Middle Curradux Creek and Third Curradux Creek Causeway Upgrades

Review of Environmental Factors

QUEANBEYAN-PALERANG REGIONAL COUNCIL

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Executive Summary

This Review of Environmental Factors (REF) assesses the proposed upgrades to two causeways along Charleys Forest Road, namely the Middle Curradux Creek and Third Curradux Creek causeways, located within the Shoalhaven catchment in New South Wales. Commissioned by Queanbeyan-Palerang Regional Council, the proposal aims to improve flood resilience, road safety, and ecological connectivity while mitigating environmental impacts.

The scope of works includes upgrading the Middle Curradux Creek causeway by retaining the existing 600 mm pipe culvert and constructing a 4.5 m-wide concrete slab causeway. At the Third Curradux Creek site, the works involve replacing the existing triple 600 mm pipe culverts with four upsized 750 mm reinforced concrete pipes (RCPs) and constructing a 6 m-wide concrete slab causeway. Both sites incorporate erosion and sediment control measures, downstream rock armouring, and revegetation with native species.

Key considerations in the REF include the avoidance and mitigation of potential environmental and social impacts, particularly in relation to aquatic and riparian ecosystems and traffic and accessibility, as follows:

Aquatic Ecosystems

- Both creeks are mapped as Key Fish Habitat under the *Fisheries Management Act 1994* (FM Act). Although the works are restricted to the road reserve, there is potential to temporarily affect aquatic habitats and water quality during construction due to sedimentation, flow disruptions, and the use of machinery.
- Stringent erosion and sediment controls, a dewatering management plan, and the rehabilitation of disturbed areas will minimise these impacts and enhance ecological connectivity post-construction, particularly at Third Curradux Creek, where some dredging of downstream sediments is proposed.

Traffic and Accessibility

- Temporary traffic delays will occur during construction, but daily accessibility will be maintained. Measures to minimise disruptions include traffic management plans and community consultation. Upon completion, road safety and resilience will be significantly improved.

Biodiversity

- Although no threatened species are expected to be directly impacted, potential effects on local protected flora and fauna and habitats will be mitigated through clear delineation of the impact areas, maximising the protection of riparian and roadside vegetation, and careful planning to minimise disturbance.

Based on the current description of the activity in the study areas provided, the proposal will require a permit from the Department of Primary Industries (Fisheries) under Part 7 of the NSW FM Act associated with dredging and reclamation within the watercourse and temporary blocking of fish passage. This is required for both Third Curradux Creek and Middle Curradux Creek.

Further assessments under Section 5.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) are not necessary, as the proposal is not likely to significantly affect the environment, threatened species, ecological communities, or their habitats. The REF confirms that there are no significant impacts on matters of national environmental significance or Commonwealth land, and thus, a referral to the Commonwealth

Department of Climate Change, Energy, the Environment and Water under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is not required.

With robust safeguards in place, including those outlined in the Construction Environmental Management Plan (CEMP), the proposal will proceed with minimal environmental impact, delivering critical infrastructure improvements while ensuring compliance with statutory requirements.

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Abbreviations

Abbreviation	Description
AHIMS	Aboriginal Heritage Information Management System
ASS	Acid Sulfate Soils
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BS Act	*Biosecurity Act 2015* (Cth)
CEMP	Construction Environmental Management Plan
DPI	Department of Primary Industries
DPE	Department of Planning and Environment
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPA	NSW Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ESC	Erosion and Sediment Control
FM Act	*Fisheries Management Act 1994* (NSW)
IBRA	Interim Biogeographic Regionalisation for Australia
KFH	Key Fish Habitat
LEP	Local Environment Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NRAR	National Resources Access Regulator
PCT	Plant Community Type
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
PPE	Personal Protective Equipment
QRC	Quadrant Rail Consulting
REF	Review of Environmental Factors

SEPP	State Environmental Planning Policy
SHR	State Heritage Register
TEC	Threatened Ecological Community
TfNSW	Transport for NSW
TMP	Traffic Management Plan
WM Act	*Water Management Act 2000* (NSW)
WONS	Weeds of National Significance

1 INTRODUCTION

This chapter introduces the proposal, provides context for the environmental assessment, and describes the purpose of the report.

PROPOSAL IDENTIFICATION

Queanbeyan-Palerang Regional Council (Council) propose to upgrade two existing causeways within 2 km of each other on Charleys Forest Road, to improve the resilience of the assets and reduce the vulnerability to future disasters.

This Review of Environmental Factors (REF) assesses both proposals, enabling efficiencies in reporting while ensuring each site is distinctly addressed where required, to guide Council and its contractors.

A summary of the proposals is provided below in Table 1 and the location of the proposal and study areas are shown in Figure 1 and Figure 2, and geographically in Figure 3.

Table 1: Proposal overview

Site	Middle Curradux Creek Causeway	Third Curradux Creek Causeway
Location	1674 Charleys Forest Road (Figure 1)	1350 Charleys Forest Road (Figure 2)
Area (Approx.)	2000 m²	2600 m²
Completion	June 2025	May 2026
Key Features	Construction of a concrete slab causeway and associated road pavement works. Retention of the existing 600 mm pipe culvert in situ. Downstream tie-in of concrete to existing stonework for structural integrity.	Construction of a concrete slab causeway and associated road pavement works. Removal of the existing triple 600 mm pipe culvert. Replacement with four upsized 750 mm reinforced concrete pipes for enhanced flow capacity. Rock armouring and dredging to improve flow and create a permanent pond downstream.

Figure 1: Middle Curradux Creek study area as viewed from the northern downstream embankment.

Figure 2: Third Curradux Creek study area, as viewed from downstream looking towards Charleys Forest Road and upstream.

PURPOSE OF THE REPORT

The proposals are subject to assessment by a REF under Division 5.1 of *Environmental Planning and Assessment Act 1979* (EP&A Act). For the purposes of these works, Council is the proponent and the determining authority under Division 5.1 of the EP&A Act. This REF has been prepared by QRC on behalf of Council.

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposal and assessment of associated environmental impacts have 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 *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act).

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

Figure 3: Proposal location

2 DESCRIPTION OF THE PROPOSAL

This chapter describes the proposal, providing an overview of the study area, the known design parameters, and the expected construction methodology, including associated infrastructure and activities.

THE STUDY AREA

Regional context

The study area is located in the Southeastern Highlands Interim Biogeographic Regionalisation for Australia (IBRA) region, within the Bungonia subregion. The two causeways, at Middle and Third Curradux Creeks, are within 2 km of each other along Charleys Forest Road, approximately 18 km (straight line distance) north east of Braidwood, New South Wales (NSW). Both creeks are ephemeral third-order streams within the Shoalhaven River catchment.

Conservation Values and Surrounding Character

The study area lies in proximity to a major state ecological corridor formed by interconnected national parks that extend in a north-south direction and link to the coast. This corridor includes:

- Morton National Park to the north
- Budawang National Park, Monga National Park, Deua National Park, and Wadbilliga National Park, to the east and southeast, and
- South East Forest National Park, further south.

The streams at Middle and Third Curradux Creeks are part of this broader connectivity network. These ephemeral watercourses provide east-west ecological connections between the ecological corridor of national parks and the Shoalhaven. While modified by rural activities, the riparian zones of these streams play a role in supporting local biodiversity and facilitating species movement.

Land use

The study areas and surrounds are zoned RU1 Primary Production under the Queanbeyan-Palerang Regional Local Environmental Plan 2022 (LEP). The objectives of this zone are as follows:

2.1.1.1 RU1 Primary Production

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To minimise the impact of development on the natural environment*
- *To ensure development does not unreasonably increase the demand for public services or public facilities*

Land ownership

Charleys Forest Road is a public regional road maintained by Council. The proposal's footprint would be contained wholly within Council Road Reserve.

THE PROPOSAL

Design

The proposal involves upgrading two causeways along Charleys Forest Road to improve flood resilience, road safety, and ecological connectivity. The specific elements for each site are as follows:

Middle Curradux Creek Causeway

- Retain the existing 600 mm pipe culvert.
- Construct a new 4.5 m-wide concrete causeway with a roughened surface to facilitate water flow and improve traction.
- Remove portions of the existing stone wall and integrate the concrete causeway into the downstream channel to ensure structural stability and hydrological continuity.
- Implement erosion and sediment controls to minimise sedimentation and runoff into the creek.
- Trim overgrown Acacia vegetation along the road to improve sightlines and visibility for drivers.
- Maintain a 1% crossfall on the causeway to manage surface drainage effectively.

Third Curradux Creek Causeway

- Remove the existing triple 600 mm culverts and replace with four 750 mm reinforced concrete pipes (RCPs) to significantly enhance flow capacity and minimise flood risks.
- Construct a 6 m-wide concrete causeway designed to handle increased flow and prevent erosion.
- Install rock armour at the downstream outlet to stabilise the area and protect against scouring.
- Create a permanent pond approximately 4 to 5 m in extent at the downstream outlet to enhance ecological function and provide aquatic habitat.
- Undertake controlled dredging downstream (600–700 mm depth) within a defined 6 m x 4 m area to restore flow paths and remove sediment deposits.
- Stabilise dredged areas with jute mesh and revegetate using native species, including *Lomandra longifolia*, to ensure long-term bank stability.
- Maintain existing table drains and implement a 1% crossfall on the road approaches to support effective surface water drainage.

Site Commissioning

- Establish site compounds and stockpile areas within previously disturbed zones to minimise environmental impacts.
- Implement two levels of erosion and sediment controls to prevent sediment migration (if stockpiling near the creek).
- Use of silt curtains, coffer dams, and sediment traps as necessary to manage runoff and protect water quality.
- Install temporary fencing to delineate and protect areas of ecological sensitivity.

Construction works

- Clear and grub the construction footprint, trimming vegetation as necessary to minimise disturbance.
- Perform earthworks to prepare road approaches, culvert bases, and outlet areas, ensuring minimal disruption to existing landforms.
- Install reinforced concrete causeways, larger pipe culverts, and rock protection at outlets to improve erosion control and enhance structural stability.
- Complete downstream works at Third Curradux Creek, including dredging, rock armouring, and planting to improve aquatic and riparian habitats.
- Prepare road surfaces and install guideposts and signage for road safety.

Decommissioning

- Remove all temporary erosion controls, silt fences, and coffer dams upon project completion.
- Stabilise disturbed areas using topsoil and revegetate with deep-rooting native species, focusing on riparian plants to enhance bank stability and prevent future erosion.
- Dispose of waste materials at approved facilities.

This REF has been based on the scope of work detailed in this section and within the footprint of the study areas provided (Figure 3).

Construction equipment

The following construction plant and equipment are expected to be used:

- Excavators (6 to 20 tonne)
- Grader, roller and water cart
- Trucks for material transport (e.g., truck-and-dog configurations)
- Concrete mixers and compactors
- Bobcat and backhoe
- Passenger vehicles to transport workers
- Safety equipment (Personal Protective Equipment (PPE).

Expected hours of work

The proposal will be undertaken during standard working hours:

Monday to Friday:	7:00 am – 6:00 pm
Saturday:	8:00 am – 1:00 pm
Sunday and Public Holidays:	No work

Ancillary features

Ancillary works will include storage parking and stockpile areas and temporary site office.

LIMITATIONS

This REF is based on the current scope of work and the designs attached in Appendix 1 Design plans. Any modifications to the proposal's footprint or methodology outside the current study area may necessitate a reassessment of potential impacts.

3 NEEDS AND OPTIONS CONSIDERED

This chapter describes the strategic and operational need for the proposed causeway upgrades, highlights limitations in the existing infrastructure, defines the project objectives, and evaluates the options considered, incorporating the current designs as a baseline for further refinement.

STRATEGIC NEED

The proposed upgrades are funded by the Infrastructure Betterment Fund under the NSW Betterment Program, which supports resilience improvements that reduce vulnerability to natural disasters, ensure service continuity, and lower economic risks.

LIMITATIONS OF EXISTING INFRASTRUCTURE

The existing crossings are limited in the following ways:

- Flood Susceptibility: The existing crossings are susceptible to flooding during storm events, disrupting essential connectivity.
- Current culverts at Third Curradux Creek are undersized, with inadequate flow capacity, leading to overtopping, erosion and loss of road base material and sediments downstream.
- Flooding increases repair and maintenance frequency and costs to Council.

PROPOSAL OBJECTIVES

The objectives of the proposed upgrades are to:

- Improve flood resilience
- Enhance road safety
- Support aquatic habitat conservation
- Reduce maintenance demands and costs

ALTERNATIVES AND OPTIONS CONSIDERED

Council have explored options for the proposal as follows:

Option 1 Do Nothing

Retaining the current causeways avoids short-term environmental impacts but perpetuates flooding issues, sedimentation and increasing maintenance costs. Long-term infrastructure failure is likely under this scenario.

Option 2 Remediation of the current crossings

Reinforcing the existing culverts and implementing erosion controls would provide a temporary solution at lower costs but would not address flood resilience, erosion and sedimentation or enhance aquatic ecology.

Option 3 – upgrade the works, as proposed

The preferred option involves implementing the works in accordance with the design outlined in Appendix 1 Design plans and incorporating the avoidance and mitigation measures detailed in this report. This option improves climate resilience, enhances flow capacity, and supports fish passage through a design that aligns with ecological and hydrological objectives.

Option 3 is recommended, contingent on adherence to the environmental management measures outlined in this report and compliance with DPI Fisheries permit approval conditions. By utilising the existing disturbed corridor, this approach minimises environmental disruption and optimises outcomes for both the natural environment and infrastructure resilience.

4 STATUTORY AND PLANNING FRAMEWORK

This chapter provides the statutory and planning framework for the proposal and considers the provisions of relevant state environmental planning policies, local environmental plans and other legislation.

Table 2 provides a description of the legislative context for the proposal. Where an approval or consideration is required, this report addresses the objectives and requirements of the legislation.

Table 2: Statutory Planning Context

Name	Relevance to the Project
	Commonwealth
Commonwealth Environment Protection and Biodiversity Conservation Act 1999 **(EPBC Act)**	The EPBC Act protects Matters of National Environmental Significance (MNES), such as threatened species and ecological communities, migratory species (protected under international agreements), and National Heritage places (among others). Any actions that will or are likely to have a significant impact on the MNES require referral and approval from the Australian Government Environment Minister. Significant impacts are defined by the Commonwealth (reference http://www.environment.gov.au/epbc/guidelines-policies.html) for MNES. Potential impacts to Matters of National Environmental Significance (MNES) have been assessed in this report. The proposed works are unlikely to significantly impact MNES and that a controlled action approval will not be required.
	State
NSW *Environmental Planning and Assessment Act 1979*	The EP&A Act is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of projects. Part 5 of the EP&A Act sets out the requirements for infrastructure and environmental impact assessment. Section 2.109 Development permitted without consent – general (*1) Development for the purpose of a road or road infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land. Section 2.108 includes reference to 'causeways' as road infrastructure facilities.* Accordingly, this REF satisfies Sections 5.5 and 5.6 of that Act by examining, and taking into account to the fullest extent possible, all matters which are likely to affect the environment. This REF is intended to assist, and ensure compliance, with the EP&A Act including Sections 5.5 and 5.6.

Environmental Planning and Assessment Regulation 2021 **(EP&A Regulation)**	Section 171 of the EP&A Regulation sets out the environmental factors which must be taken into consideration when preparing a REF. This REF addresses all Section 171 factors. Section 171(4) of the EP&A Regulation sets out the conditions in which an REF must be published on the determining authority's website or NSW Planning Portal. These conditions are if – *(a) the activity has a capital investment value of more than $5 million, or* *(b)the activity requires an approval or permit as referred to in any of the following provisions before it may be carried out—* *(i) Fisheries Management Act 1994, sections 144, 200, 205 or 219,* *(ii) Heritage Act 1977, section 57,* *(iii) National Parks and Wildlife Act 1974, section 90,* *(iv)Protection of the Environment Operations Act 1997, sections 47–49 or 122, or* *(c) the determining authority considers that it is in the public interest to publish the review.* The Project will require a Fisheries permit, and therefore Council should publish this REF. In accordance with section 5, the REF must be published as follows: *a) before the activity commences, or* *(b) if publishing the review before the activity commences is not practicable—as soon as practicable, and no later than 1 month, after the activity commences.*
NSW *National Parks and Wildlife Act 1974* **(NPW Act)**	The NPW Act is administered by the Director-General of the National Parks and Wildlife Services (NPWS), who is responsible for the control and management of all national parks, historic sites, Reserves, and Aboriginal areas (among others). The main aim of the Act is to conserve the natural and cultural heritage of NSW. The Act aims to conserve the natural and cultural heritage of NSW. Where works will disturb Aboriginal objects, an Aboriginal Heritage Impact Permit (AHIP) is required. There are no previously recorded Aboriginal sites or objects within the study area and the study area has undergone previous ground disturbance related to construction of the road and causeways as well as past dredging maintenance downstream of the Third Curradux Creek Causeway. This REF has been undertaken in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (hereafter referred to as 'CoP') (DECCW 2010), and no further assessment is recommended.
NSW *Biodiversity and Conservation Act 2016* **(BC Act)**	The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

	Section 7.3 of the Act requires proponents of activities subject to Part 5 of EP&A Act to determine whether they will have a significant impact on threatened species or ecological communities. The test for significant impact is described in Section 7.3 of the BC Act. If a significant impact is likely to occur, the proponent of the activity must prepare a Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) following Section 7.2 of the BC Act. A desktop review of relevant background materials and databases and a site inspection was undertaken to identify the potential presence of Threatened Ecological Communities (TECs), flora, or fauna, or whether potential habitat for these entities is present. Further detail is included in the biodiversity chapter; however it is concluded that the proposed works are unlikely to significantly impact on any NSW state listed threatened species or ecological communities. No further assessment is required.
NSW *Biosecurity Act 2015* (BS Act).	The BS Act provides a framework for the prevention, elimination and minimisation of biosecurity risks posed by a biosecurity matter, dealing with a biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter. Whilst the Act provides for all biosecurity risks, implementation of the Act for weeds is supported by Regional Strategic Weed Management Plans (RSWMP) developed for each region in NSW. Appendix 1 of the South East Regional Strategic Weed Management Plan 2023 – 2027 identifies the priority weeds for control at a regional scale. Some of these weeds are also State Priority Weeds. One species of priority weed was identified adjacent to the study area: *Rubus fruticosus sp. agg*. (Blackberry) – Containment and/or Asset Protection – Weed of National Significance (WONS). State priority. Management measures for the above weeds are included in this REF.
NSW *Water Management Act 2000* (WM Act)	The WM Act aims to provide for the sustainable and integrated management of water resources for NSW. The Act requires developments on waterfront land to be ecologically sustainable and recognises the benefits of aquatic ecosystems to agriculture, fisheries, and recreation. The WM Act is administered by the Natural Resources Access Regulator (NRAR) and establishes an approval regime for activities within waterfront land, defined as the land 40 m from the highest bank of a river, lake, or estuary. A Controlled Activity Approval (CAA) is typically required for work within waterfront land. Section 91E of the Act creates an offence for carrying out a controlled activity within waterfront land without approval. However, according to Section 41 of the *Water Management (General) Regulation 2018*, a public authority is exempt from Section 91E (1) of the Act and Council is exempt from requiring a CAA.
NSW *Heritage Act 1977* (Heritage Act)	The Heritage Act provides protection of the environmental and cultural heritage of the State which includes places, buildings, works, relics, movable objects, or

	precincts that are of State or local heritage significance. The NSW State Heritage Register (SHR) is the statutory register under Part 3A of the Heritage Act. Listing on the SHR means that any proposed works or alterations (unless exempted) to listed items must be approved by the Heritage Council or its delegates under section 60 of the Act. The study area is not located within the curtilage of any SHR listing and it is unlikely that there will be impacts to any unknown archaeological resource within the study area and as such, no further work will be required.
NSW *Protection of the Environmental Operations Act 1997* (POEO Act)	The POEO Act includes provisions relating to the protection of the environment. There are serious offences under this Act for causing pollution of air, noise, water or land. Part 5.4 illustrates the requirements to minimise air pollution, Part 5.5 communicates the conditions to minimise noise pollution and Part 5.7 describes the obligation to notify pollution incidents. The proposal will comply with these Parts throughout all aspects. In the unlikely event of a pollution incident, notification will be completed as required.
NSW *Fisheries Management Act 1994* (FM Act)	The FM Act provides for the protection, conservation and recovery of threatened species defined under the Act. It also makes provisions for the management of threats to threatened species, populations and ecological communities defined under the Act, as well as the protection of fish and fish habitat in general. The proposal involves the removal of material (concrete causeway, pipes) from water land as well as temporary obstruction of fish passage during construction of Key Fish Habitat (KFH), and as such a permit under Part 7 of the FM Act is required.
Planning Instruments	
***State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP)**	The aim of the T&I SEPP is to facilitate the effective delivery of infrastructure across NSW by identifying whether certain types of infrastructure require consent, can be carried out without consent or are exempt development. Pursuant to clause 2.109 of the T&I SEPP, development for the purpose of road infrastructure facilities may be carried out by or on behalf of a public authority without consent.
Queanbeyan Palerang Regional Local Environmental Plan (LEP) 2022	The Queanbeyan-Palerang Regional Council LEP guides and provides a framework for managing land use and development within the local government areas. The LEP was designed to promote sustainable development within the area. Both Middle and Third Curradux Creeks are mapped as a 'Watercourses' on the Riparian Lands and Watercourses Map and in accordance with clause 7.4 of the LEP, and as 'Biodiversity' on the Terrestrial Biodiversity Map and in accordance with clause 7.2 of the LEP. The study areas are mapped as Vegetation Category 3 on the Bushfire Prone Land.

