Transport for NSW

Putty Road, Terrys Creek Slope Remediation

Minor works review of environmental factors

June 2023

NSW GOVERNMENT

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Acknowledgement of Country

Transport for NSW acknowledges the Wanaruah, Wonnarua People, the traditional custodians of the land on which the MR503, Putty Road, Terrys Creek Slope Remediation is proposed.

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

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

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

MW REF approval and authorisation

Approved by	Michael Coyte, Project Manager
Organisation	Transport for NSW
Signed	
Date	16 June 2023

Reviewed and Approved by	Skye Ferguson, A/ Area Manager – Wollemi Yengo
Organisation	National Parks and Wildlife Services
Signed	
Date	27 Jun 23

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1. Introduction

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

The description of the proposed works and assessment of associated environmental impacts has been undertaken in the context of section 171 of the *Environmental Planning and Assessment Regulation 2021,* Guidelines for Division 5.1 Assessments (DPE, 2022), the *Biodiversity Conservation Act 2016 (NSW)* (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 Transport examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

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

2. The proposal

2.1 Description

2.1.1 Proposal location details

Table 2-1: Proposal location details

Location details	
Title	MR503, Putty Road, Terrys Creek Slope Remediation Minor Works Review of Environmental Factors
File number	A50253766
Road name and number	MR503, Putty Road
Closest crossroad(s)	Milbrodale Road (9km north of proposal location)
Chainage of works	N/A
Local government area	Singleton Shire Council
Transport for NSW region	North Region

Figure 2-1: Location of proposal

2.1.2 Proposal description

Transport for NSW proposes to remediate and stabilise slopes at nine locations (identified as slopes No. 3, 4, 5, 7, 8, 9, 10, 11, 13) along a three-kilometre stretch of MR503, Putty Road at Terrys Creek, around 10km south of Milbrodale (the proposal). The location of the proposal is shown in Figure 2-1. The length of the individual slopes along MR503, Putty Road range from around 60 metres to 190 metres. Site 3 and 7 are partially located within Wollemi National Park and Site 9 is partially located within Yengo National Park, with all sites in close proximity to the boundaries of both National Parks.

The proposal includes embankment treatment using soil and rock nails to reinforce the embankment slope with three -five metres of vertical shotcrete finish at all nine locations. The works also include the establishment of a one-metre-wide road shoulder with no fines concrete backfill. The reinstatement of guardrailing is proposed in damaged areas as it integrates with the no fines concrete shoulder widening. Rip rap rock placement is required on some locations to the lower part of the embankments for additional revetment and scour protection.

The works extent along MR503, Putty Road over nine site locations with a traffic control footprint extending around 2.5 kilometres. The total embankment treatment footprint (the maximum potential area of disturbance and the area used as the basis for this assessment) for all nine site locations is around 1.6 ha.

A typical cross section of the soil nail and shotcrete works is provided in Figure 2-2, while the proposal sites are shown in Figure 2-3 to Figure 2-6. It is noted that no remediation works will be undertaken within or from Terry's Creek however environmental controls may be placed at the limits of the watercourse. Watercourses as displayed in Figure 2-3 to Figure 2-6 are indicative only and not survey accurate.

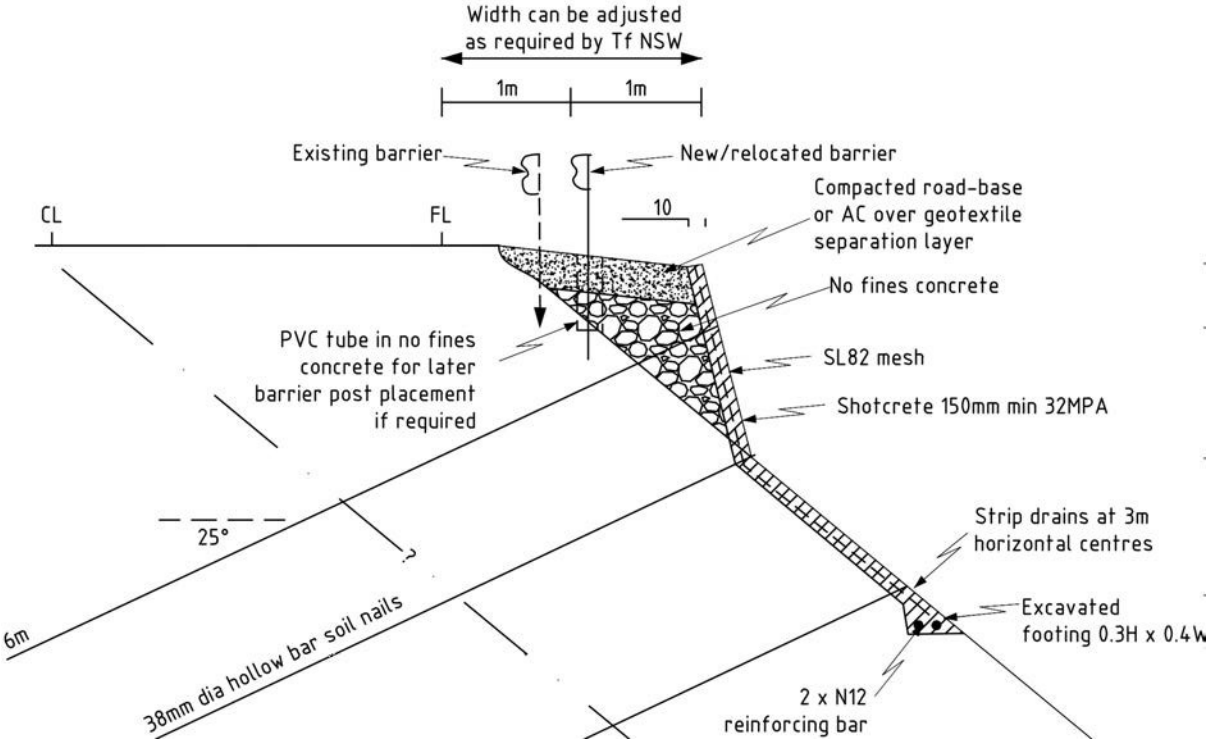

Figure 2-2: Typical cross section

Figure 2-3: Proposal sites 3, 4 and 5

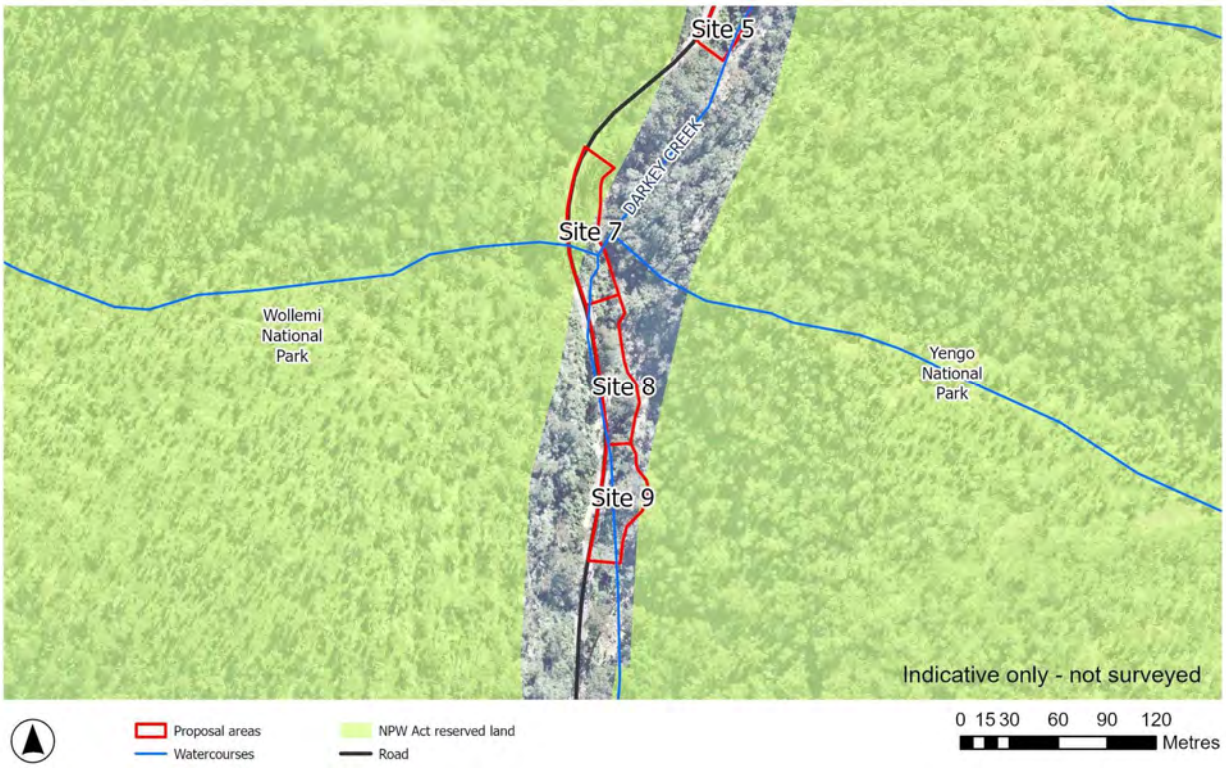

Figure 2-4: Proposal sites 7, 8 and 9

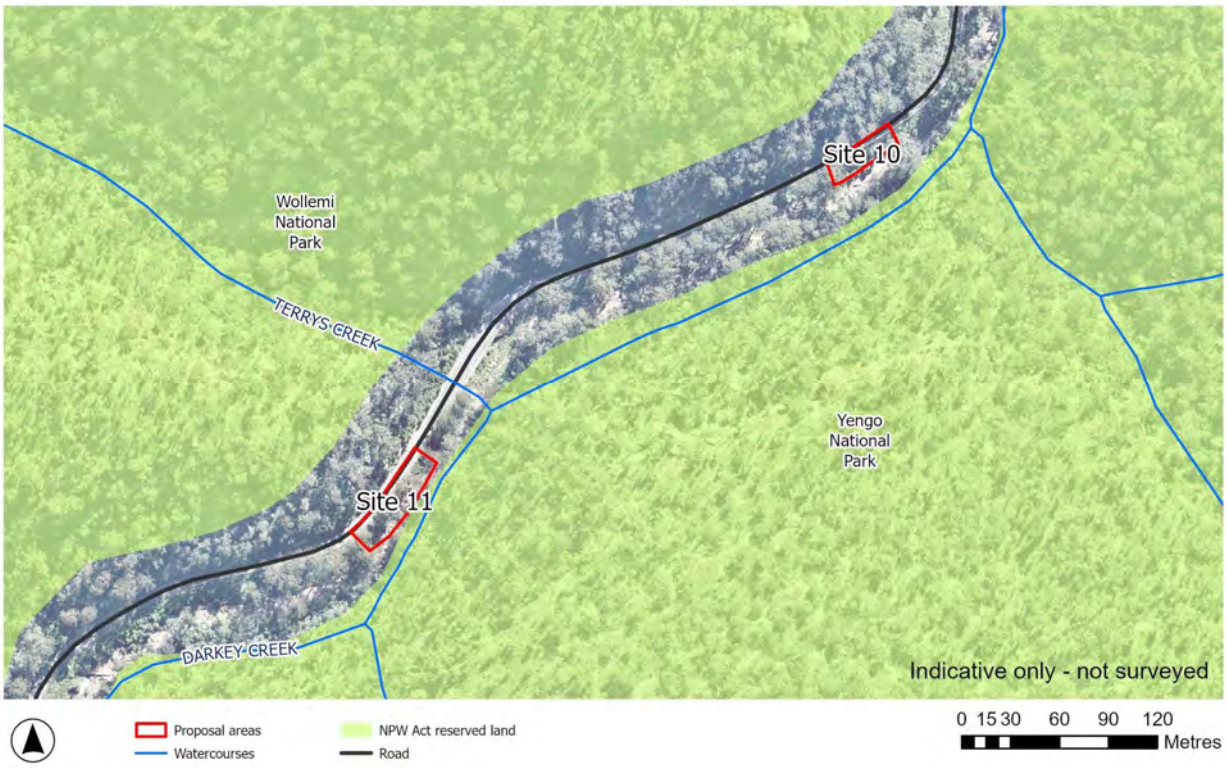

Figure 2-5: Proposal sites 10 and 11

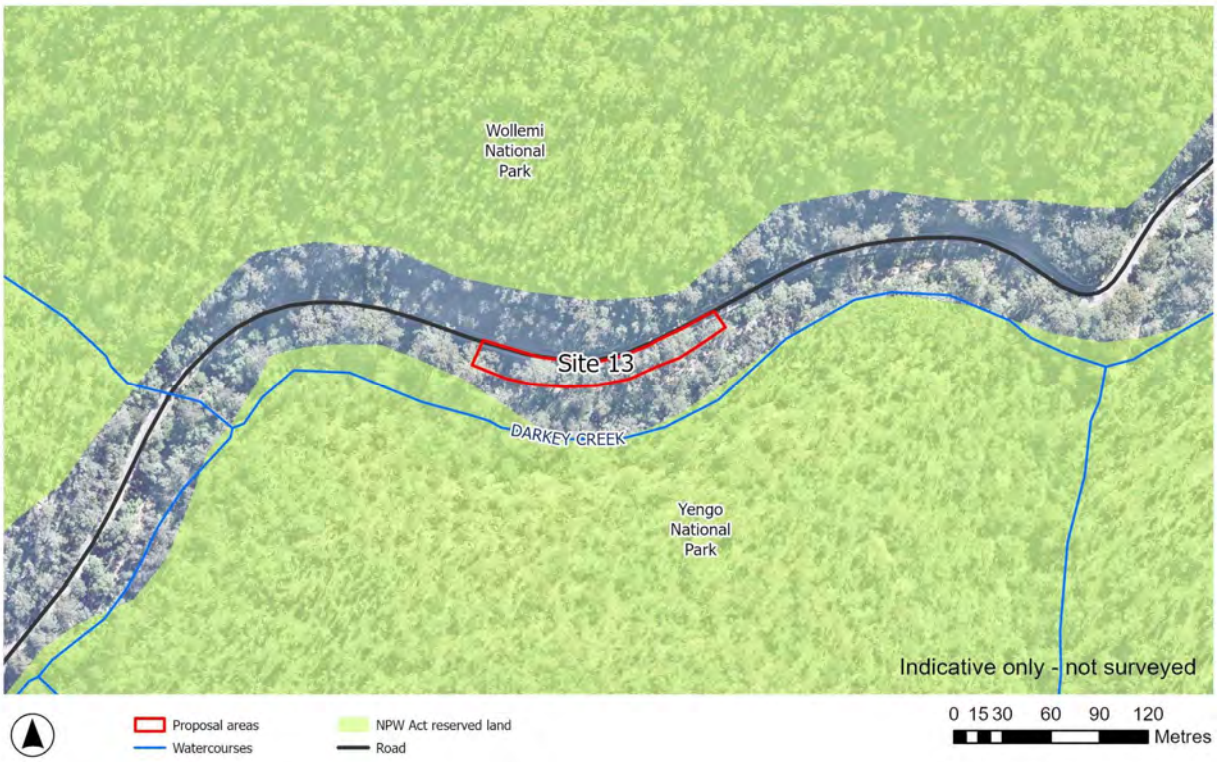

Figure 2-6: Proposal site 13

Work methodology

The proposal is anticipated to involve the following work methodology:

- Implement traffic and environmental control measures
- Clear vegetation and remove loose materials along the embankments
  - Trim vegetation to ground level and remove trimmed vegetation, existing accumulated surface humus and any small and fallen trees from the slope treatment area
  - Remove large canopy trees based on arborist assessment recommendations and which occur in the area of proposed shotcrete, with the trunk cut close to ground level as practical with the root system left in place
  - Remove loose soil and surface rock from batter slope and crest to form a surface for placement of the blinding layer. Larger rock embedded in the embankment batter to remain with mesh and shotcrete shaped around or over the larger rocks. Soil nail layout to be adjusted so that soil nails are drilled through larger embedded rock
- Excavate a bench (0.4m in width and 0.3m in height) along the proposed toe of the wall to allow for thickening of the shotcrete at the wall toe to form a footing for structural intergrity and erosion protection.
- Install strip drains to exit below or through base of shotcrete walls
- Place 50mm thick fibrecrete blinding layer to stabilise existing slope surface for drilling
- Drill and install soil nails to Transport Specification R64 Soil Nailing
  - Install three to four rows of soil nails with the upper row to be installed 0.5m vertical height below the embankment hinge point (pavement fog line)
  - Install with vertical spacing ranging from 1.0m to 1.5m (predominantly 1.5m) and horizontal spacing of 1.5m with soil nails positioned in a staggered pattern
  - Install within 100mm diameter boreholes drilled at an inclination of 25 degrees from the horizontal
  - Install at lengths between 6m and 12m depending on geological conditions
  - On completion of drilling, clean the drillhole of all loose and deleterious material by flushing with air and protect or seal the drillhole opening to prevent the entry of foreign matter prior to grouting
  - Inject grout
- Install sacrificial formwork along crest for shoulder widening around 1m to create a verge for the guardrailing installation
- Install face reinforcement mesh and spray with shotcrete to form walls (achieving a minimum thickness of 150mm)
- Backfill behind new walls with no fines concrete
- Form widened road shoulder / verge (to 1m wide) to support guardrailing installation
- Place rip/rap boulder protection along toe of embankments at sites 3, 7 and 11, which can be undertaken after the shotcrete wall construction.
- Re-locate and re-establish guard rail where required.

Plant and equipment

The equipment and machinery to be used includes:

- Small and medium size excavators
- Soil/rock nail drilling rig which is a small rig on rubber tracks
- Knuckle boom sled nailing platform

- Six wheel dump trucks
- Concrete delivery trucks and concrete pumps
- Elevated work platforms and booms
- Telehandler and franna cranes maybe required.

Working hours

Work will be conducted during standard working hours:

- 7am to 6pm Monday to Friday
- 8am to 1pm Saturdays
- No works on Sundays and Public Holidays.

However, to minimise disruption to traffic using MR503, Putty Road and to allow works to be completed more quickly, some work may be required to be conducted outside these hours. Working outside standard hours would occur during the following periods:

- 6:30am to 7am Monday to Saturday
- 1pm to 6pm Saturday.

2.1.3 Proposal objectives

The objectives of the proposal are to:

- Stabilise the slopes of the road embankments along MR503, Putty Road
- Improve safety for motorists using the MR503, Putty Road
- Minimise long-term environmental and social impacts
- Minimise disruptions to road users and the community

2.1.4 Ancillary facilities

Table 2-2: Ancillary facilities

Ancillary facilities		
Will the proposal require the use or installation of a compound site? Up to four compound / plant laydown facilities would be required for the proposal, shown in Figure 2-7 to Figure 2-10. No tree removal is proposed for the establishment and operation of the compound facilities. All proposed compound and plant laydown areas are in existing disturbed areas. Site compound No.1 is an existing gravel area located around three kilometres north of the proposal on the western shoulder of MR503, Putty Road. It has an area of around 950m^2 and would be used for a worker amenity, associated vehicle parking and storage. Site compound No.2 is an existing gravel area on the western side of MR503, Putty Road located where Terrys Creek crosses MR503, Putty Road, just to the north of Site 11. This small area would be used for plant laydown, vehicle parking and a lunchroom. Site compound No.3 is an existing gravel area around 1.2 kilometres to the south of the proposal on the eastern shoulder of MR503, Putty Road. This area would be used for a site office, worker amenities, associated vehicle parking and storage. The site has an area of about 1,300m^2. Site compound No.4 is an existing gravel area located around five kilometres south of the proposal on the western shoulder of MR503, Putty Road. It has an area of around 400m^2 and would be used for a storage of plant and equipment.	Yes ☒	No ☐
Will the proposal require the use or installation of a stockpile site? Up to two stockpile site facilities would be required for the proposal, shown in Figure 2-11 and Figure 2-12, and would be used in accordance with the Stockpile Site Management Guideline (EMS-TG-10). It is noted that most of the spoil from the works would be used for the reshaping of the embankments to support final profile requirements. No tree removal is proposed for the establishment and operation of the stockpile facilities. Stockpile site No.1 is an existing Transport stockpile site located around three kilometres south of the proposal off the western side of MR503, Putty Road. It has an area of around 3,000m^2 and would be used, if required, to temporarily stockpile any additional soil from the proposal that is not reused. Temporary stockpiling of mulched vegetation may also occur at this site. Stockpile site No.2 is an existing Transport stockpile site area located around 13 kilometres south of the proposal on the western shoulder of MR503, Putty Road. It has an area of around 4,000m^2 and would be used, if required, to temporarily stockpile any additional soil from the proposal that is not reused. Temporary stockpiling of mulched vegetation may also occur at this site.	Yes ☒	No ☐
Are any other ancillary facilities required (e.g., temporary plants, parking areas, access tracks)?	Yes ☐	No ☒

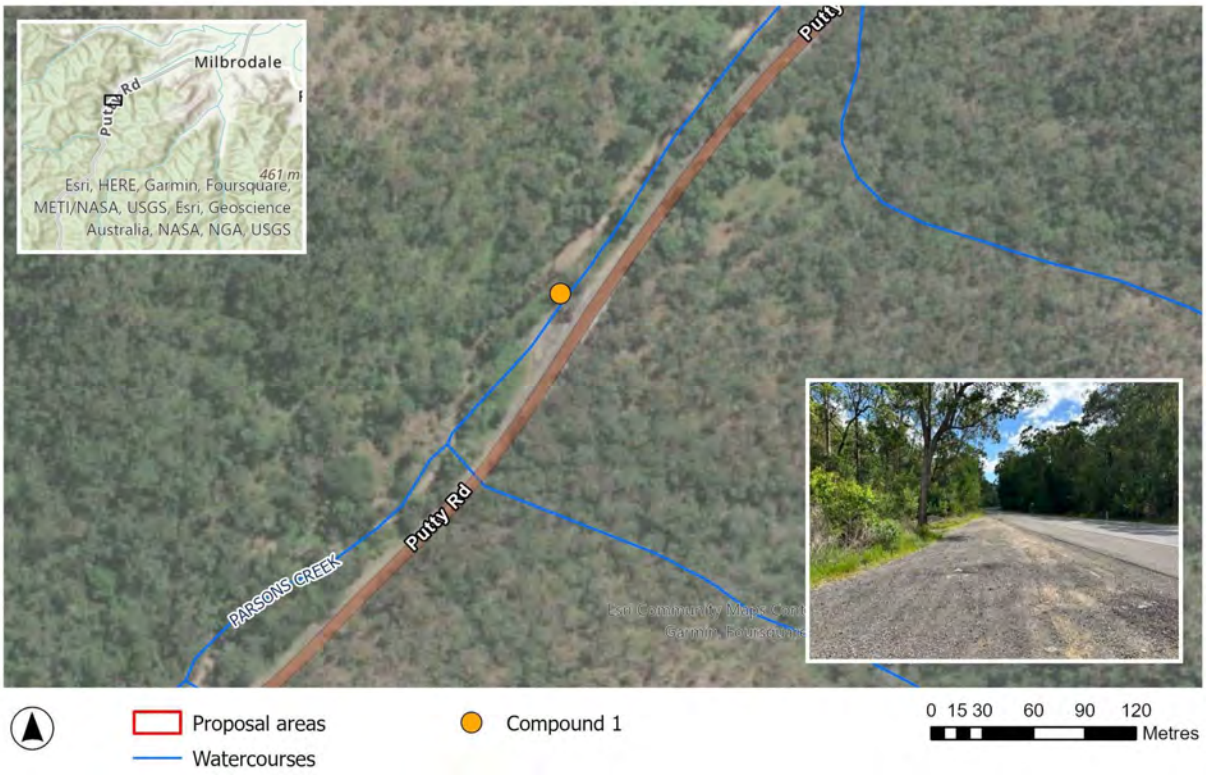

Figure 2-7: Compound site 1 location

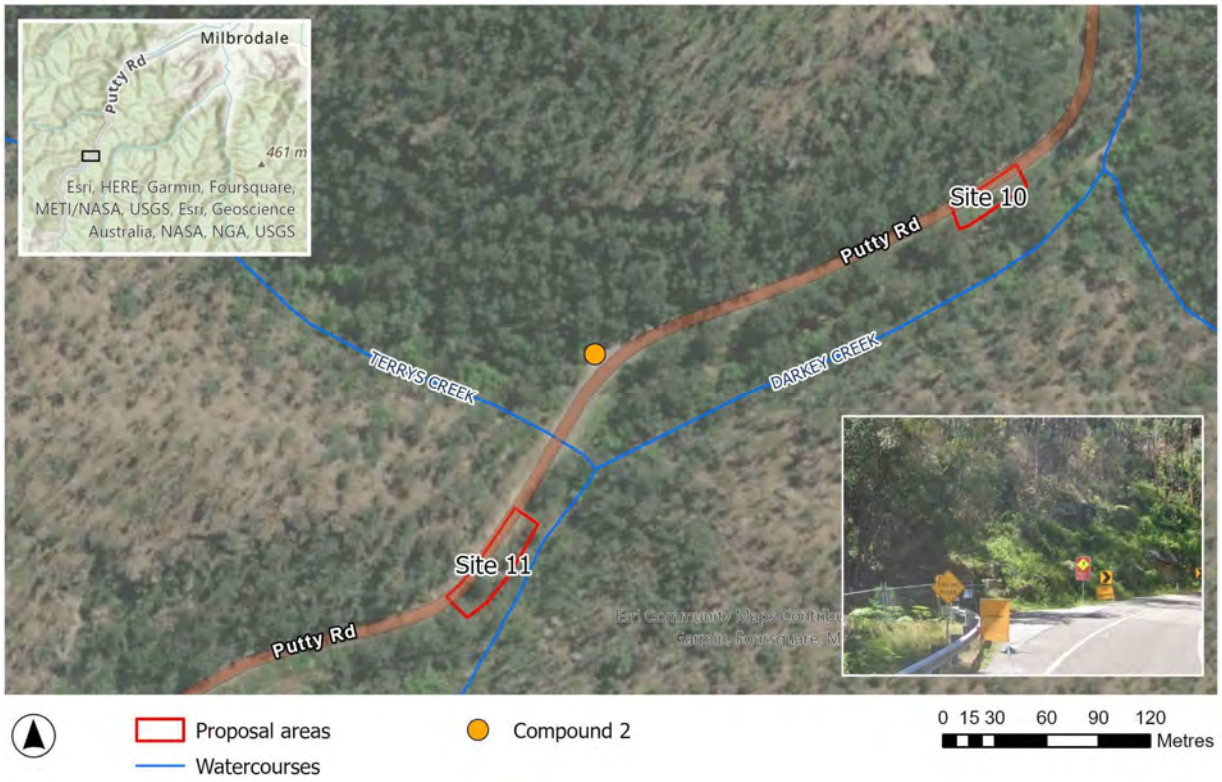

Figure 2-8: Compound site 2 location

Figure 2-9: Compound site 3 location

Figure 2-10: Compound site 4 location

Figure 2-11: Stockpile site 1 location

Figure 2-12: Stockpile site 2 location

2.1.5 Proposed date of commencement

The indicative date for the commencement of the proposal is August - September 2023.

2.1.6 Estimated length of construction period

Weather permitting, the anticipated duration for the proposed works would be around four to six months.

2.2 Need and options

2.2.1 Options considered

The options considered for the proposal included:

- Option 1: Do nothing
- Option 2: Stabilise slopes with soil and rock nails and shotcrete walls
- Option 3: Stabilise slopes with gabion wall or retaining structure
- Option 4: Buttress support of the embankment by placement of a rock fill berm
- Option 5: Support of the embankment by an anchored soldier or sheet pile wall
- Option 6: Excavation and replacement of the pavement

Option 1 would not address the objectives of the proposal and the current safety, traffic and environmental impacts would continue or potentially worsen.

Option 2 would have the smallest number of environmental impacts which would be minimised by the proposed safeguards and management measures, while native vegetation removal would be offset to ensure no net loss of biodiversity values consistent with the No net loss guidelines (Transport for NSW, 2022) and Tree and hollow replacement guidelines (Transport for NSW, 2022). Option 2 best addresses the instability of the identified slopes and would allow for necessary repairs to be made to MR503, Putty Road to achieve a safe road environment for motorists. An evaluation of the options is provided below in Table 2-3.

Table 2-3: Evaluation of options

Option No.	Description	Evaluation
1	Do nothing	Does not address the objectives of the proposal and the current safety, traffic and environmental impacts would continue or potentially worsen.
2	Stabilise slopes with soil and rock nails and shotcrete walls	Preferred option. This option: • Is simple proven methodology for stabilisation of fill embankments including recent projects on the MR503, Putty Road. • Requires no excavation of the pavement area with construction plant working from the closed lane while maintaining traffic on the northbound lane. • Facilitates widening of embankment shoulder by no fines concrete which will improve the performance of the guardrailing. • Nil disturbance to the creek bed area (Darky Creek). The placement of selective rock fill at the toe of the embankment treatment areas is not within the creek bed. • Can be progressively constructed in a timely manner with the option to have concurrent contractors / works fronts .
3	Stabilise slopes with gabion wall or retaining structure	This is an environmental invasive option and is not considered a feasible option as this would require deep excavation into a rock foundation through fill and colluvial soils adjacent to the traffic lane and Darky Creek.

4	Buttress support of the embankment by placement of a rock fill berm	Not preferred due to construction and extensive environmental risks and disturbance as works are adjacent to Darky Creek and a tight and narrow road corridor. Requires excavation of a foundation up to 4m in the creek floor area (identified as key fish habitat) and formation of a construction access track along the creek edge for excavator and rigid body truck access.
5	Support of the embankment by an anchored soldier or sheet pile wall	Not preferred due to construction risks with the need for larger machinery and drilling equipment that would result in full road closure. Geotechnically the road may not be fit for purpose with the use of heavy machinery to complete this option.
6	Excavation and replacement of the pavement	Not preferred due to construction risks. This option would require substantial excavation to achieve a satisfactory level of safety and there is a risk associated with undertaking temporary excavation adjacent to the live northbound traffic lane.

2.2.2 Justification for the proposal

The subject fill embankments are in the order of 80 years old and given the proximity to the creek line, have generally been deteriorating for most of this time. The original drystone walls that appear to have been in the upper fill profile are predominantly no longer present with an over-steep fill batter now extending close to the edge of pavement and at some locations to the alignment of the barrier posts. This progressive deterioration in the drystone walls is due to a combination of effects including erosion from flooding events, tree jacking and rainfall event concentrated pavement sheet runoff due to poor road pavement camber and undersized or partially blocked culverts leading to scouring and erosion of the fill shoulders and walls. Embankment slips are also evident from the recent storm events.

The above issues have required the restriction of MR503, Putty Road at this location to the southbound lane for safety, with traffic controllers required on site 24/7. The proposal is therefore needed to remediate the subject slopes and allow MR503, Putty Road to be restored to two-way traffic movements.

The proposal would improve safety conditions for motorists using MR503, Putty Road. While the proposal would involve impacts to the surrounding environment, including vegetation clearing and soil disturbance, there is an opportunity for beneficial reuse of waste material and the potential environmental impacts of the proposal have been identified as relatively minor and can be addressed by safeguards and offsets. On balance, the benefits derived from proceeding with the proposed slope embankment works outweigh the potential road safety impacts.

2.3 Statutory and planning framework

2.3.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

The State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the state, including for roads and road infrastructure facilities. Section 2.109 of the SEPP (Transport and Infrastructure) permits development on any land for the purpose of a road or road infrastructure facilities to be conducted by or on behalf of a public authority without consent.

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

The proposal does not require development consent or approval under State Environmental Planning Policy (Resilience and Hazards) 2021, State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021, State Environmental Planning Policy (Precincts – Central River City) 2021, State Environmental Planning Policy (Precincts – Western Parkland City) 2021, State Environmental Planning Policy (Precincts – Regional) 2021 or State Environmental Planning Policy (Planning Systems) 2021.

The proposal is partly located on land reserved under the *National Parks and Wildlife Act 1974* (NPW Act) (Yengo National Park and Wollemi National Park) noting that the reserve boundaries do not accurately follow the alignment of the existing road in all areas. The relevant SEPP (Transport and Infrastructure) provisions only

apply to works on land reserved under the NPW Act where they are authorised under that Act. The National Parks and Wildlife Service has been consulted regarding the proposal and, if required, an authorisation under the NPW Act would be obtained for those parts of the works within the Yengo National Park and Wollemi National Park.

NPW Act provisions are discussed further in Section 2.3.2.

2.3.2 Other relevant legislation and environmental planning instruments

Protection of the Environment Operations Act 1997

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

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

Heritage Act 1977

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

An excavation permit is required to disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged, or destroyed. A permit is also required to disturb or excavate any land on which the person has discovered or exposed a relic. Section 139(4) of the *Heritage Act 1977* makes provision for the issuing of an exception in certain prescribed circumstances. While the proposal is partly within the Greater Blue Mountains Area World Heritage Area (the boundaries of which correspond to the two national parks), there are no other listed heritage items within or near the proposed area (refer to Section 3.5). An excavation permit would not be required for the proposal.

National Parks and Wildlife Act 1974

The proposal is partly located within and adjacent to the Yengo National Park and Wollemi National Park which are reserved land under the NPW Act (noting that the boundaries of the reserves do not accurately follow the alignment of the existing road in all areas). As can be seen in Figure 2-3 to Figure 2-6, Site 3 and 7 are partially located within Wollemi National Park and Site 9 is partially located within Yengo National Park, with all sites in close proximity to the boundaries of both National Parks. Wollemi National Park is upslope of the proposed works and Yengo National Park is generally downslope from the proposed works. Works on reserved land need to be consistent with the objects of the NPW Act and need to be in accordance with the plan of management for the reserve and may need to be authorised.

