wine Shop	18 Foley Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Muswellbrook Ambulance	Market, William Streets MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV

Muswellbrook Brick Works	Muswellbrook Common MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	LGOV
Muswellbrook Bridge	Kayuga Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Muswellbrook Cemetery	Bowman and Brecht Streets MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	LGOV
Muswellbrook Conservation Area	MUSWELLBRO OK NSW 2333	Muswellbrook		Conservation Area	GAZ
Muswellbrook High School	King Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Muswellbrook High School - Building B00K	King Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
Muswellbrook High School - Building B00K	King Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
Muswellbrook High School - Buildings B00B and B00E	King Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
Muswellbrook High School - Buildings B00B and B00E	King Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
Muswellbrook Hotel	46 Market Street (Cnr Carl Street) MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Muswellbrook Infants School	Dolahenty Street (corner of King Street) MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Muswellbrook Police Station	William Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Muswellbrook Police Station , Former	26 William Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
Muswellbrook Post Office	7 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Muswellbrook Railway Precinct	Market Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
Muswellbrook Railway Precinct	Market Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
Muswellbrook Railway Station	Market Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Muswellbrook Railway Station	Market Street MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	GAZ

Muswellbrook Railway Station and yard group	Main Northern railway MUSWELLBRO OK NSW 2333	Muswellbrook	01208	Complex / Group	HNSW
National Australia Bank building	46-50 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Negoa Homestead	Kayuga Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Oak Milk Factory	Hunter Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Overdene	Bengalla Road MUSWELLBRO OK NSW 2333	Muswellbrook		Unknown	GAZ
Overdene	79 Bengalla Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Plashett Homestead	Edderton Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Police Station	William Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Post Office	MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Presbyterian Manse	106 Hill Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Prince of Wales Tavern	28-30 Sydney Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Railway Depot	Victoria Street MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	GAZ
Railway depot (roundhouse)	Bell Street MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	LGOV
Railway Hotel	10-14 Market Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Railway signal box	Market Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Residential Heritage Conservation Area	MUSWELLBRO OK NSW 2333	Muswellbrook		Conservation Area	LGOV
Rous Lench	Denman Road MUSWELLBRO OK NSW 2333	Muswellbrook	00211	Landscape	HNSW
Rous Lench	710 Denman Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV

Royal Hotel	10-16 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Royal Hotel, Former	1 Sydney Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Rural Bank Buidling (Demolished - 1991)	45 Bridge Street (Cnr Brook Street) MUSWELLBRO OK NSW 2333	Muswellbrook		Archaeological- Terrestrial	LGOV
School of Arts/Town Hall	3 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Shamrock Hotel	30 William Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Shop façade	34 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Shop front	34 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Shop Front	MUSWELLBRO OK NSW 2333	Muswellbrook		Unknown	LGOV
Simpson Park and Reserve	Market Street (corner of Sydney Street) MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	LGOV
Skellatar - St Mary's Catholic School	17 Fitzgerald Avenue MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
St Alban's Anglican Church	20 Brook Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
St Alban's Anglican Church Rectory	Corner Hunter Terrace and Brook Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
St Alban's Anglican Church Sunday School	15 Hunter Terrace MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
St Alban's Group	Brook Street MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	LGOV
St Alban's Precinct	Brook Street and Hunter Terrace MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	GAZ
St Alban's Precinct	Hunter Terrace MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	GAZ

St Heliers	70 St Heliers Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
St Heliers Correctional Centre	McCully's Gap Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
St Heliers Correctional Centre - Admin & outbuildings	McCully's Gap Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
St Heliers Correctional Centre - Officers Accommodation	McCully's Gap Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
St Heliers Correctional Centre - Stables	McCully's Gap Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	SGOV
St James' Roman Catholic Church	Brook Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
St James' Roman Catholic Church Convent	Brook Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
St James' Roman Catholic Presbytery	4 Sowerby Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
St John's Presbyterian Church	Hill Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
St. Alban's Anglican Church	Hunter Terrace MUSWELLBRO OK NSW 2333	Muswellbrook	00458	Built	HNSW
St. Heliers	McCulleys Gap Road MUSWELLBRO OK NSW 2333	Muswellbrook		Unknown	GAZ
St. James Roman Catholic Church including surrounds	Brook Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
St. John's Presbyterian Church Precinct	Hill Street MUSWELLBRO OK NSW 2333	Muswellbrook		Complex / Group	GAZ
St. Mary's School Skelletar	Tindale Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Stone Bridge	Grass Tree Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	GAZ
Stone Bridge	Muscle Creek Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Taskers Pharmacy	26 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV

Timber Cottage	129 Hill Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Two Storey Shop	7-11 Sydney Street MUSWELLBRO OK NSW 2333	Muswellbrook		Unknown	GAZ
Uniting Church	MUSWELLBRO OK NSW 2333	Muswellbrook		Unknown	GAZ
Uniting Church - Upper Hunter Parish Trinity Uniting Church	110 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Valley Hotel/Motel	33 Sydney Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Weidmann Cottage	132 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook	00260	Built	HNSW
Weidmann Cottage	126 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Westpac Bank building	19 Bridge Street MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV
Yammanie	307 Denman Road MUSWELLBRO OK NSW 2333	Muswellbrook		Built	LGOV

Stuart J Hill Pty Ltd
23 Kinchega Court
Wattle Grove New South Wales 2173
Attention: Stuart Hill

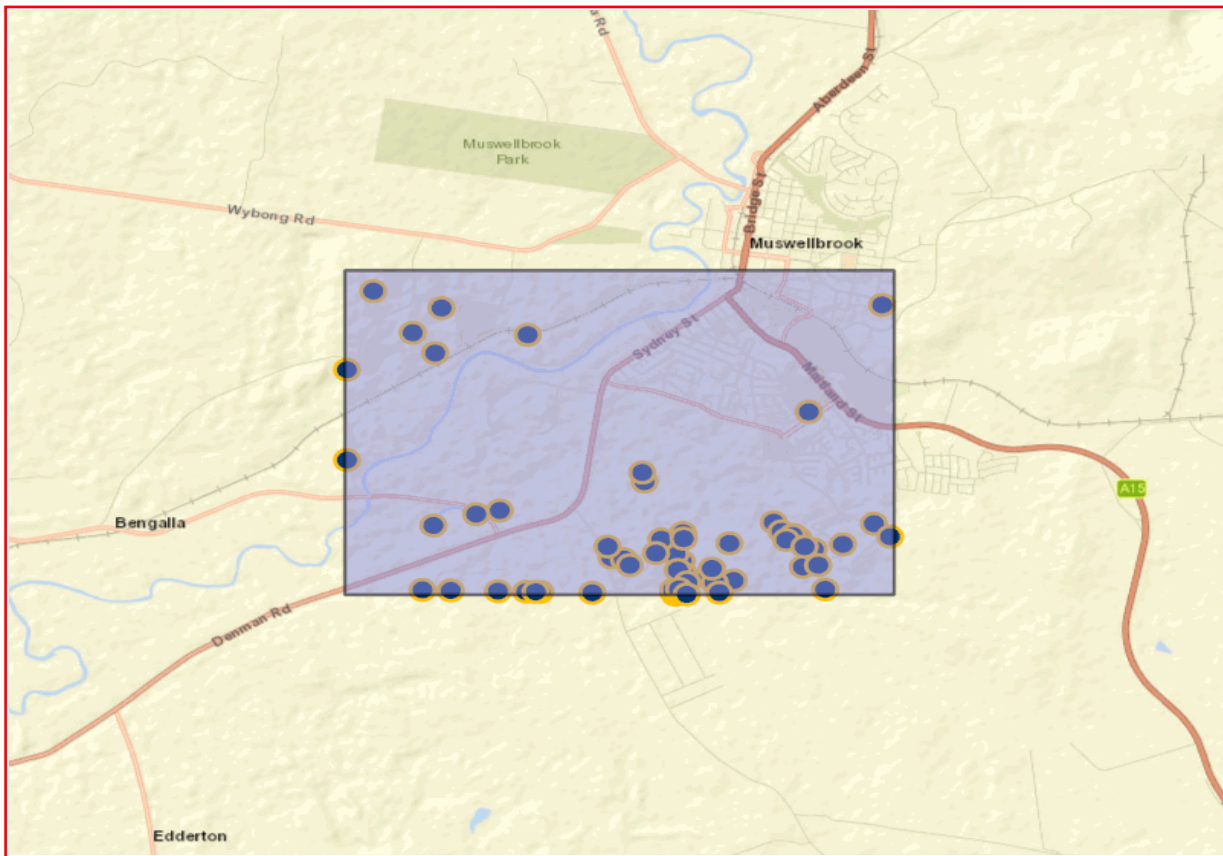
Date: 17 May 2022

Email: stuart@hillsenvironmental.com.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -32.3014, 150.8438 - Lat, Long To : -32.2652, 150.9056, conducted by Stuart Hill on 17 May 2022.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

65	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-2032	Thomas Mitchell Industrial 1	AGD	56	299693	6424441	Open site	Valid	Artefact : 1		99644
	Contact Searle	Recorders		Ms.Penny Mccardle				Permits	2352,2427,2556	
37-2-4416	MWB SEW 001	GDA	56	300131	6425577	Open site	Partially Destroyed	Artefact : 1		
	Contact	Recorders		Mr.Neville Baker				Permits	3612	
37-2-4573	MWB Pipeline 008	GDA	56	300543	6424599	Open site	Destroyed	Artefact : -		
	Contact	Recorders		Mr.Ryan Desic,Mr.Ryan Desic				Permits		
37-2-1738	PK117	AGD	56	298500	6424000	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders		Mr.Peter Kuskie				Permits	2275	
37-2-6091	A02-5876	GDA	56	298856	6427368	Open site	Valid	Artefact : -		