	Clause 5.12 of the LEP states that the LEP does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without development consent, or that is exempt development, under State Environmental Planning Policy (Transport and Infrastructure) 2021. Therefore, the LEP provisions do not restrict the works however, this REF will consider the consistency of the project with the LEP, assessing potential impacts on watercourses, biodiversity and water quality accordingly.

5 CONSULTATION

SEPP (TRANSPORT AND INFRASTRUCTURE) CONSULTATION

Part 2.2 of the Transport and Infrastructure SEPP identifies situations where consultation needs to be undertaken by public authorities with local councils or other government agencies prior to the commencement of some forms of development. In this case, consultation with Council is not required as Council is the proponent and therefore Clauses 2.10 to 2.12 and 2.14 do not apply. Table 3 outlines these requirements.

Table 3: Consultation required with Council

Is consultation with Council required under sections 2.10, 2.11, 2.12, 2.14 of the SEPP (Transport and Infrastructure)?		
Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	Yes ☐	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?	Yes ☐	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?	Yes ☐	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?	Yes ☐	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?	Yes ☐	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?	Yes ☐	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 heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	Yes ☐	No ☒
Is the proposal within the coastal vulnerability area and inconsistent with a certified coastal management program applying to that land? Note: See interactive map at **Coastal management - (nsw.gov.au)**. Note the coastal vulnerability area has not yet been mapped. Note: a certified coastal zone management plan is taken to be a certified coastal management program.	Yes ☐	No ☒

Are the works located on flood liable land? If so, will the works change flooding patterns to more than a minor extent? 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 Floodplain Development Manual: the management of flood liable land (nsw.gov.au).	Yes ☐	No ☒
Will the works involve development for the purposes of an educational establishment or school-based childcare? If yes, consideration must be given to Planning for Bush Fire Protection before carrying out the development in an area that is bushfire prone land	Yes ☐	No ☒

Clause 2.15 identifies consultation triggers for consultation with public authorities other than local councils, however following review of this Clause it can be concluded that there is no requirement for Council to consult with public authorities in terms of the Transport and Infrastructure SEPP. The triggers are included in Table 4.

Table 4: Consultation with other public authorities

Is consultation with a public authority (other than Council) required under sections 2.15 of the SEPP (Transport and Infrastructure)?		
Are the works adjacent to a national park, nature reserve or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	Yes ☐	No ☒
Are the works on land in Zone C1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone, other than land reserved under the *National Parks and Wildlife Act 1974*?	Yes ☐	No ☒
Do the works comprise a fixed or floating structure in or over navigable waters?	Yes ☐	No ☒
Are the works on defence communications facility buffer land within the meaning of clause 5.15 of the Standard Instrument?	Yes ☐	No ☒
Are the works on, or reasonably likely to have an impact on, a part of the Willandra Lakes Region World Heritage Property—the World Heritage Advisory Committee and Heritage NSW	Yes ☐	No ☒
Are the works within a Western City operational area specified in the Western Parkland City Authority Act 2018, Schedule 2 with an estimated development cost of $30 million or more?	Yes ☐	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)	Yes ☐	No ☒
Are the works on land in a mine subsidence district within the meaning of the *Coal Mine Subsidence Compensation Act 2017*?	Yes ☐	No ☒

DPI Fisheries

NSW DPI has jurisdiction over all fish and marine vegetation in State waters. This includes permanent and intermittent freshwater areas and 'water land' below the highest astronomical tide in tidal areas, extending to three nautical miles offshore (or beyond where other legislative powers of the State apply). 'Water land' is defined under the FM Act as land submerged by water, whether permanently or intermittently or whether forming an artificial or natural body of water and includes wetlands and any other land prescribed by the regulations as water land.

Both Middle and Third Curradux Creeks are classified as Class 3 Minimal Fish Habitat under DPI Fisheries guidelines, representing the upper limits of fish habitat connectivity. At the study areas for each, both are mapped as Key Fish Habitat, at the top of the KFH extent. The proposal at Third Curradux Creek involves the removal of material from water land and as such a dredging permit under section 200 of the FM Act is required. Further, it is anticipated that some instream work would be required at Middle Curradux Creek, to create downstream rock armouring and pool creation. The proposed works may also require the temporary obstruction of fish passage and as such a permit under section 219 of the FM Act is likely required.

Public Exhibition

Section 171(4) of the EP&A Regulation sets out the conditions in which an REF must be published on the determining authority's website or NSW Planning Portal. These conditions are if –

> *(a) the activity has a capital investment value of more than $5 million, or*
>
> *(b)the activity requires an approval or permit as referred to in any of the following provisions before it may be carried out—*
>
> > *(i) Fisheries Management Act 1994, sections 144, 200, 205 or 219,*
> >
> > *(ii) Heritage Act 1977, section 57,*
> >
> > *(iii) National Parks and Wildlife Act 1974, section 90,*
> >
> > *(iv)Protection of the Environment Operations Act 1997, sections 47–49 or 122, or*
>
> *(c) the determining authority considers that it is in the public interest to publish the review.*

The project requires a Fisheries permit, and therefore Council should publish this REF. In accordance with section 5 of the EP&A Regulation, the REF must be published as follows:

> *a) before the activity commences, or*
>
> *(b) if publishing the review before the activity commences is not practicable—as soon as practicable, and no later than 1 month, after the activity commences.*

It is therefore recommended that Council ensures that the final REF is published as soon as practicable.

Community Engagement

It is recommended that Council engage with local landholders in relation to the proposal during the design phase in relation to proposed design, potential impacts and any access restrictions. Likely impacts are related to traffic and access impacts as well as potential noise and dust emissions. The surrounding land uses are rural, and the closest sensitive receivers to each site are as follows:

- Middle Curradux Creek – dwelling at Lot 2 DP 785205, 1588 Charleys Forest Road, approximately 300 m south of the study area.
- Third Curradux Creek – dwelling at Lot 222 DP 721897, 1385 Charleys Forest Road, approximately 750 m southwest of the study area

It is also recommended that Council consult with emergency services and bus operators in relation to access and detours.

6 ENVIRONMENTAL ASSESSMENT

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment, potentially impacted upon by the proposal, are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act.
- The factors specified in the Guideline for Division 5.1 assessments (DPE, 2022a) and as required under section 171 of the *Environmental Planning and Assessment Regulation 2021*. The factors specified in section 171 of the Environmental Planning and Assessment Regulation 2021 are also considered in **Appendix 2 Consideration of State and Commonwealth Environmental Factors**.
- Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

TERRESTRIAL BIODIVERSITY

This section describes the potential impacts of the proposed works on native vegetation, threatened species, populations and communities listed under the BC Act and EPBC Act, as well as associated habitat features, and to determine appropriate recommendations to mitigate or minimise impacts.

Methodology

6.1.1.1 Desktop review

A review of relevant literature, databases and aerial photography was undertaken prior to conducting the field survey. The list of threatened species and ecological communities returned by the database searches was then used to inform the survey.

- NSW Department of Planning and Environment (DPE) Wildlife Atlas (BioNet) search for threatened species/populations listed under the NSW BC Act previously recorded within 5 km radius around subject site.
- Commonwealth Department of Climate Change Energy, the Environment and Water (DCCEEW) Protected Matters Online Search Tool
- NSW Biodiversity Values Map (BV Map)
- Aerial mapping (SIX Maps and SEED portal)
- 1:25,000 hydro-line data (Natural Resource Access Regulator)
- Department of Primary Industries Fisheries NSW Spatial Data Portal for threatened freshwater fish species
- Key Fish Habitat mapping (NSW DPI)
- Queanbeyan-Palerang Regional LEP and DCP
- Other relevant aerial imagery, mapping or reports.

6.1.1.2 Likelihood assessment

Following the desktop review, a likelihood assessment was conducted for each threatened and migratory species identified during the database search. This assessment applies to the identified study area in Figure 3. This assessment was based on database or other records, presence, or absence of suitable habitat, features of the study area and professional judgement. Five terms for the likelihood of occurrence of species are used in this report, defined below:

- “known” = the species was or has been observed on the site
- “likely” = a medium to high probability that a species uses the site

- “potential” = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- “unlikely” = a very low to low probability that a species uses the site
- “no” = habitat on site and within the study area is unsuitable for this species.

6.1.1.3 Field Survey

The field survey was conducted on 10 January 2025 by Skye O’Brien, QRC’s Senior Environmental Consultant. This involved traversing the full extent of the study area to assess:

- vegetation (including assessment of floristic structure and composition)
- aquatic ecology (including KFH)
- the presence of, or potential habitat for, threatened flora and fauna (including hollow-bearing trees and other important habitat features)
- opportunistic fauna sightings.

Rapid assessments involved describing the vegetation structure, as well as topographic position, soils and any other relevant abiotic factors.

Assessments of the suitability of the available habitat for threatened flora and fauna species included locating any features of importance to threatened biodiversity and recording its location using Avenza Maps Pro. Elements of specific interest included, but were not limited to, hollow-bearing trees, rock outcrops, stick nests, riparian areas and culverts/bridges.

6.1.1.3.1.1 Survey limitations

A targeted survey for threatened flora and fauna species considered likely to occur was not conducted during the field survey. Instead, a habitat assessment was undertaken to determine the suitability of the study area to provide habitat. Noting the habitat features present was considered sufficient to assist in determining whether any threatened species are likely to be present and inform the potential requirements for impact assessments, further targeted survey requirements and/or and pre-clearance surveys prior to works commencing.

6.1.1.4 Impact assessment

This step involves an assessment of potential direct and indirect impacts to threatened and migratory species. If any impacts are determined mitigation strategies will be discussed. Assessments of Significance are undertaken in accordance with the following legislation:

- BC Act for threatened species and/or TECs
- FM Act for threatened species
- EPBC Act for any MNES.

It should be noted that if any impacts are determined to be significant under the EPBC Act a Referral will be required and Species Impact Statement or Biodiversity Development Assessment Report under the BC Act.

Existing Environment

6.1.1.5 Vegetation

6.1.1.5.1 Third Curradux Creek

The vegetation at Third Curradux Creek displays a mix of native and exotic species. Upstream of the causeway, riparian vegetation is dominated by *Imperata cylindrica* (Cogon Grass), *Geranium solanderi* (Native Geranium) and native sedges and rushes. Downstream, vegetation is also dominated by *Imperata cylindrica*, particularly on the southern bank, along with *Lythrum salicaria* (Purple Loosestrife), *Rubus fruticosus sp. agg*. (Blackberry) and some *Myriophyllum papillosum* (Water Milfoil) in the dry bed. Further downstream, *Lomandra*

longifolia (Spiny-head mat rush) and *Pteridium esculentum* (Bracken Fern) occur in patches amongst the *Lythrum salicaria* (Figure 4). The immediate roadside vegetation in the study area is predominantly disturbed, featuring a combination of exotic species including *Lotus corniculatus* (Lotus bird's-foot trefoil), *Trifolium repens* (White Clover) and *Eragrostis brownii* (Common Lovegrass). Moving away from the causeway along the road, vegetation also includes scattered natives such as *Lomandra longifolia*, *Pteridium esculentum* and grasses including *Microlaena stipoides var. stipoides* (Weeping Grass) and patchy *Themeda triandra* (Kangaroo Grass). Structural diversity is minimal within the study area with a sparse midstory layer with occasional Acacia regrowth and no canopy layer present.

Figure 4: Third Curradux Creek downstream vegetation looking south from the northern bank.

6.1.1.5.2 Middle Curradux Creek

The vegetation at Middle Curradux Creek study area is predominantly exotic, with limited structural diversity. Upstream of the causeway, the vegetation includes a mix of exotic grasses and native grasses such as *Microlaena stipoides var. stipoides* (Weeping Grass), *Poa spp* (Tussock). and *Phalaris aquatica* (Canary Grass), as well as *Onopordum acanthium* (Scotch Thistle) with sparse regrowth of juvenile *Acacia* shrubs. Downstream, the banks are stabilised with placed rock and support Acacia shrubs to the south, sedges, and tussock-forming species like Poa. The study area lacks a canopy layer and exhibits very limited midstory growth (Figure 5).

Rubus fruticosus sp. agg. is a declared priority weed species listed within the Southeast Regional Strategic Weed Management Plan 2023 – 2027. Blackberry is a State priority listed in the category of Containment and/or Asset Protection and is widely distributed in some areas of the state. As Weeds of National Significance, their further spread through trade should be minimised to protect priority assets (South East Local Land Services, 2022).

Figure 5: Middle Curradux Creek looking upstream.

6.1.1.6 Plant Community Types

The database search of the State vegetation mapping within SEED (NSW Govt, 2024) identified the following Plant Community Types (PCTs) (Figure 7; Figure 7).

Third Curradux Creek

PCT 3746 Southern Tableland Snow Gum-Candlebark Shrub Forest.

This PCT has no TEC associations. Based on the description below, this PCT was evident surrounding the study area. Along road edges, this PCT likely persists in a degraded form.

A mid-high to tall shrubby sclerophyll open forest to woodland restricted to intermittently damp flats along streams, and adjacent footslopes, in north-east parts of the Southern Tablelands. This PCT is known from Nerriga west to Boro and south to Snowball, and from Mandemar south to Penrose and west to Brayton, with a northern outlier at Hartley. It occurs at elevations of 500-900 metres asl with mean annual precipitation of 650-1050 mm, commonly on sandy-clay alluvium and colluvium derived from sandstone, rhyolite and granitoid substrates. A sparse to mid-dense canopy very frequently includes Eucalyptus pauciflora, commonly with Eucalyptus rubida and occasionally Eucalyptus viminalis. The shrub stratum may be sparse to mid-dense and commonly includes Kunzea parvifolia and Melichrus urceolatus, occasionally Brachyloma daphnoides, Leptospermum myrtifolium, Bossiaea buxifolia or Kunzea ericoides, and rarely Gompholobium minus, Aotus ericoides, Banksia marginata, Daviesia mimosoides or Pultenaea subspicata. A mid-dense ground layer includes a diverse suite of grasses, graminoids, forbs and ferns, commonly including Goodenia hederacea, Hypericum gramineum, Microlaena stipoides, Gonocarpus tetragynus, Themeda triandra, Lomandra longifolia, Hydrocotyle laxiflora, Poranthera microphylla, Pteridium esculentum and Stylidium graminifolium, occasionally with Aristida ramosa, Dianella revoluta, Lomandra filiformis, Senecio prenanthoides or Lomandra multiflora subsp. multiflora. On well-drained flats derived from more fertile substrates this community may be replaced by PCT 3347.

PCT 3737 Bungonia Tableland Scribbly Gum Shrub Forest

This PCT has no TEC associations.

A dry shrubby sclerophyll open forest of shallow soils on rolling low tableland hills, primarily within the Bungonia subregion of the South Eastern Highlands. This PCT is distributed from Cookbundoon Range foothills east to Arthursleigh and Penrose, and south to Larbert and Wog Wog, at elevations of 550-700 metres asl with 650-950 mm mean annual rainfall. This community is strongly associated with moderately infertile sandy clay soils derived from sedimentary rocks, particularly sandstones of the Abercrombie Formation, however also has scattered occurrences on other geologies including other sedimentary, granite and ignimbrite rocks. A mid-high to tall tree canopy is very frequently dominated by Eucalyptus rossii, commonly with Eucalyptus mannifera and/or Eucalyptus dives and occasionally Eucalyptus macrorhyncha. An occasional sparse small tree layer includes scattered Allocasuarina littoralis, and a sparse to mid-dense shrub layer commonly includes Brachyloma daphnoides and Persoonia mollis, with diverse occasional species including Daviesia leptophylla, Gompholobium minus, Melichrus urceolatus, Hakea dactyloides, Aotus ericoides, Hibbertia obtusifolia, Lomatia ilicifolia, Persoonia linearis, Leucopogon virgatus and Xanthorrhoea concava. The sparse to mid-dense ground layer has a suite of tough, wiry plants that very frequently includes Goodenia hederacea, Dianella revoluta and Lomandra multiflora subsp. multiflora, and commonly Gonocarpus tetragynus, Lomandra filiformis, Patersonia sericea, Rytidosperma pallidum, Lomandra obliqua, Lepidosperma gunnii and Entolasia stricta. Occasionally present are Hovea linearis, Opercularia diphylla, Stylidium graminifolium, Microlaena stipoides, Lomandra glauca or Poa sieberiana. On higher rugged hills this community is replaced by PCT 3643, while on gentle footslopes with deeper soils it may grade into PCT 3738.

Middle Curradux Creek

– no adjacent PCT mapping.

6.1.1.7 Threatened Ecological Communities

Threatened Ecological Communities were not identified in the study areas.

6.1.1.8 *Threatened flora species*

The desktop review identified four threatened flora species listed under the BC or EPBC Acts that have been recorded within a 5 km radius of the study area (Figure 8). No threatened flora species were found during field surveys however targeted surveys were not undertaken. The study areas are restricted largely to the disturbed road corridor and are unlikely to impact threatened flora species.

6.1.1.9 *Threatened fauna species*

The desktop review identified a total of four threatened, migratory or marine fauna species listed under the BC and/or EPBC Act that have been recorded within a 5 km radius of the study area, including three bird species and one mammal species (Figure 8). None of these species were observed during the field survey, and habitat does not exist within or adjacent to the study area.

The study area is a narrow corridor and does not contain habitat for the above listed species. The impact area did not contain hollow bearing trees, logs or debris.

6.1.1.10 *Fauna habitat*

The study area contains no suitable habitat for threatened fauna species. Although predominantly exotic, the groundcover vegetation within the study area and particularly along creekbanks is likely to provide habitat for common protected fauna including insects, reptiles, frogs and birds. Mature trees adjacent to or in proximity to the study areas would be protected during construction.

6.1.1.11 *Likelihood of occurrence*

A likelihood of occurrence has been undertaken in Table 5. It is unlikely that the below species occur within the study area. Given the small size of the study areas, disturbed road edges and lack of suitable habitat, assessments of significance have not been undertaken.

Table 5: Likelihood of occurrence

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution / Habitat	Likelihood of Occurrence
^^*Callocephalon fimbriatum*	Gang-gang Cockatoo	E1,P,3	E	Found in tall mountain forests and woodlands during the breeding season (spring/summer), particularly wet sclerophyll forests. In non-breeding season, moves to lower altitudes in open Eucalypt forests and woodlands, box-gum, box-ironbark assemblages, and urban areas. Breeds in tree hollows of Eucalypts at least 9 m above the ground with hollow diameters ⩾10 cm.	No - no habitat identified within the study areas.

Calyptorhynchus lathami lathami	South-eastern glossy Black Cockatoo	V,P,2	V	Dependent on forests and woodlands dominated by Allocasuarina species, which provide essential food resources (cones and seeds). Often nests in large hollows of mature eucalypts. Habitat includes open forests and woodlands.	No - no habitat identified within the study area.
Petroica phoenicea	Flame Robin	V,P		Breeds in upland tall moist Eucalypt forests and woodlands, shifting in winter to lower-altitude dry forests, open woodlands, pastures, and native grasslands. Feeds on small invertebrates on the ground, tree trunks, and logs. Nests are built in sheltered sites like tree cavities or banks, near ground level.	Unlikely - recorded sighting within region; clearing restricted to minimal roadside groundcovers at the crossing. Proposed works unlikely to significantly impact this highly mobile species.
Dasyurus maculatus	Spotted-tailed Quoll	V,P	E	Occurs in forests and woodlands with dense vegetation cover, often near watercourses. Habitat features include hollow-bearing trees, fallen logs, rock crevices, and dense understorey for shelter. Diet consists of small mammals, birds, reptiles, and invertebrates.	Unlikely - no evidence of suitable habitat or species observed within the study area.

Caesia parviflora var. minor	Small Pale Grass-lily	E1		Occurs in grasslands, grassy woodlands, and open forests, often in areas with sandy or gravelly soils. Prefers well-drained soils with low competition from dense understorey.	Unlikely - no suitable habitat identified within the study area.
Dillwynia glaucula	Michelago Parrot-pea	E1		Found in dry sclerophyll forests and woodlands, often in shallow or rocky soils, particularly along ridges or slopes. Associated with sandy or gravelly soils.	Unlikely - no suitable habitat identified within the study area.
Eucalyptus aggregata	Black Gum	V	V	Grows in poorly drained soils along watercourses, swamps, and floodplains. Found in grassy woodlands and open forests, often in cool temperate areas.	No - no suitable habitat identified within the study area.
Grevillea renwickiana	Nerriga Grevillea	E1		Found in heathlands and dry sclerophyll woodlands on rocky outcrops, often on sandstone soils. Endemic to the Nerriga area in southern NSW	No - no suitable habitat identified within the study area.