The proposal involves essential maintenance and repair of an existing road with overall minor impacts (refer to Chapter 3). Impacts associated with that part of the proposal within and adjacent to the Yengo National Park and Wollemi National Park are not likely to impede the achievement of the objects in Section 2A of the NPW Act, the implementation of the management principles for National Parks in Section 30E of the NPW Act, or the policies and actions in the Yengo National Park, Parr State Conservation Area and Finchley Aboriginal Area Plan of Management (NPWS, 2009) and the Wollemi National Park Plan of Management (NPWS, 2001) (refer to Appendix F where these matters are reviewed). Consultation with the National Parks and Wildlife Service has occurred in relation to the proposal (refer to Section 2.4).

The harming or desecrating of Aboriginal objects or places is an offence under section 86 of the *National Parks and Wildlife Act 1979*. Under section 90, an Aboriginal heritage impact permit may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities, or persons. The potential impacts and relevant safeguards in relation to Aboriginal heritage are discussed further in Section 3.5.

Biodiversity Conservation Act 2016

The BC Act seeks to conserve biological diversity and promote ecologically sustainable development; to prevent extinction and promote recovery of threatened species, populations, and ecological communities; and to protect areas of outstanding biodiversity value.

The BC Act provides a listing of threatened species, populations and ecological communities, areas of outstanding biodiversity value, and key threatening processes. Part 7 of the BC Act requires that the significance of the impact on threatened species, populations and endangered ecological communities listed under the BC Act or *Fisheries Management Act 1994*, are assessed using a five-part test. Where a significant impact is likely to occur, a Species Impact Statement or Biodiversity Development Assessment Report (BDAR) must be prepared.

Vegetation at the proposal sites was found to conform to PCT 3237 (Hunter Range Blue Gum Gully Forest). PCT 3237 does not conform to any threatened ecological community listed by the BC Act or EPBC Act. No threatened flora species listed under the EPBC Act or BC Act were recorded or considered likely to occur within the area investigated. As no threatened species are adversely impacted by the proposal, assessments referring to the EPBC Act Significant Impact Guidelines and Section 7.3 of the BC Act is not required. Assessments undertaken concluded that the proposal would not have a significant effect on hollow-dependent fauna, or any areas of their habitats. The full Biodiversity Assessment Report undertaken by Lesryk Environmental can be found in Appendix C.

Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Section 4.2.

A referral is not required for proposed road activities that may affect nationally listed threatened species, endangered ecological communities, and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land, found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water under the EPBC Act.

2.4 Community and agency consultation

2.4.1 SEPP (Transport and Infrastructure) consultation

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

Table 2-4: Consultation required with Council

Is consultation with Council required under sections 2.10 - 2.12 and 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?	Yes ☐	No ☒
Is the proposal within the coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	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). The proposal sites are not identified as flood prone (either within a flood planning area or within the extent of historic floods) by Singleton Council flood mapping.	Yes ☐	No ☒

Table 2-5: Consultation with other public authorities

Is consultation with a public authority (other than Council) required under sections 2.13, 2.15 and 2.16 of the SEPP (Transport and Infrastructure)?		
Are the works located on flood liable land? (To any extent) (SEPP (Transport and Infrastructure) s2.13) If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance? 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). The proposal sites are not identified as flood prone (either within a flood planning area or within the extent of historic floods) by Singleton Council flood mapping.	Yes ☐	No ☒
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? The proposal is located adjacent to the Yengo National Park and Wollemi National Park. Consultation with the National Parks and Wildlife Service has occurred in relation to the proposal (refer to Section 2.4 and the correspondence in Appendix F).	Yes ☒	No ☐
Are the works on land in Zone C1 National Parks and Nature Reserves or in a land use zone equivalent to that zone? Most of the proposal is located on land zoned Zone C1 National Parks and Nature Reserves, noting that the SP2 Infrastructure zoning for MR503, Putty Road does not align with the actual road formation. Consultation with the National Parks and wildlife Service has occurred in relation to the proposal (refer to Section 2.4 and Appendix A).	Yes ☒	No ☐
Do the works include a fixed or floating structure in or over navigable waters?	Yes ☐	No ☒

Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	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?	Yes ☐	No ☒
Are the works on buffer land around the defence communications facility near Morundah?	Yes ☐	No ☒
Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	Yes ☐	No ☒

Table 2-6: Notification of council and occupiers of adjoining land

Do Council and occupiers of adjoining land need to be notified under section 2.110 of the SEPP (Transport and Infrastructure)?		
Does the proposal include a car park intended for the use by commuters using regular bus services?	Yes ☐	No ☒
Does the proposal include a bus depot?	Yes ☐	No ☒
Does the proposal include a permanent road maintenance depot or associated infrastructure, such as garages, sheds, tool houses, storage yards, training facilities and workers amenities?	Yes ☐	No ☒

2.4.2 Other agency and community consultation

Transport provided details of the proposal National Parks and Wildlife Service by email on 20 March 2023. A response as received on 8 May 2023. The response noted that the planned works are almost wholly located within the road reserve and asked that if any hollow bearing trees are identified as requiring either partial or full removal, preference should be given to only partial removal leaving the hollow in situ where possible. If partial removal is not possible, trees with hollows that are to be completely felled should be left onsite nearby for potential re-occupation rather than being removed from site. This feedback is now reflected in safeguard BD14. A copy of correspondence is provided in **Appendix F**.

Due to the limited scope and nature of the proposal (road and slope rehabilitation), broad stakeholder consultation is not considered necessary. Suitable signage would be placed to inform road users of changes in traffic conditions prior to and during the implementation of the proposal. The project will obtain a Road Occupancy Licence (ROL) and will notify the local community prior to the works commencing.

3. Environmental assessment

This section provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environmental potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in section 171 of the Environmental Planning and Assessment Regulation 2021.

The matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) are also considered in section 4. Site-specific safeguards are provided to ameliorate the identified potential impacts.

3.1 Soil

Table 3-1: Soil

Description of existing environmental and potential impacts		
Are there any known occurrences of salinity or acid sulfate soils in the area? Department of Planning and Environment acid sulfate soil risk mapping does not identify any of the proposal footprints as having a risk of acid sulfate soil occurrence. Reference to SEED data (NSW State-wide Hydrogeological Landscapes 2020 (First Edition)) indicates the proposal footprints have a very low overall salinity hazard.	Yes ☐	No ☒
Does the proposal involve the disturbance of large areas (e.g., >2ha) for earthworks? The proposal would require the disturbance of existing roadside slopes. The area of potential disturbance (and the basis for the assessment in this REF) at each site ranges from about 640m^2 to 3,000 m^2. Sites would be disturbed on a progressive basis. The total maximum area of all sites is about 1.6ha.	Yes ☐	No ☒
Does the site have constraints for erosion and sedimentation controls such as steep gradients or narrow corridors? The proposal sites are constrained by steep slopes and the proximity of the MR503, Putty Road travel lanes. Effective erosion and sediment controls can still be implemented across the gradient and at the base of each slope, and in any other areas as required, to avoid or minimise any potential impacts to soils.	Yes ☒	No ☐
Are there any sensitive receiving environments that are located in or nearby the likely proposal area or that would likely receive stormwater discharge from the proposal? Sensitive receiving environments include (but are not limited to) wetlands, state forests, national parks, nature reserves, rainforests, drinking water catchments). There are no wetlands, state forests, nature reserves, rainforests or drinking water catchments within or adjacent to the proposal footprints. The proposal is partly within and adjacent to Yengo National Park and Wollemi National Park, which are part of the Greater Blue Mountains World Heritage Area. In the absence of appropriate controls, polluted stormwater could be released from the site into downstream waterways. The proposed safeguards in this section and Section 3.2 would address water quality risks during construction.	Yes ☒	No ☐
Is there any evidence within or nearby the likely footprint of potential contamination? A search (30 March 2023) of the NSW Environment Protection Authority (EPA) contaminated land record of notices for the Singleton local government area returned no records near the proposal footprint. A search of the list of NSW contaminated sites notified to EPA (30 March 2023) also returned no records near the proposal footprint. Current and former land use (road reserve, bushland) at the proposal locations does not indicate the potential for land contamination.	Yes ☐	No ☒

Is the likely proposal footprint in or nearby highly sloping landform? The proposal sites are steep roadside slopes that require stabilisation.	Yes ☒	No ☐
Is the proposal likely to result in more than 2.5ha (area) of exposed soil? The total area for disturbance across the sites is less than 2.5ha.	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

ES1	Erosion and sediment control measures are to be implemented and maintained to: • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets • Reduce water velocity and capture sediment on site • Minimise the amount of material transported from site to surrounding pavement surfaces • Divert clean water around the site (In accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book)).
ES2	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.
ES3	Erosion and sediment control measures are not to be removed until the work is complete, and areas stabilised.
ES4	A progressive erosion and sediment control plan is to be prepared for the works by the Contractor or Contractors engaged for the works. The erosion and sediment control plan are to be developed in accordance with Bluebook principles.
ES5	Parking of vehicles and storage of plant/equipment is to occur only within the designated proposal footprints or at nominated ancillary sites.
ES6	Existing ground cover vegetation will be retained to the greatest extent possible to minimise the area of exposed soils.
ES7	The use of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).

3.2 Waterways and water quality

Table 3-2: Waterways and water quality

Description of existing environmental and potential impacts		
Is the proposal located within, adjacent to or near a waterway? The proposal is adjacent to Darkey Creek and Terrys Creek which flow into the Hunter River via Wollombi Brook. Selective placement of rock armour along the toe of the fill embankment is proposed and is expected to minimise further slope erosion during periods of high flow in the adjacent creek. This would help maintain watercourse structure and would minimise impact on water quality associated with the scouring of creek banks. In the absence of appropriate controls, works within the watercourse have the potential to affect water quality. The proposed safeguards in this section and Section 3.1 would address water quality risks during construction.	Yes ☒	No ☐
Is the location known to flood or be prone to water logging?	Yes ☐	No ☒

The proposal sites are not identified as flood prone (either within a flood planning area or within the extent of historic floods) by Singleton Council flood mapping.		
Is the proposal located within or immediately adjacent to the area managed by Water NSW covered by chapter 8 of State Environmental Planning Policy (Biodiversity and Conservation) 2021 (SEPP (Biodiversity and Conservation))?	Yes ☐	No ☒
Would the proposal be undertaken on a bridge or ferry?	Yes ☐	No ☒
Is the proposal likely to require the extraction of water from a local water course	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

WQ1	There is to be no release of dirty water into drainage lines and waterways.
WQ2	Water quality controls measures are to be used to prevent any materials (e.g. grout, sediment etc) entering drainage or waterways.
WQ3	Shotcreting operations would not occur during periods of rainfall or where a medium or higher chance (≥40%) of rainfall is forecast by the Bureau of Meteorology.
WQ4	Waste shotcrete would be frequently removed from the road pavement and other areas to prevent mobilisation during a rainfall event.
WQ5	Vehicle wash down would occur in a bunded area within the existing Transport for NSW depot at Howes Valley.
WQ6	Plant and equipment will be inspected regularly to ensure there are no leakages of fuel, oil, and hydraulic fluid.
WQ7	All fuels, chemicals and liquids will be stored in an impervious bunded area within the compound site when not in use.
WQ8	If refuelling of plant and equipment is required on site it will take place on flat ground only using 20 litre drums within a bunded area large enough to contain 120 per cent of the container's contents.
WQ9	If an incident (e.g. spill) occurs, the Environmental Incident Procedure (Transport for NSW, 2021) is to be followed and the Transport for NSW Contract Manager and Environment Manager notified immediately.
WQ10	An emergency spill kit is to be kept on site and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances. All staff are to be made aware of the location of the spill kit and trained in its use.
WQ11	Procedures will be developed by the Contractors for managing the worksite where there is a risk of high rainfall, including removal and storage of plant and equipment and securing of the site, and access arrangements.
WQ12	All workers will be advised of the location of the spill kit and trained in its use.

3.3 Noise and vibration

Are there any residential properties or other noise sensitive areas near the location of the proposal that may be affected by the work (i.e., church, school, hospital)?

Table 3-3: Noise and vibration

Description of existing environmental and potential impacts		
During construction? There are no noise sensitive receivers near any of the proposal works sites, compound locations or Stockpile 1 (the nearest being more than 1.5 kilometres away and shielded by intervening topography). Stockpile 2 is located about 140 metres from a residential dwelling on the eastern side of MR503, Putty Road, while another dwelling is about 360 metres to the west (but shielded by topography).	Yes ☐	No ☒
During operation? There would be no operational noise associated with the proposal. Refer to discussion below.	Yes ☐	No ☒
Is the proposal going to be undertaken only during standard working hours? Standard working hours • Monday-Friday: 7:00am to 6.00pm • Saturday: 8.00am to 1.00pm • Sunday and Public Holidays: no work Work will be conducted primarily during the above standard working hours. However, to minimise disruption to traffic using MR503, Putty Road and to allow works to be completed more quickly, some work would need to be conducted outside these hours. Work outside standard hours would occur during the following periods: • 6:30am to 7am Monday to Saturday • 1pm to 6pm Saturday.	Yes ☐	No ☒
Is any explosive blasting required for the proposal?	Yes ☐	No ☒

Would construction noise or vibration from the proposal affect sensitive receivers? Yes ☒ No ☐

Sensitive receivers would not be affected by the slope stabilisation works due to the distances between noise source and receiver and shielding by topography. There is some potential for the nearest receiver to Stockpile 2 to be affected by infrequent stockpiling activities.

Construction noise impacts associated with Stockpile 2 have therefore been considered in accordance with the Construction Noise and Vibration Guideline (Transport for NSW, 2022) and associated noise estimator tool. The 'distance-based noisiest plant' worksheet was used with the 'excavator dumping rubbles' adopted as the noisiest plant.

Noise management levels (NMLs) were established for the proposal using the Rating Background Level (RBL) for the R0 representative environment defined in the noise estimator. This level best reflects the low traffic volumes on the MR503, Putty Road. The selected ground type used in the assessment was for 'undeveloped green fields, rural areas with isolated dwellings. A line of sight between noise source and receiver was assumed.

Key assessment results for the noisiest plant to residential receivers (for Stockpile 2) are summarised below. The results show that noise sensitive receivers are not likely to experience noise above NMLs during construction of the proposal.

Noise impact (day)	Distance (m)	Affected receivers
Affected distance (>NML)	525	2
Noticeable (5-10 dBA > Background)	N/A	N/A
Clearly audible (10-20 dBA > Background)	N/A	N/A
Moderately intrusive (20-30 dBA > Background)	250	1
Highly intrusive (>30 dBA > Background)	120	0
Highly noise affected (> 75 dBA)	25	0

Noise impact (night)	Distance (m)	Affected receivers
Affected distance (>NML)	760	2
Noticeable (5-10 dBA > Background)	760	2
Clearly audible (10-20 dBA > Background)	525	2
Moderately intrusive (20-30 dBA > Background)	250	1
Highly intrusive (>30 dBA > Background)	120	0
Highly noise affected (> 75 dBA)	25	0

Would operation of the proposal alter the noise environment for sensitive receivers? Yes ☐ No ☒

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

Would the proposal result in vibration being experienced by any surrounding properties or infrastructure during operation? Yes ☐ No ☒

There would be no operational vibration associated with the proposal.

Safeguards

Safeguards to be implemented are:

NV1	The standard mitigation measures identified in Appendix B of the Construction Noise and Vibration Guideline (Transport for NSW, 2022) will be implemented.
NV2	A letterbox drop notification for residential receivers within 760 metres of Stockpile 2 will occur at least five business days prior to works starting. The extent of the notification will be confirmed with reference to the noise assessment and the specific types of activities proposed. The notification will detail work activities, dates and hours, impacts (including any changed traffic

	arrangements) and mitigation measures. It will also include a contact number for enquiries and complaints.

3.4 Air quality

Table 3-4: Air quality

Description of existing environmental and potential impacts		
Is the proposal likely to result in large areas (>2ha) of exposed soils? The proposal would require the disturbance of existing roadside slopes, including vegetation removal and drilling for soil nails. The area of potential disturbance (and the basis for the assessment in this REF) at each site ranges from about 640m^2 to 3,000m^2. The total maximum disturbance area of all sites is about 1.6ha. The total amount of dust generated from earthworks would depend on the silt and moisture content in the soil, prevailing weather conditions and the types of activities being conducted. As the area to be disturbed is not near sensitive receivers, dust impacts are expected to be minor. Any dust impacts would be highly localised and can be managed with the proposed safeguards.	Yes ☐	No ☒
Are there any dust-sensitive receivers located within the vicinity of the proposal during the construction period? There are no sensitive receivers near any of the proposal works sites, compound locations or Stockpile 1 (the nearest being more than 1.5 kilometres away). Stockpile 2 is located about 140 metres from a residential dwelling on the eastern side of MR503, Putty Road, while another dwelling is about 360 metres to the west. These dwellings are unlikely to be affected by any localised dust from stockpiling operations.	Yes ☐	No ☒
Is there likely to be an emission to air during construction? The proposal would not result in a material increase in air pollution. The proposal would result in minor exhaust emissions from equipment and vehicles. Given the scale of the proposal and implementation of appropriate controls, the potential for adverse air quality impacts on receivers and the general environment is considered minor.	Yes ☒	No ☐

Safeguards

Safeguards to be implemented are:

AQ1	Work will not be conducted during high winds or in weather conditions where elevated level of dust or air borne particulates are likely.
AQ2	Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.
AQ3	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.
AQ4	Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).

3.5 Aboriginal heritage

Table 3-5: Aboriginal heritage

Description of existing environmental and potential impacts		
Would the proposal involve disturbance in any area that has not been subject to previous ground disturbances? All of the proposal sites have been previously disturbed by prior road construction and maintenance works.	Yes ☐	No ☒
Has an online Aboriginal Heritage Information Management System (AHIMS) search been completed? Updated AHIMS searches were conducted on 20/4/2023. There are no AHIMS sites near any of the proposal works sites, compound locations or Stockpile 1 (the nearest being more than 1.5 kilometres away and shielded by intervening topography). Site 37-5-0151 (Art (Pigment or Engraved)) is located about 40 metres to the west of Stockpile 2 on the western side of MR503, Putty Road. This site would not be impacted by the proposal.	Yes ☒	No ☐
Is there potential for the proposal to impact on any items of Aboriginal heritage? The proposal would not affect known Aboriginal sites. The risk of encountering unregistered sites is considered low given the extent of previous disturbance at the sites.	Yes ☐	No ☒
Would the proposal involve the removal of mature native trees? The AHIMS search did not identify any previously recorded culturally modified trees within or adjacent to the proposal area.	Yes ☒	No ☐
Is the proposal consistent with the requirements of the legacy *Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation* (PACHCI)? Advice from the Transport's Aboriginal Community and Heritage Partner (Appendix E) noted that the AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area and indicated that the proposal is unlikely to harm known Aboriginal objects or places.	Yes ☒	No ☐

Safeguards

Safeguards to be implemented are:

AH1	If Aboriginal heritage items are uncovered during the works, all works must cease in the vicinity of the find and the Transport for NSW Aboriginal Community and Heritage Partner and the Environment Manager contacted immediately. The steps in the unexpected heritage items procedure (Transport for NSW, 2022) must be followed.
AH2	Site inductions will cover the location of nearby Aboriginal sites and the requirement to avoid impacts. Inductions will be informed by a map showing the location of Aboriginal archaeological sites.

3.6 Non-Aboriginal heritage

Table 3-6: non-Aboriginal heritage

Description of existing environmental and potential impacts		
The following online heritage database searches were completed on the 14/04/23: • Transport (including legacy Roads and Maritime) section 170 register. • NSW Heritage database. • Commonwealth Heritage List, established under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). • Australian Heritage Database • Local Environmental Plan(s) heritage items.	Yes ☒	No ☐
Are there any items of non-Aboriginal heritage or heritage conservation areas listed on relevant heritage databases/registers that are located within the vicinity of the proposal? While the proposal is partly within the Greater Blue Mountains Area World Heritage Area (the boundaries of which correspond to the two national parks), there are no other listed heritage items within or near the proposed area. Impacts on the World Heritage area would not be significant (refer to Section 4.2).	Yes ☒	No ☐
Is the proposal likely to occur in or near features that indicate potential archaeological remains? A Historical Archaeological Impact Assessment was conducted for the proposal by Extent Heritage (refer to Appendix B) The assessment notes that the line of MR503, Putty Road has changed over the course of the nineteenth and twentieth centuries, undergoing several route deviations and structural improvements. This overland route from Sydney to the Hunter region was an established Aboriginal track before becoming known as Howes Track in the early nineteenth century, and soon after, Bulga Road. The northern section of the route underwent a deviation away from the mountains in the late nineteenth century to follow Darkey Creek and Parsons Creek. This portion of the road is where the study area is located. By the twentieth century the route had become known as MR503, Putty Road as well as Main Road 503, and in the mid twentieth century further upgrades were made. The existing section of road between Putty and Singleton, which includes the study area, was widened and improved during WWII. The assessment notes archaeological remains within the study area, if they should survive, related to the evolution of MR503, Putty Road would not meet thresholds for archaeological significance at a Local or State level. The dry-stone retaining walls may have some minor landscape values; however, they are not visible from the road. There is generally a poor standard of construction employed in the building of retaining walls. Moreover, in some locations, the walls appear to be nothing more than a rubble revetment facing. The original construction methods may have contributed to the ultimate failure of portions of these walls. The proposal would impact the extant road alignment and embankment including the dry-stone walls, constructed during 1939-present. The proposed works are unlikely to impact historical archaeological deposits associated with earlier development phases, which are likely to have been heavily disturbed by later works. The assessment concludes that the proposal is likely to have no archaeological impact.	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

HH1	If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the unexpected heritage items procedure (Transport for NSW, 2022) must be followed. The Transport for NSW Environment Manager must be contacted immediately.

3.7 Biodiversity

Table 3-7: Biodiversity

Description of existing environmental and potential impacts		
Have relevant database searches been conducted? • Database searches were carried out as part of the Biodiversity Assessment (included in Appendix C) and included: • BioNet threatened species records within the locality (10km radius) (February 2023) • State Vegetation Type Map • BioNet Vegetation Classificiation database (February 2023) • Biodiversity Values Map and Threshold Tool (February 2023) • NSW WeedWise (DPI) website (February 2023) • Commonwealth EPBC Act Protected Matters Search Tool (PMST) (February 2023) • National Flying-fox monitoring viewer (February 2023) • Groundwater Dependent Ecosystems Atlas (February 2023) • Department of Primary Industries (Fisheries) NSW Spatial Data Portal (February 2023) • Areas of Outstanding Biodiversity Value register (February 2023). Field surveys were conducted on 22 February 2023.	Yes ☒	No ☐
Did the database searches identify any endangered ecological communities, threatened flora and/or threatened or protected fauna, or migratory species in or within the vicinity of the proposed works? Both Commonwealth and State listed matters must be considered. <u>Vegetation communities</u> Vegetation at the proposal sites conforms to PCT 3237 (Hunter Range Blue Gum Gully Forest) is characterised by a sparse canopy of Round-leaved Gum (*Eucalyptus deanei*) to 50 metres tall with occasional lower Rough-barked Apple (Angophora floribunda). There are also occurrences of Forest Oak (*Allocasuarina torulosa*), Blue-leaved Stringybark (*Eucalyptus agglomerata*) and Grey Gum (*E.punctata*). At some locations the canopy is absent. There is a dense tall shrub/small tree layer that is 4 metres to 10 metres tall of Brush Kurrajong (*Androcalva fraseri*), Sandpaper Fig *(Ficus coronata*), Gosford Wattle (*Acacia prominens*), Scrub Myrtle (*Backhousia myrtifolia*) and Native Peach (*Trema tomentosa*) interspersed with shrubs such as Elderberry Panax (Polyscias sambucifolia) and Coffee Bush (Breynia oblongifolia). The shrub/small tree layer is 2-4 metres tall. Vines and scramblers, particularly Kangaroo Vine (Cissus antarctica), Water Vine (*C.hypoglauca*) and Molucca Bramble (*Rubus moluccanus*), are common. Due to the dense mid-storey there is little groundcover apart from gaps where there is Bracken (Pteridium esculentum), Rainbow Fern (*Calochlaena dubia*), Harsh Ground Fern (*Hypolepis muelleri*) and Slender Bamboo Grass (*Austrostipa verticillata*). On the disturbed areas immediately adjacent to the road, weeds such as Turkey Rhubarb (*Rumex sagittatus*), Guinea Grass (Panicum maximum var. maximum) and Blackberry Nightshade (Solanum nigrum) are present. PCT 3237 does not conform to any threatened ecological community listed by the BC Act or EPBC Act. <u>Threatened flora</u> No threatened flora species listed under the EPBC Act or BC Act were recorded or considered likely to occur within the area investigated. As no threatened species are considered to be adversely impacted by the proposal, assessments referring to the EPBC Act Significant Impact Guidelines and Section 7.3 of the BC Act is not required. <u>Threatened fauna</u> No threatened fauna was recorded during the course of the field investigation. Up to nine hollow-bearing trees will be cleared. Most of the trees could be occupied by hollow-depended native fauna such as microbats and arboreal possums. One tree (Tree 86, Slope 13) could be used by large forest owls. Considering the hollow-diameters available the following threatened hollow-depended fauna could occur: Yellow-bellied Glider (*Petaurus australis*), Squirrel Glider (*Petaurus norfolcensis*), Greater Glider (*Petauroides volans*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Corben's Long-eared Bat (*Nyctophilus corbeni*), Greater Broad-nosed Bat	Yes ☒	No ☐

(*Scoteanax rueppellii*), Eastern Coastal Free-tailed Bat (*Mormopterus norfolkensis*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Glossy Black-cockatoo (*Calyptorhynchus lathami*), Little Lorikeet (*Glossopsitta pusilla*), Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*) and Sooty Owl (*Tyto tenebricosa*).

While previously recorded in the broader area, a large number of these species are highly unlikely to occur within or near the proposal sites due to the impacts associated with the Black Summer wildfires. It is also noted that, while considered, indicators of the presence of several of these animals, such a V-shaped incisions on specific feed trees and crushed accumulations of Casuarina cones, were not observed.

As targeted surveys were not conducted, assessments referencing the criteria provided under Section 7.3 of the BC Act were undertaken on these hollow-dependent species. The assessments concluded that the proposal would not have a significant effect on hollow-dependent fauna, or any areas of their habitats.

Does the proposal involve pruning, trimming or removal of any tree/s? Yes ☒ No ☐

By the completion of the field investigations, 94 trees had been recorded, nine of which are hollow bearing. Each of the 94 trees recorded (these comprised of 24 small, 38 medium sized, and 32 large tree) are within the proposed impact footprint of the slope remediation work. This represents a worst-case estimate of impacts on trees, and it is expected that a smaller number of trees will be identified for removal during pre-work planning.

The table below provides a preliminary estimate of tree removal and offset requirements.

Tree size	Estimated native tree removal (worst-case scenario)	Required number of replacement trees	Required cost transfer into Conservation Fund
Small	24	48	$3,000
Medium	38	152	$19,000
Large	32	256	$32,000
Extra large	0	N/A	N/A
Hollows	9	27 hollows (max)* 6 hollows (min)*	$4,500
Total	94	456	$58,500

* Replacement depends on opccupancy, which would be confirmed by ecological inspection prior to the start of works.

Is the proposal likely to impact nationally listed threatened species, ecological communities, or migratory species? Yes ☐ No ☒

No threatened ecological communities or threatened flora and fauna species listed under the EPBC Act were recorded within, or near to, the proposal area. Similarly, none were considered likely to occur or rely upon the habitat to be disturbed for any of their necessary lifecycle requirements.

Impacts on migratory species are not expected.

Would the proposal require the removal of any other vegetation? Yes ☒ No ☐

The extent of affected vegetation is discussed above. The proposal would require the removal of up to about 0.9ha of PCT 3237.

Would the proposal affect any tree hollows or hollow logs? Yes ☒ No ☐

The proposal would impact up to nine hollow bearing trees. Impacts on hollow-dependent fauna are discussed above.

Are there any known areas of outstanding biodiversity value or areas mapped as 'littoral rainforest' or 'coastal wetland' under chapter 2 of SEPP (Resilience and Hazards) in or within the vicinity of the proposed work? Yes ☐ No ☒

Would the proposal provide any additional barriers to the movement of wildlife? The main barrier to ground traversing fauna present within the area surveyed is MR503, Putty Road itself. Beyond existing influences, the undertaking of the works will not affect any fauna movements, nor will they have an adverse cumulative impact when associated with the existing road network. The works will not further fragment or isolate any habitat area, nor present a barrier to fauna dispersal patterns. Post-work, flying species and those highly tolerant of traversing urban environments/infrastructure, would still be able to move across and through the proposal sites. The proposal would not isolate or further fragment any habitat areas, nor erect any additional barriers to the movement and dispersal patterns of flying species (i.e. birds, bats), nor any gliding arboreal mammals, which may be currently negotiating MR503, Putty Road at this location. There are already gaps (e.g. the creeks and existing road) that gliders (if present) will be easily negotiating.	Yes ☐	No ☒
Would the proposal disturb any natural waterways or aquatic habitat? The watercourse downslope of the remediation sites is mapped as Key Fish Habitat. The proposal would not result in any direct or indirect adverse impact on surface hydrology within the proposal area and is not expected to impact any of those drainage lines that occur beyond the limits of the work. Selective placement of rock armour along the toe of the fill embankment is expected to minimise further slope erosion during periods of high flow in the adjacent creek. There would be a minor increase in impermeable road surface, however substantial changes to runoff volumes and velocities are not expected.	Yes ☐	No ☒
Would the proposal disturb any crevices or other locations (such as on bridges and culverts) for potential bat habitat? Drainage lines (these being culverts that direct runoff under MR503, Putty Road), are present in the works area, however, impacts on these (beyond existing inputs from MR503, Putty Road) are considered to be minor. The proposal would not have a direct or indirect impact on these drainage lines, all of which are ephemeral, or the flow of water through them. No microbats, particularly cave-dependent State listed species, were observed within any of the culvert inspection. Inspection of the culverts present did not provide an indication of occupation of these structures (e.g. guano accumulations) by this ground of mammals.	Yes ☐	No ☒

<u>Groundwater dependant ecosystems (GDE)</u>

Low potential terrestrial GDE has been identified within the proposal area.

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

<u>Weeds</u>

Of those introduced plant species recorded, Blackberry (*Rubus fruiticosus* spp. agg), which was recorded at Site 4, and Black Locust (*Robinia pseudoacacia*), Site 3, are listed:

- under Schedule 3 of the NSW Biosecurity Regulation 2017
- as a Priority Weed in the Hunter region (which includes Singleton LGA)

Safeguards listed in Section 3.7 have been proposed to address the potential for the spread of weeds.

<u>Invasion and spread of pathogens and disease</u>

There is a risk that the proposal would introduce, spread and/or exacerbate the plant diseases caused by Phytophthora cinnamomic and Myrtle Rust (*Puccinia psidii*). These diseases are most likely introduced or spread through the importation or movement of soil, water and landscaping materials, either directly or through incidental attachment to machinery. Although there was no obvious evidence for the presence of Phytophthora cinnamomi or Myrtle Rust in the vegetation of the proposal site, safeguards listed in Section 3.7 have been proposed to address the risk of pathogen spread.

Fauna injury and mortality

Vegetation clearing is required for the proposal. Given the proposal would be conducted within a modified environment (due to the existing landslips), there is minimal expectation that sheltering animals would be injured during the course of the proposed work.

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

Beyond current levels of impact due to the existing presence of MR503, Putty Road and the volume of traffic that typically uses this road, the operation phase of the proposal is not expected to notably increase injuring or mortality of fauna within the. The proposal would be unlikely to alter the rate of vehicle strikes on those fauna species recorded or potentially occurring.

Noise, light and vibration

The proposal footprint has been affected by noise, light and vibration from the adjoining trafficable surfaces. As the proposal is for repairs to slope and drainage upgrades, the impacts of noise, light and vibration from passing vehicles during the operation phase are unlikely to be significantly greater than existing impacts

Safeguards

Safeguards to be implemented are:

BD1	Pre-clearing surveys will be conducted in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
BD2	Native vegetation removal will be minimised through pre-construction planning.
BD3	Vegetation clearance limits will be identified on site maps/plans and on-site exclusion zones will be established as per Guide 2: Biodiversity Guidelines Protecting and managing biodiversity on RTA projects (RTA, 2011).
BD4	Vegetation removal would be conducted in accordance with Guide 4: Clearing of vegetation and removal of bush rock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
BD5	Native vegetation would be re-established in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
BD6	Habitat will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bush rock.
BD7	The felled trees will be cut at ground level, retaining the stump/root system in the ground, maintaining soil stabilisation. The root structure of removed trees must be left undisturbed.
BD8	Fauna that may be present on-site during works will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
BD9	Inspections for the presence of any sheltering native species would be conducted under vehicles and machinery at the start of shift, prior to their use.
BD10	Weed species would be managed in accordance with Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) and the Biosecurity Act 2015 (general duty to prevent, eliminate or minimise any biosecurity risk). This would include disposing of weeds and weed contaminated soil at an appropriate waste management facility.
BD11	If unexpected, threatened fauna or flora species are discovered, stop works immediately and follow the Unexpected Threatened Species Find Procedure in Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
BD12	To prevent the spread of pathogens, the Best Practice Hygiene Protocols in Guide 7: Pathogen management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) will be implemented.
BD13	The removal of trees will be offset in accordance with the Transport Tree and hollow replacement guidelines. If tree planning is proposed, a Tree Replacement Plan is to be prepared.
BD14	If any hollow bearing trees are identified as requiring either partial or full removal, preference will be given to only partial removal leaving the hollow in situ where possible. If partial removal is not

	possible, trees with hollows that are to be completely felled will be left onsite nearby for potential re-occupation rather than being removed from site. Trees identified with habitat features would be soft fallen in the presence of an onsite arborists.
BD15	Vegetation and tree removal will be undertaken with an agreed stage approach.