	Contact	Recorders		Niche Environment and Heritage,Mr.Wade Goldwyer				Permits		
37-2-4540	MWB STP 006	GDA	56	300928	6424311	Open site	Valid	Artefact : 1		
	Contact	Recorders		Mrs.Rebecca Newell				Permits		
37-2-2704	Yammanie Isolated Find 1 (YIF 1)	AGD	56	301620	6424760	Open site	Valid	Artefact : 1		
	Contact	Recorders		Ms.Tudur Llwyd Davies				Permits		
33-2-0027	MPO 2017/1	GDA	56	296973	6425781	Open site	Valid	Artefact : -		
	Contact	Recorders		Niche Environment and Heritage,Mr.Balazs Hansel				Permits		
37-2-0571	B2 ;	AGD	56	297105	6427689	Open site	Destroyed	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders		Bobbie Oakley,K Calley				Permits	851	
37-2-4110	MAC78	GDA	56	300480	6424184	Open site	Valid	Artefact : 28		
	Contact	Recorders		Mr.Neville Baker,AECOM Australia Pty Ltd - Sydney				Permits		
37-2-0001	Yammanie;Muswellbrook;	AGD	56	300370	6424500	Open site	Valid	Artefact : -	Open Camp Site	953
	Contact	Recorders		Helen Brayshaw				Permits		
37-2-4176	MAC41	GDA	56	301099	6424372	Open site	Valid	Artefact : 4		
	Contact	Recorders		Mr.Neville Baker,AECOM Australia Pty Ltd - Sydney				Permits		
37-2-2707	Yammanie Isolated Find 4 (YIF 4)	AGD	56	302466	6424915	Open site	Valid	Artefact : 1		
	Contact	Recorders		Ms.Tudur Llwyd Davies				Permits	3120	
37-2-1814	RP65	AGD	56	298950	6424000	Open site	Destroyed	Artefact : -	Open Camp Site	
	Contact	Recorders		Unknown Author,RPS Australia East Pty Ltd - York Street Sydney ,Ms.Jo Nelson				Permits		
37-2-2708	Yammanie Isolated Find 5 (YIF 5)	AGD	56	302641	6424757	Open site	Valid	Artefact : 1		
	Contact	Recorders		Ms.Tudur Llwyd Davies				Permits	3120	
37-2-2700	Yammanie Artefact Scatter 3 (YAS 3)	AGD	56	301670	6424720	Open site	Valid	Artefact : 15		
	Contact	Recorders		Ms.Tudur Llwyd Davies				Permits		
37-2-4104	MFLD05	GDA	56	300323	6424867	Open site	Partially Destroyed	Artefact : 1		
	Contact	Recorders		Biosis Research (to be deleted)				Permits	3463	