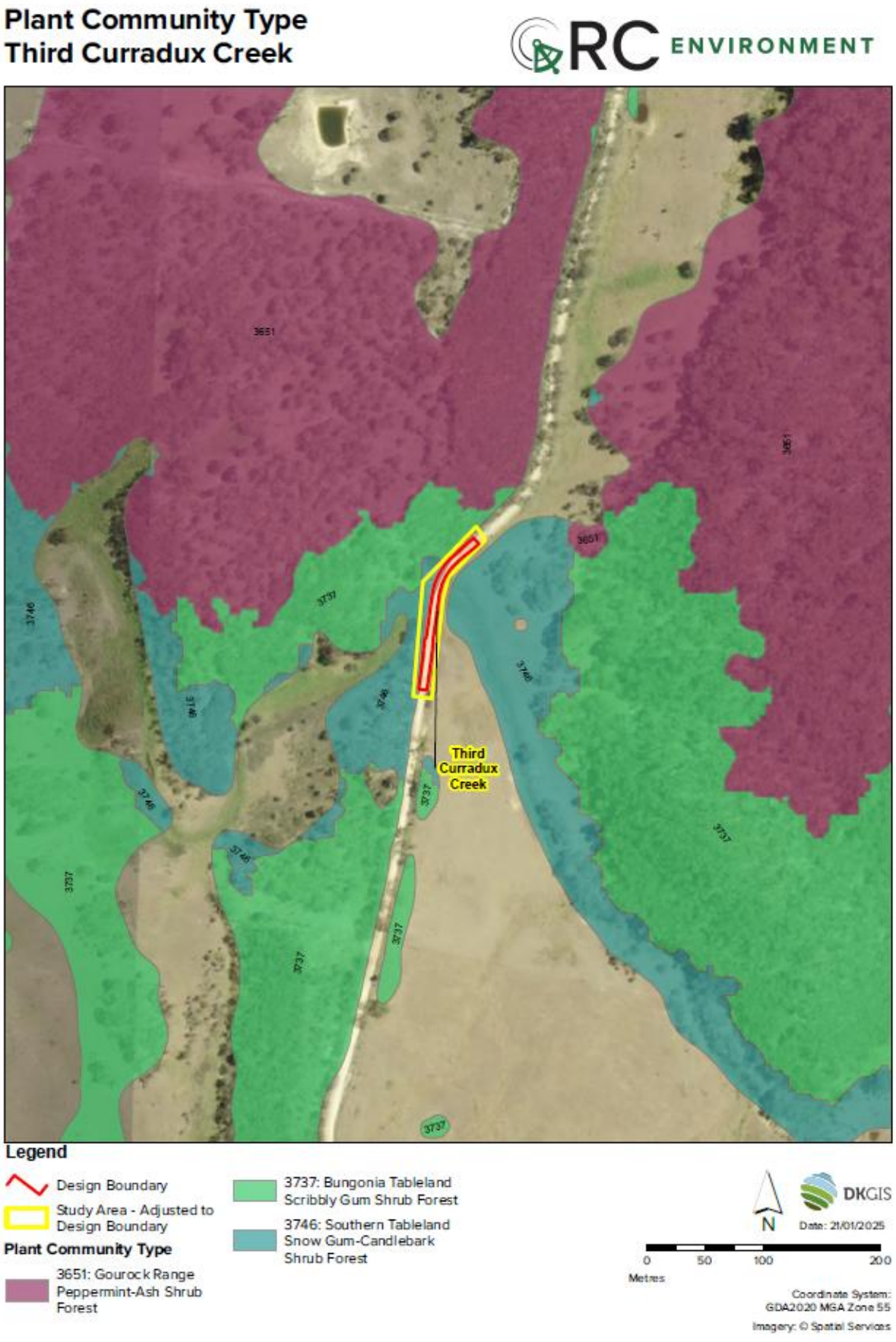

Figure 6: State Vegetation Type Mapping – Third Curradux Creek

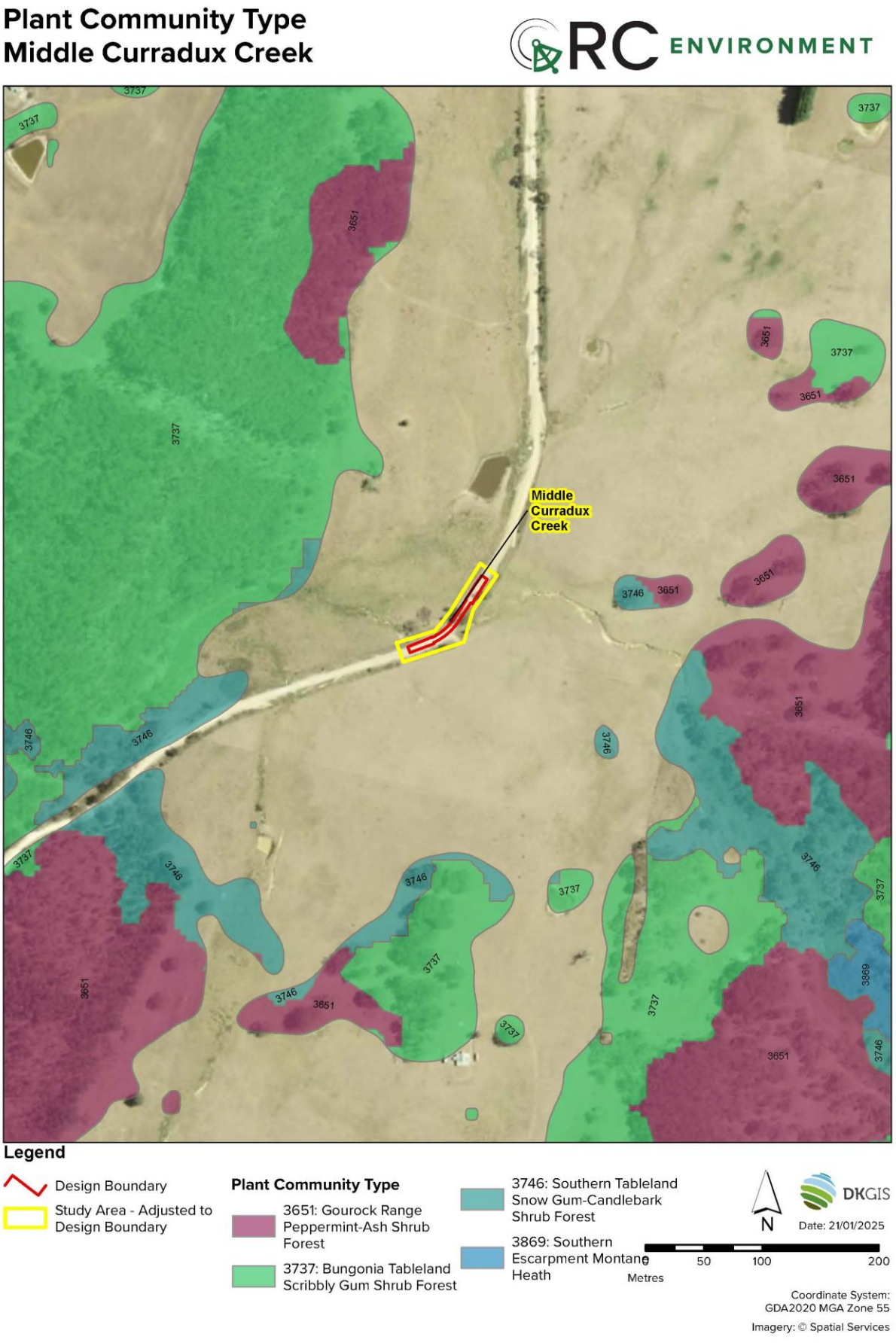

Figure 7: State Vegetation Type Mapping – Middle Curradux Creek

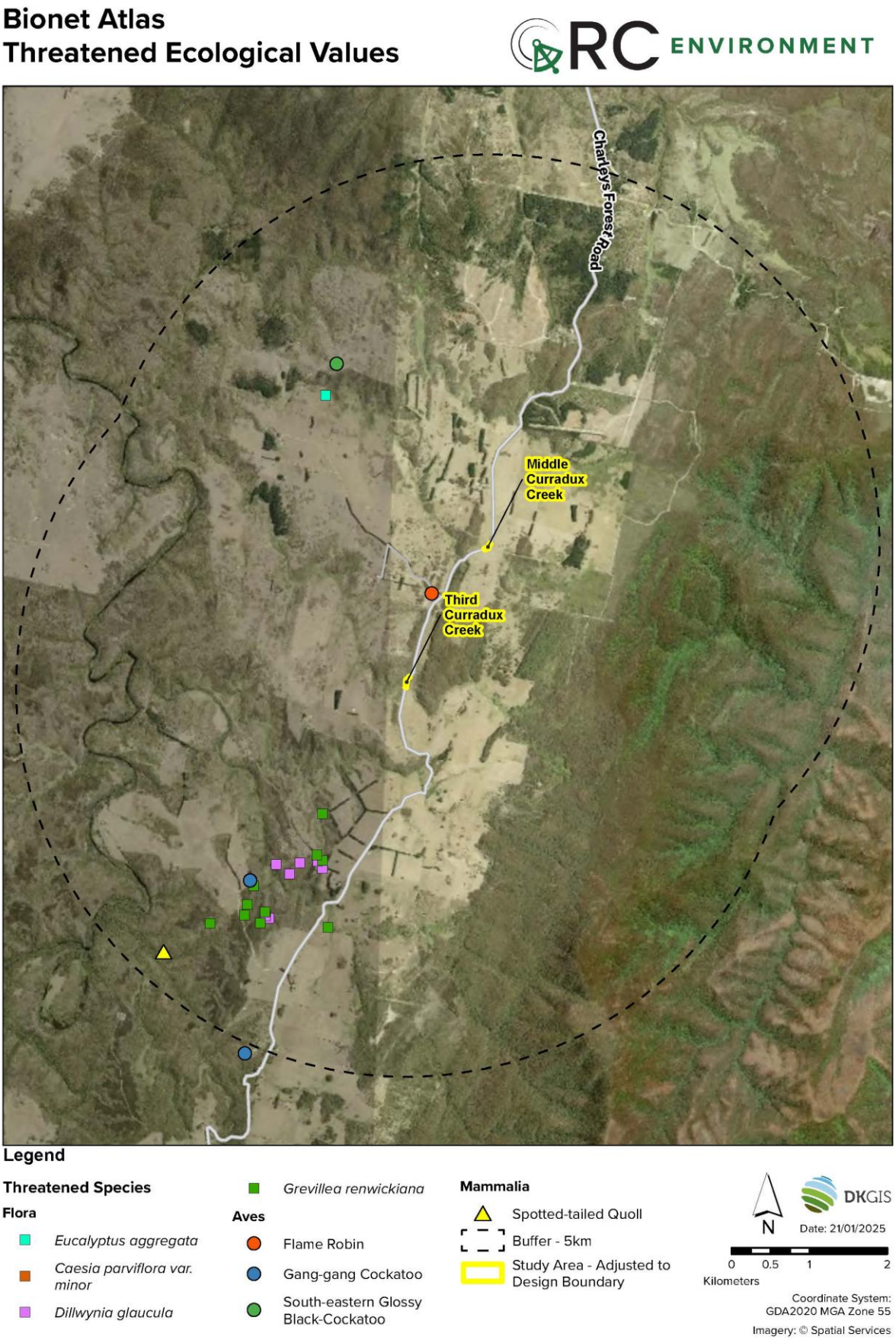

Figure 8: Threatened ecological values identified within 5 km of the study areas

Potential Impacts

6.1.1.12 Construction

6.1.1.12.1.1 Direct impacts

The proposed works are unlikely to result in direct impacts to TECs and threatened flora and fauna. The causeways are not being widened and therefore impacts are restricted to the existing corridor. Direct impacts are likely to be limited to:

- Damage to the stream bed and banks during removal of the existing crossing at Third Curradux Creek and dredging of sediments downstream of the causeway.
- Removal and disturbance to small areas of roadside groundcover vegetation in the immediate vicinity of the causeways.
- Removal of minimal groundcover riparian vegetation downstream of Third Curradux Creek causeway, to a maximum 6 m in length and 4 m width (Figure 14).

6.1.1.12.1.2 Indirect impacts

The following indirect impacts may occur, but are also expected to be managed through the mitigation measures specified in Table 6:

- Further introduction of exotic species
- Trampling of native vegetation for machinery and vehicle access
- Soil compaction
- Increase in surface water runoff, sedimentation and nutrients at both sites during and following construction
- Increase in noise and disturbance to fauna inhabitants in adjacent vegetation.

6.1.1.13 Operation

The works are expected to improve ecological connectivity and fish passage through replacement and upsizing of the existing pipe culvert at Third Curradux Creek. The proposal would also minimise loss of sediments through stabilisation and upgrade to the causeways at both sites.

Mitigation Measures

Table 6: Terrestrial Biodiversity mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
TB1	Threatened species – general	Minimise the extent of disturbance and work within the existing road / crossing corridor only. Material stockpile and equipment storage areas should be restricted to existing disturbed areas and not within the watercourse or riparian zone (minimum 20 m from the watercourse). Ensure workers are informed of exclusion zones at establishment and prestart/toolbox talks. Works must be stopped if any previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required	Contractor	Prior to and during construction

		approvals must be obtained. Works must not recommence until Council has provided written approval to do so.		
TB2	Fauna management – general	Any occupied nests located or any fauna which are inadvertently injured must be reported to Wildcare Queanbeyan or a similar organisation and relocated from the works area by a suitably qualified fauna handler. The CEMP shall include instructions for dealing with orphaned or injured native animals and include the contact details for Wildcare Queanbeyan or the NSW Wildlife Information, Rescue and Education Service Inc (WIRES).	Contractor	Construction
TB3	Rehabilitation	The works area should be rehabilitated / revegetated with native riparian species to ensure bank stabilisation and reinstatement of habitat. Deep rooting species are to be selected, e.g *Lomandra longifolia* Areas exposed in the work footprint including road edges must be planted with native vegetation to ensure bare ground will be stabilised and covered with vegetation.	Contractor	Construction and post construction
TB4	Pathogens and weeds	Wash down equipment and vehicles before and after use, to manage the introduction and spread of pathogens and weed propagules into the surrounding area, and downstream. Priority weed species should be targeted in accordance with the NSW DPI WeedWise recommended control measures. Where priority weeds, weeds of national significance and/or soil contaminated with those species is found onsite, it will be removed from the site in sealed plastic bags and disposed of offsite at an appropriately licensed waste disposal facility.	Contractor	Construction

AQUATIC BIODIVERSITY

Methodology

The assessment involved a desktop review to identify current records of aquatic species and habitat in the study area and surrounding catchment. These included searches of online databases and a review of available spatial data and relevant literature, including the following:

- Review of the FM Act, including determination of KFH
- Potential for the works to impact threatened species under the FM Act have also been considered
- Review of the WM Act and relevant requirements pertaining to Controlled Activity Approval
- KFH Mapping (NSW Fisheries)
- Policy and Guidelines for Fish Habitat Conservation and Management (Fairfull, 2013).

The aquatic environment was inspected during the field survey on the 10 January 2025 to validate desktop findings and describe the condition and characteristics of the creek.

Existing Environment

Both Third and Middle Curradux Creeks are 3rd order waterways and mapped KFH at the study areas, as identified on 1:25,000 topographic mapping. Both sites are at the confluence of 2nd order waterways and therefore at the top of 3rd order waterways (Figure 9).

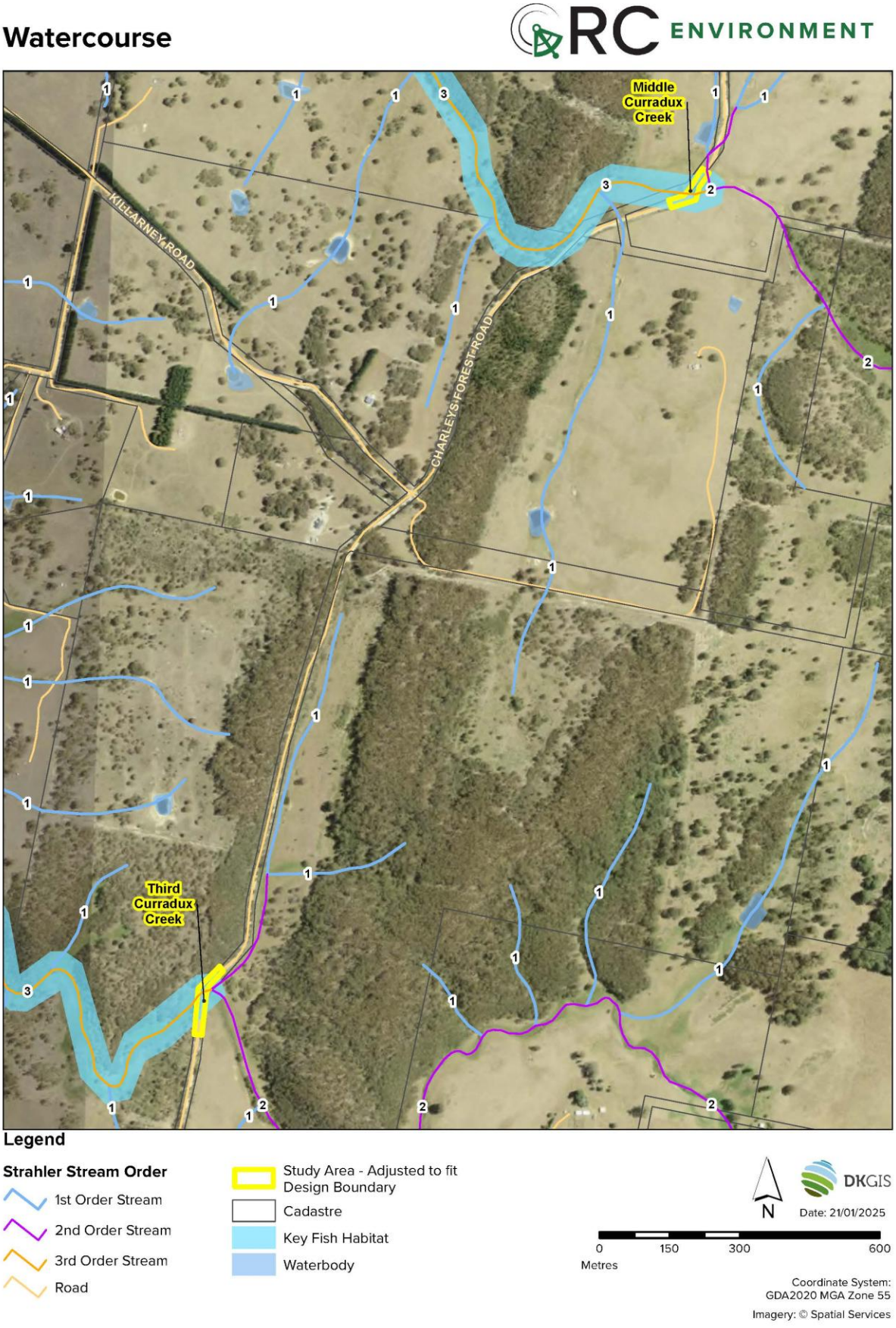

Figure 9: Watercourses

6.1.1.14 Waterway classification

The waterway classification scheme factors in the functionality of the waterway as fish habitat. Following desktop and site inspection, it is conservatively considered that Third and Middle Curradux Creek in the study areas exhibit a waterway classification of *Class 3 – Minimal key fish habitat*. The characteristics of this classification include *'Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for 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 other CLASS 1-3'* (Fairfull, 2013).

6.1.1.15 Habitat sensitivity

NSW DPI Fisheries assesses activity and development proposals with consideration for the 'sensitivity' of the affected fish habitat. In this context, 'sensitivity' is defined by the importance of the habitat to the survival of fish (noting that 'fish' under the FM Act includes all aquatic invertebrates) and its robustness (ability to withstand disturbance). Both Middle and Third Curradux Creeks in the study area locations were conservatively observed to have features associated with a sensitivity rating of *Type 2 – Moderately sensitive key fish habitat*. These features include freshwater habitats supporting native wetland vegetation. Middle Curradux Creek was less sensitive, although does support some native vegetation.

6.1.1.16 Site observations

The aquatic environment of Third Curradux Creek is characterised by its intermittent flow regime. Upstream of the causeway (Figure 10), the creek is approximately 3 metres wide and held water at the time of the survey, though it was turbid due to recent rainfall. Floating pondweed was observed within the channel. Downstream, ponding occurred immediately beyond the existing culverts (Figure 11), but the creek bed further downstream was dry, with a gravel base comprising road base material washed downstream. This sediment buildup is altering natural flow patterns, impeding downstream water movement. No large woody debris, such as logs or snags, were observed in the channel either upstream or downstream.

Middle Curradux Creek featured ponding water both upstream and downstream of the existing crossing at the time of the survey, although turbidity was noted due to the recent rainfall. The downstream section is reinforced with placed rock along the northern bank and instream concrete, and the presence of ponding water suggests localised hydrological disruption (Figure 12). Riparian vegetation along the downstream banks provides some stabilisation but is sparse, with so habitat features such as snags or large woody debris observed within the watercourse.

Figure 10: Third Curradux Creek - upstream of the crossing, taken from existing crossing.

Figure 11: Third Curradux Creek - downstream of the crossing, looking upstream

Figure 12: Middle Curradux Creek - downstream of the crossing, looking upstream

Figure 13: Middle Curradux Creek – road approach looking south.

6.1.1.17 Threatened species

The desktop review identified no threatened species or ecological communities listed under the FM Act that have the potential to occur within a 5 km radius of the study area.

Potential Impacts

6.1.1.18 Construction Phase

The proposed works at Middle and Third Curradux Creeks aim to improve flood resilience, enhance water flow, and facilitate aquatic connectivity. While the upgrades are designed to mitigate long-term impacts on the environment, construction activities may result in temporary and localised impacts on aquatic habitats.