3.8 Trees

Table 3-8: Trees

Description of existing environmental and potential impacts		
Does the proposal involve pruning, trimming or removal of any tree/s? Refer to Section 3.7. By the completion of the field investigations, 94 trees had been recorded, nine of which are hollow bearing. Each of the 94 trees recorded (these comprised of 24 small, 38 medium sized, and 32 large trees) are within the proposed impact footprint of the slope remediation work. This represents a worst-case estimate of impacts on trees, and it is expected that a smaller number of trees will be identified for removal during pre-work planning and detailed design. Removal of trees would be undertaken following assessment and under the supervision of an AQF Level 5 Arborist.	Yes ☒	No ☐
Do the trees form part of a streetscape, an avenue or roadside planting?	Yes ☐	No ☒
Have the trees been planted by a community group, Landcare group or by council or is the tree a memorial or part of a memorial group e.g., has a plaque?	Yes ☐	No ☒
Do the trees form part of a heritage listing or have other heritage value?	Yes ☐	No ☒

Safeguards

Refer also to safeguards proposed in section 3.7.

3.9 Traffic and transport

Table 3-9: Traffic and transport

Description of existing environmental and potential impacts		
Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during construction? No detours are needed for the proposal. The proposal would involve continued lane closures (and associated stop/slow measures) and a reduced speed limit, resulting in some disruptions and delays to traffic flow. It is noted that the proposal sites are currently under traffic control with MR503, Putty Road currently restricted to one lane.	Yes ☒	No ☐
Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation?	Yes ☐	No ☒
Is the proposal likely to affect any other transport nodes or transport infrastructure (e.g., bus stops, bus routes) in the surrounding area? Or result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation? A minor adjustment to a bus stopping location at the Compound No.1 site may be required. This would occur in consultation with the relevant bus service operator.	Yes ☒	No ☐

Safeguards

Safeguards to be implemented are:

TT1	During construction, traffic and/or pedestrian movements would be managed in accordance with *Traffic control at work sites – Technical manual* (version 6.1, 2022) as necessary.
TT2	Consultation with the relevant bus service operator will occur regarding any changes to bus stopping locations near Compound No.1.
TT3	A traffic control plan will be prepared in accordance with the 'Traffic control at work sites manual' (Transport for NSW, 2022) and Australian Standard 1742.3 Manual of control devices

3.10 Socio-economic

Table 3-10: Socio-economic

Description of existing environmental and potential impacts		
Is the proposal likely to impact on local business?	Yes ☐	No ☒
Is the proposal likely to require any property acquisition?	Yes ☐	No ☒
Is the proposal likely to alter any access for properties (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to alter any on-street parking arrangements (either temporarily or permanently)? While designated on-street parking would not be affected, areas nominated for parking / stockpiling (refer to Section 2.1.4) would be unavailable for other vehicles to use as pull over areas for the duration of construction.	Yes ☐	No ☒
Is the proposal likely to change pedestrian movements or pedestrian access (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to impact on any items or places of social value to the community (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to reduce or change visibility of any businesses, farms, tourist attractions or the like (either temporarily or permanently)?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

SE1	All complaints received during the work are to be recorded on complaints register and dealt with promptly.

3.11 Landscape character and visual amenity

Table 3-11: Landscape character and visual amenity

Description of existing environmental and potential impacts		
Is the proposed work over or near an important physical or cultural element or landscape? (For example, heritage items and areas, distinctive or historic built form, National Parks, conservation areas, scenic highways etc.)? The MR503, Putty Road route is frequently used by tourists and recreational drivers. It traverses scenic bushland and rural landscapes. The proposal is partly located within and adjacent to the Yengo National Park and Wollemi National Park which are reserved land under the NPW Act (noting that the reserve boundaries do not accurately follow the alignment of the existing road in all areas). The proposal involves slope stabilisation at multiple locations on an existing rural road. Maintenance works on roadside slopes are an expected element of rural road corridor and the works would therefore not represent a departure from the existing landscape character. The affected areas are relatively small in the context of the MR503, Putty Road route. Most of the affected areas are located on slopes which face away from the MR503, Putty Road and are not visible from the perspectives of road users. The works would have limited impact on the driver experience.	Yes ☒	No ☐
Would the proposal obstruct or intrude upon the character or views of a valued landscape or urban area? For example, locally significant topography, a rural landscape or a park, a river, lake or the ocean or a historic or distinctive townscape or landmark? The proposal footprint includes views of a rural / bushland landscape. The proposal does not include any high or bulky elements that would obscure these views. The use of shotcrete has some potential to alter the character of the road corridor, however the areas of proposed shotcrete are small, largely out of view of passing motorists. Opportunities to further minimise the visual contrast of the shotcrete with existing landscape character will be investigated during detailed design of the proposal.	Yes ☐	No ☒
Would the proposal require the removal of mature trees or stands of vegetation, either native or introduced? The proposal involves removal of some native vegetation which would be visible to road users during and following construction (refer to Section 3.7). Viewers are not considered particularly sensitive as they would experience the change at speed and the area of impact is small relative to the wider bushland landscape.	Yes ☒	No ☐
Would the proposal result in large areas of shotcrete visible from the road or adjacent properties? While shotcrete is proposed, the areas are downslope and would generally not be visible from the road. Shotcrete use would be managed in accordance with TfNSW R64 design guidelines.	Yes ☐	No ☒
Would the proposal involve new noise walls or visible changes to existing noise walls?	Yes ☐	No ☒
Would the proposal involve the removal or reuse of large areas of road corridor, landscape, either verges or medians?	Yes ☐	No ☒
Would the proposal involve substantial changes to the appearance of a bridge (including piers, girders, abutments and parapets) that are visible from the road or residential areas?	Yes ☐	No ☒
If involving lighting, would the proposal create unwanted light spillage on residential properties at night (in construction or operation)? If lighting is required, lighting equipment would be directed at the work area and there would be limited potential for impacts adjacent bushland areas. No residences would be affected.	Yes ☐	No ☒

Would any new structures or features to be constructed, result in over shadowing to adjoining properties or areas?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

V1	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.
V2	All construction related material and equipment will be removed from the proposal footprint at the completion of work and disturbed areas restored.
V3	Construction site lighting will be oriented to minimise the risk of light spill impacts on adjacent bushland.
V4	Opportunities to further minimise the visual contrast of the shotcrete with existing landscape character will be investigated and would be managed in accordance with Roads and Maritime Shotcrete Design Guidelines 2016.

3.12 Waste

Table 3-12: Waste

Description of existing environmental and potential impacts		
Is the proposal likely to generate >200 tonnes of waste material (contaminated and /or non-contaminated material)? The proposal would generate over 200 tonnes of waste in the worse-case scenario (primarily green waste). It is anticipated that the proposal would result in the generation of the following waste streams: • General waste • Mulched vegetation • Concrete waste • Material removed from the rock face. Waste would be classified and either reused (where permitted) and used for sediment/erosion controls within the road reserve along MR503, Putty Road or disposed of by Transport (or appointed contractor) at an appropriately licenced facility.	Yes ☒	No ☐
Is the proposal likely to require a licence from EPA?	Yes ☐	No ☒
Is the proposal likely to require the removal of asbestos?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

W1	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 undertaken as a last resort (In accordance with the *Waste Avoidance & Resource Recovery Act 2001*).
W2	Waste material is to be reused in accordance with any waste exemptions or disposed of legally in accordance with its waste classification.
W3	There is to be no disposal or re-use of construction waste on to other land.
W4	Bulk project waste (e.g. fill) sent to a site not owned by the Roads and Maritime Services (excluding EPA licensed landfills and resource recovery facilities) is to have prior formal written approval from the landowner, in accordance with Environmental Direction No. 20 – Legal Off-

	site Disposal of Roads and Maritime Services Waste. This includes waste transported for reuse, recycling, disposal or stockpiling.
W5	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.
W6	All construction related material and equipment will be removed from the proposal footprint at the completion of work and disturbed areas restored.
W7	A Waste Management Plan must be prepared that follows the Roads and Maritime Services Technical Guide: Management of road construction and maintenance waste.
M8	If vegetation is to be mulched and transported off site for beneficial reuse, it is to be assessed for the presence of weeds, pest, and other disease and a Mulch Management Plan prepared in accordance with the Roads and Maritime Technical Procedure: Mulch Management

4. Consideration of State and Commonwealth environmental factors

4.1 Environmental Planning and Assessment Regulation 2021 factors

The following factors, listed 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 4-1: Consideration of section 171 of the EP&A Regulation factors

Environmental factor	Impact
a) **Any environmental impact on a community?** The proposal would have a minor and short-term impact on the community, which is attributable to construction noise, lane closures, delays and construction related visual impacts. Safeguards have been proposed to address identified potential impacts. Over the long-term, the community would benefit from improved safety.	Negative (minor and short-term) Positive (long-term)
b) **Any transformation of a locality?** The proposal would result in some transformation of the locality in the short-term due to visual impacts associated with construction works. Over the longer term the proposal is unlikely to be noticeable in the broader bushland and rural landscape.	Negative (minor and short-term)
c) **Any environmental impact on the ecosystems of a locality?** The proposal would have limited impact on ecosystems. Impacts on threatened species, communities and/or their habitats are discussed in Section 3.7. The impacts would be minimised with the implementation of the safeguards as detailed in this REF.	Negative (minor and short-term)
d) **Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?** The proposal would result in a minor reduction in the aesthetic value of the locality as a result of construction related activities and the removal of trees/vegetation. Works would be contained to the minimum area required to achieve the proposed objectives. The impacts would be minimised with the implementation of the safeguards as detailed in this REF.	Negative (minor short-term and long-term)
e) **Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?** The proposal would not affect any known Aboriginal sites. Indirect impacts on nearby listed non-Aboriginal heritage items would be negligible. The proposal footprint is disturbed and is likely to have low or zero archaeological potential. While the proposal is partly within the Greater Blue Mountains Area World Heritage Area (the boundaries of which correspond to the two national parks), there are no other listed heritage items within or near the proposed area. Impacts on the World Heritage area would not be significant (refer to Section 4.2). The proposal would have minimal impact on on-going ecological and biological processes and would not impact threatened species or threatened ecological communities.	Not significant
f) **Any impact on habitat of any protected animals (within the meaning of the *Biodiversity Conservation Act 2016*)?** The proposal may result in the removal of some sheltering and foraging resources for small mammals, reptiles, birds and insects. The proposed safeguards are considered adequate to minimise impacts on protected animals.	Negative (minor and short-term)

Environmental factor	Impact
g) **Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?** The proposal would not endanger any species of animal, plant or other form of life.	Nil
h) **Any long-term effects on the environment?** Over the longer term the proposal would improve safety for road users.	Positive (long-term)
i) **Any degradation of the quality of the environment?** There would be potential for minor, short-term impacts on the quality of the environment including amenity (air quality and noise), visual and potential water quality impacts. Safeguards have been proposed to address the potential impacts.	Negative (minor short-term)
j) **Any risk to the safety of the environment?** The proposal would not result in a risk to the safety of the environment. Over the longer term the proposal would improve safety for road users.	Nil (short-term) Positive (long-term)
k) **Any reduction in the range of beneficial uses of the environment?** The proposal would not reduce the range of beneficial uses of the environment.	Nil
l) **Any pollution of the environment?** Minor, short-term risks to water quality would be present in the event of a spill or release of material from the work site during construction. Safeguards have been proposed to address the risk of water pollution. Any dust impacts would be highly localised and can be managed with the proposed safeguards.	Negative (minor short-term and long-term)
m) **Any environmental problems associated with the disposal of waste?** The proposal would result in some waste as noted in Section 3.12. Waste generated would be transported from the proposal footprint, tracked and disposed of at a licensed waste facility.	Nil
n) **Any increased demands on resources, natural or otherwise which are, or are likely to become, in short supply?** The proposal would not increase demand for resources which are likely to become in short supply.	Nil
o) **Any cumulative environmental effect with other existing or likely future activities?** Noting the relatively limited scale of the proposal no cumulative environmental effects as a result of existing or likely future activities have been identified. Coordination with other slope remediation projects on MR503, Putty Road will allow any cumulative impacts (primarily construction traffic) to be minimised.	Negative (minor short-term)
p) **Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?** The proposal would not influence coastal processes and/or coastal hazards.	Nil
q) **Any impact on applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1?** The nominated regional strategic plan is the Hunter Regional Plan 2036. As the proposal is for the repair of an existing road, it does not directly align (but is consistent with) with many of the directions in the Hunter Regional Plan. The proposal is however consistent with Direction 26: Deliver infrastructure to support growth and communities. The Singleton Shire Council Local Strategic Planning Statement 2041 (Singleton LSPS) identifies the key outcomes Council aims to achieve in relation to land uses, activities, landforms and built forms. The proposal supports the following planning priorities identified in the Singleton LSPS:	Positive (short-term and long-term)

Environmental factor	Impact
• Planning Priority 3.2: Development is resilient to hazards and the impacts of climate change – the proposal would provide improved road transport infrastructure with a reduced hazard risk. • Planning Priority 12: Transport infrastructure is protected, efficient and supports economic growth – proposal would provide more resilient transport infrastructure that supports access to the Singleton local government area.	
r) **Any impact on other relevant environmental factors?** In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to Chapter 3 of this assessment.	Nil

4.2 Matters of National Environmental Significance

Table 4-2: Matters of national environmental significance

Environmental factor	Impact
a) **Any impact on a World Heritage property?** Part of the proposal is within the Yengo National Park and Wollemi National Park, which is also within the Greater Blue Mountains World Heritage Area. With reference to the significant impact criteria in Matters of National Environmental Significance - Significant impact guidelines 1.1 (Department of the Environment, 2013) it is noted that: • one or more of the World Heritage values would not be lost • one or more of the World Heritage values would not be degraded or damaged, and • one or more of the World Heritage values would not be notably altered, modified, obscured or diminished. The relevant World Heritage criteria for this item are: (ix) to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals. (x) to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation. The proposal would have minimal impact on on-going ecological and biological processes and would not impact threatened species or threatened ecological communities.	Nil
b) **Any impact on a National Heritage place?** Part of the proposal is within the Yengo National Park and Wollemi National Park, which is also within the Greater Blue Mountains Area (listed on the National Heritage List). With reference to the significant impact criteria in Matters of National Environmental Significance - Significant impact guidelines 1.1 (Department of the Environment, 2013) it is noted that: • one or more of the National Heritage values would not be lost • one or more of the National Heritage values would not be degraded or damaged, and • one or more of the National Heritage values would not be notably altered, modified, obscured or diminished.	Nil
c) **Any impact on a wetland of international importance (often called 'Ramsar' wetlands)?** The proposal is 40-50 kilometres upstream of the Hunter Estuary Wetlands. Noting the distance to these wetlands, the minor nature of the works and the	Nil

Environmental factor	Impact
expected improvements to water quality post-works, not impacts on these wetlands are expected.	
d) **Any impact on nationally threatened species, ecological communities or migratory species?** No threatened ecological communities or threatened flora and fauna species listed under the EPBC Act were recorded within, or near to, the proposal area. Similarly, none were considered likely to occur or rely upon the habitat to be disturbed for any of their necessary lifecycle requirements. Impacts on migratory species are not expected.	Nil
e) **Any impact on a Commonwealth marine area?** There would be no environmental impact on a Commonwealth marine area.	Nil
f) **Does the proposal involve a nuclear action (including uranium mining)?** The proposal does not involve a nuclear action.	Nil
Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	Nil

5. Summary of safeguards and environmental management measures

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

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

Factor	ID	Impact
General	G1	If the scope of the works changes at any time, review under the Roads and Maritime Services Environmental assessment procedure for routine and minor works (EIA-PO5-1) and complete any further requirements prior to undertaking works associated with the changed scope.
	G2	An environmental management plan is prepared in accordance with the specifications set out in QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan), QA Specification G40 – Clearing and Grubbing, QA Specification G10 - Traffic Management and implemented prior to the commencement of works.
	G3	No new access tracks to be created for the works.
	G4	Parking of vehicles and storage of plant/equipment is to occur on existing paved areas. Where this is not possible, vehicles and plant/equipment are to be kept away from environmentally sensitive areas and outside the dripline of trees.
Soil	ES1	Erosion and sediment control measures are to be implemented and maintained to: • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets • Reduce water velocity and capture sediment on site • Minimise the amount of material transported from site to surrounding pavement surfaces • Divert clean water around the site. (In accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book)).
	ES2	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.
	ES3	Erosion and sediment control measures are not to be removed until the works are complete, and areas are stabilised.
	ES4	A progressive erosion and sediment control plan is to be prepared for the works.
	ES5	Parking of vehicles and storage of plant/equipment is to occur only within the designated proposal footprints or at nominated ancillary sites.
	ES6	Existing ground cover vegetation will be retained to the greatest extent possible to minimise the area of exposed soils.
	ES7	The use of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).
	WQ1	There is to be no release of dirty water into drainage lines and waterways.

Waterways and water quality	WQ2	Water quality controls measures are to be used to prevent any materials (e.g. grout, sediment etc) entering drainage or waterways.
	WQ3	Shotcreting operations would not occur during periods of rainfall or where a medium or higher chance (≥40%) of rainfall is forecast by the Bureau of Meteorology.
	WQ4	Waste shotcrete would be frequently removed from the road pavement and other areas to prevent mobilisation during a rainfall event.
	WQ5	Vehicle wash down would occur in a bunded area within the existing Transport for NSW depot at Howes Valley.
	WQ6	Plant and equipment will be inspected regularly to ensure there are no leakages of fuel, oil and hydraulic fluid.
	WQ7	All fuels, chemicals and liquids will be stored in an impervious bunded area within the compound site when not in use.
	WQ8	If refuelling of plant and equipment is required on site it will take place on flat ground only using 20 litre drums within a bunded area large enough to contain 120 per cent of the container's contents.
	WQ9	If an incident (e.g. spill) occurs, the Environmental Incident Procedure (Transport for NSW, 2021) is to be followed and the Transport for NSW Contract Manager and Environment Manager notified immediately.
	WQ10	An emergency spill kit is to be kept on site and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances. All staff are to be made aware of the location of the spill kit and trained in its use.
	WQ11	Procedures will be developed for managing the worksite where there is a risk of flooding, including removal and storage of plant and equipment and securing of the site, and access arrangements.
	WQ12	All workers will be advised of the location of the spill kit and trained in its use.
Noise and vibration	NV1	The standard mitigation measures identified in Appendix B of the Construction Noise and Vibration Guideline (Transport for NSW, 2022) will be implemented.
	NV2	A letterbox drop notification for residential receivers within 760 metres of Stockpile 2 will occur at least five business days prior to works starting. The extent of the notification will be confirmed with reference to the noise assessment and the specific types of activities proposed. The notification will detail work activities, dates and hours, impacts (including any changed traffic arrangements) and mitigation measures. It will also include a contact number for enquiries and complaints.
Air quality	AQ1	Work will not be conducted during high winds or in weather conditions where elevated level of dust or air borne particulates are likely.
	AQ2	Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.
	AQ3	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.
	AQ4	Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).
Aboriginal heritage	AH1	If Aboriginal heritage items are uncovered during the works, all works must cease in the vicinity of the find and the Transport for NSW Aboriginal Community and Heritage Partner and the Environment Manager contacted

		immediately. The steps in the unexpected heritage items procedure (Transport for NSW, 2022) must be followed.
	AH2	Site inductions will cover the location of nearby Aboriginal sites and the requirement to avoid impacts. Inductions will be informed by a map showing the location of Aboriginal archaeological sites.
Non-Aboriginal heritage	HH1	If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the unexpected heritage items procedure (Transport for NSW, 2022) must be followed. The Transport for NSW Environment Manager must be contacted immediately.
Biodiversity	BD1	Pre-clearing surveys will be conducted in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
	BD2	Native vegetation removal will be minimised through pre-construction planning.
	BD3	Vegetation clearance limits will be identified on site maps/plans and on-site exclusion zones will be established as per Guide 2: Biodiversity Guidelines Protecting and managing biodiversity on RTA projects (RTA, 2011).
	BD4	Vegetation removal would be conducted in accordance with Guide 4: Clearing of vegetation and removal of bush rock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
	BD5	Native vegetation would be re-established in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
	BD6	Habitat will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bush rock.
	BD7	The felled trees will be cut at ground level, retaining the stump/root system in the ground, maintaining soil stabilisation. The root structure of removed trees must be left undisturbed.
	BD8	Fauna that may be present on-site during works will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
	BD9	Inspections for the presence of any sheltering native species would be conducted under vehicles and machinery at the start of shift, prior to their use.
	BD10	Weed species would be managed in accordance with Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) and the Biosecurity Act 2015 (general duty to prevent, eliminate or minimise any biosecurity risk). This would include disposing of weeds and weed contaminated soil at an appropriate waste management facility.
	BD11	If unexpected, threatened fauna or flora species are discovered, stop works immediately and follow the Unexpected Threatened Species Find Procedure in Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).
	BD12	To prevent the spread of pathogens, the Best Practice Hygiene Protocols in Guide 7: Pathogen management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) will be implemented.
	BD13	The removal of trees will be offset in accordance with the Transport Tree and hollow replacement guidelines. If tree planning is proposed, a Tree Replacement Plan is to be prepared.

	BD14	If any hollow bearing trees are identified as requiring either partial or full removal, preference will be given to only partial removal leaving the hollow in situ where possible. If partial removal is not possible, trees with hollows that are to be completely felled will be left onsite nearby for potential re-occupation rather than being removed from site.
	BD15	Vegetation and tree removal will be undertaken with an agreed stage approach.
Trees	N/A	Refer to measures proposed for biodiversity.
Traffic and transport	TT1	During works, traffic would be managed in accordance with Traffic control at work sites Technical Manual (Transport for NSW, 2022)
	TT2	Consultation with the relevant bus service operator will occur regarding any changes to bus stopping locations near Compound No.1.
	TT3	A traffic control plan will be prepared in accordance with the 'Traffic control at work sites manual' (RTA, 2010a) and Australian Standard 1742.3 Manual of uniform control devices
Socio-economic	SE1	All complaints received during the work are to be recorded on complaints register and dealt with promptly.
Landscape character and visual amenity	V1	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.
	V2	All construction related material and equipment will be removed from the proposal footprint at the completion of work and disturbed areas restored.
	V3	Construction site lighting will be oriented to minimise the risk of light spill impacts on adjacent bushland.
	V4	Opportunities to further minimise the visual contrast of the shotcrete with existing landscape character will be investigated and would be managed in accordance with Roads and Maritime Shotcrete Design Guidelines 2016.
Waste	W1	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 undertaken as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2001*).
	W2	Waste material is to be reused in accordance with any waste exemptions or disposed of legally in accordance with its waste classification.
	W3	There is to be no disposal or re-use of construction waste on to other land.
	W4	Bulk project waste (e.g. fill) sent to a site not owned by the Roads and Maritime Services (excluding EPA licensed landfills and resource recovery facilities) is to have prior formal written approval from the landowner, in accordance with Environmental Direction No. 20 – Legal Off-site Disposal of Roads and Maritime Services Waste. This includes waste transported for reuse, recycling, disposal or stockpiling.
	W5	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.
	W6	All construction related material and equipment will be removed from the proposal footprint at the completion of work and disturbed areas restored.

5.1 Licensing and approvals

Table 5-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
Roads Act 1993	Road occupancy licence	Prior to the start of activity

5.2 Other requirements

Table 5-3: Other requirements

Requirement		
Environmental management plan sent to SMES for review.	Yes ☒	No ☐

6. Certification, review and decision

6.1 Certification

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

Prepared by

Signature 

Name:	Jacob Mifsud
Position:	Consultant
Company name:	bd infrastructure
Date:	7 June 2023

Minor Works REF reviewed by:

Signature 

Name:	Stuart Hill
Position:	Principal - Environment
Company name:	bd infrastructure
Date:	7 June 2023

6.2 Environment staff review

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

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

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

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

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

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

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

6.3 Environment staff recommendation

It is recommended that the proposal to carry out slope remediation works on MR503, Putty Road near Terrys Creek, as described in this Minor Works REF, proceed subject to the implementation of all safeguards identified in the Minor Works REF and compliance with all other relevant statutory approvals, licences, permits and authorisations.

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

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

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

Recommended by:

Signature 

Name: Renae Martin

Position: Environmental & Sustainability Manager

Date: 28/06/2023

Noted by:

Signature 

Name: Katherine Holzner

Position: Senior Project Manager

Date: 30/6/2023

6.4 Determination

In accordance with the above recommendation, I certify that I have reviewed and endorsed the contents of this Minor Works REF, and to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under Section 170 of the EP&A Regulation, and the information is neither false nor misleading.

I determine that Transport for NSW may proceed with the activity:

Signature 

Name: David Pattison

Position: Snr Manager Project Services North

Date: 07/07/2023

6.5 EP&A Regulation publication requirement

Table 6-1: EP&A Regulation publication requirement

Requirement		
Does this Minor Works REF need to be published under section 171(4) of the EP&A Regulation?	Yes ☒	No ☐

7. Definitions

Table 7-1: Definitions

Term	Definition
BC Act	*Biodiversity Conservation Act 2016*
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FM Act	*Fisheries Management Act 1994* (NSW)
LEP	Local Environmental Plan
PCT	Plant Community Type
REF	Review of Environmental Factors
SEED	Sharing and Enabling Environmental Data (online NSW data resource)
SEPP	State Environmental Planning Policy

Appendix A: NPW Act objectives and NPWS guidelines

The objects in Section 2A and the management principles identified in Part 4 Division 2 of the NPW Act are considered in the table below.

Reference	Object / principle	Comment
2A(1)(a)	(a) the conservation of nature, including, but not limited to, the conservation of — (i) habitat, ecosystems and ecosystem processes, and (ii) biological diversity at the community, species and genetic levels, and (iii) landforms of significance, including geological features and processes, and (iv) landscapes and natural features of significance including wilderness and wild rivers	The proposal would not inhibit the pursuit of this objective. The proposal would help address existing erosion and sedimentation associated with slope failures. Safeguards and management measures have been proposed to avoid, minimise and mitigate potential impacts associated with the proposal.
2A(1)(b)	(b) the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to — (i) places, objects and features of significance to Aboriginal people, and (ii) places of social value to the people of New South Wales, and (iii) places of historic, architectural or scientific significance	The proposal would not inhibit the pursuit of this objective. Impacts on Aboriginal cultural heritage is not expected. There would be no impact on places of historic, architectural or scientific significance. The Historical Archaeological Assessment concludes that there is zero to low potential for archaeological resources to be present within the study area, with any surviving resources assessed as having no archaeological significance.
2A(1)(c)	(c) fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation	The proposal would not inhibit the pursuit of this objective.
2A(1)(d)	(d) providing for the management of land reserved under this Act in accordance with the management principles applicable for each type of reservation.	The management principles for national parks in Section 30E of the NPW Act are considered below in this table.
30E(2)(a)	(a) the conservation of biodiversity, the maintenance of ecosystem function, the protection of geological and geomorphological features and natural phenomena and the maintenance of natural landscapes	The proposal would have some impacts on native vegetation, which would be minimised and offset. Potential biodiversity impacts of the proposal have been assessed (refer to Section 3.7) and have been identified as not significant. The proposal would also help address existing erosion, sedimentation and weed propagation issues.
30E(2)(b)	(b) the conservation of places, objects, features and landscapes of cultural value	Impacts on Aboriginal cultural heritage and non-Aboriginal heritage are not expected.
30E(2)(c)	(c) the protection of the ecological integrity of one or more ecosystems for present and future generations	The proposal involves the essential maintenance / repair of an existing asset within and adjacent to Yengo National Park and Wollemi National Park. Potential biodiversity impacts of the proposal have been assessed (refer to Section 3.7) and have been identified as not significant.
30E(2)(d)	(d) the promotion of public appreciation and understanding of the national park's natural and cultural values	The proposal would not inhibit the pursuit of this objective.
30E(2)(e)	(e) provision for sustainable visitor or tourist use and enjoyment that is compatible with the conservation of the national park's natural and cultural values	The proposal would not inhibit the pursuit of this objective.

Reference	Object / principle	Comment
30E(2)(f)	(f) provision for the sustainable use (including adaptive reuse) of any buildings or structures or modified natural areas having regard to the conservation of the national park's natural and cultural values	Not relevant to the proposal.
30E(2)(fa)	(fa) provision for the conducting of development in any part of a specific area (within the meaning of the Hunter Water Act 1991) in the national park that is permitted under section 185A having regard to the conservation of the national park's natural and cultural values	Not relevant to the proposal.
30E(2)(g)	(g) provision for appropriate research and monitoring.	Not relevant to the proposal.

The specific management objectives from the Yengo National Park, Parr State Conservation Area and Finchley Aboriginal Area Plan of Management are considered in the table below.

Management objectives	Comment	Comment
3.0 Management Objectives	promotion of wildlife corridors that link the parks to other protected lands and enhance their conservation value	The proposal would involve the removal of about 0.9 ha of vegetation and up to 94 mature trees (worst-case) but would not isolate or further fragment any habitat areas or erect any additional barriers to the movement and dispersal. Refer to Section 3.7.
3.0 Management Objectives	limiting the impact of fire in the parks and on adjoining properties	The proposal would not alter fire regimes.
3.0 Management Objectives	protection of the warm temperate and dry rainforest communities	Vegetation at the site is Hunter Range Blue Gum Gully Forest which is a class of wet sclerophyll forest.
3.0 Management Objectives	protection, and where necessary restoration, of wilderness values;	The proposal would not impact wilderness values. At its closest point, the proposal is about 600 metres from the Yengo Wilderness Area.
3.0 Management Objectives	consultation with the Central Coast Hunter Range Region Aboriginal Heritage Advisory Committee in relation to management of the parks;	The objective relates to broader park management. The proposal would not inhibit pursuit of this objective.
3.0 Management Objectives	provision of opportunities for the Aboriginal community to continue their traditional practices and maintain sites;	The proposal would not inhibit pursuit of this objective.
3.0 Management Objectives	maintenance of dispersed, low-impact recreation opportunities, including vehicle-based and self-reliant activities, so that visitors may experience the heritage, scenic, natural and wilderness values of the parks	The proposal supports this objective by facilitating continued safe access to the Yengo National Park (via MR503, Putty Road).

Management objectives	Comment	Comment
3.0 Management Objectives	management of Big Yango homestead and associated areas to conserve and interpret the cultural heritage values	The proposal would have no impact on Big Yango homestead
3.0 Management Objectives	promotion of public awareness and appreciation of the parks, with emphasis on: • their importance as part of the system of conservation areas in the Sydney Basin; • wilderness values; and • adoption of minimal impact recreation practices by park visitors	The proposal would not inhibit pursuit of this objective.

The specific management objectives from the Wollemi National Park Plan of Management are considered in the table below.

Management objectives	Comment	Comment
3.0 Management Objectives	to manage Wollemi National Park in recognition of its role as part of a contiguous system of parks, reserves and other protected lands;	The objective relates to broader park management. The proposal would not inhibit pursuit of this objective.
3.0 Management Objectives	to maintain the park's biodiversity with emphasis on the protection of threatened species;	The proposal would not have significant impacts on biodiversity. Refer to Section 3.7.
3.0 Management Objectives	to protect and where necessary restore areas to a wilderness condition within the proposed Wollemi Wilderness Area;	The proposal is not near the Wollemi Wilderness Area.
3.0 Management Objectives	to protect the park's catchment values;	The proposal represents an option which minimises impacts on nearby watercourses. Safeguards have been proposed to address potential impacts on water quality.
3.0 Management Objectives	to provide and manage wilderness recreation opportunities;	The proposal would not inhibit pursuit of this objective.
3.0 Management Objectives	to provide developed recreation destinations at selected areas on the edges of the park;	The proposal would not inhibit pursuit of this objective.
3.0 Management Objectives	to promote public awareness, understanding and appreciation of the park with emphasis on: • wilderness and world heritage values; • natural and cultural heritage values; • threatening processes and minimal impact use; and • community participation in park management.	The proposal would not inhibit pursuit of this objective.

The recommendations in Developments adjacent to NPWS lands: Guidelines for consent and planning authorities (as relevant to the proposal) are considered in the table below.

Category	Recommended approach	Comment
Erosion and sediment control	Appropriate erosion and sedimentation control measures should be implemented before works commence and maintained for the duration of construction and until soil is stabilised. As general erosion and sediment control measures, NPWS recommends that: • Clearance of native vegetation is kept to a minimum • Areas of retained vegetation are fenced off during construction • Areas of bare soil and stockpiles are managed to prevent erosion during the construction process • Disturbed areas are rehabilitated and appropriately stabilised as soon as possible following construction (this includes removal of control measures, such as sediment fences, when they are no longer required). To prevent sediment moving from an adjacent property onto NPWS land, and to avoid and minimise erosion risks, NPWS also recommends that appropriate controls should be applied in accordance with the following guidance documents: • Erosion and sediment control on unsealed roads (OEH 2012) • Managing Urban Stormwater – Soils and Construction, Volume I (Landcom 2004) • Managing Urban Stormwater – Soils and Construction, Volume II (DECC 2008) • A Resource Guide for Local Councils: Erosion and Sediment Control (DEC 2006)	Measures to address soil and water quality impacts have been included in Sections 3.1 and 3.2. Once complete, the proposal would address erosion and sedimentation impacts associated with slope failures.
Stormwater runoff	Development proposals for areas adjacent to NPWS land should incorporate stormwater detention and water quality systems (with appropriately managed buffer areas) within the development site. Water sensitive urban design (WSUD) principles should be applied to developments in catchments upstream from wetlands. Stormwater should be diverted to council stormwater systems or to infiltration and subsurface discharge systems within the development site. The discharge of stormwater to NPWS land, where the quantity and quality of stormwater differs from natural levels, must be avoided.	Following the completion of works the quality of stormwater flows are expected to improve the existing situation due to the stabilisation of the subject slopes. Minimal changes to the volume and velocity of road related runoff is anticipated (as there would be minimal change to the impermeable surfaces within the catchment). Refer to Section 3.2 for further discussion of hydrology and water quality.
Wastewater	Requirements relating to wastewater infrastructure and discharge.	Not relevant to the proposal.