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-0576	B7 ;	AGD	56	296845	6426709	Open site	Destroyed	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders	Elizabeth Rich					Permits	851	
37-2-2559	Thomas Mitchell Drive PAD 1	AGD	56	300400	6424300	Open site	Not a Site	Potential Archaeological Deposit (PAD) :-		
	Contact	Recorders	Ms.Penny Mccardle					Permits	2823,2824	
37-2-2702	Yammanie Artefact Scatter 6 (YAS 6)	AGD	56	301404	6424912	Open site	Valid	Artefact : 3		
	Contact	Recorders	Ms.Tudur Llwyd Davies					Permits		
33-2-0026	MPO 2017/2	GDA	56	297938	6427683	Open site	Valid	Artefact : -		
	Contact	Recorders	Niche Environment and Heritage,Mr.Balazs Hansel					Permits		
37-2-4544	MWB STP 003	GDA	56	300822	6424406	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mrs.Rebecca Newell					Permits		
37-2-4546	MWB STP 005	GDA	56	300898	6424341	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mrs.Rebecca Newell					Permits		
37-2-0028	Ramrod Creek;	AGD	56	301724	6424366	Open site	Valid	Artefact : -	Open Camp Site	310
	Contact	Recorders	Len Dyall					Permits		
37-2-4569	MWB Pipeline 003	GDA	56	300460	6424215	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Ryan Desic					Permits		
37-2-4571	MWB Pipeline 005	GDA	56	300461	6424247	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Ryan Desic,Mr.Ryan Desic					Permits		
37-2-4574	MWB Pipeline 009	GDA	56	300552	6424951	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Ryan Desic,Mr.Ryan Desic					Permits		
37-2-4545	MWB STP 004	GDA	56	300570	6424445	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mrs.Rebecca Newell					Permits		
37-2-2697	Yammanie Artefact Scatter 5 (YAS 5)	AGD	56	301541	6424694	Open site	Valid	Artefact : 8		
	Contact	Recorders	Ms.Tudur Llwyd Davies					Permits		
37-2-2701	Yammanie Artefact Scatter 4 (YAS 4)	AGD	56	302142	6424652	Open site	Valid	Artefact : 8		
	Contact	Recorders	Ms.Tudur Llwyd Davies					Permits	3120	
33-2-0028	MPO 2017/4	GDA	56	297881	6427124	Open site	Valid	Artefact : -		
	Contact	Recorders	Niche Environment and Heritage,Mr.Balazs Hansel					Permits	4431	
37-2-4865	MWB SEW REBURIAL	GDA	56	300269	6424694	Open site	Valid	Artefact : -		
	Contact	Recorders	Mrs.Rebecca Newell					Permits		
37-2-4572	MWB Pipeline 006	GDA	56	300505	6424489	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Ryan Desic,Mr.Ryan Desic					Permits		
37-2-4111	MAC76	GDA	56	300608	6424337	Open site	Valid	Artefact : 3		
	Contact	Recorders	Mr.Neville Baker,AECOM Australia Pty Ltd - Sydney					Permits		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-2699	Yammanie Artefact Scatter 1 (YAS 1)	AGD	56	301835	6424584	Open site	Valid	Artefact : 32		
	Contact	Recorders	Ms.Tudur Llwyd Davies					Permits	3120	
37-2-6092	A01-5876	GDA	56	298857	6427371	Open site	Valid	Artefact : -		
	Contact	Recorders	Niche Environment and Heritage,Mr.Wade Goldwyer					Permits		
37-2-2804	MSFL01	GDA	56	302605	6427814	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mrs.Georgia Roberts					Permits		
37-2-0608	B39;	AGD	56	298500	6425000	Open site	Valid	Artefact : -	Open Camp Site	2687,100681
	Contact	Recorders	Bobbie Oakley					Permits	828	
37-2-4429	Reburial	GDA	56	299756	6424766	Open site	Valid	Artefact : 1		
	Contact	Recorders	Biosis Research (to be deleted)					Permits		
33-2-0029	MPO 2017/5	GDA	56	297638	6427371	Open site	Valid	Artefact : -		
	Contact	Recorders	Niche Environment and Heritage,Mr.Balazs Hansel					Permits	4431	
37-2-4418	MWB	GDA	56	300131	6425577	Open site	Deleted	Artefact : 1		
	Contact	Recorders	Mr.Neville Baker					Permits		
37-2-4184	MAC40	GDA	56	301045	6424831	Open site	Valid	Artefact : 2		
	Contact	Recorders	Mr.Neville Baker,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-1920	AD4	AGD	56	297800	6424800	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Peter Kuskie					Permits		
37-2-1601	CC112	AGD	56	297700	6424000	Open site	Destroyed	Artefact : -	Open Camp Site	
	Contact	Recorders	Unknown Author,RPS Australia East Pty Ltd - Hamilton,Mrs.Tessa Boer-Mah					Permits		
37-2-0607	B38;	AGD	56	298250	6424950	Open site	Valid	Artefact : -	Open Camp Site	2687,100681
	Contact	Recorders	Bobbie Oakley					Permits		
37-2-4115	MAC77	GDA	56	300523	6424255	Open site	Valid	Artefact : 6		
	Contact	Recorders	Mr.Neville Baker,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4575	MWB Pipeline 010	GDA	56	300559	6424879	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Ryan Desic,Mr.Ryan Desic					Permits		
37-2-2705	Yammanie Isolated Find 2 (YIF 2)	AGD	56	301490	6424800	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Tudur Llwyd Davies					Permits		
37-2-2703	Yammanie Artefact Scatter 7 (YAS 7)	AGD	56	301886	6424390	Open site	Valid	Artefact : 4		
	Contact	Recorders	Ms.Tudur Llwyd Davies					Permits		
37-2-4541	MWB STP 007	GDA	56	300950	6424218	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mrs.Rebecca Newell					Permits		
37-2-2706	Yammanie Isolated Find 3 (YIF 3)	AGD	56	301607	6424752	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Tudur Llwyd Davies					Permits		
37-2-2057	Thomas Mitchell Industrial 2	AGD	56	299826	6424424	Open site	Valid	Artefact : 2		
	Contact Searle	Recorders	Ms.Penny Mccardle					Permits	2427,2556	