Third Curradux Creek

At Third Curradux Creek, the works include replacing the existing triple 600 mm culverts with quad 750 mm reinforced concrete pipes (RCPs). This upgrade will significantly enhance flow capacity, reduce sedimentation, and prevent debris buildup, improving fish passage and hydrological connectivity. Additional works include dredging downstream of the outlet to remove accumulated sediment over no more than a 6 m long and 4 m wide area and to a maximum depth of 0.6–0.7 m depth within the existing creek bed, reshaping and stabilising the banks with rock armouring, and establishing a permanent pond to enhance aquatic habitat. Vegetation replanting using native species such as *Lomandra longifolia* will occur along the disturbed areas, contributing to long-term bank stability and habitat restoration. Figure 14 identifies the location of instream dredging and adjacent rehabilitation areas.

Temporary impacts during construction include potential sediment runoff, streambed disturbance, and obstruction of flow. A comprehensive water management plan, including dewatering strategies, will be implemented to minimise disruptions. Construction activities will be confined within the road reserve and existing disturbance zones to avoid impacts on undisturbed areas.

Middle Curradux Creek

At Middle Curradux Creek, the works primarily involve retaining the existing 600 mm culvert, reconstructing the causeway with a 4.5 m wide concrete surface, and installing additional scour protection. The causeway will be designed with a 1% crossfall and a lower profile, ensuring minimal disruption to water flow while preventing future sedimentation and debris accumulation. Removal of the existing concrete slab downstream will be followed by placement of large, interlocked flood rocks for armouring. This will stabilise the creek bed and banks, preventing further erosion and maintaining aquatic habitat integrity.

Construction activities will not extend beyond the road reserve or involve direct disturbance of the creek bed, minimising impacts to aquatic habitats. Dewatering and erosion controls will be implemented as part of the Construction Environmental Management Plan (CEMP).

Potential construction impacts include the following:

- Erosion and sediment runoff into the creeks may degrade water quality and harm aquatic species.
- Use of heavy machinery may cause localised damage to the creek bed and banks.
- Temporary waterway blockages during construction may impede downstream aquatic connectivity.
- Accidental spills from construction equipment may contaminate the waterway.

The temporary obstruction of fish passage at Third Curradux Creek during construction would be mitigated by scheduling works during low flow or dry periods. Fish passage would be restored immediately after construction, with the upgraded design facilitating better movement for aquatic species.

Figure 14: Third Curradux Creek – instream works, downstream

6.1.1.19 Operation Phase

Post-construction, the upgraded crossings are expected to enhance aquatic habitat conditions. At Third Curradux Creek, the increased culvert capacity and permanent pond at the outlet will support better water flow, reduce sedimentation, and improve aquatic species movement. At Middle Curradux Creek, the stabilised banks, scour protection measures and enhancement of downstream pooling, will reduce erosion and sediment transport, maintaining water quality.

The upgraded designs, including road surface improvements and sediment control measures, will reduce the risk of future flooding and hydrological disruptions, providing long-term benefits to aquatic ecosystems. Regular maintenance will ensure continued functionality and minimal operational impacts on aquatic habitats.

Mitigation Measures

Table 7: Aquatic Biodiversity mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
AB1	Direct impacts on aquatic fauna – dewatering	Prepare a Dewatering Management Plan in line with DPI Fisheries guidelines. Engage a qualified aquatic ecologist to relocate fish and other aquatic fauna upstream during appropriate seasonal windows.	Contractor	Prior to Construction
AB2	Indirect impacts on aquatic fauna – decreased water quality	Develop a CEMP addressing pollution, contamination, and erosion. Implement sediment controls per the "Blue Book" and monitor daily. Stabilise exposed banks using geofabric, coir logs, and jute matting.	Contractor or Council	Prior to construction
AB3	Impacts on aquatic fauna and habitat – general measures	Visually inspect the waterway during works for any signs of fish kill (fish gasping, or crowding) and immediately reported to DPI Fisheries contact officer. Do not extract water from the creek for dust suppression or construction purposes. All temporary works, flow diversion barriers and in-stream sediment control barriers must be removed as soon as practicable and in a manner that does not promote future channel erosion. Works are to be undertaken during times of no or low flows and when the Bureau of Meterology forecast for Rossi indicates several days of dry weather. Avoid harm to riparian vegetation outside of the work footprint by implementing appropriately delineated no-go areas.	Contractor	Construction

		No removal of snags, large woody debris or trees and shrubs is permitted. Ensure all machinery and equipment are cleaned of soil and plant material before arriving on-site to prevent the introduction of invasive species		
AB4	Rehabilitation	Rehabilitate disturbed areas with deep-rooted native vegetation (e.g., *Lomandra longifolia*). Monitor rehabilitated areas quarterly for two years to ensure plant establishment and stabilisation.	Contractor	Construction post construction

HYDROLOGY AND WATER QUALITY

Existing Environment

6.1.1.20 Catchment and location

The study areas are located within the Shoalhaven River catchment, one of the significant catchments in New South Wales. The Shoalhaven catchment includes a variety of land uses, from conservation and grazing to rural residential and small agricultural properties. Middle and Third Curradux Creeks are third-order streams under the Strahler classification, feeding into the Mongarlowe River downstream.

These creeks are ephemeral, typically flowing during and after rainfall events, and serve as important contributors to local hydrological connectivity. They provide ecological linkages between upland national parks to the east (including Deua and Monga National Parks) and the Shoalhaven River system, which ultimately drains towards the coast. The surrounding area consists of gently undulating low hills and riparian corridors, with predominantly grazing land and patches of native vegetation.

6.1.1.21 Water quality

Limited site-specific water quality data is available for Middle and Third Curradux Creeks. However, observations suggest that the streams are subject to intermittent flow, which may lead to sediment accumulation in lower-energy sections of the watercourse. Potential existing impacts on water quality include:

- Sediment deposition from upstream erosion and unsealed road surfaces near the crossings.
- Nutrient inputs from grazing activities in the surrounding land.

No data indicates the presence of significant water pollution or eutrophication, but ongoing management of sediment and runoff is necessary to maintain downstream water quality.

6.1.1.22 Flooding and drainage

Both creeks are subject to periodic flooding during high rainfall events, contributing to erosion, sediment transport, and loss of headwalls or gravel washouts near the existing crossings. Historical drainage and causeway designs have insufficient capacity to handle peak flows, leading to localised flooding and structural damage. Proposed upgrades aim to address these drainage limitations and improve flow conveyance.

Potential Impacts

6.1.1.23 Construction

Construction activities have the potential to impact hydrology and water quality within the study areas and downstream. Key risks include:

- Soil disturbance, grubbing of groundcover vegetation and earthworks may increase sediment loads entering the creeks, reducing water clarity and potentially smothering aquatic habitats.
- Accidental spills of fuel, oils, or other petrochemicals from machinery could contaminate surface water.
- Clearing of riparian vegetation for access and construction may reduce streambank stability, contributing to erosion and sedimentation.
- Poorly managed stockpiles or construction materials could be transported into waterways by wind or runoff.
- Temporary construction measures such as coffer dams and dewatering may disrupt natural flow patterns.

These impacts could reduce aquatic ecosystem health, affecting sediment transport, water temperature regulation, and aquatic habitats downstream.

6.1.1.24 Operation

The proposals would likely have long-term positive effects on hydrology and water quality. Improvements include:

- Replacing inadequate culverts with larger capacity RCPs and stabilising creekbanks will reduce flooding frequency and associated sedimentation.
- Formalising the road surface and improving erosion controls will limit sediment loss from vehicle traffic and unsealed surfaces.
- Improved drainage infrastructure will better handle peak flows, reducing scouring and protecting downstream habitats.

However, increased impervious surfaces from widened and sealed roads may lead to higher volumes and velocities of stormwater runoff, potentially causing localised scouring. Appropriate drainage design will mitigate these impacts.

Mitigation Measures

Table 8: Hydrology and water quality mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
HWQ1	Erosion and sediment controls	All safeguards in Soils, ESC1 to ESC4 shall be implemented to migate impacts to water quality and waterways from erosion and sedimentation.	Contractor	Construction, Post-construction
HWQ2	Aquatic environments	Works are to be undertaken during times of no or low flows and when the Bureau of	Contractor/Council	Prior to construction

		Meterology forecast for Charleys Forest indicates several days of dry weather. Avoid harm to riparian vegetation outside of the work footprint by implementing appropriately delineated no-go areas. No removal of snags, large woody debris or trees is permitted. Visually inspect the waterway during works for any signs of fish kill (fish gasping, or crowding) and immediately reported to DPI Fisheries contact officer. Minimisation of disturbance to soil and water adjacent to, and within, all watercourses in the works area. Location of construction compounds (at least 20 m from any drainage lines). Location and management of stockpiles, such as locating stockpiles away from any drainage lines near the works areas.		
HWQ3	Spills & water quality	Adequate procedures will be established and detailed in the CEMP, including notification requirements to the DPE, for incidents that cause material harm to the environment. Any hazardous materials stored on site will be stored in the compounds and within impervious and bunded enclosures capable of storing 120% of the volume of material stored there. If machinery enters the watercourse it must be done so in accordance with the Fisheries permit, and be cleaned, degreased and appropriately serviced prior to works. Emergency spill kits are to be kept at the site (vehicle kits).	Contractor	Construction

		No refuelling of plant or machinery within 50 m of the waterway. No storage of fuels on site. Storage of any fuels, oils or other chemicals must be minimum 20 m from the waterways and appropriately bunded. Workers will be trained in the spill management plan and the use of the spill kits. To control substance leak: • Conduct prestart checks. • Do not operate plant if leak is detected. • Inform Project Manager if leak, spill or escape occurs.		
HWQ4	Flooding	In the event of flooding, works in affected areas will cease during flood events and will not commence until floodwaters have receded. Weather forecasts will be checked regularly 12 hourly (as a minimum) so that equipment and materials in flood areas can be secured prior to heavy rainfall events. As part of the CEMP a flood contingency plan will be prepared documenting procedures and actions to be taken in the event of high flows or flooding during construction works.	Contractor	Construction

Aboriginal Cultural Heritage

The following section regarding Aboriginal heritage has been conducted in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (hereafter referred to as 'CoP') (DECCW 2010). This due diligence process aims to determine whether Aboriginal objects will be harmed by the proposed works, as required under Part 6 of the NPW Act. The CoP sets out the reasonable and practicable steps which individuals and organisations need to take to:

- Identify whether or not Aboriginal objects are, or are likely to be, present in an area.
- Determine whether or not their activities are likely to harm Aboriginal objects (if present); and,
- Determine whether an Aboriginal Heritage Impact Permit (AHIP) from Heritage NSW or further assessment is required.

Existing Environment

The following table outlines the steps as per the CoP due diligence process.

Table 9: Code of Practice – generic due diligence process

Steps	Assessment for site
1. Will the activity disturb the ground surface or any culturally modified trees?	The proposed works will result in no disturbance of areas not subject to previous disturbance associated with the existing causeways crossings and road construction and maintenance. • Third Curradux Creek Downstream of the crossing, dredging of washed out road base and gravel would be required. This area is shown on the design plans in Appendix 1 Design plans and has been maintained in the past. Further, the existing road width of 6 m will be maintained with no widening of the road and causeway is proposed. • Middle Curradux Creek Instream dredging works are not required. The existing road width of 4.5 m will be maintained with no widening proposed. No culturally modified trees will be impacted by the proposed works.
2a, 2b. Search the AHIMS database and any other relevant sources of information. **c. Determine if the activity is in area where landscape features indicate the presence of Aboriginal objects. According to the Due Diligence Code of Practice (DECCW 2010a), archaeologically sensitive landscapes can include areas:** **- Within 200m of waters; or** **- Located within a sand dune system; or** **- Located on a ridge top, ridge line, headland; or**	A, b) AHIMS Database Search An extensive search of the AHIMS database, which is maintained by Heritage NSW and regulated under Section 90Q of the NPW Act, was conducted on 21 January 2025 to identify if any registered Aboriginal sites were present within, or adjacent to, the study area. The search resulted in the identification of 0 Aboriginal sites within the vicinity of the study area. The AHIMS search results are presented in full in Appendix 4. No sites have previously been recorded as being within or in proximity to the study area.

- Located within 200m below or above a cliff face; or **- Within 20m of or in a cave, rock shelter, or a cave mouth and is on land that is not disturbed land.** **The Due Diligence Code of Practice (DECCW 2010a:18) defines disturbed land as areas that have any land that:** **"Has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable. Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks."**	Heritage Database Search Searches of the Australian Heritage Database, State Heritage Inventory (SHI) and the LEP were conducted on 9 January 2025 to determine if any places of archaeological significance were located within the study area. No Aboriginal archaeological sites or heritage items were recorded on these databases as being within the study area. c) The study areas are located within 200 m of waters. Watercourses are recognised as archaeologically sensitive landscape features due to their potential to support past and present Aboriginal use and occupation. Waterways often provided essential resources, including water, food, and materials for tool-making, and were critical for travel and cultural practices. In this context, the study areas meet the criteria for an archaeologically sensitive landscape. However, the specific land within the study areas can be considered disturbed land under the Code, as the sites have been modified through prior infrastructure construction, including the existing causeways, culverts, associated road alignments and previous mainteinance within the road reserve. These prior activities have likely altered the natural land surface, reducing the likelihood of intact Aboriginal objects remaining within the immediate footprint of the proposed works.
3. Can you avoid harm to Aboriginal objects listed on AHIMS or identified by other sources of information and/or disturbance of the landscape feature?	The proposed study area does not contain any sensitive archaeological features, and no Aboriginal sites are expected to be harmed by the proposed works. However, while prior roadworks and causeway construction have modified the land, areas adjacent to or beyond the immediate disturbance zones, particularly up and downstream, may still retain undisturbed and archaeologically significant deposits.
4. Does the desktop assessment/visual inspection confirm the presence of Aboriginal objects, or indicate the likelihood or Aboriginal objects being present?	The desktop assessment has identified that the study area has been disturbed in relation to the existing crossings, vehicular movements and grading of Charleys

	Forest Road, indicating a low to nil potential for intact subsurface archaeological deposits in the study areas. Visual inspection undertaken on the 10 January 2025 confirmed the extent of disturbance (noting this was not an inspection undertaken by an archaeologist).
5. Further investigation and impact assessment.	Aboriginal objects are unlikely to be present in the study area and the proposed works will not impact known sites and objects. As such, no further assessment is required and mitigation measures will be required to ensure no harm will occur to unexpected finds, and works can proceed with caution.

Mitigation Measures

Table 10: Aboriginal cultural heritage safeguards and mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
AH1	Discovery of Unidentified Aboriginal cultural material during works.	Under the NPW Act 1977 all Aboriginal places and objects are protected from harm, even if they have not been previously identified during the assessment process. If Aboriginal material is discovered during works then the steps as outlined below should be followed: • All work must cease in the vicinity of the find and project manager notified immediately. • A buffer zone of 10m should be fenced in all direction of the find and construction personnel made aware of the 'no go' zone. • NSW Heritage must be notified of the find and advice sought on the proper steps to be undertaken. • After confirmation with NSW Heritage a heritage consultation should be engaged to undertake assessment of the find and provide appropriate management recommendations to the proponent.	Contractor	Construction

AH2	Discovery of Human Remains	In the highly unlikely event that human remains are discovered during any construction work, than all activity in the vicinity of the find must cease. As a first step the local police must be notified, followed by NSW Heritage and advice sought on appropriate next actions. No work can continue on the site until cleared with police and NSW Heritage.	Contractor	Construction

NON-ABORIGINAL HERITAGE

Methodology

Heritage items can also be of 'state significance' in which case they are listed on the NSW Heritage Register by the NSW Heritage Council under the *Heritage Act 1977*. These items are usually substantial and consist of buildings, bridges or other structures that represent events in the local area. Searches of the Australian Heritage Database, Commonwealth Heritage List, Section 170 Heritage and Conservation Register, State Heritage Register (SHR) and the LEP were conducted on the 9 January 2025 to determine if any places of historic heritage area located within or in proximity to the study area.

Existing Environment

While specific historical events or notable landmarks in Charleys Forest are not extensively documented, the area's history is likely intertwined with the broader development of the Southern Tablelands region, known for its agricultural heritage and rural lifestyle. The closest item is the Bentleys Point Mining Site, Listing No. I5, listed on the Queanbeyan Palerang LEP as being of local significance. The curtilage of the item is over Lots 26, 100 and 191, DP 755949, located approximately 4 km west of the study areas and will not be impacted by the proposed works.

Potential Impacts

The proposed works have not been identified as having the potential to impact any historical heritage items or areas of historical archaeological significance. Table 11 outlines general mitigation measures in the event unexpected archaeological finds / relics are uncovered during the proposed works

Mitigation Measures

Table 11: Non-Aboriginal heritage safeguards and mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
HH1	Non-Aboriginal heritage	In accordance with Section 146 of the *Heritage Act 1977*, if an archaeological relic (such as a deposit, feature, or artefact) is uncovered during works, work must cease in the affected area and Heritage NSW must be notified. Further advice and consultation would be required, and approvals may be required from Heritage NSW under	Contractor	Construction

	delegation regarding any relics, should they be discovered during works. Stop work if human remains are found and contact NSW Police. If remains are suspected to be Aboriginal, Heritage NSW must be notified as well.	

SOILS

Existing Environment

6.1.1.25 Topography

The landforms within the study area consist of gently undulating low hills, shallow valleys and riparian corridors that define the landscape. Water sources are present in the form of Middle and Third Curradux Creeks. Elevations in the area generally range between 600 and 800 metres above sea level.

The study areas themselves are situated within the road reserve of Charleys Forest Road, which traverses these low-lying valleys and creek crossings. The topography in the immediate vicinity of the proposals consists of gentle slopes that drain into the creek corridors except for downstream Third Curradux Creek which is at the base of a steep vegetated slope. Middle Curradux Creek features a relatively stable channel with limited downstream erosion, whereas Third Curradux Creek has experienced more significant impacts from flooding, including gravel washout and stone headwall loss. These localised landform characteristics directly influence the design and management considerations for the proposed upgrades.

6.1.1.26 Soil Landscapes

The study areas are located in the Bungonia subregion of the NSW South Eastern Highlands Bioregion (IBRA7). Greater Soil Group mapping maps the following soil types within and adjacent to the study areas (Figure 15):

- Third Curradux Creek – Soloths
- Middle Curradux Creek – Soloths and Yellow Podzolic Soils upstream

Soloths are acidic soils with a bleached subsurface layer and typically occur in areas with poor drainage. These soils are prone to waterlogging and are often found in lower-lying areas or gentle slopes. Soloths can be highly dispersive, making them susceptible to erosion when disturbed, especially under wet conditions.

Yellow Podzolic Soils: Yellow Podzolic Soils are acidic, well-drained soils with a characteristic yellow subsurface horizon caused by the accumulation of iron oxides. These soils are commonly found in undulating landscapes and are moderately fertile, supporting vegetation adapted to acidic conditions. However, they are vulnerable to erosion on slopes if vegetation is removed.

Both soil types highlight the need for effective erosion and sediment control measures during construction activities, particularly near waterways and on disturbed slopes. These considerations should be incorporated into the proposal's soil and water management plans.

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Figure 15: Greater Soil Groups in the study areas

6.1.1.27 Acid Sulfate Soils

A review of the Acid Sulphate Soil Risk Maps indicate that ASS have not been mapped within or in proximity to the study area. This spatial dataset identifies areas of land, that when exposed or drained becomes oxidised causing sulphuric acid to be produced.

6.1.1.28 Contaminated Land

A search of the contaminated land record (NSW EPA, 2025) for the Queanbeyan-Palerang Council LGA conducted on the contaminated land sites register maintained by the NSW EPA under the *Contaminated Land Management Act 1997* identified no contaminated land sites within a 10 km radius of the study area.

Potential Impacts

6.1.1.29 Construction

The proposed works have the potential to introduce contaminants to soils via construction machinery. These include hydrocarbons, lubricants, oils, or other chemical pollutants, particularly at the site compound where vehicles, machinery, and other equipment may be stored. Spillage, dust, or leachate, and water containing biological contaminants such as nutrients and bacteria, are also potential sources of soil contamination.

The works are unlikely to disturb acid sulfate soils, which are not mapped for the area. Additionally, the works are not proposing to impact factors that are likely to change salinity levels, such as altering water tables; and no mapped areas of salinity occur in the study area or its vicinity.

Overall, short-term risks to soils would be small and localised. Known mitigation strategies are considered highly likely to adequately address these risks. Stabilisation and revegetation would act to resist soil erosion following construction.

6.1.1.30 Operation

Operational impacts on soils beyond those occurring during the construction phase are not anticipated, provided that the impact area is stabilised and rehabilitated post-construction.

Mitigation Measures

Table 12: Soil mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
ESC1	Installation of erosion and sedimentation controls	Implement erosion and sediment control (ESC) measures in accordance with the CEMP and the guidelines outlined in the 2008 Landcom publication Managing Urban Stormwater: Soils and Construction, 4th edition ("The Blue Book"). Ensure site access is stabilised to reduce tracking of sediment off-site, with approaches kept free of dust during works.	Contractor	Construction

		Minimise the extent of disturbed areas by completing works in the shortest possible timeframe. Cover loads of soil and other erodible materials during transportation and keep them covered until unloading for use or disposal at an appropriate waste facility. Immediately clean up and remove any spills of soil or other erodible material on sealed access routes or roadways. Divert surface runoff away from sensitive areas, stockpiles, and erodible materials. Keep vehicles in designated areas both when in use and parked. Schedule works when adverse weather conditions are not forecast. Stockpile out of the corridor		
ESC2	Erosion and Sediment Controls – Third Curradux Creek	Install small bund/coffer dam on the inlet to capture water and then pump or pipe it 'clean water' around the site. Place geofabric on disturbed embankments overnight when rain is forecast. Temporary stockpiles located within 20 m of the creek will have two levels of controls implemented, i.e. silt fence, bunding.	Contractor	Construction
ESC3	Maintenance of erosion and sedimentation controls	Stop work during and after heavy rainfall to reduce the risk of mobilising sediment. Inspect erosion controls regularly (daily during workdays) and after significant rainfall. Fix damaged controls immediately and remove accumulated sediment or waste material from within the sediment controls regularly.	Contractor	Construction
ESC4	Stabilisation	Stabilise exposed banks and earthworks to prevent erosion before vegetation or rock armour is established. This would include placing geofabric on bare soil beneath rock	Contractor	Construction; Operation

	armour, coir logs along drainage lines and jute matting on proposed planting areas. Erosion and sediment control measures are not to be removed until the work is complete, and areas are stabilised. Stabilisation of disturbed areas shall commence as soon as possible after the areas have been disturbed. Revegetate bare areas of the bank and riparian corridors with native and deep rooted riparian species, to stabilise the soil and prevent additional sediment from entering the creek.	