Category	Recommended approach	Comment
Pests, weeds, and edge effects	During construction works adjoining parks, the boundary of the NPWS park and any buffer will require demarcation using a visually obvious barrier such as temporary fencing or flicker tape to reduce the risk of accidental encroachments.	The proposal footprint would encroach the Yengo National Park and Wollemi National Park. Any access to or works on NPWS land would be in accordance with an authorisation.
Fire and the location of asset protection zones	Relates to bush fire hazard reduction works, including the establishment of asset protection zones.	Not relevant to the proposal.
Boundary encroachments and access through NPWS land	NPWS land is not to be used: • To access development sites • To store materials, equipment, workers' vehicles or machinery • For maintenance access after development. Measures, such as temporary fencing of 'no-go' areas during construction or installation of permanent, wildlife-compatible fencing should be considered, and will require NPWS approval if they are proposed to be located along the site boundary.	Access to Yengo National Park and Wollemi National Park is only required to the extent that the existing road and embankments sit within the park.
Visual, odour, noise, vibration, air quality and amenity impacts	Visual (including lighting), noise, odour, and air quality impacts of development adjacent to NPWS land to ensure that they do not affect the amenity or public enjoyment of the land.	Visual impacts are considered in Section 3.11. Noise impacts are considered in Section 3.3. Air quality impacts are considered in Section 3.4.
Threats to ecological connectivity and groundwater-dependent ecosystems	Vegetation, waterways, and water bodies close to NPWS land that exhibit ecological connectivity should be retained, protected and, where necessary, rehabilitated. For proposals involving the extraction of groundwater, NPWS recommends that consent authorities obtain and consider a comprehensive assessment of any potential impacts that may occur to groundwater-dependent ecosystems in NPWS lands.	Potential biodiversity impacts and suitable safeguards are discussed in Section 3.7. The proposal is not likely to intercept groundwater and no groundwater extraction are proposed. Temporarily elevated groundwater levels would drain quicky given the steep profile and sandy nature of the soils.
Cultural heritage	Adequate consideration should be given to potential impacts of nearby development on the heritage values of NPWS land.	No impacts on Aboriginal or non-Aboriginal heritage are expected. Refer to Section 3.5 and Section 3.6.
Access to parks	Any potential impacts on the accessibility to NPWS parks. Works should not block or in any way impede access to tactical fire trails.	The proposal would not affect access to Yengo National Park and Wollemi National Park. The proposal would not affect tactical fire trails.

Appendix B: Historical Archaeological Impact Assessment

EXTENT
PEOPLE-CENTRED HERITAGE

Putty Road, Terrys Creek Slope Remediation

Historical Archaeological Impact Assessment

Prepared for BD Infrastructure

June 2023 – FINAL

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Document information

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Author(s):	Clare Fitzpatrick Hayley Edmonds Hannah Morris

Document control

Version	Internal reviewer	Date	Review type
Draft 01	Graham Wilson Hannah Morris	30/03/2023 03/04/2023	Technical QA
Draft 02	Hannah Morris	10/05/2023	Client comments Mapping updates
Final	Hannah Morris	05/06/2023	Mapping updates

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1. Introduction

1.1 Project initiation

Extent Heritage Pty Ltd has been commissioned by BD Infrastructure on behalf of Transport for NSW (TfNSW) to undertake a Historical Archaeological Impact Assessment (HAIA) in advance of proposed slope remediation works along Putty Road. The study area extends along Putty Road, 6km south of Milbrodale over a length of approximately 10km. Putty Road was severely impacted following the rainfall and flood events of July 2022. Consequently, Transport for NSW plan to undertake slope remediation works across a series of nine embankment sites over a distance of 2.5km, 1.3km north of Terrys Creek to 1.2km south of Terry Creek. Within these nine embankment sites, a series of dry stone walls have been identified as potential historical archaeological remains.

This report provides an evaluation of the study area's potential to contain historical archaeological remains and their significance, and an assessment of the impacts of proposed works on these remains, This report is intended to act as a standalone document to contribute to the preparation of the Minor Works Review of Environmental Factors (MWREF) report, to support the proposed construction works at the nine embankment site locations.

1.2 Study area location and identification

The study area, comprised of nine separate embankment sites, is located along Putty Road, 6km south of Milbrodale. The study area lies within the Singleton Council local government area and is bound by Wollemi National Park to the west and Yengo National Park to the east.

The nine sites all comprise southbound fill embankments located approximately 10km south of Milbrodale and stretch across a distance of 2.5km. These slopes are referenced in relation to Terrys Creek, a downstream connecting waterway that crosses Putty Road. These sites occur along the embankment between Putty Road and Darkey Creek and are located both north and south of Terrys Creek.

This report addresses the sites listed below in Table 1 and shown in Figure 1.

Table 1. List of nine embankment sites comprising the study area.

TfNSW Site	TfNSW Slope No.	Description	Coordinates (MGA)		Length (m)
			Start	End	
3	018011	Terrys Creek North	307070 6376649	307095 6376682	135
4	018010	Terrys Creek North	306999 6376432	307016 6376472	60
5		Terrys Creek North	307019 6376492	307048 6376551	60
7	018009	Terrys Creek North	306920 6376321	306927 6376358	80
8		Terrys Creek North	306933 6376217	306932 6376244	60

TfNSW Site	TfNSW Slope No.	Description	Coordinates (MGA)		Length (m)
			Start	End	
9		Terrys Creek North	306936 6376171	306931 6376121	40
10	018008	Terrys Creek North	306864 6375871	306840 6375856	45
11	018006	Terrys Creek South	306942 6376142	306943 6376157	45
13	018003	Terrys Creek South	305831 6375114	305948 6375134	140

Figure 1. Study area

1.3 Development description

BD Infrastructure on behalf of TfNSW proposes to undertake slope remediation work at nine sites along the embankment between Putty Road and Darkey Creek. These sites are characterised by developing rotational failures present in the fill embankment with pavement deformation and tension cracks in the southbound traffic lane. They are subject to southbound lane closure and 24-hour traffic control until permanent remediation works are completed.

The works across the nine embankment sites comprise initially of sediment controls and vegetation clearing, before soil and rock nails are applied to the road shoulder and a shotcrete finish is applied to the embankment. The works will require reshaping of the downslope embankments by spreading and reshaping the existing embankment. Pending the condition of the lower embankment, turf reinforcement matting or hydramulch may be employed for stabilisation.

1.4 Statutory context

Historical archaeological relics in NSW are protected by state legislation and environmental planning instruments provided by local government. Specific legislation relevant to this project includes:

- *Singleton Local Environmental Plan 2013 (Singleton LEP 2013);*
- *Environmental Planning and Assessment Act 1979* (NSW) (EPA Act); and
- *Heritage Act 1977* (NSW) (the Heritage Act).

1.4.1 NSW Heritage Act 1977

The Heritage Act is designed to conserve the environmental heritage of New South Wales (NSW) and regulate development impacts on the state's heritage assets. Significant historical archaeological features are afforded automatic statutory protection by the 'relics' provisions of the Act. A 'relic' is defined in the Act as:

> any deposit, artefact, object or material evidence that:
>
> a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and
>
> b) is of State or local heritage significance.

In accordance with section 139(1) of the Heritage Act, it is an offence to disturb or excavate land, where this may affect a relic, without an approval or excavation permit issued by the Heritage Council of NSW, or an endorsed 'exemption' or 'exception' to disturb or expose and destroy a relic. Sites that may contain archaeological relics are usually managed under sections 140 (application) and 141 (approval) of the Heritage Act. Sites with potential archaeology, listed on the State Heritage Register (SHR), are managed under sections 60 (application) and 63 (approval) of the Heritage Act.

1.4.2 Environmental Planning and Assessment Act 1979

Environmental planning instruments made under the EPA Act include SEPPs, that deal with matters of state or regional environmental planning significance, and Local Environmental Plans (LEPs), that guide planning decisions for local government areas. The study area falls within the Singleton LGA. Currently, the relevant environmental planning instrument is the Singleton LEP 2013.

1.4.2.1 Singleton Local Environmental Plan 2013

The objectives of the Singleton LEP 2013 with respect to environment and heritage are provided in the following clauses:

5.10 Heritage conservation

(1) Objectives – The objectives of this clause are as follows—

(a) to conserve the environmental heritage of the City of Sydney;

(b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views,

(c) to conserve archaeological sites,

(d) to conserve Aboriginal objects and Aboriginal places of heritage significance.

(2) Requirement for consent – Development consent is required for any of the following—

(a) demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance)—

(i) a heritage item,

(ii) an Aboriginal object,

(iii) a building, work, relic or tree within a heritage conservation area,

(b) altering a heritage item that is a building by making structural changes to its interior or by making changes to anything inside the item that is specified in Schedule 5 in relation to the item,

(c) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed,

(d) disturbing or excavating an Aboriginal place of heritage significance,

(e) erecting a building on land—

(i) on which a heritage item is located or that is within a heritage conservation area, or

(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance,

(f) subdividing land—

(i) on which a heritage item is located or that is within a heritage conservation area, or

(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance.

(7) Archaeological sites

The consent authority must, before granting consent under this clause to the carrying out of development on an archaeological site (other than land listed on the State Heritage Register or to which an interim heritage order under the Heritage Act 1977 applies)—

(a) notify the Heritage Council of its intention to grant consent, and

(b) take into consideration any response received from the Heritage Council within 28 days after the notice is sent.

1.4.3 Listings

Extent Heritage undertook a review of all available heritage databases including the NSW State Heritage Register (SHR), NSW State Heritage Inventory (SHI), Singleton LEP 2013, Section 170 Register (S170), National Heritage List, Commonwealth Heritage List, and National Trust Heritage List (NT). This search showed no heritage items, heritage conservation areas, or archaeological sites within the study, or in its direct vicinity.

The study area is bound on either side of the road corridor by NSW National Parks, with Wollemi National Park to the west and Yengo National Park to the east. Both National Parks lie within the Greater Blue Mountains World Heritage Area.

1.5 Previous reports and investigations

The study area has been subject to the following geotechnical investigation:

- Putty Road Emergency Works, Fill Embankment Remediation. Sites 3 to 5, 7 to 11, and 13, North and South of Terrys Creek. Geotechnical Investigation and Design Report. (Newcastle Geotech, 2023)

Additional information regarding the sites and their construction was provided by TfNSW.

1.6 Objectives

This report aims to present an overview of the potential historical archaeological resource and its significance located within the study area. The archaeological potential was assessed on the basis of comparative mapping and review of relevant historical materials. This report also

assesses the potential development impacts on the identified archaeological resources and provides recommendations for the management of these impacts.

1.7 Approach and methodology

This report was prepared in accordance with the principles and procedures established by the following documents:

- *The Australia ICOMOS Charter for Places of Cultural Significance, 2013* (the *Burra Charter*) (Australia ICOMOS 2013);
- *Archaeological Assessment Guidelines* (Heritage Office and Department of Urban Affairs and Planning 1996);
- *Assessing Significance for Historical Archaeological Sites and 'Relics',* (Heritage Branch, Department of Planning 2009); and
- '*Historical Archaeology Code of Practice*' (Heritage Office, Department of Planning 2006).

1.8 Limitations

This report uses primary historical documentation in addition to secondary historical documentation previously prepared by third party heritage consultants. This report does not review the built heritage or Aboriginal cultural heritage associated with the subject area.

Extent Heritage carried out a historical archaeological site inspection of the study area on 17 March 2023. The investigation was limited by site access, steep terrain and safety precautions concerning vehicle traffic and slope instability. Additionally, visibility was impacted by dense vegetation, with inspections carried out from behind the road guard rails. The limitations encountered during the site visit do not affect the assessment of historical archaeological potential or the conclusions and recommendations found in this report.

1.9 Author identification

This report was prepared by Clare Fitzpatrick (research assistant), Hayley Edmonds (heritage advisor), and Hannah Morris (senior heritage advisor). The report was reviewed by Graham Wilson (principal heritage advisor).

2. Historical context

The following historical overview of the study area has been prepared to provide context to the cultural significance of the entire study area. It provides a rationale for historical developments in the area and assists in identifying historical archaeological potential within the study area.

2.1 Introduction

The line of Putty Road has changed over the course of the nineteenth and twentieth centuries, undergoing several route deviations and structural improvements. This overland route from Sydney to the Hunter region was an established Aboriginal track before becoming known as Howes Track in the early nineteenth century, and soon after, Bulga Road.

The northern section of the route underwent a deviation away from the mountains in the late nineteenth century to follow Darkey Creek and Parsons Creek. This portion of the road is where the study area is located. By the twentieth century the route had become known as Putty Road as well as Main Road 503, and in the mid twentieth century further upgrades were made. The existing section of road between Putty and Singleton, that includes the study area, was widened and improved during WWII.

2.2 Wonnarua Country

The Wonnarua are the traditional owners of the Hunter Valley region, including the land on which the study area sites. The traditional boundaries of Wonnarua Country extend across from the Upper Hunter River, north to Barrington Tops, west to the Great Dividing Range, and extending to Putty in the south. Neighbouring in the south are the traditional lands of the Darkinjung people.

Prior to European arrival, the land sustained lives and communities for countless generations, providing a storehouse of resources from not only the coastline, harbours, and rivers, but also the mountains and valleys. Aboriginal presence around this area is evident through the presence of stone tools, middens, grinding grooves, and rock art, while community histories preserve knowledge and stories relating to the region.

2.3 Nineteenth century development of Putty Road

2.3.1 Howe's Track

Newcastle and the Hunter valley region were pivotal in supporting the growth of the NSW colony in the early nineteenth century. The rich resources of the region were known to colonists as early as the late 1790s. An overland route from Sydney to the Hunter region was first officially sought in 1819. Until this point, travel between Sydney and Newcastle was predominantly taken via coastal water transport, between Port Jackson and Port Hunter. Newcastle's early industries centred on coal and cedar, with coal first identified by John Shortland in 1797 (Doring and Doring 1996, 200).

Newcastle, the successor of a failed penal colony attempted in 1801-1802, was established in 1804. The convicts at Newcastle were engaged in timber felling and coal mining with timber camps established along the Hunter River. The products of their labour were shipped down the river and the coast to Sydney (Doring and Doring 1996, 200).

By the 1810s, the growing population of New South Wales required further agricultural and pastoral production. Several farms were established in the Hunter Valley region and, by the end of the decade, an overland route to the region's 'extensive plains of rich and fertile lands' (as described by Governor Macquarie in 1819) was sought. In the same letter to Earl Bathurst, Macquarie referenced the existence of such a route, noting that it had 'become familiar to several of those persons who have been transported thither' (HRA v.10, 43).

During October and November 1819, John Howe set out from the Hawkesbury to establish a route to the Hunter River. The party comprised eight men, including two Aboriginal men. The group crossed through Darkinjung County in the south, into Wonnarua Country in the north. Led by the Darkinjung guides and following known Aboriginal tracks, the party crossed the Colo River near Wheeney Creek. Then, keeping west of the Macdonald River, they passed Yengo Mountain. The group crossed the Upper Macdonald before crossing the range between the watersheds of the Hawkesbury and the Hunter. They reached the Hunter River, close to present-day Singleton, on 5 November. After following the river for some distance, the party returned to Windsor via the 'rough country,' returning after an absence of 22 days (HRA v.10, 810). Although Howe had succeeded in reaching the Hunter, he returned dissatisfied with the route.

In February 1820, Howe set out again from Windsor, this time with a larger party of 15 which again included two Aboriginal men. Led again by Darkinjung guides along known Aboriginal tracks, the party reached the Hunter River on 15 March with Howe subsequently naming the area St Patrick's Plains. The party continued along the river to the west before returning to Windsor.

The route, shown in Figure 2 and Figure 3, was marked by blazed trees by April 1820 and was in use for the transport of cattle and sheep by 1821, though it was not trafficable by cart until November 1822 (Griffin 2005, 2-3). The Colonial Secretary's Office declared the road from Richmond to Wallis Plains open in March 1823. The notice stated that "A written Permit must, however, be obtained from this Office, designating the Brands of the Animals proposed to be driven; enumerating their Numbers; and naming the Individuals intended to accompany them, together with the Ships that they came by; the Indulgences (if any) that they possess; and specifying the Days during which this Journey will be accomplished' (*The Sydney Gazette and New South Wales Advertiser* 1823, 1).

2.3.2 Bulga Road

By 1823, Newcastle's convicts were sent to Port Macquarie and the town was re-established as a free settlement. Bulga Road, as it was known, was soon deemed unsuitable for the increasing movement required between Sydney and Newcastle due to the steepness and ruggedness of the track. Consequently, an alternate route to connect Sydney with the Hunter was surveyed by

Heneage Finch in 1825, becoming known as the Great North Road. Construction of this new road was carried out between 1826 and 1836 by convict road gangs.

Despite these developments, Bulga Road remained in use. The track was primarily used for the transport of stock and for movement between settlements along its route. Land along the Bulga Road was leased and sold from the 1830s, with farms established from Colo to Howe's Valley. North of Howe's Valley, the road travelled along the Bulga Mountain before reaching Milbrodale station.

Figure 2. Sketch map showing the roads around Singleton and Jerry's Plains, 1842. Study area in red. (Source: SLNSW_FL12327283).

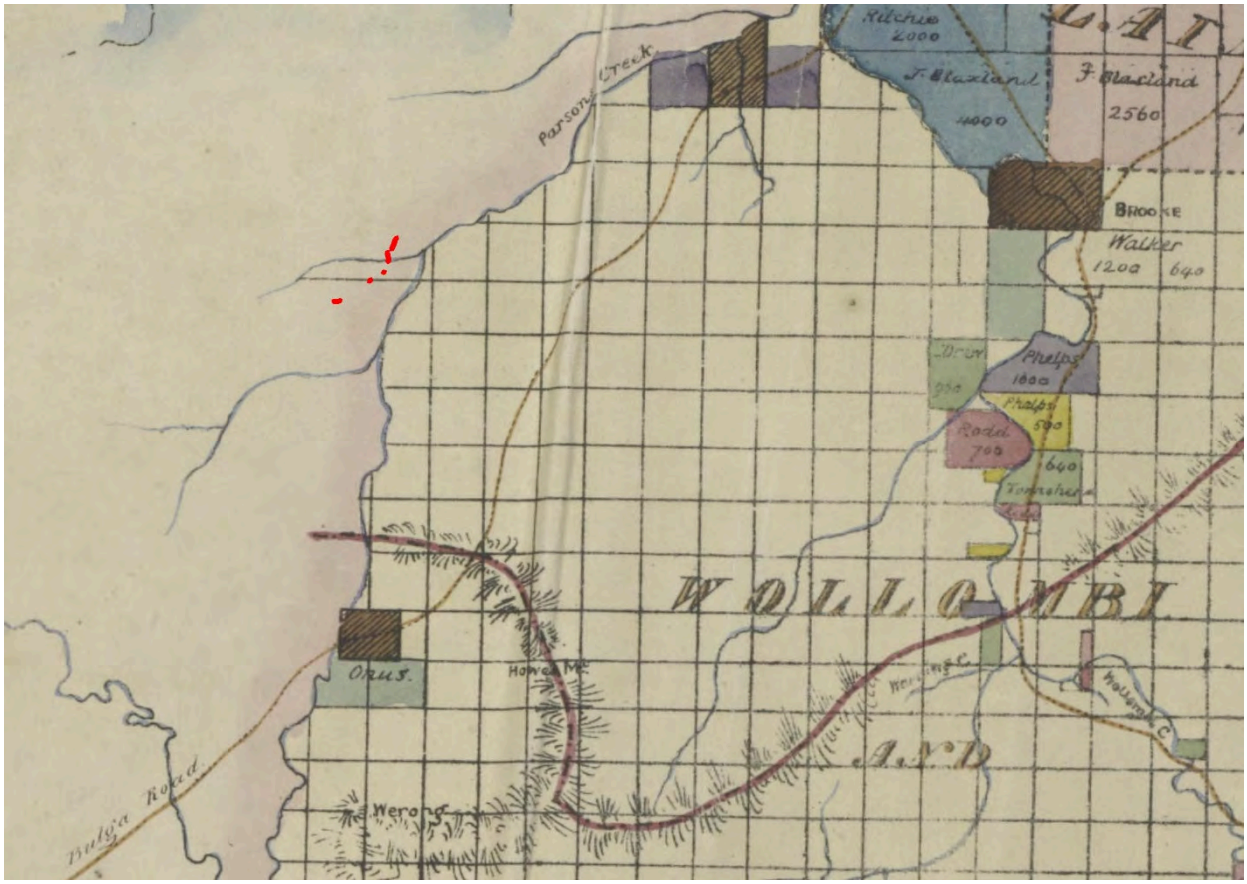

Figure 3. Map of the County of Northumberland, 1843. Study area in red. (Source: NLA, nla.obj-2236340989-1).

2.4 Nineteenth century development within the study area

2.4.1 Darkey Creek deviation – informal track (c.1870-1889)

By the mid-1870s, an alternate route following Darkey Creek to avoid travelling across the Bulga Mountains was in use and was described as a rough bridle track. Reports of works undertaken to the mountain route noted that the track via Darkey Creek had been 'abandoned in favour of the older and better road' (*The Maitland Mercury and Hunter River General Advertiser* 1874, 3).

2.4.2 Darkey Creek deviation – formalised road (1890-1889)

In the following decade, repairs to the road across the Bulga Mountains were called for. As such, the matter was referred to the Commissioner for Roads in April 1884 (*Singleton Argus* 1884, 2). A report in July that year noted that 38,838 head of stock had travelled along the road in the first quarter of the year. It stated that the road was 'rugged and steep,' and that a deviation would improve the road 'very materially' (*Sydney Morning Herald* 1884, 8).

In June 1886, it was reported that a deviation to the Bulga Road was to be considered following the preparation of a survey and a cost-estimate for the works (*Australian Town and Country Journal* 1886, 13). The design of the deviation was under preparation by August 1887:

Improvements on the Bulga Road

> A step is now being taken by the Survey Department which, if crowned with success, will result in a great gain to drovers and the travelling public using the Bulga Road from Singleton to the upper Hawkesbury. A survey now in active progress has for its object the discovery and opening of a travelling route via Darkie (or Parsons) Creek valley in place of over the Bulga mountain. Starting with a deviation at Milbrodale station, it is intended, if found practicable, to keep to the low ground near the creek (instead of as now scaling the long mountain that flanks the creek on the left) and follow this up to its head waters, which the present route after running along the neighbouring ridge for some eight- or nine-miles crosses, after an arduous descent from the high ground. It is also in contemplation to cross Howe's mountain at a spot more favourable than that now traversed by the stock road and should this be feasible the route from Milbrodale to Howe's Valley (on the Hawkesbury side of the range) will be considerably shortened and no mountain journeys will present themselves, except the inevitable one over the high watershed that parts the Hunter waters from those of the Hawkesbury. Along Darkie Creek there is even now a rough bridle track, which is not infrequently availed of by some of the more fearless residents of the locality, and part of the route now proposed was years ago surveyed for the purpose of forming a road via the portion of the creek. The descent to the creek was to have taken place some miles further from Howe's mountain than it now occurs, but on reconsideration it was decided not to leave the high ground till absolutely necessary. The design, however, goes to show that along at least some part of the valley of Darkie Creek it has already been found possible to open a road, and the idea is now that at comparatively small expense it will be found practicable to run the route along the whole length of the valley, and thus any ascending and descending of the high steep ridge which hems it in on the eastern side will be obviated. We may add that the officer in charge of the survey anticipates that he will be able to report favourable as to the object in view (Singleton Argus 1887, 2).

The following year, Crown Lands on either side of Parson's Creek and Darkey Creek were reserved from sale for travelling stock. The reserve (Reserve No. 6425) had a total area of 3,250 acres, and passed through the parishes of Parnell, Poppong, Bulga and Milbrodale (*New South Wales Government Gazette* 1888, 3850).

Tenders for the 'Darkey Creek Deviation, Bulga Road', were advertised from July 1889 and again in December (*Sydney Morning Herald* 1889a, 2; *Sydney Morning Herald* 1889b, 2). The Singleton Argus reported that:

> The Darkey Creek road deviation is a troublesome work, and one which contractors have refused to face, although they have tendered. Arrangements have been made by which the work will be carried out, and no further delay is now likely to occur (*Singleton Argus* 1889, 2).

Fresh tenders were again invited in July 1890, to close on 3 September (*New South Wales Government Gazette* 1890a, 5531). Eight tenders were received, with the lowest tender from Gallagher and Duggan totalling £4268 (*Evening News* 1890, 5). On 8 October, the government gazetted that Gallagher and Duggan's tender had been accepted (*New South Wales Government Gazette* 1890b, 7790).

In February 1891, the Singleton Argus reported that construction of the new road via Darkey Creek to Howe's Valley was progressing rapidly, with forty to fifty men at work (*Singleton Argus* 1891, 2). By May, it was reported that five miles of the deviation were 'approaching completion,

but there is some ten miles more to make before the new road can be opened, and for this work no tenders have been invited' (*The Daily Telegraph* 1891, 5).

Further tenders for works on the Darkey Creek Deviation were advertised in June 1891 (*The Maitland Mercury and Hunter River General Advertiser* 1891, 1). The following month, it was reported that 'the whole of the deviation down Darkey Creek on the Bulga Road, was pegged and levelled, and sections had been made' (*The Sydney Morning Herald* 1891, 3). The works continued into the following year. In May 1892, the Singleton Argus reported a complaint:

> …that though a distance of nine miles of the Darkey Creek road has been completed, it has not been thrown open for traffic, and that as a consequence drovers and others suffer considerable avoidable inconvenience by having to take routes over the Bulga ranges. It is asserted that where the road passes through paddocks, some of the owners have securely fastened up fences across it in order to prevent traffic (*Singleton Argus* 1892, 2).

On 18 October 1892, the road was gazetted (Figure 4). It was described as 'part of road from Jerry's Creek to Richmond up Parson's Creek' (*New South Wales Government Gazette* 1892, 8334). In March 1893, Reserve No. 6425 was revoked, and Travelling Stock Reserves 17436, 17437, and 17438 were notified in its place (*New South Wales Government Gazette* 1893, 2513). The study area lies in 17436 (Figure 5).

The condition of the road was discussed during a Patrick Plains Shire Council meeting in March 1923. The stretch of road between Bulga and Howes Valley was reportedly in good condition and 'was a credit to the maintenance man in charge' (*Singleton Argus* 1923, 3).

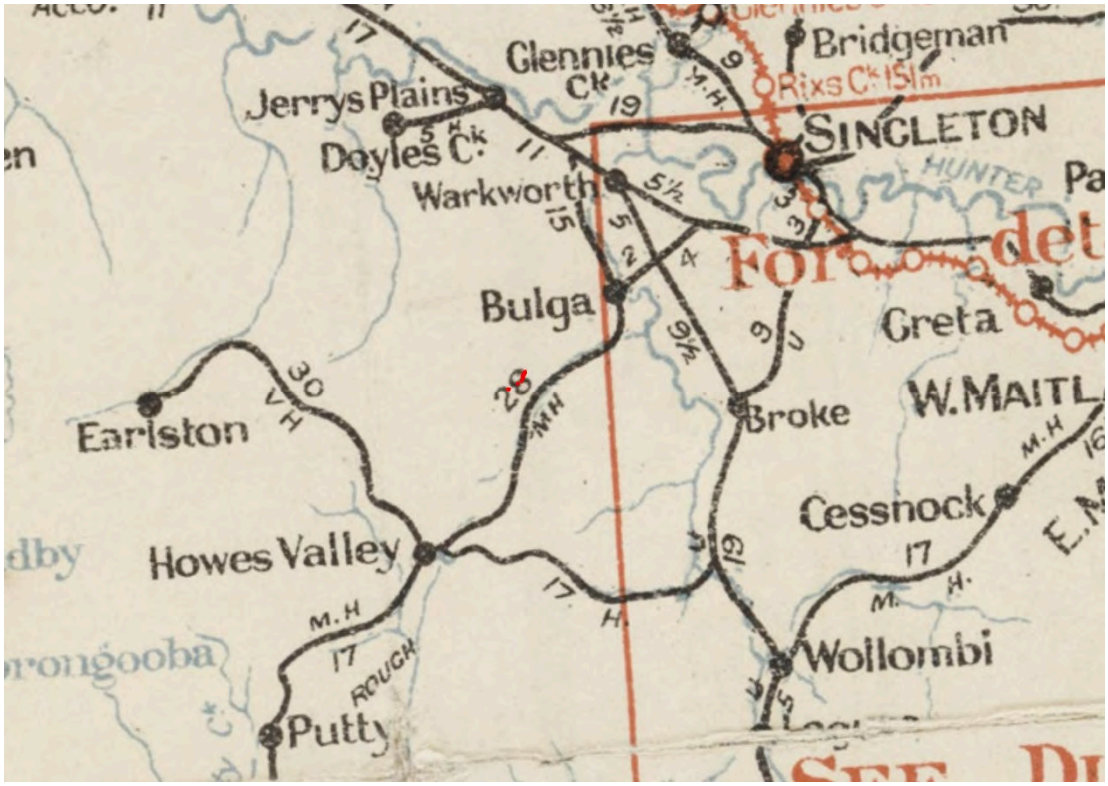

Figure 4.Road map of New South Wales, 1905, showing deviation of Putty Road, now following the creek line of Darkey Creek. Study area in red. (Source: SLNSW, FL16167949).

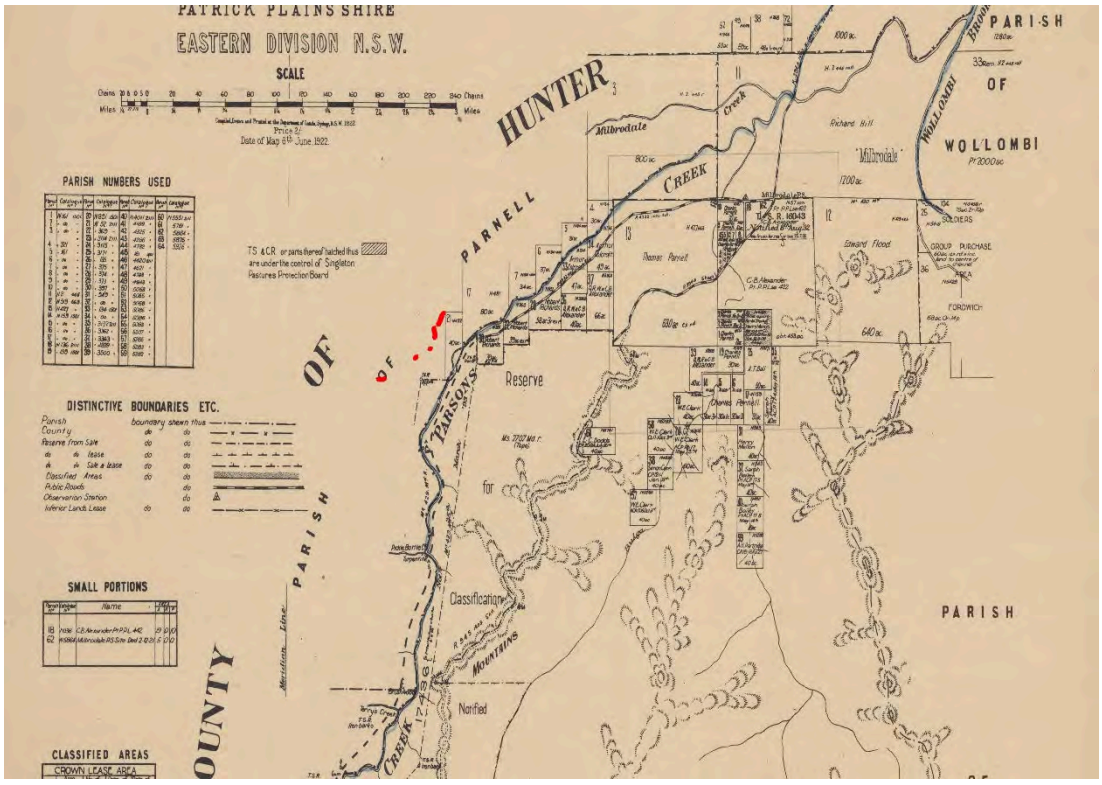

Figure 5. Map of Parish of Northumberland, 1922, showing Travelling Stock Route following the Putty Road deviation along Darkey Creek. Study area in red. (Source: NLA http://nla.gov.au/nla.obj-233865916).

2.5 Twentieth century development in the study area

2.5.1 Putty Road improvement works (1939-present)

Putty Road, formerly Bulga Road, was proclaimed Main Road No. 503 in August 1939. The road extended from the Richmond-Victoria Road at Lower Kurrajong, via Upper Colo, Putty, Howes Valley, and Bulga to the Singleton Municipal Boundary (*NSW Government Gazette* 1939, 4193).