Report generated by AHIMS Web Service on 17/05/2022 for Stuart Hill for the following area at Lat, Long From : -32.3014, 150.8438 - Lat, Long To : -32.2652, 150.9056. Number of Aboriginal sites and Aboriginal objects found is 65

This information is not guaranteed to be free from error omission. Heritage NSW and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-4430	MFLD05: 06 & 07 Reburial	GDA	56	299756	6424766	Open site	Valid	Artefact : 1		
	Contact	Recorders	Biosis Research (to be deleted)					Permits		
37-2-1742	PK121	AGD	56	298000	6424000	Open site	Destroyed	Artefact : -	Open Camp Site	
	Contact	Recorders	Mr.Peter Kuskie,RPS Australia East Pty Ltd - Hamilton,Mrs.Tessa Boer-Mah					Permits		
37-2-0129	Yammanie;Ramrod Creek;2;	AGD	56	300000	6425500	Open site	Valid	Artefact : -	Open Camp Site	316
	Contact	Recorders	Len Dyall					Permits		
37-2-0113	Ramrod Creek;	AGD	56	300500	6424000	Open site	Valid	Artefact : -	Open Camp Site	316
	Contact	Recorders	Len Dyall					Permits		
37-2-2698	YST 1	AGD	56	301541	6424694	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	Recorders	Ms.Tudur Llwyd Davies,RPS Australia East Pty Ltd - Newcastle					Permits		
37-2-2033	Harvey Norman Site Muswellbrook	AGD	56	301749	6426285	Open site	Valid	Artefact : 6		
	Contact Searle	Recorders	John Mathews					Permits		
37-2-2752	YIF 6	GDA	56	302070	6424281	Open site	Valid	Artefact : 1		
	Contact	Recorders	ERM - Thornton					Permits		
37-2-1817	RP68	AGD	56	298800	6424000	Open site	Destroyed	Artefact : -	Open Camp Site	
	Contact	Recorders	Unknown Author,RPS Australia East Pty Ltd - York Street Sydney ,Ms.Jo Nelson					Permits		
37-2-1815	RP66	AGD	56	298900	6424000	Open site	Destroyed	Artefact : -	Open Camp Site	
	Contact	Recorders	Unknown Author,RPS Australia East Pty Ltd - York Street Sydney ,Ms.Jo Nelson					Permits		
37-2-1919	CC100	AGD	56	299500	6424000	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Peter Kuskie					Permits		
37-2-4543	MWB STP 002	GDA	56	300866	6424516	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mrs.Rebecca Newell					Permits		
37-2-2751	YAS 2	GDA	56	301842	6424805	Open site	Valid	Artefact : 2		
	Contact	Recorders	ERM - Thornton					Permits		
37-2-2058	Thomas Mitchell Industrial 3	AGD	56	299890	6424350	Open site	Valid	Artefact : 3		
	Contact Searle	Recorders	Ms.Penny Mccardle					Permits	2427,2556	