NOISE AND VIBRATION

Existing Environment

The study area is in a rural setting characterised by low ambient noise levels typical of sparsely populated agricultural areas. Background noise in the area primarily originates from natural sources such as wind, birds, and occasional vehicle movements along Charleys Forest Road, which is unsealed and lightly trafficked.

The closest sensitive receivers to the study area are:

- Middle Curradux Creek: A dwelling at Lot 2 DP 785205, 1588 Charleys Forest Road, approximately 300 m south of the study area.
- Third Curradux Creek: A dwelling at Lot 222 DP 721897, 1385 Charleys Forest Road, approximately 750 m southwest of the study area.

These residences may experience occasional noise impacts from light and heavy vehicle traffic on Charleys Forest Road. However, given the rural nature of the locality, overall noise levels are generally low, and there are no existing vibration sources of significance.

Potential Impacts

6.1.1.31 Construction

6.1.1.31.1.1 Noise

Construction activities are expected to generate temporary noise impacts from the operation of plant and machinery, vehicle movements, and earthworks. Noise sources may include:

- Excavators, graders, and compactors.
- Delivery trucks transporting materials to and from the site.
- Light vehicles for personnel access.

While noise impacts are anticipated to be temporary and limited to standard work hours, nearby sensitive receivers, particularly the residence at 1588 Charleys Forest Road, may experience short-term disturbances during periods of high-intensity construction.

6.1.1.31.1.2 Vibration

Vibration levels during construction will vary depending on the activity and equipment used. Equipment such as compactors, vibratory rollers, and heavy trucks may generate vibration during certain activities. However, given the distance of the sensitive receivers (300 m and 750 m) from the worksites, the risk of vibration impacts, such as structural damage or human disturbance, is considered negligible.

6.1.1.32 Operation

Once the proposals are complete, operational noise levels are expected to improve. The upgraded crossings and road surface will result in a smoother ride, reducing noise generated by vehicles traversing the crossings.

Mitigation Measures

Table 13: Noise and vibration mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
NV1	Hours of work	Construction work to be carried out during standard hours: • Monday to Friday: 7:00 am to 6:00 pm • Saturday: 8:00 am to 1:00 pm • No work on Sundays or public holidays. Any work outside these hours will require approval, notification, and a management plan.	Contractor	Construction
NV2	Management of machinery	Turn off vehicles and machinery when not in use to prevent idling noise. Maintain all equipment and machinery to meet Australian noise attenuation standards. Fit all equipment with noise-muffling devices and maintain documentation of servicing.	Contractor	Construction
NV3	Site layout	Plan the site layout to locate noisy equipment and activities away from sensitive receivers where practical. Minimise reversing of machinery near sensitive receivers to reduce noise impacts	Contractor	Construction

NV4	Consultation and notification	Notify neighboring residents about construction activities and potential noise impacts before works commence. Provide a mechanism (e.g., signage with contact information) to receive and respond to noise complaints promptly. Maintain a complaints register and implement noise monitoring if triggers are exceeded	Contractor; Council	Pre-construction and Construction

AIR QUALITY

Existing Environment

The study area is in a rural setting surrounded by farmland and large-lot rural properties. Air quality in the locality is generally expected to be good due to low population density and natural forested surroundings. However, localised dust is generated by unsealed sections of Charleys Forest Road, particularly under dry and windy conditions or with increased vehicle use.

Other minor sources of air pollutants in the area include emissions from motor vehicles, agricultural activities (e.g., ploughing, harvesting, and slashing), and seasonal smoke from domestic fireplaces or hazard reduction burns. These are sporadic and have a limited impact on the overall air quality.

Potential Impacts

6.1.1.33 Construction

The sensitive receivers are unlikely to experience impacts from dust and emissions during construction given the small study area and scope of work and short time period for exposed ground. However, short term temporary impacts from dust and emissions during construction may occur, particularly if wind conditions carry particulates towards these locations. These impacts may result from:

- Movement of construction vehicles and machinery to and from the site.
- Uncovered loads of transported materials.
- Unloading and placement of construction materials.
- Aeolian transport from stockpiles during dry and windy conditions.

Exhaust emissions from diesel-powered construction equipment and idling vehicles due to temporary road closures or traffic controls may also contribute to localised air quality impacts. However, these emissions are expected to be negligible compared to background emissions from agricultural activities and other existing sources.

6.1.1.34 Operation

The operational phase of the proposals is anticipated to improve air quality at the study areas through formalising the existing gravel road approaches and causeways, stabilising exposed earth, and rehabilitating disturbed areas.

Mitigation Measures

Table 14: Air quality mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
AQ1	Dust emissions	Cover all transported materials to minimise dust emissions. Water work areas as necessary, especially during dry and windy conditions. Suspend dust-generating activities during high-wind periods.	Contractor	Construction
AQ2	Exhaust emissions	Turn off equipment when not in use to prevent unnecessary idling. Maintain all vehicles and equipment in accordance with manufacturer specifications to ensure efficient operation Implement traffic controls to minimise stationary idling vehicles in accordance with the Traffic Management Plan.	Contractor	Construction

SOCIO-ECONOMIC

Existing Environment

The study areas are situated within the rural locality of Charleys Forest, northeast of Braidwood, with nearby localities including Mongarlowe and Wog Wog. The area is sparsely populated and characterised by small-scale agricultural operations and rural residential properties.

Braidwood, approximately 20 km southwest of the study area, is the primary service hub for the region. As of the 2021 Census, Braidwood has a population of 1,743 and provides essential services, schooling, and supplies for the surrounding rural communities. Residents of Charleys Forest and neighbouring localities are highly dependent on Charleys Forest Road for connectivity to Braidwood, Nerriga Road, and other destinations. Local travel is almost entirely reliant on private vehicles due to the absence of public transport in the region.

Potential impacts

6.1.1.35 Construction

The construction phase of the proposals may result in temporary, negative socio-economic impacts, including traffic delays and inconveniences, noise, air quality and visual amenity impacts, however there are also potential economic benefits during the construction phase. Local businesses may benefit from the contracting of local suppliers and service providers for materials, equipment, or labour may support the regional economy.

6.1.1.36 *Operation*

The proposals are expected to provide long-term, positive socio-economic benefits, including improved road safety and access, reduced maintenance costs for Council and enhanced resilience to flooding. No negative socio-economic impacts are anticipated during the operational phase.

Mitigation Measures

Table 15: Socio-economic safeguards and mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
SE1	Community Consultation	Community consultation particularly with affected neighbours is to be carried out prior to construction commencing. Early notification / advertisement of the construction period through both local and regional channels.	Contractor, Council	Prior to construction
SE2	Complaint Management	Complaints received are to be recorded and attended to promptly, notifying Council immediately of any complaints or any accidental damage to property.	Contractor, Council	Construction and operation
SE3	Access	Existing access for nearby and adjoining private properties is to be maintained at all times during the work unless otherwise agreed to by the affected property owner.	Contractor, Council	Construction and operation

TRAFFIC AND ACCESS

Existing Environment

Charleys Forest Road is a key rural road that connects several localities within the Southern Tablelands region. Starting from Braidwood, the road travels northeast through Mongarlowe, Charleys Forest, and Wog Wog, eventually linking with Nerriga Road, which provides access to Nowra and the South Coast. This road serves as a critical connection for:

- Local rural residents accessing properties and regional services.
- General traffic traveling between Braidwood and the coastal areas via Nerriga Road.
- Visitors traveling to nearby conservation areas, including Budawang National Park.

There is a school bus route on Charleys Forest Road. The service stops 8 km along Charleys Forest Road, from Mongarlowe village. The construction is outside of the school bus route, with the closest construction at Third Currudux Creek being approximately 7 km past the end of the bus route. The road is largely unsealed and traverses a sparsely populated rural landscape, with narrow sections and minimal shoulders. The only detour available is to Nerriga Road north of the study areas and to Little River Road south of the study areas. This loop provides residents access to Braidwood in both directions, however, may add significant travel distances and time, emphasising the need to minimise disruptions during construction.

Potential Impacts

6.1.1.37 Construction

Construction at both the Middle and Third Curradux Creek crossings is likely to result in temporary impacts to traffic and access, including:

- Full or Partial Closures of Charleys Forest Road at the creek crossings may be necessary for certain phases of construction. While alternative routes exist via regional roads, these detours would be lengthy and inconvenient for residents and travellers.
    - Closure is more likely at Middle Curradux Creek with the road corridor narrow at 4.5 m.
    - On the contrary, the road width at Third Curradux Creek is 6 m and would allow for construction to occur with a single lane of thoroughfare maintained, with traffic control in place.
- Temporary traffic control measures, such as stop/go systems, may cause delays for vehicles traveling through the area.
- Property owners along Charleys Forest Road may experience temporary disruptions to access during specific construction activities.
- Maintaining access for emergency services will be essential, with protocols required to ensure timely response capabilities.

6.1.1.38 Operation

Post-construction, the upgraded crossings will improve traffic and access conditions by:

- Enhancing the safety and resilience of the road, reducing the risk of closures due to flooding or infrastructure failure.
- Improving connectivity for local residents and regional traffic.
- Supporting safer and more durable road conditions for all users.

Mitigation Measures

Table 16: Traffic and transport mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
T1	Traffic flow and access	Maintain property access wherever possible during construction. Minimise traffic delays through efficient traffic control measures, such as stop/go systems.	Contractor	Construction
T2	Consultation and notification	Consultation with residents regarding access, any closures and work scheduling prior to works commencing. Undertake early community engagement, early notification / advertisement of construction period through both local and regional channels to avoid traffic delays.	Contractor, Council	Prior to construction

T3	Emergency services access	Develop and implement emergency access protocols to ensure rapid response times.	Contractor	Construction
T4	Management plan	A traffic management plan to be prepared prior to works commencing addressing provisions for emergency services and local residents and temporary traffic control measures and closure schedules.	Contractor	Prior to construction

VISUAL AMENITY AND LANDSCAPE CHARACTER

Existing Environment

The study areas are characterised by a mix of cleared agricultural land, native vegetation communities, often time dense forest, and rural road infrastructure, set against a backdrop of rolling hills and forested areas. The combination of the following natural and human-modified features creates a landscape of moderate scenic and ecological importance, balancing rural land use with conservation and connectivity values.

- Middle and Third Curradux Creeks have shallow channels with patchy riparian vegetation and sections of exposed bedrock. They provide moderate visual and ecological value, contributing to the connectivity of the landscape.
- Roadside vegetation, including scattered native trees and groundcovers, soften the visual impact of rural infrastructure along Charleys Forest Road.
- The existing causeways and sections of unsealed road are utilitarian in appearance, showing signs of wear, erosion, and disturbance, which detract from the scenic value of the area.

Potential Impacts

6.1.1.39 Construction

The proposed works may temporarily reduce visual amenity due to:

- The presence of construction equipment, vehicles, and materials.
- Exposed soil, earthworks, temporary erosion and sediment controls and stockpiles.

These impacts will be localised to the immediate worksites and are expected to be short-term. Minimal vegetation clearance will be required and would be limited to disturbed road verges within the study area and downstream of the crossing at Third Curradux Creek.

A group of Acacia shrubs immediately south of the Middle Curradux Creek crossing, on the downstream side would require trimming to maintain line of sight for vehicles. No mature trees would be impacted by the proposal.

6.1.1.40 Operation

Upon completion, the proposals are expected to improve visual amenity and contribute positively to the surrounding landscape. The rehabilitation of disturbed areas using natural approaches, such as jute matting and planting of deep-rooted native plant species, will ensure the works blend with the broader conservation

landscape. Incorporating minimal hard-engineered solutions will help maintain the visual and ecological integrity of the area.

Mitigation Measures

Table 17: Landscape Character mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
VA1	Temporary decline in visual amenity during construction	Provide a community liaison phone number and site contact for complaints. Keep work areas tidy, free of litter, and clean up at the end of each workday. Refer to waste management measures for proper disposal of materials and debris.	Contractor	Construction
VA2	Improvement to visual amenity post-construction	Remove rubbish, debris, and old infrastructure (e.g., redundant fencing) from work sites. Rehabilitate disturbed areas using native vegetation. Remove all temporary construction signage, fencing, and erosion controls upon project completion.	Council and Contractor	Construction and post-construction

WASTE

Existing Environment

No significant sources of waste are present within the study area. At Third Curradux Creek, washed-out road base and gravel is evident, both along road edges at the approach to the crossing as well as instream, downstream of the crossing.

Potential Impacts

6.1.1.41 Construction

The proposed works are not anticipated to generate significant volumes of waste, but construction activities may produce various types of waste, including:

- Excavated material from Third Curradux Creek.

- Existing drainage and crossing infrastructure (e.g., concrete pipes and slabs) from Third Curradux Creek.
- Packaging materials from construction deliveries.
- Domestic waste generated by on-site workers.

6.1.1.42 Operation

Once construction is complete, the operational phase of the proposal is not expected to generate additional waste, provided the site is appropriately managed and residual construction waste is removed during decommissioning. The upgrades, particularly at Third Curradux Creek would reduce loss of road materials into the creek.

Mitigation Measures

Table 18: Waste safeguards and mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
W1	Waste management	Resource management hierarchy principles are to be followed: • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Disposal is carried out as a last resort. (In accordance with the *Waste Avoidance & Resource Recovery Act 2001*) Transport and disposal dockets will be kept as proof of correct disposal for everything that leaves site. Spoil excavated from the site to be used on site where possible.	Contractor and Council	Construction
W2	Waste Management Strategy	Implementation of waste management strategy documented within the CEMP. The strategy should include details of the type of waste material likely to be generated, and how it would be managed (including sorting, storage and disposal), materials to be recycled, as well as measures to reduce or avoid waste generation.	Contractor	Pre construction

W3	General waste	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day. Construction staff are to be briefed on their responsibility for removal of their own general waste. Provide appropriate receptacles to store all general waste, empty immediately at the completion of works. Consideration must be given to the source separation of recyclable and re-usable materials. Secure all wastes to avoid pollutants escaping.	Contractor	Construction
W4	Contaminated waste	Although no asbestos is known to be present on site, if encountered, removal of this material must be undertaken in accordance with the Code of Practice How to manage and control asbestos in the workplace (SafeWork NSW, 2022).	Contractor	Construction

ENERGY AND CLIMATE CHANGE

Potential Impacts

6.1.1.43 Construction

During the construction period, energy consumption will occur due to the operation of vehicles, plant, and machinery. This energy use, while necessary, is considered negligible within the broader context of energy use in the locality. However, measures to mitigate energy consumption and associated emissions can be implemented to further minimise impacts.

6.1.1.44 Operation

The operational phase of the proposed causeway upgrades will not lead to an increase in greenhouse gas emissions, as the day-to-day use of the crossings will not involve energy consumption. By upgrading the crossings to more resilient structures, the proposals will enhance the ability of the crossings to convey flows and withstand flooding. These improvements contribute to the climate resilience of the infrastructure, aligning with broader climate adaptation objectives.

Mitigation Measures

Table 19: Energy and climate change mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
ECC1	Increased energy consumption and production of emissions	Ensure vehicles, plant, and machinery are maintained in good working order and operated efficiently. Avoid unnecessary idling of vehicles and machinery. Encourage carpooling or shared transportation for workers to minimise vehicle use. Prioritise local suppliers for goods and services to reduce transport-related emissions.	Contractor	Construction
ECC2	Increased production of emissions, structural inefficiency	Construction materials will be sourced locally where possible and will utilise recycled materials to the greatest possible extent Design and construct the causeways with sustainable and resilient materials to minimise maintenance needs and extend asset life.	Contractor Council	Pre-Construction

CUMULATIVE IMPACTS

Cumulative impacts are defined as those impacts that are a result of incremental, sustained and combined effects of human action and natural variations over time, both positive and negative, or by the compounding effects of a single project or multiple projects in an area, and by the accumulation of effects from past, current and relevant future projects (DPE, 2022).

Potential Impacts

The potential negative impacts identified in this REF are unlikely to have significant effects at the local or regional scale, as they are expected to be minor, site-specific, and well-managed through the implementation of mitigation measures. These impacts are not anticipated to substantially affect the environment, including threatened and migratory species, cultural heritage, greenhouse gas emissions, air, water, soils, or the community.

The two proposals at Middle and Third Curradux Creeks share a common environmental context and flowing to the Mongarlowe River downstream at similar locations. There is potential for cumulative impacts due to their proximity and overlapping construction requirements. Key considerations include:

- Both proposals may compete for local resources, such as access to haul roads, stockpile areas, and construction materials.

- Construction activities simultaneously may result in cumulative water quality impacts (e.g., sediment transport) at the downstream junction with the Mongarlowe River.
- Concurrent construction activities may amplify disruptions to local traffic, affecting access for residents, emergency services, and heavy vehicles.

While constructing both proposals simultaneously could reduce the overall duration of impacts, staggered construction (as currently planned by Council) may allow for better management of cumulative effects, particularly with respect to resource allocation and localised disruptions.

Mitigation Measures

Table 20: Cumulative impacts mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
CI1	Consultation	Council must consult internally to ensure that other Council projects and/or private developer projects occuring in the area will not create cumulative impacts in any or all of the environmental factors assessed. This should include at a minimum: • Development and Environment • Utilities • Transport and Facilities • Waste Council should consult externally to ensure that other projects occuring in the area will not create cumulative impacts in any or all of the environmental factors assessed. This should include at a minimum: • DPI Fisheries • Transport for NSW • DPE Planning Portal (Major Projects)	Contractor	Construction
CI2	Traffic Management	Ensure traffic management plans address cumulative impacts on access for residents and industries due to any overlapping construction.	Contractor	Construction

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7 ENVIRONMENTAL MANAGEMENT

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

A CEMP will be prepared by the construction contractor, to include all the mitigation measures listed in this REF, as well as any relevant conditions under any permits, licenses or other approvals obtained for the proposal.

SUMMARY OF PROPOSED MITIGATION MEASURES

Environmental mitigation measures relating to each of the environmental factors considered in this REF are summarised in Table 21.