From 1939, the Department of Main Roads undertook reconstruction of Putty Road when the military significance of an alternate inland route between Sydney and Newcastle became apparent during WWII. Prior to these works, the road had been trafficable between Upper Colo and Wheelbarrow Ridge, and between Putty and Singleton. The length between Wheelbarrow Ridge and Putty Road had fallen into disuse many years before. A new route between Wilberforce and Wheelbarrow Ridge, and the route from Wheelbarrow Ridge to Putty generally, followed the old route (Figure 6).

From Putty to Singleton the existing road, on which the study area is located, was widened and improved (Figure 7):

> The general width of the road from Singleton to Putty will be 24 feet – the standard measurement. For nine miles of the Darkeys Creek section the present road will be widened to 20 feet. Cutting through rock is necessary in this section. (*Newcastle Morning Herald and Miners' Advocate* 1939,6)

During the mid-1950s, traffic along Putty Road increased significantly as it was a shorter route to Sydney than the Pacific highway for truck drivers. Subsequently, in 1957, the road was closed as a travelling stock route. By June 1964, the entire route was sealed with gravel pavement (Department of Main Road 1976, 173).

Figure 6. Scenes on M.R. 503. Wilberforce to Putty Road (Source: Main Roads Journal Dec 1946, 59).

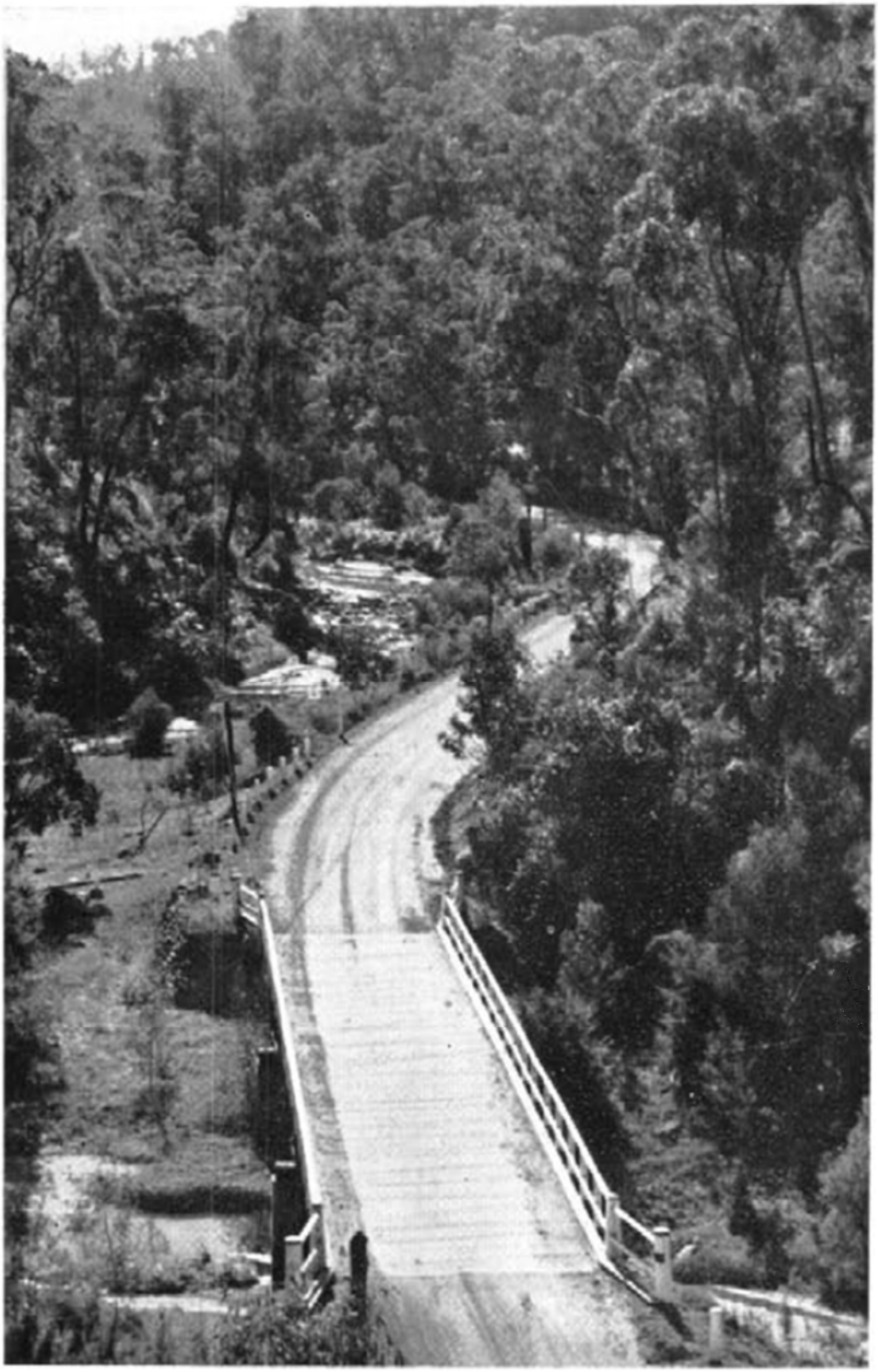

Figure 7. Scene at Darkey Creek about 4km from Milbrodale in Patricks Plains Shire (Source: Main Road Journal March 1949, 81).

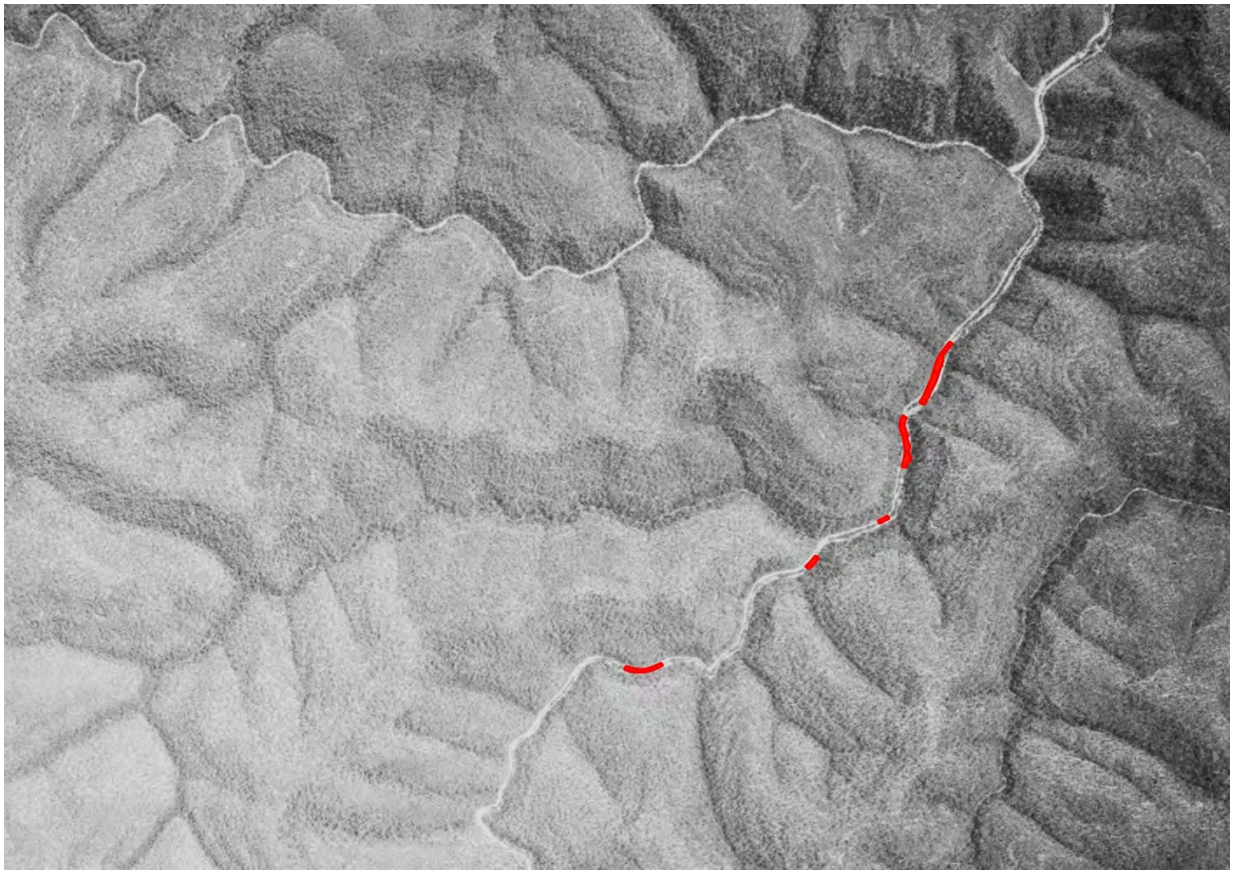

Figure 8.1964 aerial photograph taken in February 1964, showing the study area prior to road pavement sealing. Study area in red. (Source: NSW Department of Finance and Spatial Services).

2.6 Disturbance

2.6.1 Geotechnical investigations

Putty Road Emergency Works, Fill Embankment Remediation. Sites 3 to 5, 7 to 11, and 13, North and South of Terrys Creek. Geotechnical Investigation and Design Report. Report prepared by Newcastle Geotech for Transport for NSW (February 2023).

In 2023, Newcastle Geotech Pty Ltd and MHK Geotechnical Pty Ltd were commissioned by TfNSW to undertake geotechnical investigation, stability assessment and remediation design across the nine embankment sites along Putty Road following rainfall and flood events in March and July 2022. Geotechnical investigations comprised drilling of boreholes, mapping, and slope assessment to determine models, methodologies, and designs to facilitate long term remediation of the embankment slope.

The geotechnical investigations undertaken across the nine embankment sites within the study area identified that the cut and fill works were constructed with machinery including dozers and scrapers. At each of these sites, cuts were crudely formed with drill and blast with the spoil spread into the current road alignment to form the embankments. Their assessment confirmed that the remnant dry stone walls were constructed to form part of the embankment to support

the upper fill materials. Limited preparation of the sub-surface profile would have been undertaken that is evident from the results of the boreholes.

Boreholes taken along the road pavements and toe of the embankments across the nine embankment sites show minimal evidence of deposits from previous phases. Across the embankment sites the subsurface profiles along the road pavements generally consisted of fill embankment overlying a shallow colluvial soil (and in some locations, residual soil) and the sandstone bedrock below. The embankment has been founded directly onto the adjacent alluvial terrace. Only boreholes taken along toe embankments at Site 3 and to a lesser extent at Site 8, show variation in the depth and slope of the rockfill, with localised steeper area of rockfill possible evidence of older constructed revetments during Phase 2 (1890-1938).

2.6.2 Previous impacts

Twentieth century development within the study area during Phase 3 (1939 – present) remains largely extant. Developments during this phase, particularly the construction works undertaken from 1939 through to the early 1940s are likely to have heavily impacted archaeological evidence from previous historical phases. Boreholes taken along the road pavements and toe of the embankments across the nine embankment sites show minimal evidence of deposits from previous phases.

Environmental impacts have also cause heavy disturbance across the study area, that was observed during the site visit (Section 3). The loss of embankment caused by erosion and rainfall events has impacted the dry stone walls, with only remnant section remaining. Constructed between 1939 and the early 1940s, these walls once supported the upper fill embankments along steeper sections of slope. Heavy vegetation, primarily lantana shrubs have also impacted slope stability and the integrity of extant dry stone walls.

More recent disturbances along the embankment sites are generally restricted to pavement resurfacing, minor embankment widening, and guard rail installation. A number of cut batters have been remediated to address slope stability and hazards through the application of shotcrete and fibrecrete stabilisation, rock bolts and mesh, and de-vegetation works.

3. Physical description

3.1 Introduction

The study area comprises nine embankment sites along the stretch of Putty Road between Howes Valley and Milbrodale. The nine embankment sites all comprise right-hand side southbound fill embankments located approximately 10km south of Milbrodale and stretch across a distance of 2.5km. These slopes are referenced in relation to Terry's Creek, a downstream connecting waterway that crosses Putty Road. These sites occur along the embankment between Putty Road and Darkey Creek and are located both north and south of Terrys Creek.

The roadway was constructed by cutting into the natural slope, with the cut materials forming the fill embankment. The embankment fill appears to have generally been constructed with sandstone rock and sandy soil materials from the adjacent cuttings. The fill embankments are heavily vegetated and range between 4 and 8 metres in vertical height from road pavement to the embankment toe.

Across two of the nine sites (Site 4 and Site 13) localised remnant dry stone walls were identified along upper embankment fills. They were built into the upper section of the fill to provide an edging for the road alignment and placement for timber fence posts. These dry stone retaining walls measure approximately 1m-1.5m in height and up to 2m in length. An additional three sites (Site 3, Site 7, and Site 9) contained dry stone headwalls along the embankment associated with culverts. The dry stone walls across all sites have largely failed. The embankments have seen ongoing deterioration and slope instability, especially following severe rainfall events of July 2022.

3.1.1 Site Visit

On 17 March 2023, Hannah Morris (senior heritage advisor) and Clare Fitzpatrick (research assistant) from Extent Heritage alongside staff from BD Infrastructure and Transport for NSW, undertook a site inspection of the study area. The site inspection began in the northern extent of the study area at Site 3, travelling south through to Site 13 at the southern extent. The southbound lane closure was utilised to park vehicles and for pedestrian access along the length of the embankment sites.

The nine embankment sites were inspected for evidence of historical archaeological remains and potential. Extent Heritage staff walked the lengths of all embankment sites to locate and record previously identified remnant dry stone walls across all nine embankment sites. The investigation was limited by the steep profile and instability of the embankment slope. Consequently, all identified dry stone walls were inspected from behind the road guard rails. Additionally, site visibility was heavily impacted by dense vegetation, specifically the lantana shrubs covering the embankments along Putty Road.

3.2 Embankment Sites

The individual sites that comprise the study area are described here in more detail alongside photographs, with a specific focus on the remnant dry stone walls using information collected during the site visit carried out by Extent Heritage on 17 March 2023. This information is supplemented by data from previous RMS slope assessments and more recent geotechnical investigations by Newcastle Geotech (2023) following their site inspections during 2022.

Table 2, below, provides a summary of the embankment sites, including updated information on the presence and condition of dry stone walls along the embankment, as previously identified by Newcastle Geotech.

Table 2. Summary of dry stone walls along nine embankment sites.

TfNSW Site	TfNSW Slope	Dry stone wall condition (Extent Heritage, 2023)	Dry stone wall condition (Newcastle Geotech, 2023)
3	018011	Dry stone walls present only at culvert at chainage 120m, largely intact but upper course in poor condition.	Failed, minor remnant
4	018010	Minor remnant dry stone wall (two sandstone blocks)	Failed, minor remnant
5		No walls visible	Failed and remnant
7	018009	Dry stone walls present only at culvert	Failed
8		No walls visible	Failed
9		Dry stone walls present only at culvert, concrete additions	Remnant only
10	018008	No walls visible	Remnant only
11	018006	No walls visible	Remnant only
13	018003	Remnant dry stone walls present at chainage 20m, 30-35m and 45-50m	Failed and remnant

3.2.1 Site 3

Site 3 measures 135m in length and is located along TfNSW Slope 18011, north of Terrys Creek. Site 3 has been subject to extensive embankment loss and erosion, with heavy vegetation covering the steep slope towards Darkey Creek (Figure 9 to Figure 12, below).

The dry stone headwall associated with culvert 357107 at chainage 120m is still largely intact (Figure 13 to Figure 14, below). The dry stone wall measures approximately 2.5m in height and extends 3m in length. It comprises uncut sandstone, 10-20cm in size and interspersed with larger boulders. The upper courses of stone are in a poor condition due to effects of erosion and vegetation.

No other remains of dry stone walls were visible along the crest of the embankment. The original dry stone walls supporting the upper road embankment along the length of the road failed with the loss of shoulder to and behind the guard rail to the edge of the pavement. The dry stone walls were originally constructed within the embankment to support the upper fill materials.

Figure 9. Site 3, embankment loss and heavy vegetation along the steep embankment slope, looking south. Source: Extent Heritage, March 2023.

Figure 10. Site 3, embankment loss and heavy vegetation along the steep embankment slope, looking north. Source: Extent Heritage, March 2023.

Figure 11. Site 3, embankment loss and heavy vegetation along the steep embankment slope, looking north. Source: Extent Heritage, March 2023.

Figure 12. Site 3, eroded slope and vegetation above dry stone headwall, looking down to culvert at chainage 120m. Source: Extent Heritage, March 2023.

Figure 13. Site 3, culvert and dry stone headwall at chainage 120m, covered in vegetation. Source: Extent Heritage, March 2023.

Figure 14. Site 3, detail of headwall above culvert showing dry stone construction made from irregular, uncut sandstone. Source: Extent Heritage, March 2023.

3.2.2 Site 4

Site 4 measures 60m in length and is located along TfNSW Slope 18010, north of Terrys Creek. Site 4 has been subject to extensive embankment loss and erosion, with heavy vegetation covering the steep slope towards Darkey Creek (Figure 18).

Only minor remnant dry stone walls were visible along the crest of the embankment and comprised two sandstone blocks, with no lower course visible due to vegetation (Figure 15 to Figure 17). No other remains of previously identified dry stone walls were visible. The original dry stone walls supporting the upper road embankment along the length of the road failed with the loss of shoulder to and behind the guard rail to the edge of the pavement. The dry stone walls were originally constructed within the embankment to support the upper fill materials.

Figure 15. Site 4, remnant dry stone wall along eroded embankment, covered in heavy vegetation. Source: Extent Heritage, March 2023.

Figure 16. Site 4, detail of remnant dry stone wall on eroded embankment, covered in heavy vegetation. Source: Extent Heritage, March 2023.

Figure 17. Site 4, detail of two uncut sandstone blocks from remnant dry stone wall, with heavy vegetation covering embankment, looking downslope towards Darkey Creek. Source: Extent Heritage, March 2023.

Figure 18. Site 4, embankment loss and heavy vegetation along the steep embankment slope, looking north. Source: Extent Heritage, March 2023.

3.2.3 Site 5

Site 5 measures 60m in length and is located along TfNSW Slope 18010, north of Terrys Creek. Site 5 has been subject to extensive embankment loss and erosion, with heavy vegetation covering the steep slope towards Darkey Creek (Figure 19 to Figure 20).

No remains of previously identified dry stone walls were visible along the crest of the embankment. The original dry stone walls supporting the upper road embankment along the length of the road failed with the loss of shoulder to and behind the guard rail to the edge of the pavement. The dry stone walls were originally constructed within the embankment to support the upper fill materials.

Figure 19. Site 5, embankment loss and heavy vegetation along the embankment slope, with a steep drop off to Darkey Creek, looking north. Source: Extent Heritage, March 2023.

Figure 20. Site 5, embankment loss and heavy vegetation along the embankment slope, with a steep drop off to Darkey Creek, looking south. Source: Extent Heritage, March 2023.

3.2.4 Site 7

Site 7 measures 80m in length and is located along TfNSW Slope 18009, north of Terrys Creek. Site 7 has been subject to extensive embankment loss and erosion, with heavy vegetation covering the steep slope towards Darkey Creek (Figure 24).

The dry stone headwall associated with culvert 357110 at chainage 65m is in a poor condition with upper course failed with the loss of the upper embankment and erosion (Figure 21 to Figure 23). The dry stone wall measured approximately 2m in height and 2.5m in length and comprises uncut sandstone, 10-20cm in size.

No other remains of dry stone walls were visible along the crest of the embankment. The original dry stone walls supporting the upper road embankment along the length of the road failed with the loss of shoulder to and behind the guard rail to the edge of the pavement. The dry stone walls were originally constructed within the embankment to support the upper fill materials.

Figure 21. Site 7, eroded dry stone headwall and culvert with 2m scale, looking south. Source: Extent Heritage, March 2023.

Figure 22. Site 7, eroded dry stone headwall and culvert with 2m scale, looking south. Source: Extent Heritage, March 2023.

Figure 23. Site 7, detail of culvert and dry stone headwall covered in heavy vegetation. Source: Newcastle Geotech, September 2022.

Figure 24. Site 7, loss of embankment with heavy vegetation along steep embankment slope to Darkey Creek, looking north. Source: Extent Heritage, March 2023.

3.2.5 Site 8

Site 8 measures 60m in length and is located along TfNSW Slope 18009, north of Terrys Creek. Site 8 has been subject to extensive embankment loss and erosion, with heavy vegetation covering the steep slope towards Darkey Creek (Figure 25 to Figure 26).

No remains of previously identified dry stone walls were visible along the crest of the embankment. The original dry stone walls supporting the upper road embankment along the length of the road failed with the loss of shoulder to and behind the guard rail to the edge of the pavement. The dry stone walls were originally constructed within the embankment to support the upper fill materials.

Figure 25. Site 8, steep slope towards Darkey Creek with embankment loss with heavy vegetation, looking south. Adjacent cutaway secured with metal netting. Source: Extent Heritage, March 2023.

Figure 26. Site 8, erosion and embankment loss with heavy vegetation downslope to Darkey Creek, looking south. Source: Extent Heritage, March 2023.

3.2.6 Site 9

Site 9 measures 40m in length and is located along TfNSW Slope 18009, north of Terrys Creek. Site 9 has been subject to extensive embankment loss and erosion, with heavy vegetation covering the steep slope towards Darkey Creek (Figure 27).

The sandstone and concreted headwall associated with culvert 357111 at chainage 50m is in a poor condition with upper course having failed with the loss of the upper embankment (Figure 28 to Figure 30). The wall measures approximately 1m in height and 2m in length and comprises uncut sandstone, 10-20cm in size. The headwall was likely initially constructed with dry stone construction before the subsequent application of concrete rendering.

No remains of dry stone walls were visible along the crest of the embankment. The original dry stone walls supporting the upper road embankment along the length of the road failed with the loss of shoulder to and behind the guard rail to the edge of the pavement. The dry stone walls were originally constructed within the embankment to support the upper fill materials.

Figure 27. Site 9, embankment loss with erosion and heavy vegetation, looking south. Source: Extent Heritage, March 2023.

Figure 28. Site 9, culvert 357111 and dry stone headwall with evidence of concrete additions. Source: Extent Heritage, March 2023.

Figure 29. Site 9, culvert 357111and dry stone headwall with evidence of concrete additions. Source: Extent Heritage, March 2023.

Figure 30. Site 9, detail of culvert 357111 and dry stone headwall with evidence of concrete additions. Source: Extent Heritage, March 2023.

3.2.7 Site 10

Site 10 measures 45m in length and is located along TfNSW Slope 18008, north of Terrys Creek. Site 10 has been subject to extensive embankment loss and erosion, with heavy vegetation covering the steep slope towards Darkey Creek (Figure 31 to Figure 34).

No remains of previously identified dry stone walls were visible along the crest of the embankment. The original dry stone walls supporting the upper road embankment along the length of the road failed with the loss of shoulder to and behind the guard rail to the edge of the pavement. The dry stone walls were originally constructed within the embankment to support the upper fill materials.

Figure 31. Site 10, embankment loss and heavy vegetation on steep embankment slope towards Darkey Creek, looking north. Source: Extent Heritage, March 2023.

Figure 32. Site 10, embankment loss and heavy vegetation, timber post visible, looking south. Source: Extent Heritage, March 2023.

Figure 33. Site 10, embankment loss and heavy vegetation on steep embankment slope towards Darkey Creek, looking south. Source: Extent Heritage, March 2023.

Figure 34. Site 10, embankment loss and heavy vegetation on steep embankment slope towards Darkey Creek, looking south. Source: Extent Heritage, March 2023.

3.2.8 Site 11

Site 11 measures 45m in length and is located along TfNSW Slope 18006, south of Terrys Creek. Site 11 has been subject to extensive embankment loss and erosion, with heavy vegetation covering the steep slope towards Darkey Creek (Figure 35 to Figure 36).

No remains of previously identified dry stone walls were visible along the crest of the embankment. The original dry stone walls supporting the upper road embankment along the length of the road failed with the loss of shoulder to and behind the guard rail to the edge of the pavement. The dry stone walls were originally constructed within the embankment to support the upper fill materials.

Figure 35. Site 11, erosion and embankment loss downslope towards Darkey Creek, looking north. Source: Extent Heritage, March 2023.

Figure 36. Site 11, erosion and embankment loss downslope with some vegetation towards Darkey Creek, looking south. Source: Extent Heritage, March 2023.

3.2.9 Site 13

Site 13 measures 140m in length and is located along TfNSW Slope 18003, south of Terrys Creek. Site 13 has been subject to extensive embankment loss and erosion, with heavy vegetation covering the steep slope towards Darkey Creek, especially in the southern half of the site (Figure 37 to Figure 38, and Figure 47 to Figure 48). Three remnant sections of dry stone wall supporting the upper road embankment are still present between chainages 20 to 50m.

At chainage 20m the remnant dry stone wall is in a poor condition, with sandstone blocks eroding downslope (Figure 39). This section measures approximately 1.5m in length and extends down into the heavy vegetation approximately 1.5m. It comprises uncut sandstone, 10-20cm in size.

Between chainages 30 to 35m, a section of dry stone wall south of the culvert is present measuring 3m in length and approximately 1m in height (Figure 40 to Figure 42). It is in a poor condition, although the upper courses are largely intact. It comprises uncut sandstone, averaging 20cm in size with some larger 40cm boulders.

Between chainages 45 to 50m, a section of remnant dry stone wall was identified, measuring approximately 2m in length and approximately 1m in height (Figure 43 to Figure 45). The wall comprises uncut sandstone, measuring 10-20cm in size with some larger 40cm boulders. The dry stone wall is in poor condition, with upper courses failing with the loss of embankment and erosion.

No other remains of dry stone walls were visible along the crest of the embankment. The original dry stone walls supporting the upper road embankment along the length of the road failed with the loss of shoulder to and behind the guard rail to the edge of the pavement. The dry stone walls were originally constructed within the embankment to support the upper fill materials.

Figure 37. Site 13, erosion and embankment loss downslope towards Darkey Creek, looking slope. Source: Extent Heritage, March 2023.

Figure 38. Site 13, erosion and embankment loss downslope towards Darkey Creek, looking slope. Source: Extent Heritage, March 2023.

Figure 39. Site 13, remnant dry stone walls at chainage 20m, erosion along embankment, looking south. Source: Extent Heritage, March 2023.

Figure 40. Site 13, intact dry stone wall adjacent to culvert at chainage 30-35m, erosion along embankment, looking north. Source: Extent Heritage, March 2023.

Figure 41. Site 13, intact dry stone wall adjacent to culvert at chainage 30-35m, erosion along embankment, looking south. Source: Extent Heritage, March 2023.

Figure 42. Site 13, intact dry stone wall adjacent to culvert at chainage 30-35m, erosion along embankment, looking east towards Darkey Creeks. Source: Extent Heritage, March 2023.

Figure 43. Site 13, dry stone wall at chainage 45-50m, erosion along embankment, looking south. Source: Extent Heritage, March 2023.

Figure 44. Site 13, dry stone wall at chainage 45-50m, erosion along embankment, looking north. Source: Extent Heritage, March 2023.

Figure 45. Site 13, dry stone wall at chainage 45-50m, erosion along embankment, looking downslope towards Darkey Creek. Source: Extent Heritage, March 2023.

Figure 46. Site 13, detail of dry stone wall at chainage 45-50m, erosion along embankment, looking downslope towards Darkey Creek. Source: Extent Heritage, March 2023.

Figure 47. Site 13, embankment loss with erosion and heavy vegetation along steep embankment slope, looking south. Source: Extent Heritage, March 2023.

Figure 48. Site 13, embankment loss with erosion and heavy vegetation along steep embankment slope, looking south. Source: Extent Heritage, March 2023.

4. Historical archaeological potential

4.1 Introduction

This section of the report discusses the site's potential to contain archaeological evidence of the previous phases of occupation. The potential for the archaeological resource to reveal useful information about the previous uses or activities that shaped its history depends on the extent, nature, and level of its intactness.

Disturbed archaeological features and deposits in the form of fragmentary structural remains and random artefacts may be evidence of previous occupation, but their use or value in reconstructing the past though providing meaningful information is limited. This is because such features and deposits are disassociated from the stratigraphic sequence that establishes their provenance and secured date of deposition. This assessment is informed by the results of geotechnical investigations, the phases of site development, and evidence of modern disturbances likely to have impacted on or removed historical archaeological remains.

This section identifies where intact archaeological evidence is likely to be found at the site, and to what extent it may be preserved. The level of significance of archaeological evidence (known or potential) is discussed in Part 5.

4.2 Phases of development

Based on the historical research undertaken to date the following broad historical phases of development in the study area were identified:

- Phase 1 (c.1870s–1889): Darkey Creek deviation, informal track;
- Phase 2 (1890–1938): Darkey Creek deviation, formalised road; and
- Phase 3 (1939–present): Putty Road: twentieth century improvements.

Historical development undertaken during each phase with the likelihood to result in creation or destruction, of historical archaeological evidence is discussed here.

4.2.1 Phase 1 (c.1870s – 1889): Darkey Creek deviation, informal track

By the c.1870s, an alternate route along a section of Putty Road, formerly known as Bulga Road, was in use. This alternate route deviated north of Howe's Valley to bypass the steep Bulga Mountains, and instead follow along the creek line of Darkey Creek. The deviation was an informal track described as a rough bridle track. By 1874, it was reported to have been abandoned in favour of the original mountain route. However, it still saw infrequent use.

Development of the study area during this phase would have been limited to minor vegetation clearance and surface levelling. Archaeological evidence associated with this phase may include sporadic artefact discard from use of the track. Additionally, there may be evidence associated with camping reserves for travellers and stockmen in the vicinity of the study area

around creeks and river crossings. This may include artefact discard, rubbish pits, remains of ephemeral structures and fires. Based on visual inspection of the Terrys Creek crossing during the site visit, it is unlikely there were camping reserves located at this juncture due to the steep profile of the slope.

4.2.2 Phase 2 (1890 – 1938): Darkey Creek deviation, formalised road

In 1891, the informal track along Darkey Creek became a formalised deviation to Putty Road formerly Bulga Road. The new road roughly followed the route of the previous track, keeping to the low ground along the creek.

Development of the study area during this phase would have involved vegetation clearance and levelling. In some sections of road, cut and fill construction would have likely been used, whereby part of the slope is cut away and used to form the embankment.

During this phase, the road was also used as a Travelling Stock Route. Consequently, there were likely camping reserves in the vicinity of the study area at river crossings. Archaeological evidence associated with the construction of the road may include evidence of camping reserves used by construction workers along the route. Evidence of both these temporary camps may include artefact discard, rubbish pits and remains of ephemeral structures and fires. Based on visual inspection of the Terrys Creek crossing during the site visit, it is unlikely there were camping reserves located at this juncture due to the steep profile of the slope.

4.2.3 Phase 3 (1939 – present): Putty Road, twentieth century improvements

From 1939, improvements were made to the existing stretch of road along Darkey Creek. It was reported at the time that this portion of road was to be widened to 20 feet (6.1m), and that cutting through rock was going to be necessary.

These works would have involved further vegetation clearance and levelling, with any existing cut-aways increased as well as new cut-aways constructed using mechanised machinery. As part of these works, new embankments were created and existing embankments were also likely widened. The dry stone walls observed across the nine embankment sites were constructed during this phase of development to support the upper fill of the embankments.

Previous geotechnical investigations undertaken across the nine embankment sites within the study area identified that the cut and fill works were constructed with machinery including dozers and scrapers. At each of these sites, cuts were crudely formed with drill and blasted with the spoil spread into the current road alignment. Limited preparation of the sub-surface profile would have been undertaken as shown by the results of the boreholes.

In 1964, the entirety of Putty Road was sealed with gravel pavement. More recent works to the road are generally restricted to further pavement resurfacing, minor embankment widening, guard rail installation and the application of rock bolt and fibrecrete stabilisation to the adjacent cuts.

Developments during this phase, particularly the construction works undertaken from 1939 through to the early 1940s are likely to have heavily impacted archaeological evidence from previous historical phases.

4.3 Summary of historical archaeological potential

The study area has been subject to historical development since at least c.1870, when the first track along the creek line of Darkey Creek was formed and utilised as an alternative to the original Bulga Road route. Twentieth century development during Phase 3 (1939-present) has heavily impacted archaeological evidence from previous phases.

Across the nine embankment sites along Putty Road, there is nil-low potential for archaeological remains associated with the use of the informal track along Darkey Creek (Phase 1: c.1870-1889), including artefact discard and temporary campsites.

There is nil-low potential for archaeological evidence in the study area pertaining to the establishment and use of the Darkey Creek track as a formalised road and deviation of Putty Road, formerly Bulga Road, during Phase 2 (1890-1938). This includes artefact discard from use of the road, as well as archaeological evidence of temporary camps used by workers during the construction of the road and camping reserves used by stockman along the travelling stock route. Due to the steep profile of the slope at the Terrys Creek crossing, as well as long Darkey Creek, it is unlikely such camps were set up along these steeper slopes in the study area.

Twentieth century development during Phase 3 (1939-present) remains largely extant, excluding the dry stone walls constructed between 1939 and the early 1940s that support the upper fill embankments. These walls have been heavily impacted from erosion, vegetation, and embankment loss, and consequently the majority have failed. The cut and fill construction of the current road alignment is likely to have impacted deposits from previous phases with the potential for archaeology.

Boreholes taken along the road pavements and toe of the embankments across the nine embankment sites show minimal evidence of deposits from previous phases. Only boreholes taken along toe embankments at Site 3 and to a lesser extent at Site 8, show variation in the depth and slope of the rockfill, with localised steeper area of rockfill possible evidence of older constructed revetments from Phase 2.