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 22-May-2022

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	28
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	19
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	13
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [\[Resource Information \]](#)

Ramsar Site Name	Proximity	Buffer Status
Hunter estuary wetlands	50 - 100km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities [\[Resource Information \]](#)

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community likely to occur within area	In feature area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occur within area	In feature area
Hunter Valley Weeping Myall (Acacia pendula) Woodland	Critically Endangered	Community may occur within area	In feature area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community may occur within area	In feature area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area	In feature area

Listed Threatened Species [\[Resource Information \]](#)

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia			
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
FROG			
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area	In feature area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat may occur within area	In feature area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
PLANT			
Eucalyptus glaucina Slaty Red Gum [5670]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pomaderris brunnea Rufous Pomaderris, Brown Pomaderris [16845]	Vulnerable	Species or species habitat may occur within area	In feature area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area	In buffer area only
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In feature area

REPTILE

Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species

[[Resource Information](#)]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [12531]	NSW	In buffer area only

Defence

Commonwealth Land Name	State	Buffer Status
Defence - MUSWELLBROOK GRES DEPOT [11194]	NSW	In buffer area only

Unknown		
Commonwealth Land - [14106]	NSW	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
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Bird

Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
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Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
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Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
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Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
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Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
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Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
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Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
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Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
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Scientific Name	Threatened Category	Presence Text	Buffer Status
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Extra Information

Regional Forest Agreements [\[Resource Information \]](#)

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

EPBC Act Referrals [\[Resource Information \]](#)

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Mount Pleasant Optimisation Project	2020/8735	Controlled Action	Assessment Approach	In feature area
Mount Pleasant Project	2011/5795	Controlled Action	Post-Approval	In buffer area only
Mt Arthur Coal Extension Project Hunter Valley NSW	2011/5866	Controlled Action	Post-Approval	In buffer area only
Thomas Mitchell Drive Upgrade, Muswellbrook, NSW	2012/6533	Controlled Action	Completed	In buffer area only
Not controlled action				
clearing of GWB Woodland for residential development	2004/1771	Not Controlled Action	Completed	In feature area
Construction of a new power line	2011/5930	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Industrial Subdivision, Thomas Mitchell Drive	2006/3097	Not Controlled Action	Completed	In buffer area only
Ironbark Ridge Rural Residential Development	2009/5116	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular	Post-Approval	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
		Manner)		
N40-Ulan line underbridge replacement, Muswellbrook, NSW	2019/8507	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
Clearing for development of rural subdivision	2009/4931	Referral Decision	Completed	In buffer area only
Mount Pleasant Project	2010/5529	Referral Decision	Completed	In buffer area only
Bioregional Assessments				
SubRegion	BioRegion	Website		Buffer Status
Hunter	Northern Sydney Basin	BA website		In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

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Please feel free to provide feedback via the [Contact Us](#) page.

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