Table 21: Summary of proposed mitigation measures

Reference	Impact	Safeguards	Responsibility	Timing
TERRESTRIAL BIODIVERSITY				
TB1	Threatened species – general	Minimise the extent of disturbance and work within the existing road / crossing corridor only. Material stockpile and equipment storage areas should be restricted to existing disturbed areas and not within the watercourse or riparian zone (minimum 20 m from the watercourse). Ensure workers are informed of exclusion zones at establishment and prestart/toolbox talks. Works must be stopped if any previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained. Works must not recommence until Council has provided written approval to do so.	Contractor	Prior to and during construction

TB2	Fauna management – general	Any occupied nests located or any fauna which are inadvertently injured must be reported to Wildcare Queanbeyan or a similar organisation and relocated from the works area by a suitably qualified fauna handler. The CEMP shall include instructions for dealing with orphaned or injured native animals and include the contact details for Wildcare Queanbeyan or the NSW Wildlife Information, Rescue and Education Service Inc (WIRES).	Contractor	Construction
TB3	Rehabilitation	The works area should be rehabilitated / revegetated with native riparian species to ensure bank stabilisation and reinstatement of habitat. Deep rooting species are to be selected, e.g *Lomandra longifolia* Areas exposed in the work footprint including road edges must be planted with native vegetation to ensure bare ground will be stabilised and covered with vegetation.	Contractor	Construction and post construction
TB4	Pathogens and weeds	Wash down equipment and vehicles before and after use, to manage the introduction and spread of pathogens and weed propagules into the surrounding area, and downstream. Priority weed species should be targeted in accordance with the NSW DPI WeedWise recommended control measures. Where priority weeds, weeds of national significance and/or soil contaminated with those species is found onsite, it will be removed from the site in sealed plastic bags and disposed of offsite at an appropriately licensed waste disposal facility.	Contractor	Construction
AQUATIC BIODIVERSITY				
AB1	Direct impacts on aquatic fauna – dewatering	Prepare a Dewatering Management Plan in line with DPI Fisheries guidelines. Engage a qualified aquatic ecologist to relocate fish and	Contractor	Prior to Construction

		other aquatic fauna upstream during appropriate seasonal windows.		
AB2	Indirect impacts on aquatic fauna – decreased water quality	Develop a CEMP addressing pollution, contamination, and erosion. Implement sediment controls per the "Blue Book" and monitor daily. Stabilise exposed banks using geofabric, coir logs, and jute matting.	Contractor or Council	Prior to construction
AB3	Impacts on aquatic fauna and habitat – general measures	Visually inspect the waterway during works for any signs of fish kill (fish gasping, or crowding) and immediately reported to DPI Fisheries contact officer. Do not extract water from the creek for dust suppression or construction purposes. All temporary works, flow diversion barriers and in-stream sediment control barriers must be removed as soon as practicable and in a manner that does not promote future channel erosion. Works are to be undertaken during times of no or low flows and when the Bureau of Meterology forecast for Rossi indicates several days of dry weather. Avoid harm to riparian vegetation outside of the work footprint by implementing appropriately delineated no-go areas. No removal of snags, large woody debris or trees and shrubs is permitted. Ensure all machinery and equipment are cleaned of soil and plant material before arriving on-site to prevent the introduction of invasive species	Contractor	Construction
AB4	Rehabilitation	Rehabilitate disturbed areas with deep-rooted native vegetation (e.g., *Lomandra longifolia*). Monitor rehabilitated areas quarterly for two years to ensure plant establishment and stabilisation.	Contractor	Construction post construction

HYDROLOGY AND WATER QUALITY				
HWQ1	Erosion and sediment controls	All safeguards in Soils, ESC1 to ESC4 shall be implemented to migate impacts to water quality and waterways from erosion and sedimentation.	Contractor	Construction, Operation.
HWQ2	Water Usage	A detailed Erosion and Sediment Control Plan (ESCP) will be prepared by the contractor as part of the CEMP. The ESCP will describe the site specific measures to be implemented for all works areas, in accordance with the guidelines outlined in the 2004 Landcom publication *Managing Urban Stormwater: Soils and Construction*, 4th edition ("The Blue Book") and *Volume 2a Installation of Services*. The ESCP will need to be site specific and will address the following issues to prevent erosion, sediment loss and water quality impacts: • Minimisation of disturbance to soil and water adjacent to, and within, all watercourses in the works area. • Identification of site-specific sediment and erosion control measures wherever erosion is likely to occur. • Identification of any environmentally sensitive areas on or near construction sites to ensure runoff is diverted away from sensitive areas. • Requirements for vegetation clearing to be kept to a minimum. • Retention of all surface runoff on-site and where possible stormwater from off site would be diverted around the construction site. • Location of construction compounds (at least 20 m from any drainage lines).	Contractor/Council	Prior to construction

		• Location and management of stockpiles, such as locating stockpiles away from any drainage lines near the works areas. • All erosion and sediment controls would be regularly inspected, especially when rain is expected and directly after any rain events. Dirty water (from excavated footprint) would be pumped to a small sediment trap, lined with geofabric. This would allow sediments to be settled out prior to releasing the water back to the environment All areas where ground disturbance has occurred would be stabilised following completion of works to ensure there is no erosion hazard and restored to their preconstruction condition. This would involve, where required, reshaping the ground surface, covering it with topsoil excavated from the site and re-establishing an appropriate vegetation cover. Any excess spoil would either be spread across the ground in nearby areas (within the approved disturbance corridor) in such a manner as to avoid creating an erosion hazard or removed off site for disposal in accordance with relevant Council and DPE requirements.		
HWQ3	Spills & water quality	Adequate procedures will be established and detailed in the CEMP, including notification requirements to the DPE, for incidents that cause material harm to the environment. Any hazardous materials stored on site will be stored in the compounds and within impervious and bunded enclosures capable of storing 120% of the volume of material stored there. If machinery enters the watercourse it must be done so in accordance with the Fisheries	Contractor	Construction

		permit, and be cleaned, degreased and appropriately serviced prior to works. Emergency spill kits are to be kept at the site (vehicle kits). No refuelling of plant or machinery within 50 m of the waterway. No storage of fuels on site. Storage of any fuels, oils or other chemicals must be minimum 20 m from the waterways and appropriately bunded. Workers will be trained in the spill management plan and the use of the spill kits. To control substance leak: • Conduct prestart checks. • Do not operate plant if leak is detected. • Inform Project Manager if leak, spill or escape occurs.		
HWQ4	Flooding	In the event of flooding, works in affected areas will cease during flood events and will not commence until floodwaters have receded. Weather forecasts will be checked regularly 12 hourly (as a minimum) so that equipment and materials in flood areas can be secured prior to heavy rainfall events. As part of the CEMP a flood contingency plan will be prepared documenting procedures and actions to be taken in the event of high flows or flooding during construction works.	Contractor	Construction
ABORIGINAL CULTURAL HERITAGE				
AH1	Discovery of Unidentified Aboriginal cultural material during works.	Under the NPW Act 1977 all Aboriginal places and objects are protected from harm, even if they have not been previously identified during the assessment process. If Aboriginal	Contractor	Construction

		material is discovered during works then the steps as outlined below should be followed: • All work must cease in the vicinity of the find and project manager notified immediately. • A buffer zone of 10m should be fenced in all direction of the find and construction personnel made aware of the 'no go' zone. • NSW Heritage must be notified of the find and advice sought on the proper steps to be undertaken. After confirmation with NSW Heritage a heritage consultation should be engaged to undertake assessment of the find and provide appropriate management recommendations to the proponent.		
AH2	Discovery of Human Remains	• In the highly unlikely event that human remains are discovered during any construction work, than all activity in the vicinity of the find must cease. As a first step the local police must be notified, followed by NSW Heritage and advice sought on appropriate next actions. No work can continue on the site until cleared with police and NSW Heritage.	Contractor	Construction
HISTORIC HERITAGE				
HH1	Non-Aboriginal heritage	In accordance with Section 146 of the *Heritage Act 1977*, if an archaeological relic (such as a deposit, feature, or artefact) is uncovered during works, work must cease in the affected area and Heritage NSW must be notified. Further advice and consultation would be required, and approvals may be required from Heritage NSW under delegation regarding any relics, should they be discovered during works.	Contractor	Construction

		Stop work if human remains are found and contact NSW Police. If remains are suspected to be Aboriginal, Heritage NSW must be notified as well.		
SOILS				
ESC1	Installation of erosion and sedimentation controls	Implement erosion and sediment control (ESC) measures in accordance with the CEMP and the guidelines outlined in the 2008 Landcom publication Managing Urban Stormwater: Soils and Construction, 4th edition ("The Blue Book"). Ensure site access is stabilised to reduce tracking of sediment off-site, with approaches kept free of dust during works. Minimise the extent of disturbed areas by completing works in the shortest possible timeframe. Cover loads of soil and other erodible materials during transportation and keep them covered until unloading for use or disposal at an appropriate waste facility. Immediately clean up and remove any spills of soil or other erodible material on sealed access routes or roadways. Divert surface runoff away from sensitive areas, stockpiles, and erodible materials. Keep vehicles in designated areas both when in use and parked. Schedule works when adverse weather conditions are not forecast. Stockpile out of the corridor	Contractor	Construction
ESC2	Erosion and Sediment Controls – Third Curradux Creek	Install small bund/coffer dam on the inlet to capture water and then pump or pipe it 'clean water' around the site. Place geofabric on disturbed embankments overnight when rain is forecast.	Contractor	Construction

		Temporary stockpiles located within 20 m of the creek will have two levels of controls implemented, i.e. silt fence, bunding.		
ESC3	Maintenance of erosion and sedimentation controls	Stop work during and after heavy rainfall to reduce the risk of mobilising sediment. Inspect erosion controls regularly (daily during workdays) and after significant rainfall. Fix damaged controls immediately and remove accumulated sediment or waste material from within the sediment controls regularly.	Contractor	Construction
ESC4	Stabilisation	Stabilise exposed banks and earthworks to prevent erosion before vegetation or rock armour is established. This would include placing geofabric on bare soil beneath rock armour, coir logs along drainage lines and jute matting on proposed planting areas. Erosion and sediment control measures are not to be removed until the work is complete, and areas are stabilised. Stabilisation of disturbed areas shall commence as soon as possible after the areas have been disturbed. Revegetate bare areas of the bank and riparian corridors with native and deep rooted riparian species, to stabilise the soil and prevent additional sediment from entering the creek.	Contractor	Construction; Operation
NOISE AND VIBRATION				
NV1	Hours of work	Construction work to be carried out during standard hours: • Monday to Friday: 7:00 am to 6:00 pm • Saturday: 8:00 am to 1:00 pm • No work on Sundays or public holidays.	Contractor	Construction

		Any work outside these hours will require approval, notification, and a management plan.		
NV2	Management of machinery	Turn off vehicles and machinery when not in use to prevent idling noise. Maintain all equipment and machinery to meet Australian noise attenuation standards. Fit all equipment with noise-muffling devices and maintain documentation of servicing.	Contractor	Construction
NV3	Site layout	Plan the site layout to locate noisy equipment and activities away from sensitive receivers where practical. Minimise reversing of machinery near sensitive receivers to reduce noise impacts	Contractor	Construction
NV4	Consultation and notification	Notify neighboring residents about construction activities and potential noise impacts before works commence. Provide a mechanism (e.g., signage with contact information) to receive and respond to noise complaints promptly. Maintain a complaints register and implement noise monitoring if triggers are exceeded	Contractor; Council	Pre-construction and Construction
AIR QUALITY				
AQ1	Dust emissions	Cover all transported materials to minimise dust emissions. Water work areas as necessary, especially during dry and windy conditions. Suspend dust-generating activities during high-wind periods.	Contractor	Construction
AQ2	Exhaust emissions	Turn off equipment when not in use to prevent unnecessary idling.	Contractor	Construction

		Maintain all vehicles and equipment in accordance with manufacturer specifications to ensure efficient operation Implement traffic controls to minimise stationary idling vehicles in accordance with the Traffic Management Plan.		
SOCIO-ECONOMIC				
SE1	Community Consultation	Community consultation particularly with affected neighbours is to be carried out prior to construction commencing. Early notification / advertisement of the construction period through both local and regional channels.	Contractor, Council	Prior to construction
SE2	Complaint Management	Complaints received are to be recorded and attended to promptly, notifying Council immediately of any complaints or any accidental damage to property.	Contractor, Council	Construction and operation
SE3	Access	Existing access for nearby and adjoining private properties is to be maintained at all times during the work unless otherwise agreed to by the affected property owner.	Contractor, Council	Construction and operation
TRAFFIC AND ACCESS				
T1	Traffic flow and access	Maintain property access wherever possible during construction. Minimise traffic delays through efficient traffic control measures, such as stop/go systems.	Contractor	Construction
T2	Consultation and notification	Consultation with residents regarding access, any closures and work scheduling prior to works commencing. Undertake early community engagement, early notification / advertisement of construction period through both local and regional channels to avoid traffic delays.	Contractor, Council	Prior to construction

T3	Emergency services access	Develop and implement emergency access protocols to ensure rapid response times.	Contractor	Construction
VISUAL AMENITY AND LANDSCAPE CHARACTER				
VA1	Temporary decline in visual amenity during construction	Provide a community liaison phone number and site contact for complaints. Keep work areas tidy, free of litter, and clean up at the end of each workday. Refer to waste management measures for proper disposal of materials and debris.	Contractor	Construction
VA2	Improvement to visual amenity post-construction	Remove rubbish, debris, and old infrastructure (e.g., redundant fencing) from work sites. Rehabilitate disturbed areas using native vegetation. Remove all temporary construction signage, fencing, and erosion controls upon project completion.	Council and Contractor	Construction and post-construction
WASTE				
W1	Waste management	Resource management hierarchy principles are to be followed: • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Disposal is carried out as a last resort. (In accordance with the *Waste Avoidance & Resource Recovery Act 2001*) Transport and disposal dockets will be kept as proof of correct disposal for everything that leaves site.	Contractor and Council	Construction

		Spoil excavated from the site to be used on site where possible.		
W2	Waste Management Strategy	Implementation of waste management strategy documented within the CEMP. The strategy should include details of the type of waste material likely to be generated, and how it would be managed (including sorting, storage and disposal), materials to be recycled, as well as measures to reduce or avoid waste generation.	Contractor	Pre construction
W3	General waste	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day. Construction staff are to be briefed on their responsibility for removal of their own general waste. Provide appropriate receptacles to store all general waste, empty immediately at the completion of works. Consideration must be given to the source separation of recyclable and re-usable materials. Secure all wastes to avoid pollutants escaping.	Contractor	Construction
W4	Contaminated waste	Although no asbestos is known to be present on site, if encountered, removal of this material must be undertaken in accordance with the Code of Practice How to manage and control asbestos in the workplace (SafeWork NSW, 2022).	Contractor	Construction
ENERGY AND CLIMATE CHANGE				
ECC1	Increased energy consumption and production of emissions	Ensure vehicles, plant, and machinery are maintained in good working order and operated efficiently. Avoid unnecessary idling of vehicles and machinery.	Contractor	Construction

		Encourage carpooling or shared transportation for workers to minimise vehicle use. Prioritise local suppliers for goods and services to reduce transport-related emissions.		
ECC2	Increased production of emissions, structural inefficiency	Construction materials will be sourced locally where possible and will utilise recycled materials to the greatest possible extent Design and construct the causeways with sustainable and resilient materials to minimise maintenance needs and extend asset life.	Contractor Council	Pre-Construction
CUMULATIVE				
CI1	Consultation	Council must consult internally to ensure that other Council projects and/or private developer projects occuring in the area will not create cumulative impacts in any or all of the environmental factors assessed. This should include at a minimum: • Development and Environment • Utilities • Transport and Facilities • Waste Council should consult externally to ensure that other projects occuring in the area will not create cumulative impacts in any or all of the environmental factors assessed. This should include at a minimum: • DPI Fisheries • Transport for NSW • DPE Planning Portal (Major Projects)	Contractor	Construction
CI2	Traffic Management	Ensure traffic management plans address cumulative impacts on access for residents	Contractor	Construction

	and industries due to any overlapping construction.

8 CONCLUSION

The proposed upgrades to the Middle Curradux Creek and Third Curradux Creek causeways represent a strategically important initiative to improve flood resilience, road safety, and ecological connectivity along Charleys Forest Road. This REF has comprehensively assessed the potential environmental impacts of the proposal, focusing on aquatic and riparian ecosystems, biodiversity, and traffic accessibility.

Key mitigation measures include the implementation of stringent erosion and sediment controls, the preparation of a dewatering management plan, and the rehabilitation of disturbed areas using native vegetation to ensure long-term stability and habitat enhancement. Temporary traffic disruptions during construction will be effectively managed through traffic management plans and community engagement, ensuring daily accessibility for road users. Additionally, biodiversity impacts will be minimised through careful planning to protect sensitive habitats and restrict the project footprint to already disturbed areas.

The REF confirms that the proposal complies with relevant statutory requirements, including the NSW EP&A Act and FM Act, and does not necessitate further approvals under the EPBC Act. With the inclusion of robust safeguards detailed in the Construction Environmental Management Plan (CEMP), the project is expected to proceed with minimal environmental impact while delivering significant infrastructure improvements.

This proposal will not only address current safety and functionality issues but also provide long-term benefits to the local community and environment, aligning with the objectives of sustainable infrastructure development.

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9 CERTIFICATION

ASSESSOR DECLARATION

This REF provides a true and fair review of the activity in relation to its likely effects on the environment. It examines and fully considers possible all matters affecting or likely to affect the environment by reason of the proposal and provides sufficient information to determine whether the proposal is likely to significantly affect the environment, including threatened species or ecological communities, or their habitats. I have considered all environmental impacts and safeguards to the best of my knowledge and have sought advice where required.

Project Name	Middle Curradux Creek and Third Curradux Creek Causeway Upgrades
Skye O'Brien QRC Environment Canberra ACT Ph: 0413 499 433	

DETERMINING AUTHORITY DECLARATION AND APPROVAL

I have reviewed the document and consider that the proposal (including the controls and mitigation measures specified in this REF) is not likely to significantly affect the environment, including threatened species or ecological communities, or their habitats. As such it is not necessary to undertake further assessment under section 5.7 of the EP&A Act. It is recommended that the proposal can proceed subject to the implementation of all safeguards identified in the REF and compliance with all other relevant statutory approvals, licences, permits and authorisations.

Project Name	Middle Curradux Creek and Third Curradux Creek Causeway Upgrades
Role: Manager Development Name: Kylie Coe Company: QPRC Address: 257 Crawford St Queanbeyan	

Phone Number: 62856274

10 REFERENCES

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APPENDICES

APPENDIX 1 DESIGN PLANS

MIDDLE CURRADUX CREEK
NSW BETTERMENT PROGRAM
CAUSEWAY STANDRD DRAWING

LOCALITY PLAN

DRAWING INDEX

SCALE: (A1 ORIGIN) N.T.S

DATUM: AHD | ORIGIN:

COORD. SYSTEM: MGA2020

SURVEYED KM DATE SEPT 2024

DESIGNED MC/PS DATE OCT 2024

DRAWN KB/PS DATE OCT 2024

CHECKED TCP DATE DEC 2024

No	AMENDMENT	BY	DATE
C	ADDITONAL DETAIL	MC	20/01/25
B	COMMENTS FROM SITE VISIT WITH ENVIROMENTAL & FISHERIES	TCP	16/01/25
A	FOR COMMENTS	PS	24/10/24

QPRC

PROJECT: MIDDLE CURRADUX CREEK NSW BETTERMENT PROGRAM CAUSEWAY STANDRD DRAWING

12D Archive file: DESIGN\24005 MIDDLE DESIGN\24005 MIDDLE DESIGN.12daz

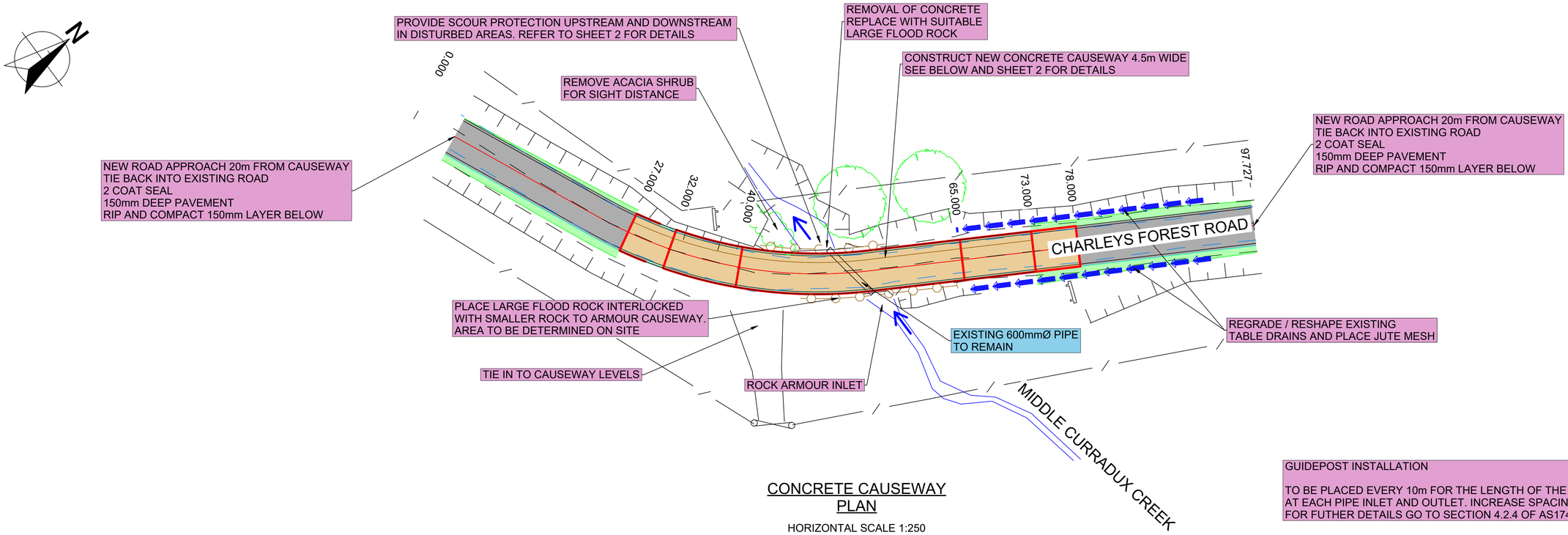
PDF file:. \24005 MIDDLE DRAFTING\PLOTS\24005 MIDDLE DESIGN REV C.pdf

JOB No. 24005 DESIGN

TITLE: COVER SHEET

SHEET 1/3

REV C

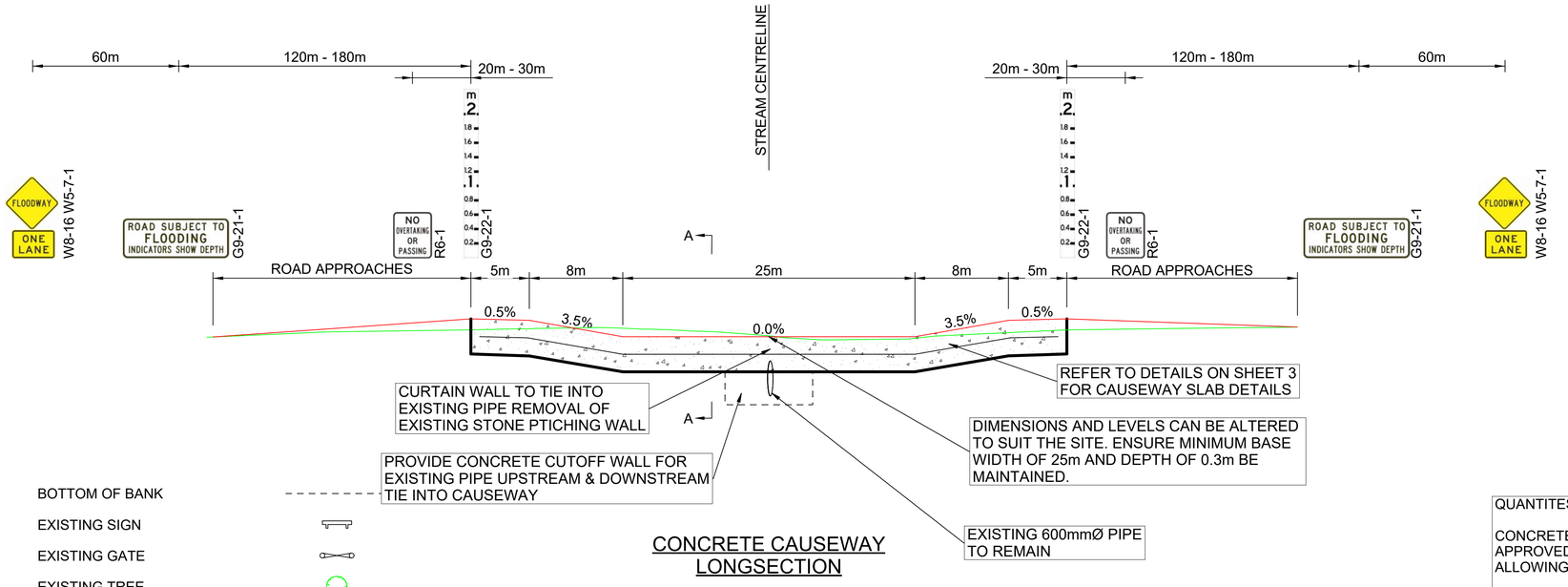


CONCRETE CAUSEWAY PLAN

HORIZONTAL SCALE 1:250

GUIDEPOST INSTALLATION

TO BE PLACED EVERY 10m FOR THE LENGTH OF THE CAUSEWAY AND ONE AT EACH PIPE INLET AND OUTLET. INCREASE SPACING TO 6m ON OUTSIDE OF CURVE. FOR FUTHER DETAILS GO TO SECTION 4.2.4 OF AS1742.2.