In summary, the high level of disturbance across the nine embankment sites and three auxiliary sites during Phase 3 (1939-present) has reduced the potential for archaeological remains from Phase 1 (c.1870-1889) and Phase 2 (1890-1938) in these areas from nil to low.

Table 3, below, lists the potential archaeological remains from all phases of historical development with summarised formation processes affecting the survival of these remains. Their likelihood of survival is graded in accordance with the following classification: Nil-Low, Moderate, High, and Extant.

Table 3. Summary of historical archaeological potential in the study area.

Phase	Site feature or site activities	Potential remains	Location	Level [or likelihood] of survival
1: (c.1870s -1889)	Land clearing	Tree boles	Entire study area	Nil-to-low
	Track use	Isolated artefacts resulting from loss or discard	Entire study area	Nil-to-low
2: (1890–1938)	Road construction	Road surfaces	Entire study area	Nil-low
	Road use	Isolated artefacts resulting from loss or discard	Entire study area	Nil-low
3: (1939–present)	Road construction	Road surfaces, including dry stone walls, wooden posts	Entire study area	Moderate-to-Extant

5. Assessment of historical archaeological significance

5.1 Basis for assessment

Archaeological significance refers to the heritage significance of known or potential archaeological remains. While they remain an integral component of the overall significance of a place, it is necessary to assess the archaeological resources of a site independently from aboveground and other heritage elements. Assessment of archaeological significance is more challenging, as the extent and nature of the archaeological features is often unknown, and judgment is usually formulated on the basis of expected or potential attributes.

5.2 NSW heritage criteria for assessing significance related to archaeological sites and relics

The following significance assessment of the subject area's archaeological resource is carried out by applying criteria outlined in the publication 'Assessing Significance for Historical Archaeological Sites and 'Relics', prepared by the Heritage Branch, formerly Department of Planning (NSW) (now Heritage NSW, Department of Premier and Cabinet) in December 2009.

5.2.1 Archaeological research potential (NSW Heritage Criterion E)

Archaeological evidence associated with Phase 1 (c.1870-1889) development in the study area including the construction and use of the informal track has limited research potential. Within the study area, archaeological evidence associated with the formalisation of Putty Road deviation along Darkey Creek including the construction of the road and its use as a travelling stock reserve, would be limited to early road levelling and sporadic artefact discard. This information would have limited research potential. Archaeological evidence associated with Phase 1 (c.1870-1889) and Phase 2 (1890-1938) is unlikely to meet the threshold for significance under this criterion.

The extant dry stone walls have low research potential for their ability to provide limited additional information regarding the construction works carried out along Putty Road between 1939 and the early 1940s. The remnant dry stone walls constructed with uncut and irregular sandstone are in poor condition and are simple utilitarian road infrastructure with no archaeological potential. The dry stone walls from Phase 3 (1939-present) do not meet threshold for significance under this criterion.

As the study area lies along the portion of Putty Road associated with the 1890 deviation, there is no archaeological evidence associated with the 1820s original route of Howes Track and Bulga Road. Consequently, archaeological evidence within the study area cannot contribute to the research potential of the broader significance of Putty Road.

5.2.2 Associations with individuals, events or groups of historical importance (NSW Heritage Criteria A, B, and D)

The study area lies in the section of Putty Road that underwent a formalised route deviation away from the original route taken by John Howe and his party in 1819 and 1820 to establish a route between Sydney and the Hunter. This deviation occurred in 1890 between Howes Valley and Milbrodale and followed Darkey Creek as opposed to crossing the Bulga Mountains. Although Putty Road more broadly is associated with John Howe and the establishment of the first overland route between Sydney and the Hunter, the route the study area lies on has no direct associations with these significant individuals or events that occurred prior to Phase 1. Archaeological evidence associated with the development of the study area during Phase 2 (1890-1939) is therefore unlikely to meet the threshold for significance under this criterion.

No further significant associations were identified within the study area. The remainder of the identified archaeological resource is unlikely to meet the threshold for significance under this criterion.

5.2.3 Aesthetic or technical significance (NSW Heritage Criterion C)

The dry stone walls date to construction works carried out between 1939 and the early 1940s. They are simple and utilitarian road structures, constructed using uncut and irregular sandstone rocks using dry stone building techniques. Additionally, the localised remnant walls are in poor condition and have little aesthetic value. The extant dry stone walls do not meet threshold for significance under this criterion.

The dry stone retaining walls are of a poor standard of construction and do not represent unique or technical achievement. The anticipated archaeological resource is unlikely to meet the threshold for significance under this criterion.

5.2.4 Ability to demonstrate the past through archaeological remains (NSW Heritage Criteria A, C, F, and G)

The archaeological potential of the study area provides limited ability to demonstrate the development of Putty Road, from Howes Track and Bulga Road to the present day, due to the route deviation that took place during Phase 2 (1890-1938). Consequently, no potential archaeological remains associated with Howes Track and Bulga Road lie within the study area.

The high level of disturbance within the study area caused by Phase 3 (1939-present) development, as well as ongoing impacts from environmental processes, have impacted archaeological evidence from earlier phases. If archaeological remains associated with the construction and use of the road from earlier phases are present, they are unlikely to be well-preserved or rare. Instead, they would be ephemeral, disturbed, and sporadic. Therefore, any archaeological remains from Phase 1 (c.1870-1889) and Phase 2 (1890-1938) are unlikely to meet the threshold for significance under this criterion.

The extant remnant dry stone walls were constructed during road widening and improvement works carried out during WWII in Phase 3 (1939-present). They are poorly preserved and provide a typical example of simple road infrastructure during the twentieth century. The dry

stone walls associated with Phase 3 do not meet the threshold for significance under this criteria.

5.2.5 Bickford and Sullivan's questions

The above NSW Heritage Criteria are supplemented by the established assessment framework developed by Anne Bickford and Sharon Sullivan (1984), who established three fundamental questions that assist in determining the research potential of an archaeological site. These three questions have been used to aid in the assessment of significance for the study area.

5.2.5.1 Can the site contribute knowledge that no other resource can?

Archaeological evidence from the study area is unlikely to contribute to knowledge that no other resource can. The study area comprises only a small section of Putty Road, which would likely present similar, or more fuller, archaeological evidence associated with the development of the route.

5.2.5.2 Can the site contribute knowledge that no other site can?

The study area would not provide information concerning the development of Putty Road that is not available along other portions of the road between Howes Valley and Milbrodale. Additionally, the earliest historical archaeological evidence within the study area pertains to the deviation of Putty Road between Howes Valley and Milbrodale to follow Darkey Creek, first mentioned in the historical record in c.1870s, and formalised as a road by 1890. Consequently, the study area cannot contribute to knowledge associated with the 1819 and 1820 original overland route established by John Howe, known as Howes Track and Bulga Road.

5.2.5.3 Is this knowledge relevant to general questions about human history or other substantive questions relating to Australian history, or does it contribute to other major research questions?

Only nil to low archaeological potential is anticipated and any potential archaeological remains are not likely to meet the threshold of local significance. As such, the study area is not likely to have the ability to contribute to significant additional information regarding the history of Putty Road, nor any major research questions.

5.3 Summary Statement of Significance

Archaeological remains within the study area, if they should survive, related to the evolution of Putty Road would not meet thresholds for archaeological significance at a Local or State level. The dry stone retaining walls may have some minor landscape values, however, they are not visible from the road. There is generally a poor standard of construction employed in the building of retaining walls. Moreover, in some locations, the walls appear to be nothing more than a rubble revetment facing. The original construction methods may have contributed to the ultimate failure of portions of these walls.

6. Potential historical archaeological impact

6.1 Potential development impacts

BD Infrastructure on behalf of Transport for NSW proposes to undertake slope remediation work at nine sites along the embankment between Putty Road and Darkey Creek. The works across the nine embankment sites comprise initially of sediment controls and vegetation clearing, before soil and rock nails are applied to the road shoulder and a shotcrete finish is applied to the embankment. The works will require reshaping of the downslope embankments by spreading and reshaping the existing embankment. Pending the condition of the lower embankment, turf reinforcement matting or hydramulch may be employed for stabilisation.

6.2 Potential archaeological impact

The proposed slope remediation works in the study area would involve ground disturbance in the form of embankment reshaping and drilling for soil and rock nails. These works would impact the extant road alignment and embankment including the dry stone walls, constructed during Phase 3 (1939-present). The proposed works are unlikely to impact historical archaeological deposits associated with Phase 1 and Phase 2, that are likely to have been heavily disturbed by works carried out during Phase 3.

In summary, as there is nil-low potential for the survivability of archaeological resources associated with Phase 1 and Phase 2, the proposed redevelopment is likely to have no archaeological impact.

6.3 Recommended mitigation measures

The program of proposed works has implemented measures to avoid directly impacting areas with remnant dry stone walls. The slope remediation works will avoid drilling through areas with remnant dry stone walls. Additionally, rock and fill materials will be places below and in front of the walls to cover them before shotcrete is applied to the embankment.

The physical remains associated with the historical development of Putty Road within the study area have a nil to low potential of survivability and do not meet the thresholds for archaeological significance at a Local or State level. Consequently, there are no recommended mitigation measures to manage archaeological resources of known potential.

In order to mitigate any impacts on historical archaeological resources beyond the potential archaeology identified in this report, proposed works in the study area should be carried out under an Unexpected Finds Procedure, attached in Appendix A.

7. Conclusions and recommendations

7.1 Key findings and conclusions

- Areas of dry stone walling are present across the study area, with varied levels of integrity.
- No historic archaeological features or relics have been identified within the study area.
- There is a nil to low potential historical archaeological deposits from Phase 1 (c.1870-1889) and Phase 2 (1890-1938) to be present within the study area.
- The high level of disturbance across the study area during Phase 3 (1939-present) has reduced the potential for archaeological remains from Phase 1 (c.1870-1889) and Phase 2 (1890-1938). This disturbance includes the construction of the road between 1939 to the early 1940s and environmental disturbances.
- Any surviving physical remains associated with the evolution of Putty Road within the proposed development do not meet the thresholds for archaeological significance at a Local or State level.
- Archaeological relics unlikely to be disturbed by the proposed slope remediation works.

7.2 Recommendations

On the balance of the evidence presented in this report, the likelihood of surviving archaeological remains of significance to be present on the site is considered nil. Based on this assessment the following recommendations are made:

- Due to the nil to low potential for archaeological resources to be present within the study area, and with any surviving resources assessed as having no archaeological significance, there is no recommendation for further archaeological investigations.
- Construction works and impacts associated with the proposed slope remediation works (as outlined in this report) may proceed with caution.
- The proposed works should be carried out under an Unexpected Finds Procedure, attached in Appendix A in order to mitigate any impacts of historical archaeological resources beyond the potential archaeology identified in this report.
- In the event that unexpected historical archaeological remains not identified in this report are discovered at the site, all works in this area should cease and Heritage NSW should be notified, in accordance with Section 146 of the Heritage Act. These remains would be assessed in a timely manner and a determination on management would be made in consultation with Heritage NSW.

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Appendix A. Unexpected Finds Procedure

Unexpected finds procedure

In the event that potential archaeological object(s) are encountered during construction, the following steps must be taken.

- **STOP ALL WORK** in the immediate vicinity of the archaeological object(s) and notify the Project Manager.
- Protect the archaeological object(s) using fencing to establish a 'no-go zone' around the object.
- Contact and engage a Heritage Professional (qualified archaeologist) who will carry out a preliminary assessment and recording of the potential archaeological object(s)
- If the Heritage Professional advises the object is not a potential Aboriginal object or significant historical relic, works will recommence in consultation with the Project Manager.
- If the Heritage Professional advises that the object is a significant historical archaeological relic, the affected area will remain protected from any further ground disturbance.
- The Heritage Professional will notify Heritage NSW about the discovery under s146 of the Heritage Act. No further ground disturbance work would be allowed in the location of the discovery until a response from Heritage NSW has been received.

Procedure for discovery of possible human skeletal remains

- If human skeletal remains are discovered, all works must cease, the area must be protected, and the NSW Police and Heritage NSW must be contacted. Any human remains must be assumed to be protected heritage items or a crime scene.
- Interpreting the age and nature of skeletal remains is a specialist field and therefore, an appropriately skilled archaeologist or physical anthropologist should be contacted to inspect the discovery site and recommend an appropriate course of action.
- Should Heritage NSW determine the remains to be of historic ancestry, the most appropriate course of action, which may include deviation of the construction works, or the careful removal of the remains and reburial elsewhere, would be decided in consultation with the Project Manager and the Heritage Professional (qualified archaeologist)
- Should the skeletal material prove to be of Aboriginal ancestry, notification of Heritage NSW (DPC) and the Local Aboriginal Land Council will be required. Notification should also be made to the Commonwealth Minister for the Environment, under the provisions of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- Should the remains determined to be of non-human origin, construction works may proceed.

Appendix C: Biodiversity Assessment Report

Transport
for NSW

Biodiversity Assessment Report for REF

Remediation of Slopes 3, 4,5,7,8,9,10,11,13 and 13a, Terrys Creek

February 2023

NSW GOVERNMENT

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Executive summary

A Biodiversity Assessment has been conducted as Transport for NSW is proposing to remediate nine slopes (referred to as Slopes #3,4,5,7,8,9,10,11, 13 and 13a) that have failed due to impacts associated with excessive rainfall experienced during the July 2022 storm event. The slopes are present along a 625-metre length of Putty Road, the sites present south of Bulga, NSW.

This Biodiversity Assessment has been carried out by Lesryk Environmental Pty Ltd to accompany a Review of Environmental Factors being prepared for the proposal. This report assesses the biodiversity impacts of the proposal thereby meeting the requirements of the NSW *Environment Planning and Assessment Act 1979*.

To permit the proposal, based on a worst-case estimate, about 0.9 hectares of vegetation, a cumulative total cleared from all nine slopes, would require disturbance/removal. Within this area, an estimated 94 trees would be removed. Of the 94 plants being cleared, these comprised of 24 small, 38 medium sized and 32 large trees, nine are hollow-bearing.

Within the area investigated, no threatened ecological communities or species listed, or currently being considered for listing, under the EPBC or BC Acts were recorded. Similarly, considering the quality and structure of the Plant Community Types and fauna habitats present, no threatened flora were considered likely to occur and/or rely on the proposal area for any of their lifecycle requirements.

As hollow-bearing trees are present, the occupation of these by threatened hollow-dependent fauna was considered. In regards to the hollow-bearing trees recorded, only 1 (this associated with Tree 86, Slope 13) has a hollow entrance diameter that would be suitable for occupation by either the large forest owls or birds (hollow diameter ≥30 cm). The remainder of the plants have hollow entrance diameters that are less than 30 cm in diameter, these expected to be available for use by animals such as microbats, small to medium-sized birds and small to medium-sized arboreal mammals.

Assessments referencing the criteria provided under Section 7.3 of the BC Act have been undertaken on hollow-dependent species.

The assessment concluded that the proposal would not have a significant effect on hollow-dependent fauna, or any areas of their habitats. As such, the preparation of a Species Impact Statement, or a Biodiversity Development Assessment Report, is not considered necessary.

In line with Transport for NSW's '*The Tree and Hollow Replacement Program: An implementation plan for payments to and from the Transport for NSW Conservation Fund* (2022)' (EMF-BD-GD-0129), 456 trees are required to be planted, and 27 artificial hollows erected, within the project limits. Alternatively, with the landowner's consent, these can be located on land adjacent to/close by the project area. Alternatively, Transport for NSW may opt to transfer $58,500 into the TfNSW Conservation Fund.

With reference to Chapter 4 of SEPP (Biodiversity and Conservation) 2021, the preparation of a Koala Plan of Management is not required.

Mitigation measures have been recommended in Section 6 of this report, these aimed at reducing the ecological impacts of the proposed work. Two primary measures recommended include:

- Minimising impact through detailed design.
- Adhering to TfNSW's *Biodiversity Guidelines* (RTA 2011).

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

- Preparation of an Erosion and Sediment Control Plan to minimise soil erosion and sediment transfer off-site, particularly addressing any potential impacts on Terrys Creek.
- Limiting vegetation removal to the minimum required to successfully permit the proposal.
- The offsetting of those trees to be cleared in accordance with the '*Tree and hollow replacement guidelines*' and the preparation of a Tree and Hollow Replacement Plan. Based on the outcomes of the field inspection, it is estimated 456 trees require replanting and 27 artificial hollows erected
    - Alternatively, TfNSW may opt to transfer $58,500 into the TfNSW Conservation Fund.

With adherence to those recommendations provided in this report, no ecological constraints to the proposal proceeding as planned were identified and none were considered likely to occur.

The adoption of the mitigation measures provided would ensure that the proposal is carried out in an ecologically sustainable manner.

1. Introduction

1.1 Proposal background

Transport for NSW (TfNSW) are proposing to undertake slope remediation work at nine sites (identified as Slopes #3, 4, 5, 7, 8, 9, 10, 11 and 13 [inclusive of 13a]) that are present downslope of Putty Road, near the NSW village of Bulga (Figure 1-1).

The declared natural disaster event of ARGN1025 'NSW Severe Weather and Flooding June/July 2022 onwards' caused extensive damage to the Region North Road transport network, with impacts on the state, regional and local networks. Subsequently significant damage occurred within the Singleton Local Government Area particularly along MR503 Putty Road. This significant rainfall event resulted in initial damage overall to 23 slope sites along Putty Road with damage extending in various locations over a 12.5 km stretch of road.

Damage to these slopes resulted in the need for emergency repair works that involved removal of spoil off the road, sealing of tension cracking within the road surface, and implementation of 24/7 traffic control until remediation works are completed.

Following the initial emergency response, Transport for NSW – Natural Disaster Recovery team has been tasked to implement a permanent remediation solution for the nine 'Terrys Creek' sites to ensure the integrity and long-term sustainability of the Putty Road ro ad corridor.

The objectives of the proposed slope remediation works are to:

- Stabilise the nine sites
- Permit the re-opening of Putty Road, including the installation of new guardrails, and engineered slope stabilisation and erosion controls; maximising stability of the slopes to prevent further destabilisation, and ensuring safety requirements are met.

To remediate the nine slopes, these having a combined total horizontal length of about 625 m, areas of about 10 m downslope of the southbound road pavement would require disturbance.

Lesryk Environmental Pty Ltd (Lesryk) has been engaged to conduct the Biodiversity Assessment and investigation to consider and assess all ecological matters affecting, or likely to affect the environment, as a result of the proposed work. The Biodiversity Assessment Report (BAR) will accompany the Review of Environmental Factors (REF) being prepared for the proposal in compliance with the requirements of Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.2 The proposal

With reference to documentation provided by TfNSW, broadly the proposal would include the:

- Delineation and establishment of a site compound
- Installation and ongoing maintenance of sediment and erosion control structures
- Creation of an access path to the top of the slope by removing existing guard railing (as required) to permit machinery and worker safe access to the works areas
- The removal of trees and vegetation on the embankment slope to permit soil nails to be installed
  - There will be no grubbing of the tree roots, plants to only be cleared down to existing embankment level.
- The removal of loose spoil from the slope face and the on-site storage of this in nominated stockpiles
- The drilling of the slope faces to the required depths
- The placement of reinforcement mesh matting on each slope
- The shotcreting of the embankment face
- The placement of hydromulch/grass on any disturbed areas to encourage site stabilisation and regeneration.

For reference, extracts of the design plans are provided (Figure 1-3).

To permit the slope remediation work, vegetation management is required, this including the removal of a number of trees.

Figure 1-1: Proposal context

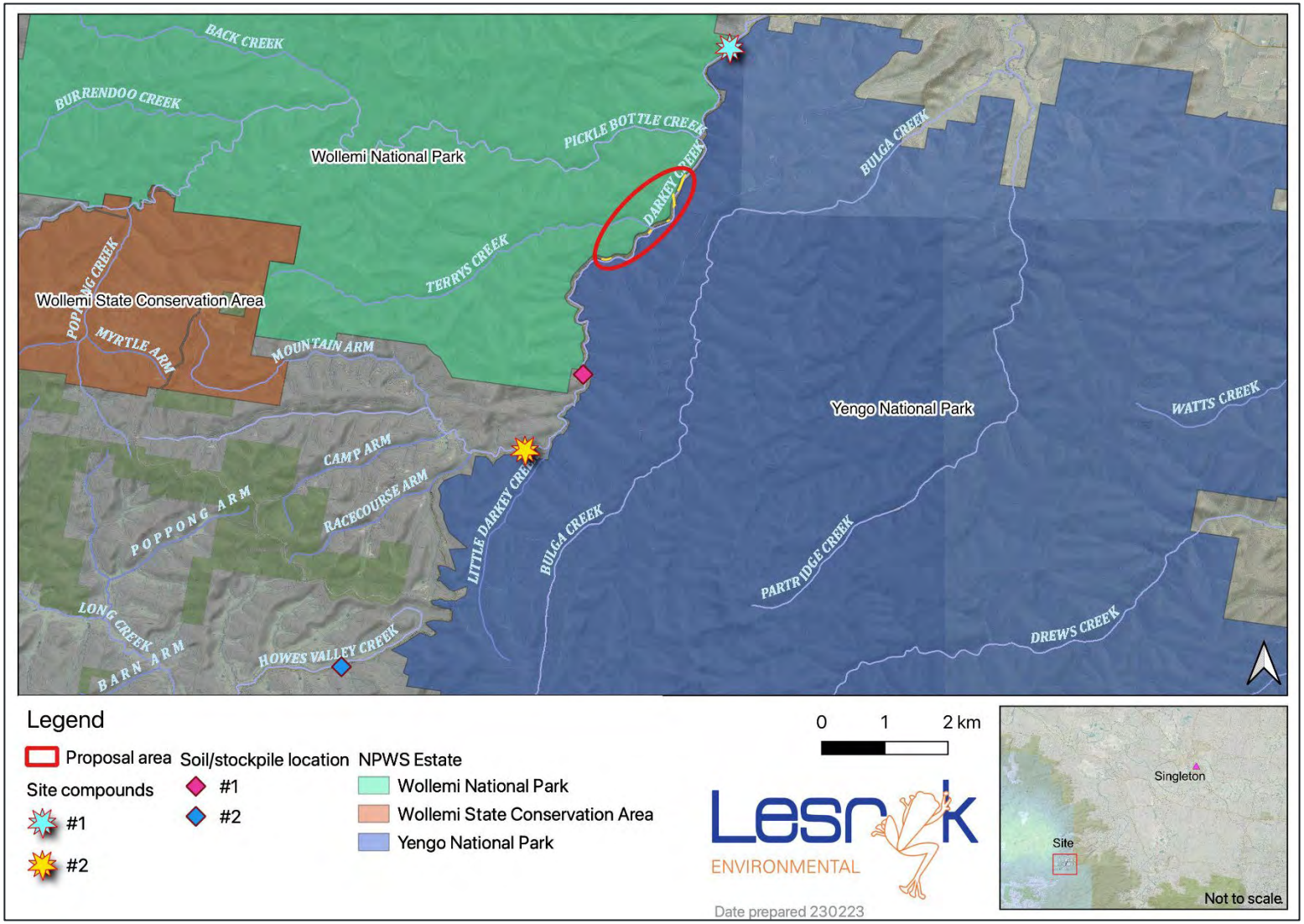
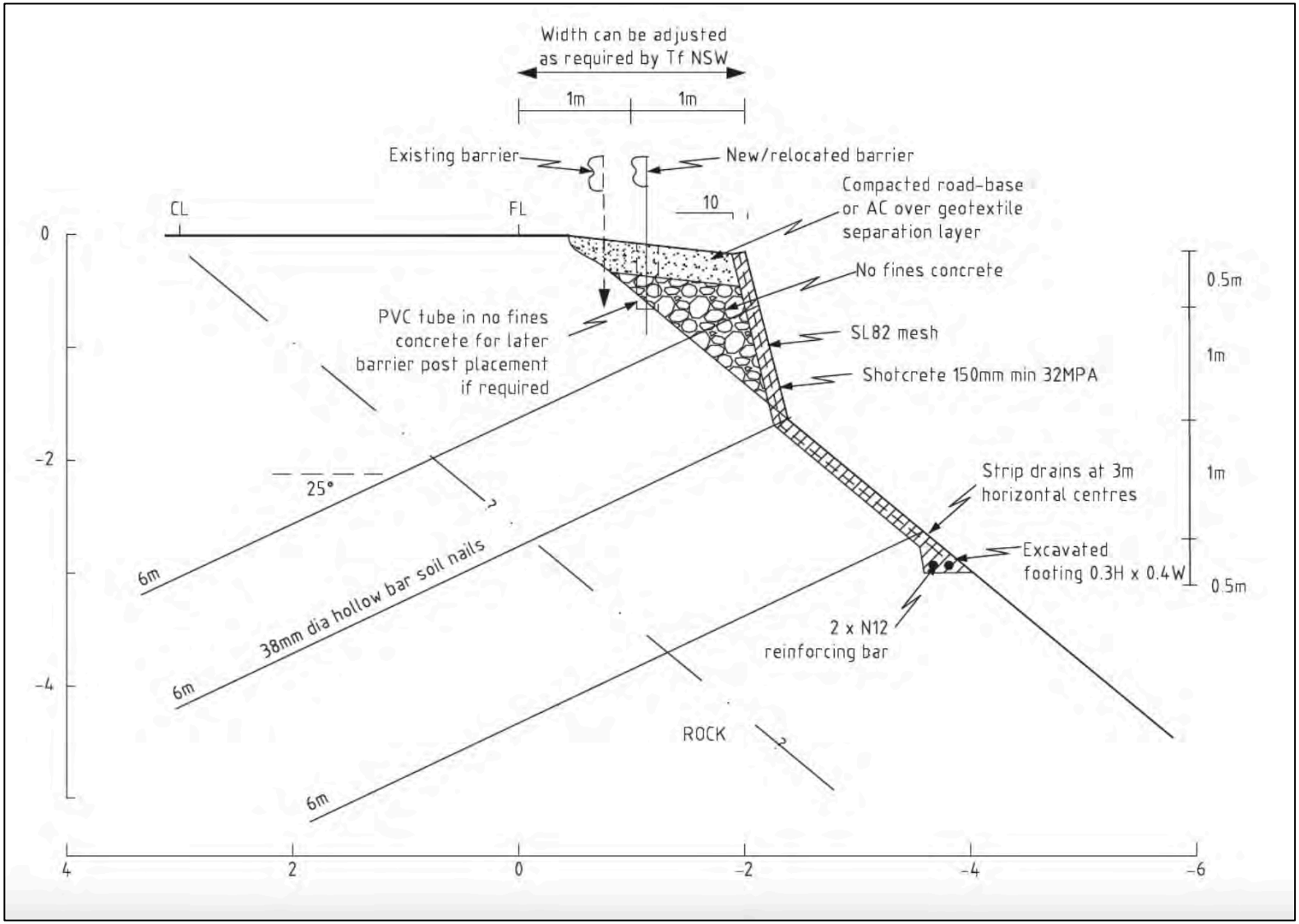


Figure 1-2: Proposal sites.

Figure 1-3: Design Plans (extract) for the proposed slope remediation works (TfNSW 2022c).



Two previously site compound, and two spoil/stockpile, locations would be used during the course of these works, these all present within existing cleared/heavily disturbed sites off the shoulders of Putty Road south-west and north-east of the proposal area (Figure 1-1). As these sites have been previously used and are cleared, no further consideration of 'impacts' associated with their use is required.

The following machinery/equipment would be used during the proposed work:

- Small and medium size excavators
- Soil/rock nail drilling rig (a small rig on rubber tracks)
- Knuckle boom sled nailing platform
- Six-wheel dump trucks
- Concrete delivery trucks and concrete pumps
- Elevated work platforms and booms
- Telehandler and Franna cranes may be required.

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

The proposal is anticipated to commence in May-June 2023 and take approximately 20-30 weeks to complete.

Construction access to the downslope embankment will be provided by closing the southbound lane to traffic. Used of the existing road pavement would negate the need to establish any temporary access tracks.

1.2.1 Assessment areas

Based on a worst-case estimate, the proposed slope stabilisation at Terrys Creek would require a work area (i.e., impact footprint in which 'disturbances would occur') totalling approximately 0.9 hectares (ha). This is composed of:

- Up to 2 m either side of proposed work elements
- Up to 10 m downslope from the guardrail of the southbound lane
- Disturbance/removal of up to 0.9 ha (based on approx. 625 m length of work plus 10 m buffers at the end of each site and a width of 10 m) of mostly native vegetation to achieve the objectives of the proposal
    - including the removal of 94 mature native trees (nine of which are hollow-bearing)
- The movement of personnel and vehicles/machinery.

1.3 Legislative context

A REF is prepared to satisfy TfNSW duties under s.5.5 of the EP&A Act to "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity" and s.5.5 in making decisions on the likely significance of any environmental impacts. This biodiversity impact assessment forms part of the REF being prepared for the Terrys Creek Slope Remediation Project and assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

Part 7 of the BC Act requires that the significance of the impact on threatened species, populations and threatened ecological communities or their habitats is assessed using the Assessment of Significance (this commonly referred to as the 'five-part test') as per Section 7.3 of the BC Act. Where a significant impact is likely to occur, a Species Impact Statement (SIS) must be prepared in accordance with the Environment Agency Head's requirements, or a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM).

In September 2015, a "strategic assessment" approval was granted by the Federal Minister in accordance with the EPBC Act. The approval applies to TfNSW's road activities being assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities and migratory species.

As a result, TfNSW road proposals assessed via an REF:

- Must address and consider potential impacts on EPBC Act listed threatened species, populations, ecological communities, and migratory species, including application of the "avoid, minimise, mitigate and offset" hierarchy

- Do not require referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for these matters, even if the activity is likely to have a significant impact
- Must use the BAM to calculate credits that would offset significant impacts on EPBC Act listed threatened species, ecological communities and migratory species.

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

2. Methods

2.1 Personnel

Personnel involved in the assessment, and their qualifications, are identified in Table 2-1.

Table 2-1: Personnel

Name	Role	Qualifications
Mr Deryk Engel	Director and Senior Ecologist. Project management, field investigation, report review and quality assurance	B.Env.Sc. (Hons)
Mr Paul Burcher	Botanist, site investigation, contribution to BAR	B.App.Sc
Ms Isabel Burcher	Site investigation, BAR write-up	B.Sc.
Mr Joseph Morton	Field ecologist, site investigation.	B.Env.Bio.

2.2 Background research

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

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

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

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

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

Terrys Creek, downslope of the nine slope remediation sites, is mapped as Key Fish Habitat. That stated, with reference to the applicable databases listed below, no listed fish or their habitats occur in proximity to the proposed works site Consultation with DPI Fisheries is not required as per Section 199(1)(a) of the FM Act, unless any dredging or reclamation activities are to be undertaken.

Drainage lines (these being culverts that direct runoff under Putty Road), are present in the works area, however impacts on these (beyond existing inputs from Putty Road) are considered to be minor. The works will not have a direct or indirect impact on these drainage lines, all of which are ephemeral, or the flow of water through them.

Table 2-2: Database searches

Database/Information sources	Date accessed	Search area
Protected Matters Search Tool (PMST) (DCCEEW 2023a)	February 2023	10 km buffer on study area
Register of critical habitat (DCCEEW 2023e)	February 2023	N/A
BioNet Atlas (DPE 2023a)	February 2023	10 km buffer on study area
Areas of Outstanding Biodiversity Value register (DPE 2023b)	February 2023	N/A
NSW WeedWise Database (DPI 2023a)	February 2023	Singleton LGA
Fisheries NSW Spatial Data Portal (DPI 2023b)	February 2023	Central Rivers layer
NSW State Vegetation Type Map (DPE 2023c)	February 2023	Study area
BioNet Vegetation Classification database (NSW Government 2023c)	February 2023	N/A
Biodiversity Values Map and Threshold Tool (NSW Government 2023d)	February 2023	Study area
PlantNet (2023)	February 2023	N/A
SEED map viewer (NSW Government 2023e)	February 2023	Study area
Threatened Species website (OEH 2023)	February 2023	N/A
Groundwater Dependent Ecosystems Atlas (BoM 2023b)	February 2023	Study area
National Flying-fox monitoring viewer (DCCEEW 2023f)	February 2023	Study area

Field guides and standard texts used include:

- Brooker and Kleinig (1999) [used to identify eucalypts]
- Fairley and Moore (2010) [other vegetation]
- Cogger (2014) [reptiles and frogs]
- Anstis (2017) [frogs]
- Churchill (2008) [flying mammals]
- Simpson and Day (2010) [birds]
- Van Dyck and Strahan (2008) [non-flying mammals]
- Triggs (1996) [identification of scats, tracks and markings].

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

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

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

- The EPBC, BC and FM Acts
- Vegetation mapping of the study region (State Government and DPE 2023c)
- The BioNet Vegetation Classification database (NSW Government 2023c).

2.3 Vegetation assessment

2.3.1 Vegetation mapping

Vegetation of the locality has been mapped and described in the NSW State Vegetation Type Map (DPE 2023c). Mapping identifies the most likely Plant Community Type (PCT) to occur in a given polygon. Refer to Section 3.1 for further details.

2.3.2 Vegetation survey and classification

The purpose of the vegetation survey was to confirm the dominant species with reference to the mapped PCTs, assess the condition of the vegetation, search for threatened species or their habitats and identify weeds.

Surveys were conducted by traversing accessible areas of the proposal area and, as far as possible, identifying all plants present as well as documenting dominant species in each stratum.

Due to the unstable nature of the nine slopes requiring remediation, and considering the steepness of each of these, it was determined that, from a researcher safety perspective, it was unsafe to enter any of the proposed work sites. As such, no surveys conducted in accordance with the BAM were completed. Therefore, the following associated template tables have been removed from this report:

- Table 2-3: Minimum number of plots required and completed per vegetation zone
- Table 2-4: Native vegetation cover in the assessment area

Nor was the vegetation integrity score calculated for inclusion in Table 3-2: Plant community types and vegetation zones including patch size and vegetation integrity (VI) score.