CONCRETE CAUSEWAY LONGSECTION

LEGEND

NEW ROAD APPROACHES	BOTTOM OF BANK
NEW CAUSEWAY	EXISTING SIGN
FLOOD ROCK	EXISTING GATE
EXISTING FENCE	EXISTING TREE
EXISTING ROAD	CONSTRUCTION CALLOUT
WATER EDGE	DRAINAGE CALLOUT
TOP OF BANK	

QUANTITES:

CONCRETE APPROX. 50m³
APPROVED IMPORT GRANULAR FILL
ALLOWING FOR 20m ROAD APPROACHES APPROX. 55m³

NOTES:

1. INSTALL FUNDING SIGNAGE AS REQUIRED
2. REFER TO REF 013QPC.ENV.REP001 BY RC ENVIRONMENT FOR PLANTING DETAILS AND ENVIRONMENTAL CONTROL REQUIREMENTS

SCALE: (A1 ORIGIN)
HORIZONTAL (1:250) : 0 5 10 15 20

DATUM: AHD
ORIGIN:
COORD. SYSTEM: MGA2020

SURVEYED KM DATE SEPT 2024
DESIGNED MC/PS DATE OCT 2024
DRAWN KB/PS DATE OCT 2024
CHECKED TCP DATE DEC 2024

No	AMENDMENT	BY	DATE
C	ADDITONAL DETAIL	MC	20/01/25
B	COMMENTS FROM SITE VISIT WITH ENVIROMENTAL & FISHERIES	TCP	16/01/25
A	FOR COMMENTS	PS	24/10/24

QPRC

PROJECT:
MIDDLE CURRADUX CREEK
NSW BETTERMENT PROGRAM
CAUSEWAY STANDRD DRAWING

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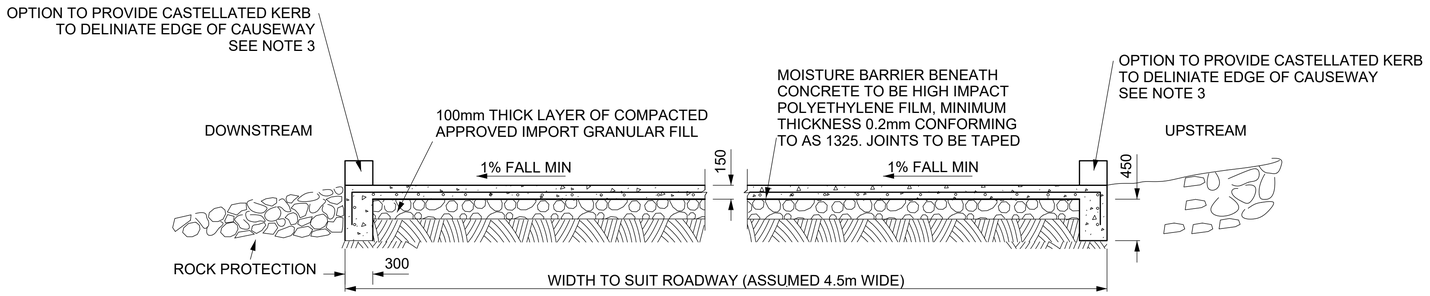
PDF file:. \24005 MIDDLE DRAFTING\PLOTS\24005 MIDDLE DESIGN REV C.pdf
JOB No. 24005 DESIGN
TITLE: ACTIVITY 2 PLAN AND LONGSECTION

SHEET 2/3
REV C



SECTION A-A - TYPICAL CROSS SECTION

NOTES:

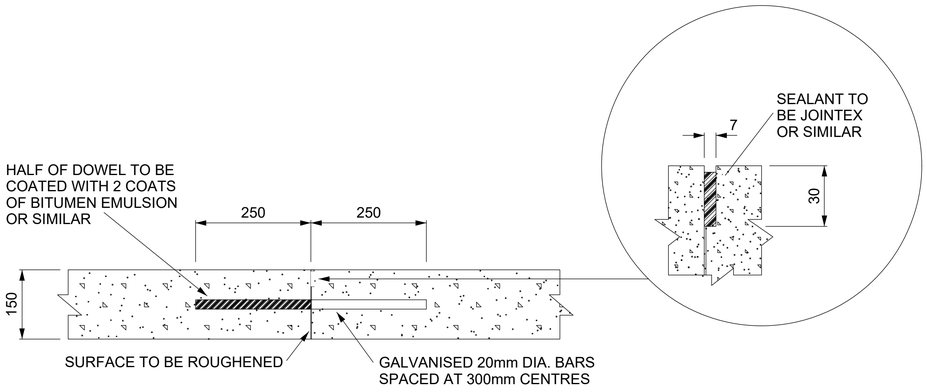
1. THE MINIMUM CAUSEWAY TRANSVERSE CROSSFALL IS TO BE 1%.
2. REINFORCED CONCRTE FOR THE CONSTRUCTION OF THE CAUSEWAY SLAB AND CURTAIN WALL:
   - (A) THE SLAB DIMENSIONS ARE TO BE SHOWN ON THE TYPICAL CROSS SECTION DETAIL.
   - (B) THE MINIMUM COMPRESSIVE STRENGTH OF THE CONCRETE IS TO BE 32 MPA AT 28 DAYS.
   - (C) THE REINFORCEMENT WILL BE SL81 MESH PLACED CENTRALLY. FOR SPLICES IN THE MESH THE MINIMUM OVERLAP (BOTH TRANSVERSE AND LONGITUDINALLY) WILL BE 400mm.
   - (D) DOWELLED JOINTS ARE TO BE PROVIDED AT MAXIMUM SPACING OF 25m IN ACCORDANCE WITH THE TRANSVERSE CONSTRUCTION JOINT DETAIL.
   - (E) HIGH IMPACT POLYETHYLENE FILM MOISTURE BARRIER IS TO BE PROVIDED UNDER THE SLAB.
3. CASTELLATED KERB FOR EDGE OF CAUSEWAY TO PROTECT VEHICLES FROM DRIVING OFF EDGE. PROVIDE 300mm WIDE BREAK IN KERB EVERY 2m.

ROCK PROTECTION

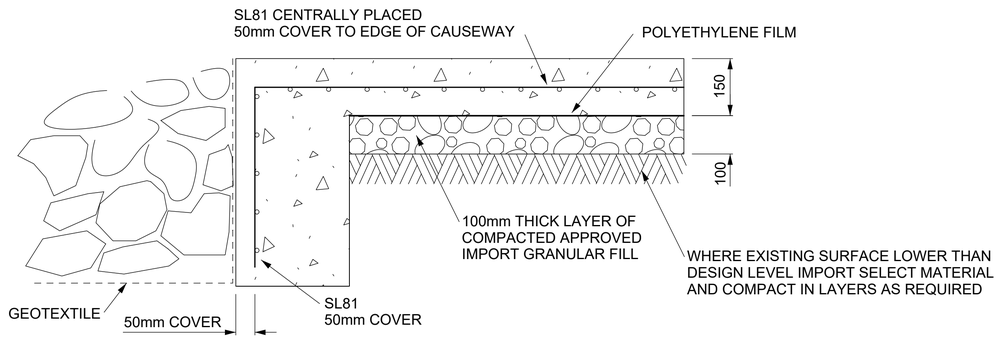
EXAMPLE OF ROCK PROTECTION PROPOSED IN DISTURBED AREAS UPSTREAM AND DOWNSTREAM OF CAUSEWAY. MIN ROCK SIZE CLASS LIGHT.

ROCK SIZE (m)	ROCK MASS (kg)	MIN. PERCENTAGE OF ROCK LARGER THAN
0.55	250	0
0.40	100	50
0.20	10	90

TABLE 3.12 STANDARD CLASSES OF ROCK SLOPE PROTECTION
AUSTROADS GUIDE TO ROAD DESIGN PART 5



TRANSVERSE CONSTRUCTION JOINT



CURTAIN WALL DETAIL

SCALE: (A1 ORIGIN) N.T.S	SURVEYED KM DATE SEPT 2024	C	ADDITONAL DETAIL — MC — 20/01/25
DATUM AHD	ORIGIN	B	COMMENTS FROM SITE VISIT WITH ENVIROMENTAL & FISHERIES — TCP — 16/01/25
COORD. SYSTEM MGA2020	DESIGNED MC/PS DATE OCT 2024	A	FOR COMMENTS — PS — 24/10/24
	DRAWN KB/PS DATE OCT 2024	No	AMENDMENT — BY — DATE
	CHECKED TCP DATE DEC 2024		

QPRC

PROJECT:
MIDDLE CURRADUX CREEK
NSW BETTERMENT PROGRAM
CAUSEWAY STANDRD DRAWING

12D Archive file: DESIGN\24005 MIDDLE DESIGN\24005 MIDDLE DESIGN.12daz
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JOB No. 24005 DESIGN
TITLE: ACTIVTY 2 STANDARD DRAWINGS

SHEET 3/3
REV C

THIRD CURRADUX CREEK
NEW BETTERMENT PROGRAM
CAUSEWAY STD DRAWING

LOCALITY PLAN

DRAWING INDEX

SCALE: (A1 ORIGIN) N.T.S

DATUM: AHD | ORIGIN:

COORD. SYSTEM: MGA2020

SURVEYED KM DATE SEPT 2024

DESIGNED MC/PS DATE OCT 2024

DRAWN PS/KB DATE OCT 2024

CHECKED TCP DATE DEC 2024

No	AMENDMENT	BY	DATE
C	ADDITIONAL DETAIL	MC	17/02/25
B	COMMENTS FROM SITE VISIT WITH ENVIROMENTAL & FISHERIES	TCP	16/01/25
A	FOR COMMENTS	PS	24/10/24

QPRC

PROJECT:
THIRD CURRADUX CREEK
NEW BETTERMENT PROGRAM
CAUSEWAY STD DRAWING

12D Archive file: DESIGN\24005 THIRD DESIGN\24005 THIRD DESIGN.12daz

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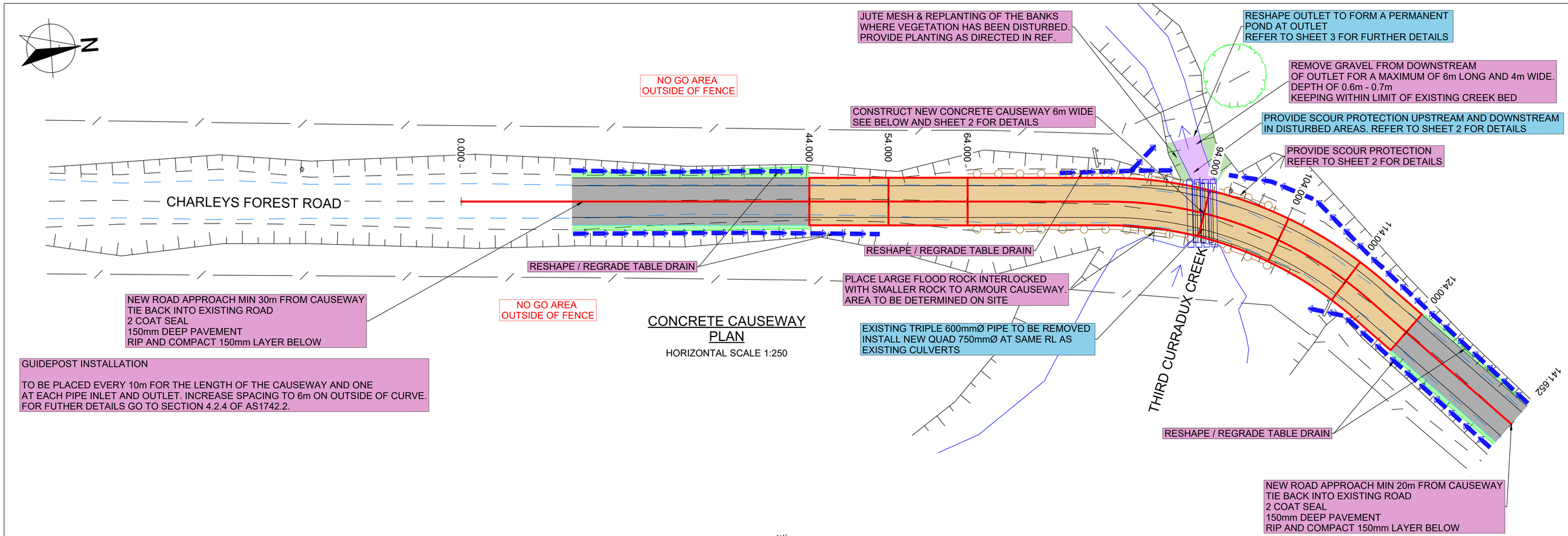
JOB No. 24005 DESIGN

TITLE: COVER SHEET

SHEET 1/6

REV C



LEGEND

NEW ROAD APPROACHES		TOP OF BANK	
NEW CAUSEWAY		BOTTOM OF BANK	
DREDGING AREA		EXISTING SIGN	
REPLANTING OF BANKS		EXISTING GATE	
FLOOD ROCK		EXISTING TREE	
EXISTING FENCE		CONSTRUCTION CALLOUT	XX
EXISTING ROAD		DRAINAGE CALLOUT	XX
WATER EDGE			

QUANTITES:

CONCRETE APPROX. 107m³
APPROVED IMPORT GRANULAR FILL
ALLOWING FOR ROAD APPROACHES APPROX. 95m³

NOTES:

1. INSTALL FUNDING SIGNAGE AS REQUIRED
2. REFER TO REF 013QPC.ENV.REP001 BY RC ENVIRONMENT FOR DREDGING RESTRICTIONS, PLANTING DETAILS AND ENVIRONMENTAL CONTROL REQUIREMENTS

SCALE: (A1 ORIGIN)
HORIZONTAL (1:250) : 0 5 10 15 20

DATUM: AHD
ORIGIN:
COORD. SYSTEM: MGA2020

SURVEYED KM DATE SEPT 2024
DESIGNED MC/PS DATE OCT 2024
DRAWN PS/KB DATE OCT 2024
CHECKED TCP DATE DEC 2024

No	AMENDMENT	BY	DATE
C	ADDITIONAL DETAIL	MC	17/02/25
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A	FOR COMMENTS	PS	24/10/24

QPRC

PROJECT:
THIRD CURRADUX CREEK
NEW BETTERMENT PROGRAM
CAUSEWAY STD DRAWING

12D Archive file: DESIGN\24005 THIRD DESIGN\24005 THIRD DESIGN.12daz
PDF file:. \24005 THIRD DRAFTING\PLOTS\24005 THIRD DESIGN REV C.pdf
JOB No. 24005 DESIGN
TITLE: ACTIVITY 3
PLAN AND LONGSECTION

SHEET 2/6
REV C

N

THIRD CURRADUX CREEK

NO GO AREA
OUTSIDE OF FENCE

DREDGING TO REMOVE GRAVEL FROM DOWNSTREAM
RESTRICTED TO 6m LONG & NO MORE THAN 4m WIDE
ASSUMED TO BE 0.6m - 0.7m DEPTH MAX.
FORM A PERMANENT POND TO ENHANCE AQUATIC
HABITAT

JUTE MESH & REPLANTING OF THE BANKS
WHERE VEGETATION HAS BEEN DISTURBED.
PROVIDE PLANTING AS DIRECTED IN REF.

PROVIDE SCOUR PROTECTION
REFER TO SHEET 2 FOR DETAILS

CHARLEYS FOREST ROAD

LEGEND

NEW ROAD APPROACHES		TOP OF BANK	
NEW CAUSEWAY		BOTTOM OF BANK	
DREDGING AREA		EXISTING SIGN	
REPLANTING OF BANKS		EXISTING GATE	
FLOOD ROCK		EXISTING TREE	
EXISTING FENCE		CONSTRUCTION CALLOUT	XX
EXISTING ROAD		DRAINAGE CALLOUT	SW1
WATER EDGE			

NOTES:

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SCALE: (A1 ORIGIN)
HORIZONTAL (1:50) : 0 1 2 3 4

DATUM: AHD
ORIGIN:
COORD. SYSTEM: MGA2020

SURVEYED KM DATE SEPT 2024
DESIGNED MC/PS DATE OCT 2024
DRAWN PS/KB DATE OCT 2024
CHECKED TCP DATE DEC 2024

No	AMENDMENT	BY	DATE
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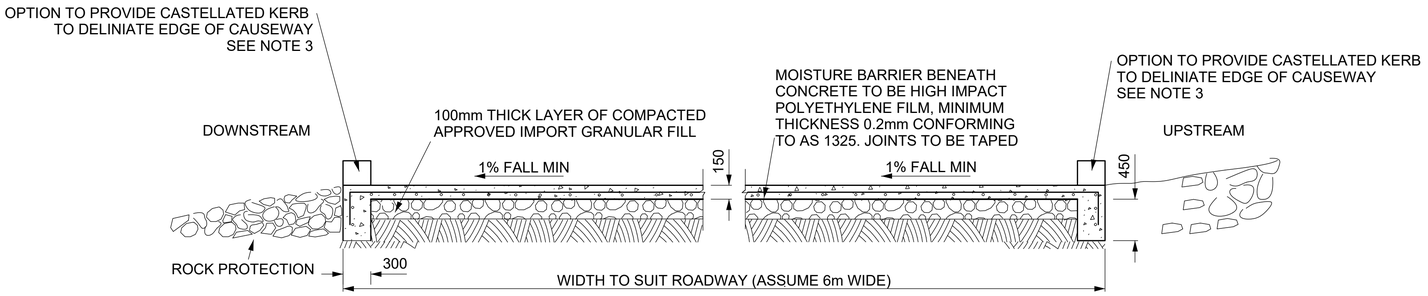
A	FOR COMMENTS	PS	24/10/24

QPRC

PROJECT:
THIRD CURRADUX CREEK
NEW BETTERMENT PROGRAM
CAUSEWAY STD DRAWING

12D Archive file: DESIGN\24005 THIRD DESIGN\24005 THIRD DESIGN.12daz
PDF file:. \24005 THIRD DRAFTING\PLOTS\24005 THIRD DESIGN REV C.pdf
JOB No. 24005 DESIGN
TITLE: ACTIVITY 3
DREDGING PLAN

SHEET 3/6
REV C



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ROCK SIZE (m)	ROCK MASS (kg)	MIN. PERCENTAGE OF ROCK LARGER THAN
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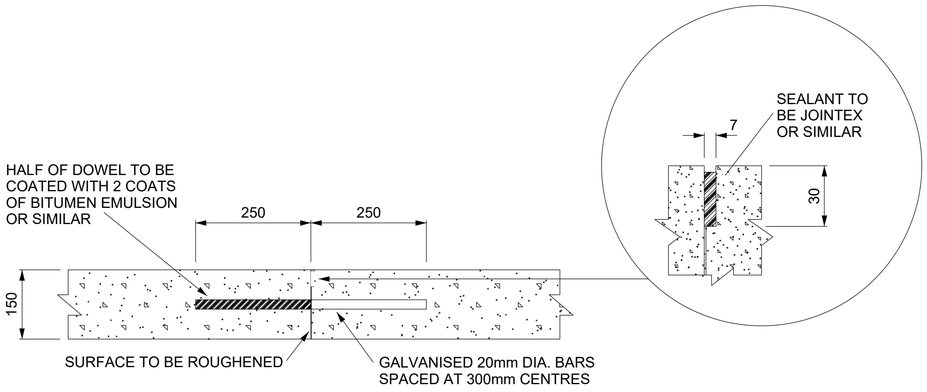
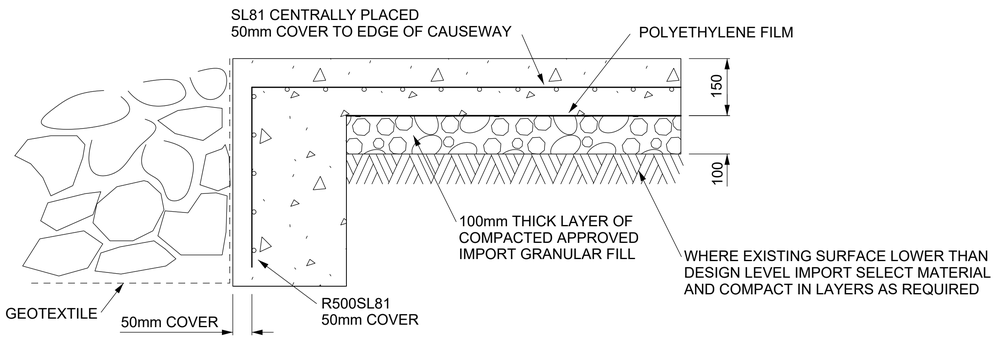
0.20	10	90