2.4 Threatened species assessment

A biodiversity assessment of the proposal area was carried out by Deryk Engel, Paul Burcher, Isabel Burcher and Joseph Morton on 22 February 2023. The weather conditions experienced during the site investigation were warm temperatures [~28°C], 50% cloud cover and a no winds.

The purpose of the field investigation was to identify those vegetation communities, fauna habitats, plants and animals present within, and in close proximity to, the proposal area that are of State and/or national conservation significance as listed under the Schedules to the EPBC and BC Acts.

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

The survey methods employed during the field investigation were:

- The identification of those plants present, including within any areas affected by direct and indirect impacts
- The identification of the structure of those vegetation communities and fauna habitats present at, and close to, the proposed work area
- The direct observation of those fauna species present within or near to the proposed work area
- Diurnal call identifications of those fauna species present, with all calls being identified in the field
- The identification of any indirect evidence such as tracks, scats, scratching, and diggings that would suggest the presence of a particular fauna species
- Leaf litter and ground debris searches for sheltering reptiles and amphibians.

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

As no waterways are present within the disturbance footprint of each of the nine slopes, no aquatic surveys were necessary. As no drainage lines are to be directly disturbed, and measures such as establishment of erosion and sedimentation controls and conducting the works during periods of dry weather will be implemented, no direct or indirect impact on Terrys Creek are considered to arise. Ephemeral drainage lines are present in the study area with the runoff typically diverted to culverts which direct runoff under Putty Road into Terrys Creek. Reference to the DPI Fisheries NSW Spatial Data Portal (DPI 2023b) indicates Terrys Creek is mapped as Key Fish Habitat.

With regard to Part 7 Division 3 of the FM Act, 'Dredging and reclamation', as defined by the Act, would not be applicable to the proposal; these defined as:

> Dredging work –
>
> a) any work that involves excavating water land
>
> b) any work that involves moving material on water land or removing material from water land.
>
> Reclamation work meaning any work that involves –
>
> a) using any material (i.e., sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim water land
>
> b) depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge)
>
> c) draining water from water land for the purpose of its reclamation.

That stated, as the works will be undertaken near Terry Creeks, in accordance with s.199 of the FM Act, as KFH is present, Transport, before carrying out or authorising the carrying out of dredging or reclamation works must:

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

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

Ultimately, the proposed slope stabilisation works would have beneficial effects on nearby KFH by addressing the current degraded nature of the area investigated and the downslope movement of sediment into the nearby waterways.

2.4.1 Habitat suitability assessment

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

2.4.2 Targeted flora surveys

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

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

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

Although not all parts of the project area were accessible by foot, it is considered that sight lines were sufficient to permit a visual assessment (this aided by the use of binoculars) of the presence/absence of threatened flora species that are associated with the project area PCTs in the TBDC.

2.4.3 Targeted fauna surveys

Based on the observations made during the diurnal investigation, combined with the identification of those habitats present, it was not considered necessary to employ any species-specific fauna survey methods (e.g. nocturnal surveys, echolocation targeting microbats).

Those survey methods that were employed are as follows:

Diurnal investigation

During the field investigation birds were identified using visual identification of observed individuals or aural identification of their vocalisations. When surveying for birds, the point count method (DECC 2004) was employed at each slope, this requiring a researcher to stand in place for a period of 20 minutes and document all birds observed or heard calling.

Given the uniformity of the habitats observed on the nine slopes, and their close proximity to each other, separate species lists for each site were not recorded.

During the diurnal investigation, a hand-held torch was used to inspect those culverts present. During these inspections, the potential presence of cave-dependent Yangochiropteran (microbats) was considered. It is acknowledged that the outlets of those culverts present were accessible.

Ground debris searches

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

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

Native tree removal count

Within the proposed work area, the individual native trees that are likely to require removal were identified and recorded. Within each area where tree removal work would be required (to permit the slope remediation), the position of those native trees that were ≥ 5 cm at Diameter at Breast Height (DBH) at 1.3 m of height were recorded. In addition, for each tree expected to be cleared, the following data was collected (and is presented in Appendix C):

- Status: whether the tree was alive or dead
- Species identification
- Diameter at breast height (DBH) (indicative).

Considering the unstable nature of each of the nine slopes and the risk these presented to researcher safety, unless present immediately adjacent/close to the existing road pavement, the individual native trees that require removal were not accessed/measured. A determination of the location of those trees to be removed was made from the road pavement, chainages provided by TfNSW being used to determining their location along Putty Road. Distances downslope of the existing pavement, and the DBH of the trees to be cleared, were estimated based on a 'measurement' of those plants that could be accessed (being those close to the road pavement).

Within the area investigated, no amenity trees are present.

Hollow-bearing tree survey

Within the surveyed proposal area, the position of those mature trees that were or were considered to be hollow-bearing (potentially used by microbats, birds and arboreal mammals), was recorded (using the above determination method).

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

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

That stated, if a tree presented a dead vertical limb or branch that could potentially be hollow-bearing, and was of predicted sufficient diameter to be utilised by a native species, it was also recorded based on the adoption of a precautionary approach.

For each recorded hollow-bearing tree, the following data was collected (and is presented in Appendix C):

- Status: whether the tree is alive or dead
- Species identification, if alive
- Diameter at breast height (DBH)
- Number of hollows
- Estimated size classes of hollow entrance:

- 4-10cm
- 10cm-15cm
- 15-30cm
- >30cm.

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

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

2.5 Limitations

By the completion of the field investigation a total of about 14 person hours of active searches had been accumulated. Given the current nature of the nine slopes, their physical condition and the size of the proposed work area, this is considered more than adequate when endeavouring to determine the diversity of native species present, their habitats and vegetation associations, and the conservation status of each of these.

Given the instability and steepness of the slopes requiring remediation, access to all parts of the proposal area (beyond those that occur within a metre of the road pavement) that required investigation was not possible. Visual inspections, these including use of binoculars, were conducted from the road shoulder above each site.

Binoculars were used to assist with the identification of plant species and present of habitat features such as nests or hollows.

During the field investigation, no adverse seasonal constraints were encountered.

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

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

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

This report is based upon data acquired from the current investigation. However, data gathered is indicative of the environmental conditions of the site at the time the field work was conducted.

3. Existing environment

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

The proposal area is located within the road corridor of Putty Road, south of Bulga, with the road width being approximately 7 m. Putty Road traverses a steep decline, with a local relief of approximately 100 m throughout the 625 m length of the investigated roadway sites.

During the course of the Black Summer (December 2019/January 2020) fires, the area in which the nine slopes occur was subject of a major wildfire event that burnt an area of about 13,6286 ha (known as the Little L Complex wildfire). Subsequent to this, to permit driver safety, areas adjacent to Putty Road were cleared of dead wood.

The road verge is generally comprised of cleared areas composed of grasses and weeds (this the result of clearing [for a distance of about 2 m] undertaken post the January 2020 fires); with sections of guardrails along the entirety of the investigated length. The investigated slopes are on a steep gradient. Vegetation is present on all of those slopes surveyed.

In July 2022, following significant rainfall during a storm event, the investigated section of Putty Road experienced major disruption from landslides, erosion, fallen trees and pavement damage. The investigated section consists of the east, south-east and south-facing slopes downslope of the road. Where the slopes have failed, road damage including cracking is visible.

Surrounding the area investigated is an open forest characterised by a canopy of trees 30+ m in height, an understorey to 10 m, and groundcover to 1 m. Leaf litter, ground debris, some sandstone outcrops and escarpments are present.

Wollemi and Yengo National Parks are present from the western and eastern boundaries of the road corridor respectively (Figure 1-2). Site 7 crosses the boundary of Wollemi National Park**.** Pending final design and cadastral boundary confirmation, TfNSW may be required to acquire land from National Parks however this requirement will not be known until end of February 2023 (TfNSW 2022c). Nevertheless, the nine slopes occur in proximity to NPWS estate and appropriate consultation will be required to be undertaken.

Terrys Creek occurs within the study area, approximately 20 m downslope of Putty Road. Ephemeral drainage lines are present in the study area with the runoff typically diverted to culverts which direct runoff under Putty Road into Terrys Creek. Reference to the DPI Fisheries NSW Spatial Data Portal (DPI 2023b) indicates Terrys Creek is mapped as Key Fish Habitat. Consultation with DPI Fisheries is not required as per Section 199(1)(a) of the FM Act, unless any dredging or reclamation activities are to be undertaken.

Reference to the Biodiversity Values Map and Threshold Tool (BVMTT) (NSW Government 2023d) identified mapped Biodiversity Values within the proposal area.

Reference to the Soil Landscape of the Singleton 1:250,000 Sheet report (Hazelton 1992) and mapping (State Government and DPE 1992) indicates the proposal area is located within the Watagan soil landscape (Figure 3-1).

Figure 3-1: Soil Landscape

Watagan landscape geology is formed by the Narrabeen Group, with parent rock consisting of Quartz sandstone, small areas of lithic sandstone, claystone, siltstone with thin pebbly bands and parent material consisting of In situ weathered parent rock and derived colluvium (Hazelton 1992). This soil landscape covers steep to very steep hills (Hazelton 1992). The most common soils are shallow Lithosols on crests (Hazelton 1992). Other soils include Yellow Podzolic Soils on the upper slopes with Yellow Earths or Earthy Sands on some midslope positions (Hazelton 1992). Other soils which may occur are Chocolate Soils, Red Podzolic Soils, Brown Earths and Xanthozems (Hazelton 1992). Limitations include minor to moderate sheet erosion associated with clearing activities; otherwise, relatively stable (Hazelton 1992).

Reference to the SEED map viewer (NSW Government 2023e) to identify the extent of acid sulfate soils within the study area, shows that the area investigated is mapped within Class 5. Typically, acid sulfate soils are not found in Class 5 areas.

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

3.1 Plant community types and vegetation zones

Reference to the State Vegetation Type Map (DPE 2023c) indicates that the following PCTs are within the area investigated:

- PCT 3151 - Northwest Sydney Sandstone Grey Myrtle Dry Rainforest
- PCT 3496 - Western Hunter Colluvial Grey Gum Forest
- PCT 3604 - Hunter Range Grey Gum-Stringybark Forest
- PCT 3608 - Hunter Range Yellow Bloodwood Forest

The mapping was found to be inaccurate, with the only PCT in the study area being PCT 3237 Hunter Range Blue Gum Gully Forest (Figure 3.2).

Only one vegetation zone within this PCT (moderate to good condition) was identified.

Table 3-1: Site attributes

Site Attributes	
Estimated size (ha)	About 0.9 ha
ASL	between 170 m and 200 m
Climate[1]	Mean summer high: 36.1 °C (January) Mean winter low: 4.8 °C (July) Mean annual rainfall – 757.8 mm
Waterbody	Terrys Creek
Critical habitat	No
IBRA Bioregion/Subregion	Sydney Basin/Yengo
Mitchell Landscape	Yengo Plateau
Soil Landscape	Watagan (Figure 3-1)
NPWS estate	Wollemi National Park (present west of the proposal site, with site 7 located partially within the boundary) and Yengo National Park (located east of the proposal site).

Within the proposed work area PCT 3237 is characterised by a sparse canopy of Round-leaved Gum (*Eucalyptus deanei*) to 50 m tall with occasional lower Rough-barked Apple (*Angophora floribunda*). There are also occurrences of Forest Oak (*Allocasuarina torulosa*), Blue-leaved Stringybark (*Eucalyptus agglomerata*) and Grey Gum (*E.punctata*). At some locations the canopy is absent. There is a dense tall shrub/small tree layer that is 4 m to 10 m tall of Brush Kurrajong (*Androcalva fraseri*), Sandpaper Fig (*Ficus coronata*), Gosford Wattle (*Acacia prominens*), Scrub Myrtle (*Backhousia myrtifolia*) and Native Peach (*Trema tomentosa*) interspersed with shrubs such as Elderberry Panax (*Polyscias sambucifolia*) and Coffee Bush (*Breynia oblongifolia*). The shrub/small tree layer is 2-4 m tall.

Vines and scramblers, particularly Kangaroo Vine (*Cissus antarctica*), Water Vine (*C.hypoglauca*) and Molucca Bramble (*Rubus moluccanus*), are common. Due to the dense mid-storey there is little groundcover apart from gaps where there is Bracken (*Pteridium esculentum*), Rainbow Fern (*Calochlaena dubia*), Harsh Ground Fern (*Hypolepis muelleri*) and Slender Bamboo Grass (*Austrostipa verticillata*). On the disturbed areas immediately adjacent to the road, weeds such as Turkey Rhubarb (*Rumex sagittatus*), Guinea Grass (*Panicum maximum var. maximum*) and Blackberry Nightshade (*Solanum nigrum*) are present.

[1] Singleton Defence AWS– This being the nearest operating weather station to the area investigated.

Figure 3-2: Plant community types and vegetation zones

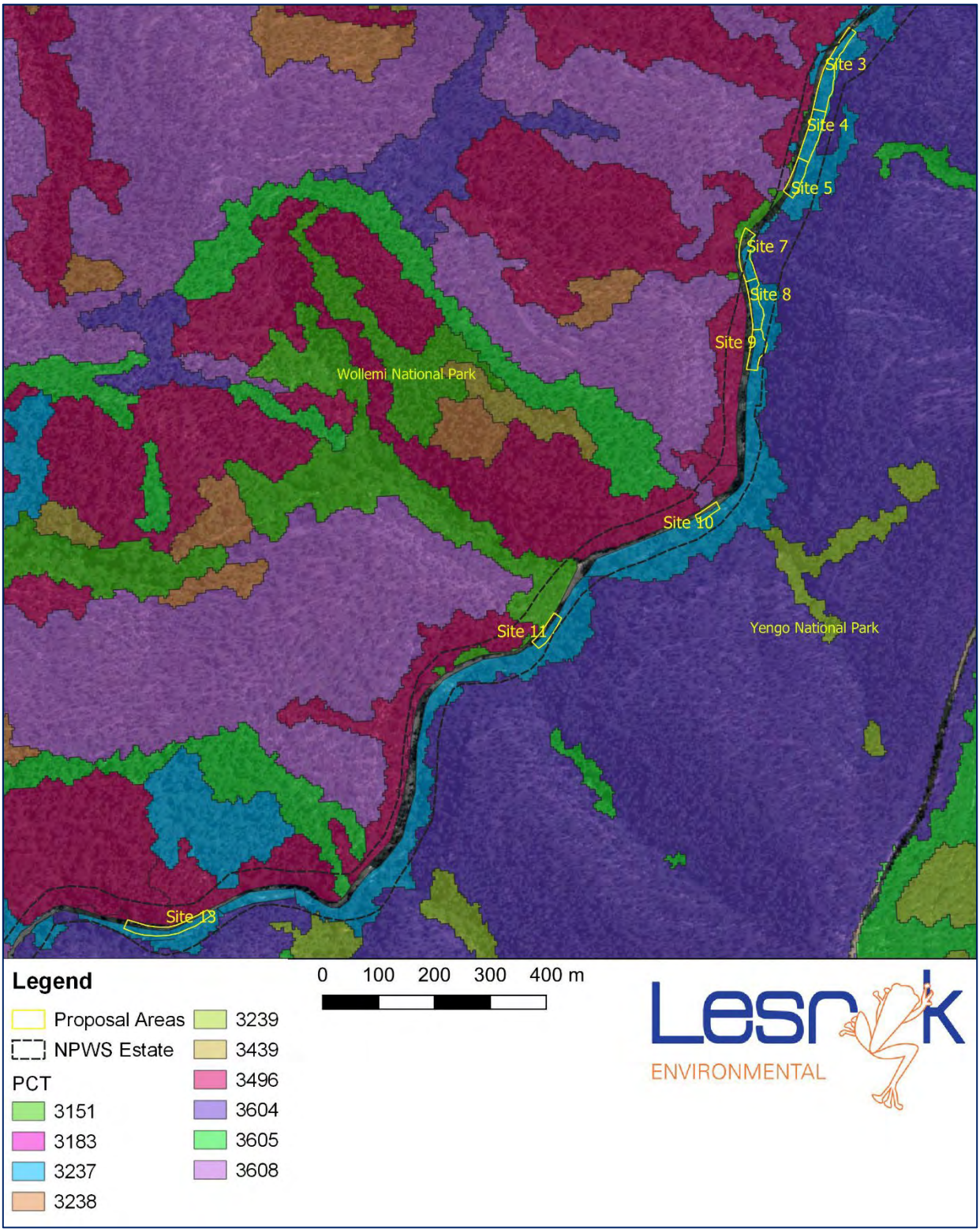


Table 3-2: Plant community types and vegetation zones

Veg. zone	Plant community type (PCT)	Threatened ecological community	Area (ha)		Patch size class	VI score
			Subject land	Study area		
Proposed works area	PCT 3237 – Hunter Range Blue Gum Gully Forest	N/A	0.9	1.9	100-1000 ha	N/A[2]

3.2 Threatened ecological communities

No TECs were identified within the proposed works area.

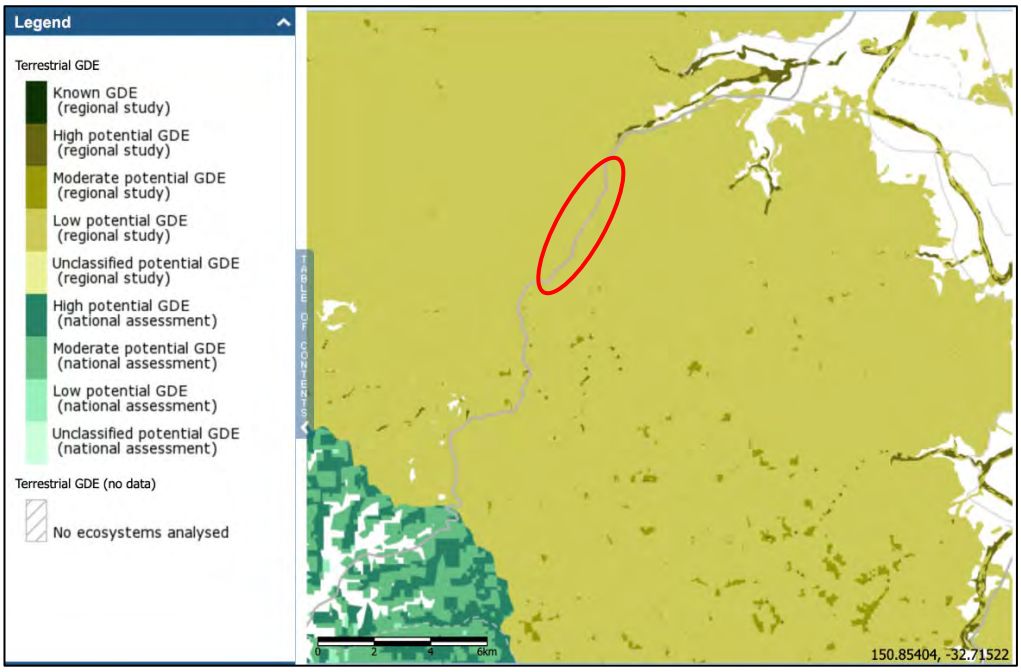
3.3 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDE) are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. Some examples of ecosystems which depend on groundwater are:

- Wetlands
- Red gum forests, vegetation on coastal sand dunes and other terrestrial vegetation
- Ecosystems in streams fed by groundwater
- Limestone cave systems
- Hanging valleys and swamps.

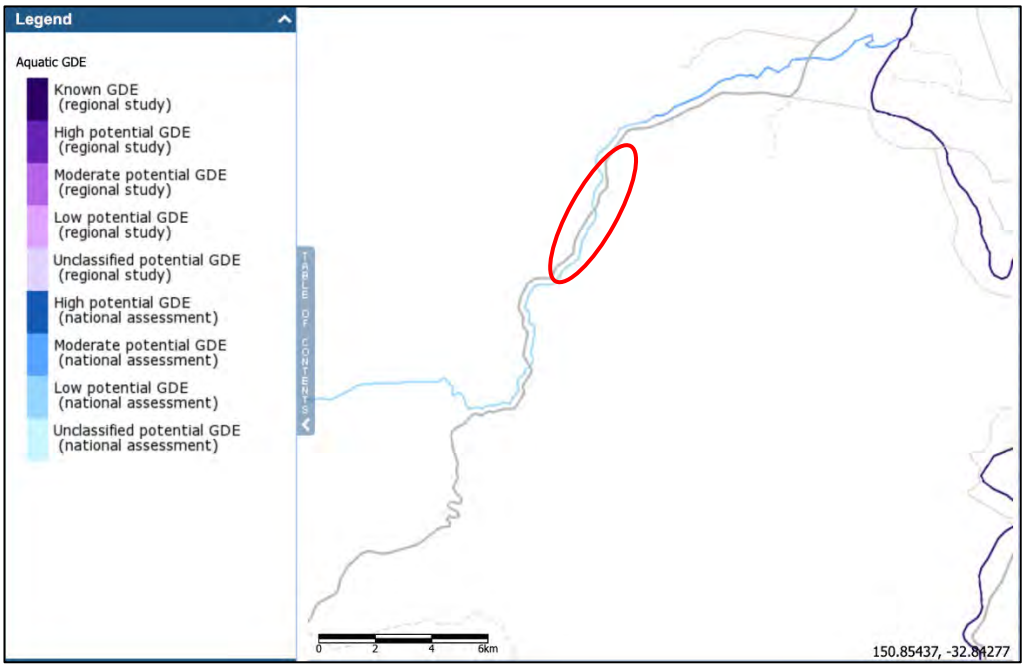
Reference to the Groundwater Dependent Ecosystems Atlas (BoM 2023b) identified low potential terrestrial (Figure 3-3a) and low aquatic GDE (Figure 3-3b) within the proposal area. No subterranean GDE were identified or analysed for the proposal area.

Figure 3-3a: Groundwater dependent ecosystems – terrestrial (red ellipse indicative of proposal area)



[2] As it was not possible to safely execute a BAM plot in the study area, a VIS has not been calculated.

Figure 3-4b: Groundwater dependent ecosystems – aquatic (red ellipse indicative of proposal area)



3.4 Threatened species

Prior to conducting the field investigation, a review of the DCCEEW PMST and BioNet databases (DCCEEW 2023a, DPE 2023a) identified 22 threatened flora species and 64 threatened fauna species, listed under the EPBC and/or BC Acts that have been previously recorded or are considered to have habitat within 10 km of the subject site (Appendix B). Those species that have been previously recorded within 10 km of the study area as per the BioNet Atlas are presented in Figures 3-4 and 3-5 (note: the locations where some species were recorded overlap). Due to a lack of their necessary habitats within the area investigated, oceanic, estuarine and wetland species were not considered.

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

While previously recorded within and/or predicted as having habitat within 10 km of the study area, the majority of threatened species identified during the literature search were assessed to have only a 'low' likelihood of occurrence, given the observed condition of the slopes investigated. These species would not occur within, or be reliant upon, the disturbed road corridor or the adjacent landslip affected slopes. The majority of these animals and plants have specific habitat requirement (as identified in Appendix B), no significant components of which are present within, or close to, the proposed work area. Better resources are present within the surrounding, larger stands of bushland.

In regards to a number of the animals listed in Appendix B, whilst previously recorded in the study region, the devastating impact of the Black Summer Wildfire is considered to have had an adverse influence on the occurrence of these species (DPIE 2020, authors field notes). The fires are considered to have affected both predator and their prey populations, with slow recruitment of pre-fire species assemblages occurring post-fire.

Though suitable habitat is present (e.g. hollow-bearing trees), occupation of these environments by some threatened animals is unlikely to occur until the extent of their prey resources recovers (DPIE 2020).

Reference to the National Flying-fox monitoring viewer (DCCEEW 2023f) did not identify any flying-fox camps present within, or near to, the proposed works area. The nearest Flying-fox camp (Singleton Hunter River [1208]) is located about 30 km north-east of the study area; last surveyed during 2022, with Category 5 [being numbers 16,000 – 49,999] Grey-headed Flying-fox's (*Pteropus poliocephalus*) being recorded. While individuals may fly over and/or forage within, and close to, the proposal area, the Grey-headed Flying-fox (Vulnerable EPBC and BC Acts) is not considered to be reliant on the vegetation that would be cleared to permit the slope stabilisation works for any of its lifecycle requirements.

Few species were recorded during the course of the site inspection, those that were detected listed in Table 3-3.

Figure 3-5: Previously recorded threatened flora.

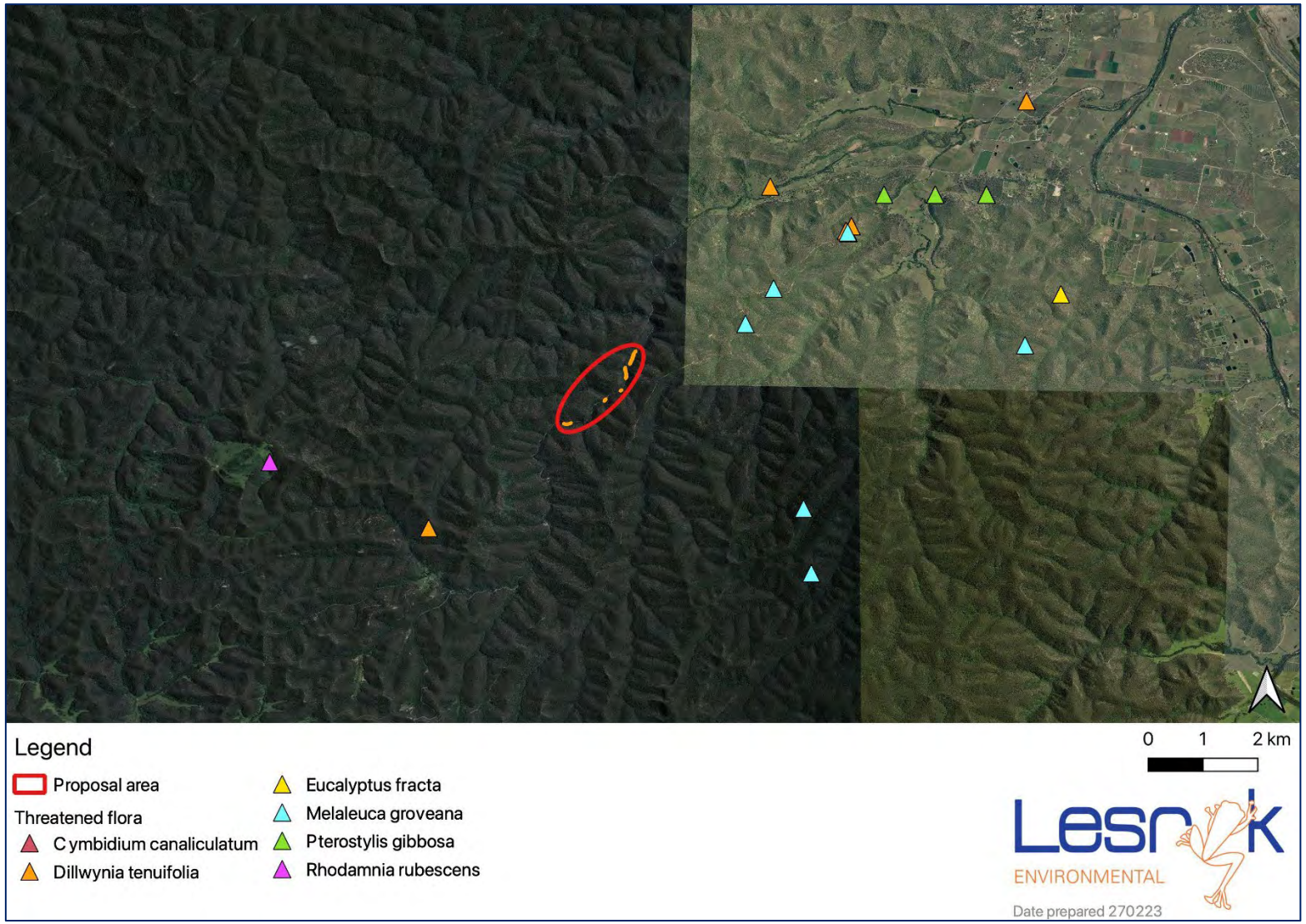


Figure 3-6: Previously recorded threatened fauna.

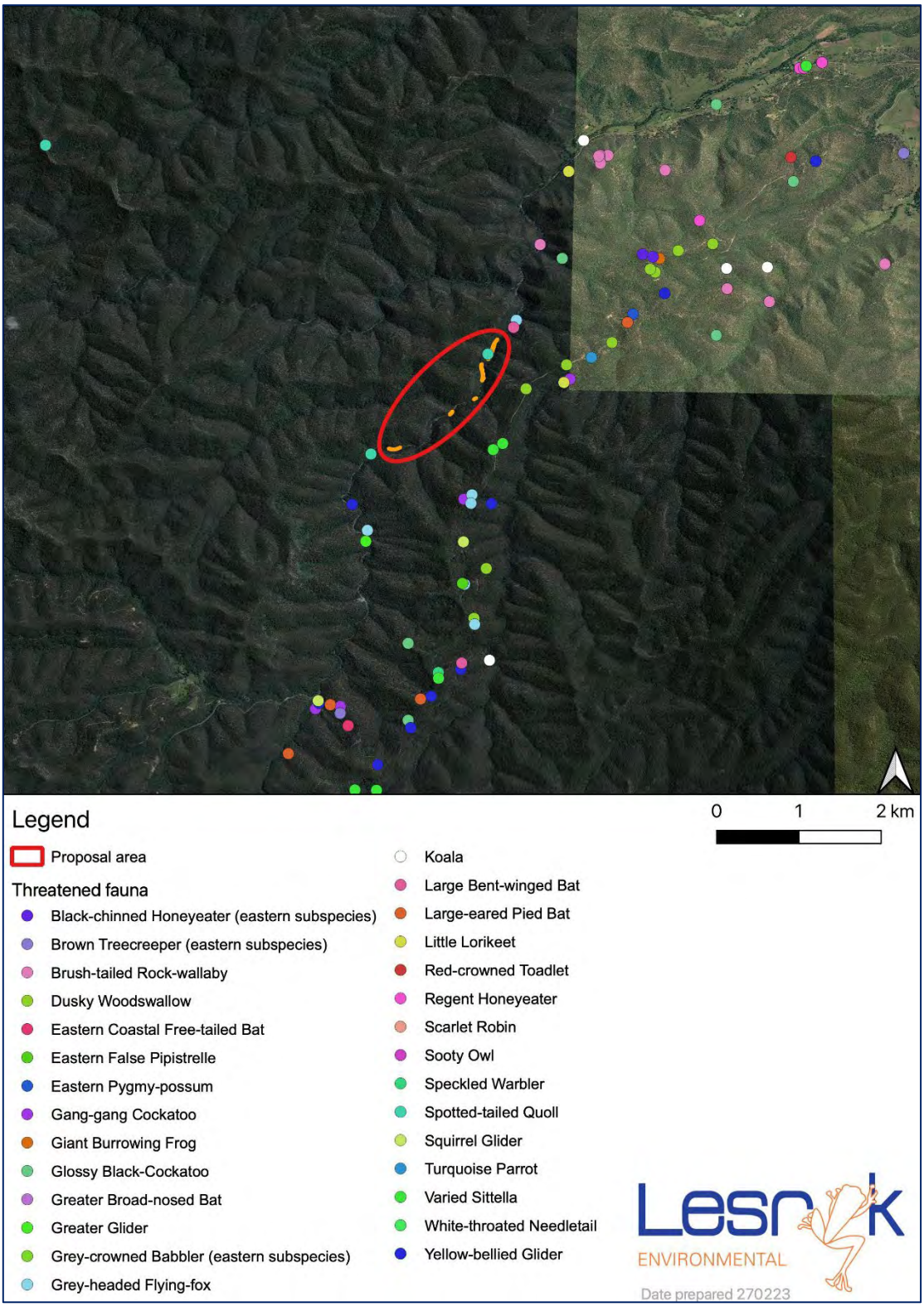


Table 3-3: Recorded fauna

Common Name	Scientific Name
BIRDS	
White-naped Honeyeater	*Melithreptus lunatus*
Eastern Rosella	*Platycercus eximius*
Wonga Pigeon	*Leucosarcia picata*
Red-browed Firetail	*Neochmia temporalis*
Noisy Friarbird	*Philemon corniculatus*
Magpie-lark	*Grallina cyanoleuca*
Noisy Miner	*Manorina melanocephala*
Pied Currawong	*Strepera graculina*
Satin Bowerbird	*Ptilonorhychus violaceus*
Grey Shrikethrush	*Colluricincla harmonica*
Silvereye	*Zosterops lateralis*
Spotted Pardalote	*Pardalotus punctatus*
Superb Lyrebird	*Menura novaehollandiae*
Eastern Yellow Robin	*Eopsaltria australis*
Common Cicadabird	*Coracina tenuirostris*
Yellow Faced Honeyeater	*Lichenostomus chrysops*
Eastern Whipbird	*Psophodes olivaceus*
Lewin's Honeyeater	*Meliphaga lewinii*
Bell Miner	*Manorina melanophrys*
Yellow-tailed Black-cockatoo	*Zanda funerea*
White-throated Treecreeper	*Cormobates leucophaea*
Eastern Spinebill	*Acanthorhynchus tenuirostris*
Willie Wagtail	*Rhipidura leucophrys*
Brown Thornbill	*Acanthiza pusilla*
Yellow-tufted Honeyeater	*Lichenostomus melanops*

In regards to the conservation status of the native species recorded, none are listed, or currently being considered for listing, under the EPBC or BC Acts. During the course of the field inspection, no State or Federally listed threatened fauna were recorded.