TABLE 3.12 STANDARD CLASSES OF ROCK SLOPE PROTECTION
AUSTROADS GUIDE TO ROAD DESIGN PART 5



TRANSVERSE CONSTRUCTION JOINT



CURTAIN WALL DETAIL

SCALE: (A1 ORIGIN)	N.T.S		
DATUM	AHD	ORIGIN	
COORD. SYSTEM	MGA2020		

SURVEYED	KM	DATE	SEPT 2024
DESIGNED	MC/PS	DATE	OCT 2024
DRAWN	PS/KB	DATE	OCT 2024
CHECKED	TCP	DATE	DEC 2024

No	AMENDMENT	BY	DATE
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A	FOR COMMENTS	PS	24/10/24

QPRC

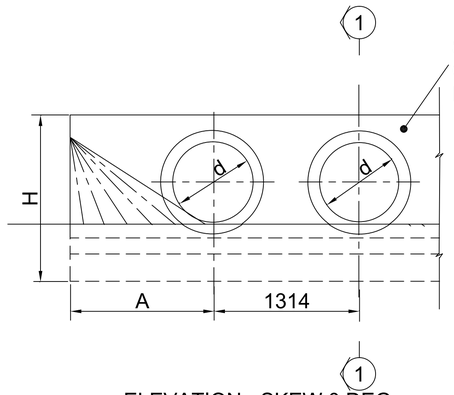
PROJECT:

THIRD CURRADUX CREEK
NEW BETTERMENT PROGRAM
CAUSEWAY STD DRAWING

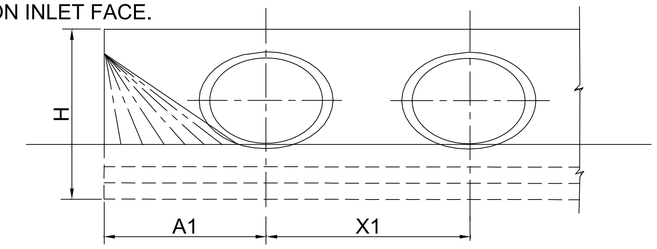
12D Archive file:	DESIGN\24005 THIRD DESIGN\24005 THIRD DESIGN.12daz
PDF file:.	\24005 THIRD DRAFTING\PLOTS\24005 THIRD DESIGN REV C.pdf
JOB No.	24005 DESIGN
TITLE:	ACTIVITY 3 STANDARD DRAWINGS

SHEET 4/6

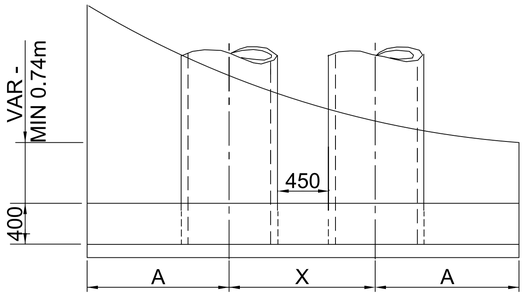
REV C



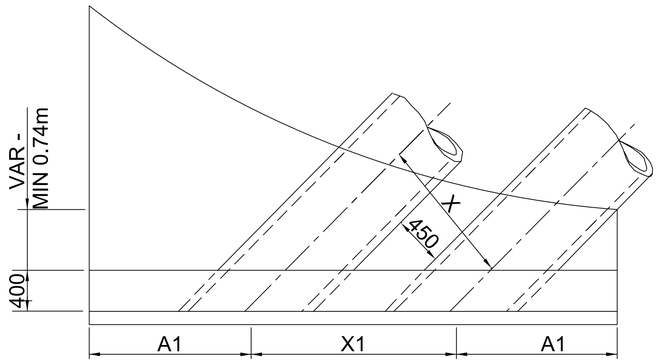
ELEVATION - SKEW 0 DEG



ELEVATION - SKEWED PIPES



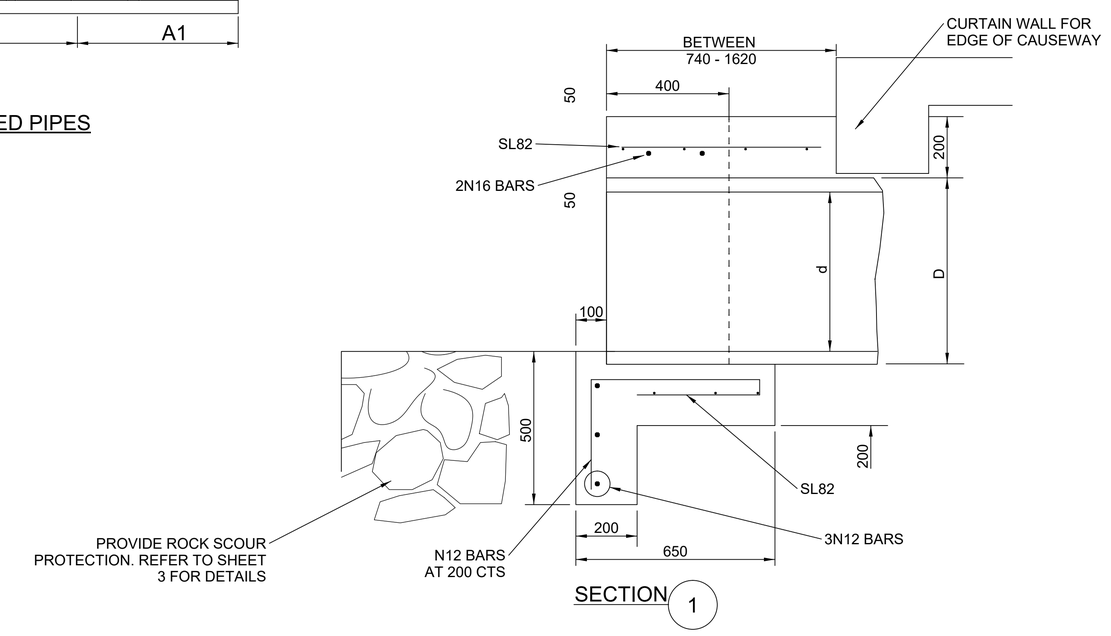
PLAN - SKEW 0 DEG



PLAN - SKEWED PIPES

NOMINAL PIPE SIZE d	SKEW 0 DEG.			
	D	H	A	X
750	864	1503	1313	1314
	SKEW 15 DEG.			
	D	H	A1	X1
750	864	1503	1318	1360
	SKEW 30 DEG.			
	D	H	A1	X1
750	864	1503	1331	1517
	SKEW 45 DEG.			
	D	H	A1	X1
750	864	1503	1361	1858

1. MINIMUM CONCRETE COMPRESSIVE STRENGTH SHALL BE 32 MPa.
2. MINIMUM COVER TO REINFORCEMENT 50mm.
3. PIPE DIAMETER APPROXIMATE ONLY. ADJUST HEIGHT TO SUIT IF LARGER.
4. BAR LAPS MUST BE AS FOLLOWS:
   (i) N12: 500mm MIN
   (ii) N16: 700mm MIN



SECTION 1

SCALE: (A1 ORIGIN)	N.T.S		
DATUM	AHD	ORIGIN	
COORD. SYSTEM	MGA2020		

SURVEYED	KM	DATE SEPT 2024
DESIGNED	MC/PS	DATE OCT 2024
DRAWN	PS/KB	DATE OCT 2024
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A	FOR COMMENTS	PS	24/10/24

QPRC

PROJECT:

THIRD CURRADUX CREEK NEW BETTERMENT PROGRAM CAUSEWAY STD DRAWING

12D Archive file: DESIGN\24005 THIRD DESIGN\24005 THIRD DESIGN.12daz

PDF file:. \24005 THIRD DRAFTING\PLOTS\24005 THIRD DESIGN REV C.pdf

JOB No. 24005 DESIGN

TITLE: ACTIVITY 3 STANDARD DRAWINGS

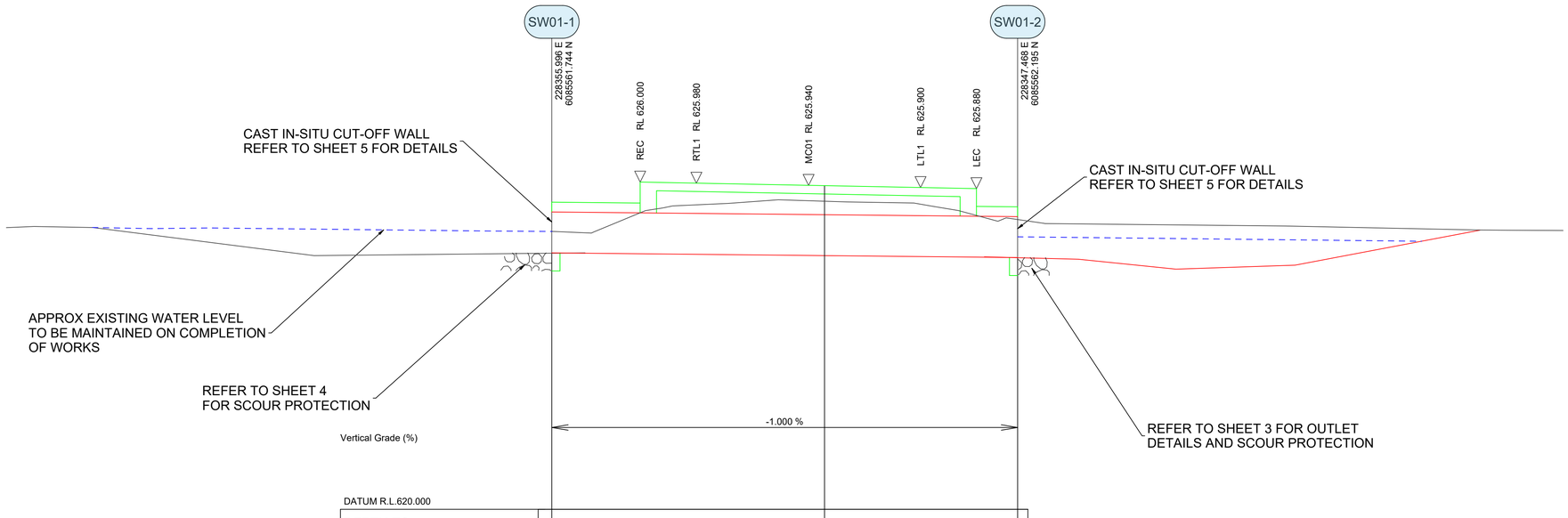
SHEET 5/6

REV C

PIPE SCHEDULE

14 x 750mmØ PIPES RPJ CLASS 4
1 x CAST IN-SITU CUT OFF WALL

NEW 4 x 750mmØ PIPES 8.54m LONG



Vertical Grade (%)			-1.000 %	
DATUM R.L.620.000				
DEPTH TO INVERT			-1.283	
DESIGN SURFACE			625.934	
PIPE INVERT	NOTE 1	624.702	624.651	624.616
CHAINAGE		0.000	5.000	8.540

Scale Horiz 1:50 Vert 1:50

LONGITUDINAL SECTION SW01

NOTE 1

1. PIPE INVERT LEVELS TO BE CONFIRMED ON SITE. ADOPT EXISTING UPSTREAM INVERT LEVEL FOR NEW INSTALLATION.
2. SET OUT BASED ON FIRST MOST SOUTHERN PIPE IN SERIES.

SCALE: (A1 ORIGIN)
HORIZONTAL (1:50) : 0 1 2 3 4
VERTICAL (1:50) : 0 1 2 3 4

DATUM: AHD
ORIGIN:
COORD. SYSTEM: MGA2020

SURVEYED KM DATE SEPT 2024
DESIGNED MC/PS DATE OCT 2024
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QPRC

PROJECT:
THIRD CURRADUX CREEK
NEW BETTERMENT PROGRAM
CAUSEWAY STD DRAWING

12D Archive file: DESIGN\24005 THIRD DESIGN\24005 THIRD DESIGN.12daz
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JOB No. 24005 DESIGN
TITLE: ACTIVITY 3
PIPE DETAILS

SHEET 6/6
REV C

APPENDIX 2 CONSIDERATION OF STATE AND COMMONWEALTH ENVIRONMENTAL FACTORS

Environmental Planning and Assessment Regulation 2021 section 171 (2)

In accordance with Part 5 of the EP&A Act the factors cited in 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.

Table 22: Clause 171 Consideration

Clause 171 EP&A Regulation	Consideration	Risk	Duration and Extent
Factor A: the environmental impact on a community	Traffic delays during construction will temporarily inconvenience road users, mitigated by traffic management and maintaining access. Improved safety and travel conditions once the works are completed.	Low	Construction - short term, negative. Operation - long term, positive.
Factor B: the transformation of a locality	The works will be confined to disturbed areas within the road reserve. Rehabilitation and revegetation will ensure bank stabilisation and prevent erosion. The locality will benefit from improved road infrastructure and reduced dust impacts.	Low	Construction - short term, negligible. Operation - long term, positive.
Factor C: the environmental impact on the ecosystems of the locality	Works involve watercourse modification, with potential impacts to aquatic habitats through sedimentation and flow disruption during construction. Rehabilitation and larger culverts at Third Curradux Creek will enhance ecological connectivity and water flow.	Moderate	Construction - short term, negative. Operation - long term, positive.
Factor D: the reduction of the aesthetic, recreational, scientific, or other environmental quality or value of the locality	Temporary reduction in visual amenity during construction due to site disturbance and machinery. Rehabilitation will improve the overall aesthetic of the road corridor and waterway banks.	Low	Construction - short term, negative. Operation - long term, positive.
Factor E: effects on a locality, place, or building of significance	No historic heritage place or Aboriginal sites will be impacted. The proposal will not affect a locality, place or building that has aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or	Low to Moderate	Construction - short term, neutral to low negative.

	other special value for present or future generations.		
Factor F: the impact on the habitat of protected animals under the Biodiversity Conservation Act 2016	Potential impacts to aquatic fauna during construction due to sedimentation, pollution, and temporary flow disruptions. Effective mitigation measures, such as fencing and vegetation protection, would be implemented.	Moderate	Construction - short term, negative.
Factor G: the endangering of a species of animal, plant, or other form of life	No species are likely to be endangered by the works. Habitat disturbances are temporary and confined to the disturbed areas.	Nil	Construction - negligible.
Factor H: long-term effects on the environment	Long-term positive effects include improved aquatic connectivity, reduced flooding risk, and stabilised banks, benefiting both the local ecosystem and road infrastructure.	Nil	Operation - long term, positive.
Factor I: degradation of the quality of the environment	Temporary degradation during construction due to dust, noise, and sedimentation, mitigated by erosion controls and site management practices. Rehabilitation will restore environmental quality.	Low / Moderate	Construction - short term, negative.
Factor J: risk to the safety of the environment	Minor risks such as chemical spills or sedimentation during construction will be mitigated through a robust CEMP and pollution controls.	Low	Construction - short term, negative.
Factor K: reduction in the range of beneficial uses of the environment	No reduction in beneficial uses is anticipated, as the works are aligned with the road's purpose and function.	Nil	NA
Factor L: pollution of the environment	Temporary pollution risks from dust, sediment, and vehicle emissions during construction. Mitigation measures include ESC and air quality controls.	Moderate	Construction - short term.
Factor M: environmental problems associated with the disposal of waste	Waste will be managed per Council's requirements, with disposal at the nearest approved facility. No environmental problems anticipated.	Nil	NA
Factor N: increased demands on natural or other resources	Common construction materials will be used, and no strain on natural resources is expected.	Nil	NA
Factor O: the cumulative environmental effect with other existing or likely future activities	No significant cumulative impacts expected, provided scheduling minimises overlap with other local projects. Coordination during planning and construction is essential.	Nil	NA
Factor P: the impact on coastal processes and coastal hazards	The proposal is not in a coastal environment and will not impact coastal processes or hazards.	Nil	NA

Factor Q: applicable local strategic planning statements, regional strategic plans, or district strategic plans made under the Act, Division 3.1	The proposal aligns with the objectives of the Queanbeyan-Palerang LEP and Local Strategic Planning Statement.	NA	NA
Factor R: other relevant environmental factors	No additional environmental factors identified.	NA	NA

APPENDIX 3 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Table 23: MNES assessment table

Environmental factor	Impact
Any impact on a World Heritage property?	N/A. The proposal will not impact on a World Heritage Property.
Any impact on a National Heritage place?	N/A. The proposal will not impact on a National Heritage Place.
Any impact on a wetland of international importance (often called 'Ramsar' wetlands)?	N/A. The proposal will not affect any part of a Ramsar Wetland.
Any impact on nationally threatened species, ecological communities or migratory species?	N/A. The proposal will not impact on nationally threatened species, ecological communities or migratory species. Refer to the Biodiversity section for assessment of the potential impacts on threatened entities.
Any impact on a Commonwealth marine area?	N/A. The proposal will not impact on a Commonwealth Marine Area.
Does the proposal involve a nuclear action (including uranium mining)?	N/A. The proposal will not involve a Nuclear Action.
Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	N/A. The proposal will not directly or indirectly impact on Commonwealth land.

APPENDIX 4 AHIMS SEARCH RESULT

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : CharliesForestRoad

Client Service ID : 967280

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	Recorders						Permits		

There are no sites found for given search criteria.

**** 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

Report generated by AHIMS Web Service on 21/01/2025 for Deidre Krejzlik for the following area at Lat, Long From : -35.3515, 149.9874 - Lat, Long To : -35.3165, 150.0492. Number of Aboriginal sites and Aboriginal objects found is 0

APPENDIX 5 NORBE ASSESSMENT

Neutral or beneficial effect

Chapter 6 (Water Catchments) of SEPP (Biodiversity and Conservation) relates to the use of land within the Sydney drinking water catchment. In accordance with Part 6.5 of SEPP (Biodiversity and Conservation), Council is required to consider whether or not an activity to which Division 5.1 of the EP&A Act applies will have a neutral or beneficial effect on water quality before carrying out the activity.

Table 24: NorBE Assessment

Section	Factor
Are there any identifiable potential impacts on water quality?	The proposed works at Middle and Third Curradux Creeks may impact water quality during construction due to soil disturbance, sediment transport, and potential contamination from machinery operations and hazardous materials. Post-construction impacts are less likely but could occur during vegetation establishment and final stabilisation of disturbed areas.
What pollutants are likely?	Sediments (fine and coarse), nitrogen, phosphorus, hazardous chemicals (e.g., oil, fuel), and pathogens. These pollutants could be mobilised during soil disturbance, machinery operation, or chemical handling.
At what stage do the impacts occur? (i.e., During construction and/or post-construction?)	Impacts are most likely during construction activities, particularly during vegetation clearing, earthworks, and machinery operation. Post-construction impacts may arise during the initial stages of site stabilisation and vegetation establishment if safeguards are not effectively maintained.
For each pollutant, list the safeguards needed to prevent or mitigate potential impacts on water quality (these may be Water NSW-endorsed current recommended practices and/or equally effective other practices)	The proposed safeguards include: • Implementation of erosion and sediment controls such as silt fences, sediment basins, and diversion drains as per the "Blue Book" (Landcom 2004). • Installation of coffer dams and silt curtains for in-stream works. • Use of spill kits and bunded storage areas for hazardous materials and fuels. • Immediate stabilisation and revegetation of exposed areas following works. • Regular inspection and maintenance of sediment controls and equipment.

Will the safeguards be adequate for the time required? How will they need to be maintained?	The safeguards will be effective if implemented and maintained throughout construction. Maintenance will include regular inspections, particularly after rainfall events, and immediate repair of any damaged controls. Sediment controls must be monitored weekly and after heavy rain. Spill kits must be restocked promptly, and workers trained in their use. Vegetation cover will need to be monitored to ensure effective stabilisation post-construction.
Will all impacts on water quality be effectively contained on the site by the identified safeguards (above) and not reach any watercourse, waterbody, or drainage depression? Or will impacts on water quality be transferred outside the site for treatment? How? Why?	The safeguards are designed to contain impacts within the site and prevent pollutants from reaching downstream environments. If unexpected overflow occurs, additional controls, such as temporary sediment basins or diversion channels, will be deployed. The design ensures that sediment and contaminants are captured and treated on-site before they reach sensitive watercourses.
Is it likely that a neutral or beneficial effect on water quality will occur? Why?	In the long term, the proposal is expected to have a neutral or beneficial effect on water quality. The upgrades will stabilise creek crossings, reduce erosion, and enhance drainage systems, leading to improved water flow and reduced sediment transport. The revegetation of disturbed areas will also enhance riparian buffers, promoting long-term water quality improvements.