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

3.5 Areas of outstanding biodiversity value

The DCCEEW's Register of Critical Habitat (DCCEEW 2023e) and DPE's Area of Outstanding Biodiversity Value (AOBV) register (DPE 2023b) (in conjunction with Part 3 of the Biodiversity Conservation Regulation 2017) per listings provided under the EPBC and/or BC Acts, did not identify any gazetted areas of critical habitat or AOBV for any flora or fauna species or communities occurring within or near the proposed work area.

3.6 Wildlife connectivity corridors

Reference to SEED Dataset mapping (NSW Government 2023e) does not identify the proposed work area as part of Fauna Key Habitats or Fauna Corridor.

The main barrier to ground traversing fauna present within the area surveyed is Putty Road itself. Beyond existing influences, the undertaking of the works will not affect any fauna movements, nor will they have an adverse cumulative impact when associated with the existing road network. The works will not further fragment or isolate any habitat area, nor present a barrier to fauna dispersal patterns.

Post-work, flying species, and those highly tolerant of traversing urban environments/infrastructure, would still be able to move across and through the proposed works area.

The area investigated, while present along and adjacent to a 625 m length of the existing road corridor of Putty Road, is located within a bushland environment that connects into a surrounding heavily vegetated landscape. This landscape includes Wollemi National Park, covering an area of 488,620 ha and extending from Broke in the east to Rylstone in the west. This National Park also provides connectivity to Yengo and Goulburn River National Parks, and Parr and Gardens of Stone State Conservation Areas.

The presence of Putty Road (this road being approximately 7 m wide) currently presents an adverse influence on the east-west movement patterns of those ground traversing species expected to occur within the investigated area. Given the scope of work proposed, ground traversing species currently negotiating this road network are considered to continue to do so post-slope remediation.

The potential removal of 94 trees to permit the work would not result in a significant amount of canopy vegetation being cleared along the investigated section of Putty Road. The proposal is not considered to have an adverse impact on gliding mammals that are more likely to occupy bushland within the surrounding region. The proposal would not isolate or further fragment any habitat areas, nor erect any additional barriers to the movement and dispersal patterns of flying species (i.e. birds, bats), nor any gliding arboreal mammals, that may be currently negotiating Putty Road at this location.

3.7 SEPP (Biodiversity and Conservation) 2021

Chapter 4 - Koala Habitat Protection 2021

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

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

Within the works area, the following Koala habitat use trees are present: Round-leaved Gum, Rough-barked Apple, Smooth-barked Apple, Blue-leaved Stringybark, Grey Gum, Turpentine and Forest Oak.

No Koala Plan of Management exists for the locality. No evidence (i.e., sightings, calls, scats etc.) to suggest that the area investigated supported a resident Koala population were identified.

The 'local' Koala population is expected to have been devastated by the Black Summer Wildfires, with no individuals likely to currently occur.

Reference to the BioNet Atlas (DPE 2023a) identified a previous Koala record about 3 km north-east of the proposal area – this being the nearest and most recent detection (sighted in 2019, pre wildfire).

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

(a) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or

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

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

3.8 Matters of National Environmental Significance

No TECs, or threatened flora and fauna species listed under the EPBC Act were recorded within, or near to, the proposal area. Similarly, none were considered likely to occur or rely upon the habitat to be disturbed for any of their necessary lifecycle requirements.

Reference to the PMST identified the following within a 10 km buffer centred on the proposal:

- The Greater Blue Mountains Area (World Heritage Property and National Heritage Listed)
- 50-100km upstream of the Hunter Estuary Wetlands (Wetlands of International Importance (Ramsar Wetlands))
- 5 TECs
- 16 Migratory Species

Additionally, no threatened species or ecological communities predicted to occur near the subject site would be reliant upon the fauna habitats or vegetation communities present, and none would be affected by the conducting of the activities proposed.

4. Avoidance and minimisation

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

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

4.1 Application of avoid and minimise principles

The objective of the proposal is to remediate the nine failed slopes (Slopes #3, 4, 5, 7, 8, 9, 10, 11 and 13 [inclusive of 13a]). While disturbance/removal of about 0.9 ha of native vegetation is unavoidable in order to achieve the overall objectives of the slope stabilisation project, the amount and quality of bushland to be cleared/disturbed is considered to provide minimal habitat resources for those species recorded, or potentially occurring, given the extent of similar retained vegetation within the surrounding locality.

The proposed work would take place within and adjacent to the existing disturbed road corridor of the investigated section of Putty Road; as such, the potential to avoid wider impacts to biodiversity is high.

To permit the proposed work, 94 trees (comprised of 24 small, 38 medium sized and 32 large) would be removed. Of the 32 large trees to be cleared, 9 of these were identified as being hollow-bearing (6 of these recorded on Slope 13).

Of the 9 hollow-bearing trees recorded only 1 (associated with Tree 86, Slope 13) had a hollow entrance that would be suitable for occupation by the large forest owls or birds (hollow diameter ≥30 cm). The remainder of the plants had hollows less than 30 cm in diameter, these expected to be available for use by microbats, small to medium-sized birds and small to medium-sized arboreal mammals).

Of those mature trees to be removed, avoidance of significant increases in canopy width would be applied; while hollow-bearing trees are recommended to be retained where possible.

Vegetation clearance would be limited to the minimum required to successfully complete the slope stabilisation works; with the selection of equipment to be used also aimed at minimising clearance requirements. Vegetation clearance and work limits would be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with Guide 2 of Transport's Biodiversity Guidelines (RTA 2011). Fencing etc. would be established at the outer limits of the drip line of any retained trees present and the areas marked as 'no-go zones', to avoid indirect impact.

In line with TfNSW's '*The Tree and Hollow Replacement Program: An implementation plan for payments to and from the Transport for NSW Conservation Fund (2022)'* (EMF-BD-GD-0129) [hereafter referred to as the *Tree and hollow replacement guidelines*], off-setting the loss of 94 trees through the re-planting of 456 trees would be required. 27 artificial hollows would need to be provided to replace the nine hollow-bearing trees that would be cleared. Alternatively, TfNSW may opt to transfer $58,500 into Transport's Conservation Fund as per the required rates listed in the *Tree and hollow replacement guidelines*.

5. Impact assessment

Potential impacts as a result of conducting the activity include the disturbance/removal of up to 0.9 ha of native and exotic vegetation, including the removal of 94 trees.

No TECs or threatened flora or fauna species were recorded. Similarly, no threatened flora species were considered to have a moderate to high likelihood off occurrence in the proposed work area.

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

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

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

5.1 Construction direct impacts

5.1.1 Removal of native vegetation

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

- those native species and ecological communities of State and/or national conservation concern that are known, or expected to occur, in the locality
- weeds of significance that would require treatment (refer to Section 5.2.4).

Based on a worst-case estimate it is expected that 0.9 ha of native and exotic vegetation would be disturbed/removed to permit the proposal (Table 5-1). Similar resources will be retained within the proposal area and beyond. Post-slope stabilisation, the sites would be permitted to naturally regenerate.

Table 5-1: Removal of native vegetation and PCT type

Veg. zone	Plant community type (PCT)	Broad condition class	TEC	Area to be impacted (ha or m^2)[1]
Veg disturbance Area	PCT 3237 – Hunter Range Blue Gum Gully Forest	Moderate-Good	N/A	0.9 ha

By the completion of the investigation, 94 trees had been recorded, nine of which are hollow-bearing (Figure 3-6, Appendix C). Each of the 94 trees recorded (these comprised of 24 small, 38 medium sized, and 32 large tree) are within the proposed impact footprint of the slope remediation work and all face removal (Figure 3-6, Appendix C). Of those mature trees to be removed, avoidance of significant increases in canopy width should be applied.

No extra-large trees or amenity trees require removal.

To replace the loss of 94 trees, TfNSW's *Tree and hollow replacement guidelines* (TfNSW 2022b) provides a calculation to assess the number of replacement plants (Table 5-2). In accordance with Section 2.4 of the *Tree and hollow replacement guidelines*, where tree replacement cannot be accommodated locally [or only partially], payment must be made to TfNSW's Conservation Fund as per the rates set out in Table 5-3. For trees with multiple stems/trunks, the replacement/payment required is only calculated for the largest stem DBH.

Figure 5-1: Tree removal (as per Tree and Hollow replacement guidelines)

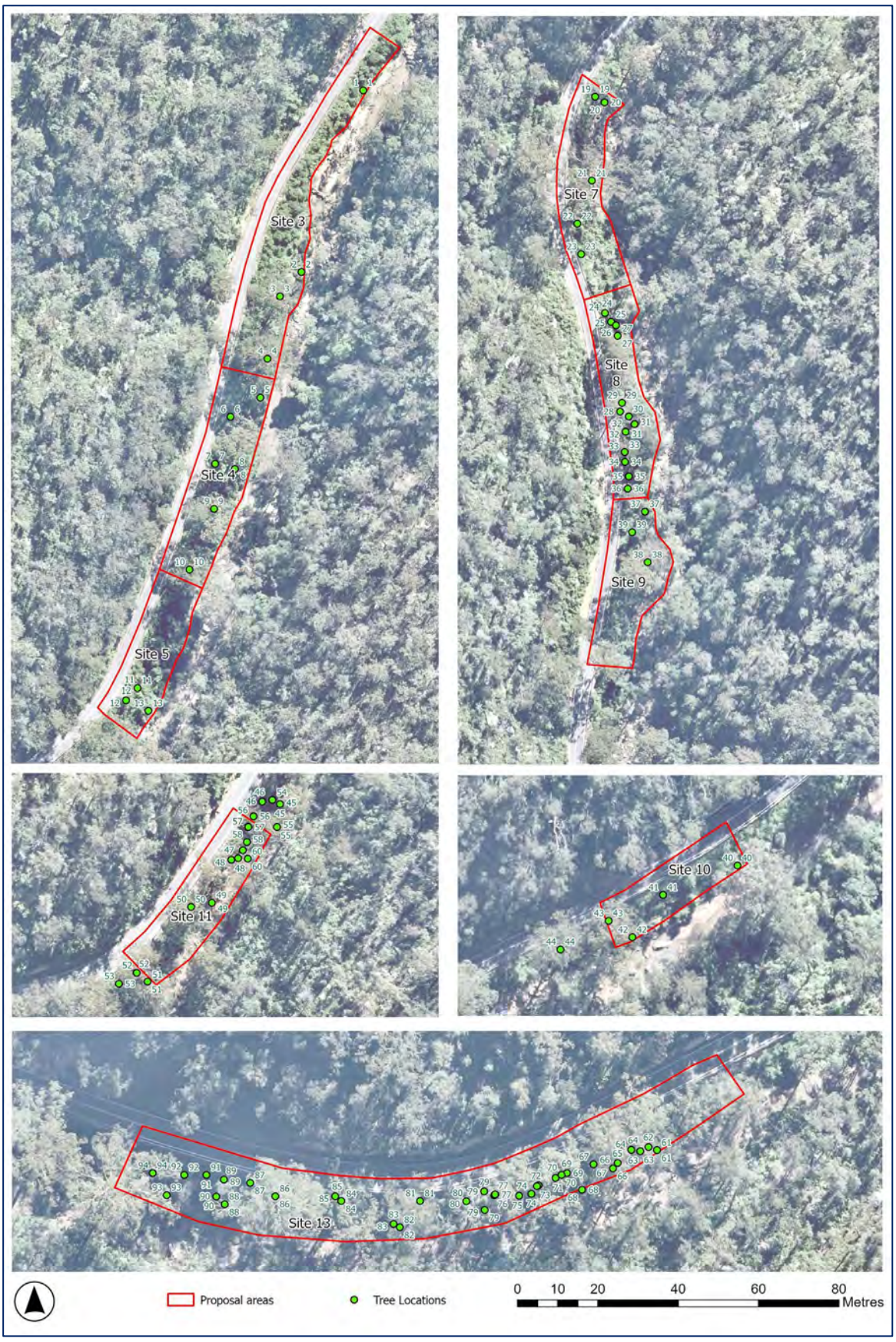


Table 5-2: Tree replacement requirements

Tree size	Tree replacement requirement
Small tree (DBH 5 – 20 cm)	Plant minimum two trees
Medium tree (DBH 20 – 50 cm)	Plant minimum four trees
Large tree (DBH 50 – 100 cm)	Plant minimum eight trees
Very Large tree (DBH > 100 cm)	Plant minimum 16 trees
Hollow replacement requirement	Provide three artificial hollows for every occupied hollow removed[3]

Table 5-3: Conservation Fund contributions

Tree size	Tree replacement requirement
Small tree (DBH 5 – 20 cm)	$125
Medium tree (DBH 20 – 50 cm)	$500
Large tree (DBH 50 – 100 cm)	$1000
Very Large tree (DBH > 100 cm)	$2500
Hollow	$500

In line with the calculation, and in reference to TfNSW's *Tree and hollow replacement guidelines*, 456 trees would require planting and 27 artificial hollows would require provision (Table 5-4). Alternatively, TfNSW may opt to transfer $58,500 into the TfNSW Conservation Fund. Transfer of funds must occur prior to commencement of work.

Table 5-4: Calculated tree replacement or (alternatively) cost transfer into Conservation Fund

Tree size	Estimated native tree removal (worst-case scenario)	Required number of replacement trees	Required cost transfer into Conservation Fund
Small trees	24	48	$3000
Medium trees	38	152	$19,000
Large trees	32	256	$32,000
Extra Large trees	0	N/A	N/A
Hollow-bearing trees	9	27 hollows	$4500
Total	94	456	$58,500

The works proposed do not meet any of the activities excluded from the requirement of replacing trees or hollows (TfNSW 2022b). The works proposed are not considered low-risk activities.

None of the trees being removed would be considered amenity trees.

Relevant to the proposal's impact on vegetation, the following Key Threatening Processes (KTP) are applicable:

- Clearing of native vegetation
- Loss of hollow-bearing trees
- Removal of dead wood and dead trees.

Given the extent of similar resources within, adjacent to and surrounding the study area, and provided the recommended mitigation measures proposed are adopted, the loss of 0.9 ha of native and exotic vegetation, this including the clearing of 9 hollow-bearing trees and the removal of dead wood and dead trees, is not considered to significantly contribute to, or increase the impact of, these KTP.

Stands of similar vegetation, in which trees that supported a range of hollow sizes and in which both dead wood/trees were observed, are present beyond the project limits.

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

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

5.1.2 Removal of threatened fauna habitat

No threatened fauna were recorded during the course of the field investigation.

Nine hollow-bearing trees will be cleared. The majority of the trees could be occupied by hollow-depended native fauna such as microbats and arboreal possums. One tree (Tree 86, Slope 13) could be used by large forest owls.

Considering the hollow-diameters available, the findings of previous surveys and in consultation of standard publicly available databases (Appendix B), the following threatened hollow-depended fauna could occur: Yellow-bellied Glider (*Petaurus australis*), Squirrel Glider (*Petaurus norfolcensis*), Greater Glider (*Petauroides volans*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Corben's Long-eared Bat (*Nyctophilus corbeni*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Eastern Coastal Free-tailed Bat (*Mormopterus norfolkensis*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Glossy Black-cockatoo (*Calyptorhynchus lathami*), Little Lorikeet (*Glossopsitta pusilla*), Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*) and Sooty Owl (*Tyto tenebricosa*).

It should be acknowledged that, whilst previously recorded, a large number of these species are highly unlikely to occur within proximity to the nine slopes being remediated due to the impacts associated with the Black Summer wildfires. It is also noted that, whilst considered, indicators of the presence of several of these animals, such a V-shaped incisions on specific feed trees and crushed accumulations of Casuarina cones, were not observed.

Whilst this is the case, as targeted surveys were not conducted, assessments referencing the criteria provided under Section 7.3 of the BC Act have been undertaken on these hollow-dependent species (Appendix F).

In line with the guidelines provided by DPE on the Assessment of Significance (DECC 2007), due to the similarity of their habitat requirements, an assessment has been undertaken on hollow-dependent fauna as opposed to assessments being carried out on individual species.

The assessment concluded that the proposal would not have a significant effect on hollow-dependent fauna, or any areas of their habitats. As such, the preparation of a Species Impact Statement is not considered necessary.

No microbats, particularly cave-dependent State listed species, were observed within any of the culverts inspection. Inspection of the culverts present did not provide an indication of occupation of these structures (e.g. guano accumulations) by this ground of mammals.

One nest (about 10 cm in diameter) was observed within Tree 3 (Slope 3). The nest was obviously deteriorating and unlikely to be used. No birds were observed attending this nest and, given its degraded and unmaintained condition, it is not considered to be of any breeding value.

No further threatened fauna habitat important to the local occurrence of threatened species previously recorded within the surrounding region was observed within the area investigated.

No further KTP than those identified above in Section 5.1.1 pertain to the removal of habitat. Removal of habitat within the proposal area would be carried out in accordance with Guide 4 of the Biodiversity Guidelines (RTA 2011).

5.1.3 Removal of threatened flora

No threatened flora species listed under the EPBC or BC Acts were recorded or considered likely to occur within the area investigated; as such, as no threatened species are considered to be adversely impacted by the proposal, the conducting of assessments referring to the EPBC Act's Significant Impact Guidelines and Section 7.3 of the BC Act is not required.

5.1.4 Aquatic impacts

Beyond existing conditions, the works proposed would not result in any direct or indirect adverse impact on surface hydrology within the proposal area, and is not expected to impact any of those drainage lines that occur beyond the limits of the work.

No land identified by SEPP Resilience and Hazards 2021 (i.e. coastal wetlands) occurs within, or near to, the study area.

No aquaculture, commercial or recreational fishing occurs within, or near to, the study area.

5.1.5 Injury and mortality

Vegetation clearing to permit the proposal would involve the removal of up to about 0.9 ha, inclusive of 94 trees (nine of which are hollow-bearing), groundcover vegetation, shrubs and natural ground debris. Given the proposal would be conducted within a modified environment (due to the existing landslips), there is minimal expectation that sheltering animals would be injured during the course of the proposed work.

During the construction phase of the proposal some ground-traversing fauna species (i.e. frogs and ground-traversing mammals) could be present and be subject to injury. Mitigation measures to minimise the impact of the proposed work on animals, if present (such as checking beneath vehicles/machinery prior to their use) have been provided to address this matter (Section 6).

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

5.1.6 Groundwater dependent ecosystems

Low potential terrestrial GDE has been identified within the proposal area (BoM 2023b).

In reference to the DPI (Office of Water)'s *Risk assessment guidelines for groundwater dependent ecosystems* (Serov *et al.* 2012), the proposed slope remediation work would not have any direct or indirect impact on a water source or aquifer structure, it would not involve groundwater extraction, and, with the adoption of mitigation measures, would not contribute to the off-site movement of sediment. The objective of the proposal, to remediate nine failed slopes [Slopes #3-13a] and improve site drainage, is to improve otherwise adverse effects if left untreated.

5.2 Indirect and operational impacts

5.2.1 Edge effects on adjacent native vegetation and habitat

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

5.2.2 Wildlife connectivity and habitat fragmentation

The proposed slope remediation work, this including the removal of about 0.9 ha of vegetation and 94 mature trees, is not considered to isolate or further fragment any habitat areas or erect any additional barriers to the movement and dispersal

patterns of flying species (i.e. birds, bats), any gliding arboreal mammals, nor ground traversing species that may be currently negotiating Putty Road. Similar resources retained present within, adjacent to and beyond the nine slopes would provide opportunities for the dispersal of species.

Post-work, hydromulching and natural regeneration of the nine slopes would contribute to any fauna links present.

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

5.2.3 Injury and mortality

The potential for fauna injury and mortality impact, beyond that identified during the construction phase of the proposal (Section 5.1.5) or currently occurring along the Putty Road at this location, would not increase during the operational phase of the proposal.

5.2.4 Invasion and spread of weeds

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

Of those introduced plants recorded, Blackberry (*Rubus fruiticosus* spp. agg), which was recorded at Site 4, and Black Locust (*Robinia pseudoacacia*), Site 3, are listed:

- Under Schedule 3 of the NSW Biosecurity Regulation 2017
- As Priority weeds for the Hunter Local Land Services Region (DPI 2023a).

Under the Regional Recommended Measure for Black Locust the entire Hunter Local Land Services Region is an exclusion zone. Therefore, the local control authority (Hunter Local Land Services) should be notified of the species' presence in the proposal area.

Blackberry is also listed as a WoNS (Weeds Australia 2023).

Eradication of these weeds prior to the commencement of the road works is recommended. As part of the ongoing maintenance of the road corridor, regular monitoring of these weeds is recommended.

5.2.5 Invasion and spread of pests

Beyond the existing diversity of exotic species and pests recorded and predicted to occur, the stabilisation of the nine slopes will not have an adverse cumulative impact. The works will not benefit any exotic pests at the expense of native species. Exotic plants and animals currently occupy, and occur in proximity to, the proposed works area.

5.2.6 Invasion and spread of pathogens and disease

There is a risk that the proposal would introduce, spread or exacerbate the plant diseases caused by *Phytophthora cinnamomi* and Myrtle Rust (*Puccinia psidii*). These diseases are most likely introduced or spread through the importation or movement of soil, water and landscaping materials, either directly or through incidental attachment to machinery.

'Infection of native plants by *Phytophthora cinnamomi*' and 'Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*)', are listed KTP's under the BC and EPBC Acts, respectively. 'Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae' is listed as a KTP under the BC Act and the disease is covered by the EPBC Act listing of 'Novel biota and their impact on biodiversity' as a KTP.

Although there was no obvious evidence for the presence of *Phytophthora cinnamomi* or Myrtle Rust in the vegetation of the proposal area, recommendations to disinfect vehicles and machinery prior to their use have been presented in Section 6.

5.2.7 Changes to hydrology

The proposed work would not result in any direct or indirect adverse impact on surface hydrology within the proposed work area.

5.2.8 Noise, light, dust and vibration

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

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

5.3 Cumulative impacts

Based on a worst-case estimate, the cumulative impact of the proposal would disturb/remove up to 0.9 ha of native and exotic vegetation, this including 94 trees (nine of which are hollow-bearing). The works will not remove any threatened species or TEC, or any areas of their habitat, nor further fragment or isolate any areas of bushland.

The proposal, being the remediation of the nine failed slopes and upgrading of the associated infrastructure, is required as a result of the July 2022 storm event and subsequent deterioration of each works site.

Through the proposed slope remediation work conducted along a 625 m long section of Putty Road, the cumulative beneficial impacts would include:

- Remediation of the nine failed slopes along Putty Road
- Re-opening of Putty Road, including the installation of new guardrails, and engineered slope stabilisation and erosion controls; maximising stability of the slopes to prevent further destabilisation, and ensuring safety requirements are met. Long-term engineering solutions to prevent on-going remediation of the nine slope sites.

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

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

5.4 Assessments of significance

Considering the hollow-diameters available, the findings of previous surveys and in consultation of standard publicly available databases, several species of threatened hollow-depended fauna could occur.

Assessments referencing the criteria provided under Section 7.3 of the BC Act have been undertaken on hollow-dependent species.

In line with the guidelines provided by DPE on the Assessment of Significance (DECC 2007), due to the similarity of their habitat requirements, an assessment has been undertaken on hollow-dependent fauna as opposed to assessments being carried out on individual species.

The assessment concluded that the proposal would not have a significant effect on hollow-dependent fauna, or any areas of their habitats (Summarised Table 5-5). As such, the preparation of a Species Impact Statement is not considered necessary.

No threatened flora or TECs are present within, or close to, the nine slopes investigated.

Table 5-5: Summary of BC Act significance assessments findings

Significance assessment question *(per Section 7.2 of the BC Act and Threatened Species Test of Significance Guidelines (OEH 2018))*						
Threatened species, or communities	a	b	c	d	e	Likely significant impact?
Hollow-dependent fauna	N	X	N	N	N	No
***Y** = Yes (negative impact), **N** = No (no or positive impact), **X** = Yes/No answer not applicable, **?** = unknown impact.*						

6. Mitigation

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

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

Table 6-1: Mitigation measures

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B01	General	An Erosion Sediment Control Plan (ESCP) would be prepared for the proposal and would be in line with the publication *Managing Urban Stormwater: Soils & Construction Guidelines* (Landcom 2004). Erosion and sedimentation control structures will be regularly maintained/replaced particularly after a heavy rain fall event. Inputs of sediment laden runoff entering Terrys Creek from the works site will be avoided by conducting the works during periods when dry weather predicted, providing erosion and sedimentation control structures [including vegetation buffers] at the toe of each slope, diverting runoff around each work sites and so forth.	Detailed design	Effective	No	Project Manager/ Contractor
B02		A Construction Environmental Management Plan (CEMP) would be prepared for the proposal.	Prior to construction	Effective	No	Project Manager/ Contractor
B03		A temporary stockpile site will be located within an existing cleared area that occurs within the northern extent of the proposal area, this managed in accordance with TfNSW's Stockpile Site Management Guideline (EMS-TG-10).	Prior/during construction	Effective	No	Project Manager/ Contractor
B04		The unexpected species find procedure is to be followed under Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011) if threatened ecological communities and threatened fauna or flora not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	No	Environment manager
B05		Spill kits commensurate with the type and quantity of hazardous material used must be available on-site.	During construction	Effective	No	Project Manager
B06	Removal of native vegetation	Native vegetation removal will be minimised through detailed design.	Detailed design	Effective	There would be a residual impact from the loss of 0.9 ha of native/exotic vegetation, including 94 trees (composed of 24 small, 38 medium, 32 large).	Project Manager/ Botanist

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B07		Vegetation clearance limits would be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with *Guide 2: Exclusion Zones* (RTA 2011). Fencing etc. would be established at the outer limits of the drip line of any retained trees and the areas marked as 'no-go zones' to avoid direct impact.	Prior to construction	Effective	No	Botanist/ Project Manager/ Contractor
B08		Pre-clearing surveys will be conducted in accordance with *Guide 1: Pre-clearing process* (RTA 2011).	Prior to construction	Effective	No	Ecologist
B09		Vegetation removal will be conducted in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* (RTA 2011). Clearing of native vegetation would be limited to the minimum required to successfully permit the proposal.	During construction	Effective	No	Contractor
B10		Removed native and non-seed-bearing exotic vegetation would be mulched or re-used on-site (e.g. to stabilise disturbed areas).	During/post construction	Effective	No	Contractor
B12		Vegetation removal work is not to be conducted during periods of high winds.	During construction	Effective	No	Contractor
B13		Weed contaminated green waste will be disposed of appropriately at a licensed landfill facility.	During/post construction	Effective	No	Contractor
B14		Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* (RTA 2011).	Post-construction	Proven	No	Contractor
B15		Removal of trees will be offset as per the '*Tree and hollow replacement guidelines*' and a Tree and Hollow Replacement Plan will be prepared.	Pre/post-construction	Effective	See B06.	Project Manager/ Environment Manager
B16	Removal of threatened fauna habitat	Threatened fauna habitat removal will be minimised through detailed design.	Detailed design	Effective	No	Ecologist/ Project Manager
B17		Habitat removal will be conducted in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* (RTA 2011). An ecologist or licensed wildlife carer must be on-site during vegetation clearing/habitat removal.	During construction	Effective	No	Contractor

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B18		Consideration should be given to retaining the hollow-bearing Tree (Tree 86) that is present on Slope 13.	Detailed design	Effective	No	Ecologist/ Project Manager
B19		An ecologist is to be present to supervise and direct the removal of the nine hollow-bearing trees. The ecologist is to collect any sheltering fauna and relocate it locally. If nocturnal species are located, these are to be released on dusk	Detailed design	Effective	No	Ecologist/ Project Manager
B20		Retained hollow-bearing trees would be clearly identified on-site (either marked on the tree themselves or road pavement) prior to the commencement of work to ensure they are not indirectly impacted or cleared.	Prior to construction	Effective	No	Ecologist/ Project Manager
B21		Habitat will be relocated, replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bushrock* and *Guide 8: Nest boxes* (RTA 2011) to minimise loss or damage to native fauna habitats.	During construction	Proven	No	Ecologist/ Project Manager
B22		Fauna will be managed in accordance with Guide 9: Fauna handling (RTA 2011).	During construction	Effective	No	Ecologist/licensed wildlife carer
B23	Removal of threatened flora	The unexpected species find procedure is to be followed (RTA 2011) if threatened flora species, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	No	Environment Manager
B24	Groundwater dependent ecosystems	Interruptions to water flows associated with groundwater dependent ecosystems will be minimised through detailed design.	Detailed design	Effective	No	Project Manager
B25	Changes to hydrology	Changes to existing surface water flows will be minimised through detailed design.	Detailed design	Effective	No	Project Manager
B26	Fragmentation of identified habitat corridors	Connectivity measures will be considered/implemented in accordance with the *Wildlife Connectivity Guidelines for Road Projects* (RTA 2011) or equivalent updated NSW Guidelines.	Detailed design, during construction and post construction	Effective	No	Project Manager/ Ecologist
B27	Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance *with Guide 2: Exclusion zones* (RTA 2011).	Prior to/during construction	Effective	No	Ecologist/ Project Manager

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B28	Injury and mortality of fauna	Fauna will be managed in accordance with *Guide 9: Fauna* handling (RTA 2011).	During construction	Effective	No	Ecologist or licensed wildlife carer
B29		Inspections for the presence of any sheltering fauna would be carried out beneath vehicles/machinery prior to use.	During construction	Effective	No	Contractor
B30		Any sheltering native species would be collected and relocated locally (nocturnal species to be released on dusk). If injured, native wildlife would be taken to a local veterinarian or wildlife carer for treatment. Once rehabilitated, these native animals must be released at their point of capture. Exotic injured wildlife would be taken to a local veterinarian and appropriately treated.	During construction	Effective	No	Ecologist or licensed wildlife carer
B31	Invasion and spread of weeds	Weed species will be managed in accordance *with Guide 6: Weed management* (RTA 2011).	Prior/during construction	Effective	No	Botanist or similarly qualified personnel
B32		In accordance with the NSW *Biosecurity Act 2015*, the Blackberry and Black Locust infestations on site would be eradicated, thereby resulting in their suppression. Furthermore, Hunter Local Land Services will be informed of the and Black Locust occurrence at Site 3.	Prior/during construction	Effective	No	Botanist or similarly qualified personnel
B33		All vehicles/machinery would enter the site via stabilised areas to prevent the introduction and spread of weed seeds and/or pathogens.	During construction	Effective	No	Contractor
B34	Invasion and spread of pests	If applicable, pest species will be managed within the proposal site.	During construction	Effective	No	Ecologist or licensed wildlife carer
B35	Invasion and spread of pathogens and disease	Pathogens (e.g. *Phytophthora cinnamonmi*) will be managed in accordance with *Guide 2: Exclusion zones* and *Guide 7: Pathogen management* (RTA 2011), including the following hygiene protocols: • Before entering and leaving the work site, workers are to remove excess soil and mud and then spray boots, tools, gloves and small equipment with recommended disinfectant supplied by the contractor (70% Methylated spirits / 30% Water) until runoff is clear. • Avoid unnecessary soil disturbance.	During construction	Effective	No	Contractor/ Project Manager

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B36	Noise, light, dust and vibration	Noise and vibration impact will be minimised through detailed design.	Detailed design	Effective	No	Project Manager
B37		Potential dust impact generated from activities (e.g. mulching) would be monitored (i.e. to ensure it is not reducing traffic visibility). If dust impact is more than manageable, work will stop and the work method reviewed.	During construction	Effective	No	Contractor
B38		All plant/equipment to be used on site will be designed and operated to control the potential emission of smoky exhaust fumes into the atmosphere. All machinery/vehicles are to be operated within standard guidelines.	During construction	Effective	No	Contractor

7. Offsets and other measures

7.1 Thresholds

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

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

Impact	Threshold	Triggered
Works involving clearing of a CEEC	Where there is any clearing of an CEEC in 'moderate to good' condition	No
Works involving clearing of an EEC	Where clearing of a EEC ≥ 2 ha in 'moderate to good' condition	No
Works involving clearing of VEC	Where clearing of VEC ≥ 5 ha in 'moderate to good' condition	No
Works involving clearing of any habitat for a known species credit fauna species or clearing of breeding habitat (as defined by the TBDC) for dual-credit fauna species (excluding exotic and planted vegetation that cannot be assigned to a plant community type)	Where clearing ≥ 1 ha in 'moderate to good' condition	No
Works involving removal of known threatened flora species and their habitat	Where loss of individuals is ≥10 or where clearing of habitat is ≥ 1 ha	No
Type 1 or Type 2 key fish habitats	Where there is a net loss of habitat	No
Any residual biodiversity impact that doesn't require offsets in accordance with the No Net Loss Guideline is to be assessed against the requirements of the Tree and Hollow Replacement Guideline.	Any clearing of hollows and/or trees ≥5cm DBH	Yes – clearing of 94 trees (9 of which are hollow-bearing). Refer to Table 7.2 below.

Table 7-2: Assessment of vegetation impacts against thresholds

Veg. zone	Plant community type (PCT)	Condition	TEC	Impact area (ha or m^2)[1]	Threshold triggered?
Proposal Area	PCT 3237	Moderate - Good	Not a TEC	0.9 ha	Tree replacement is required.

7.2 Biodiversity offset strategy/tree and hollow replacement plan

The proposed work will require the removal of 94 trees; nine of which are hollow-bearing.

To offset this loss, in line with the *Tree and hollow replacement guidelines* (TfNSW 2022b), 154 plants would need to be established within, or near, the project area. Alternatively, TfNSW may transfer $58, 500 into TfNSW's Conservation Fund.

8. Conclusion

To permit the proposed slope remediation work along the investigated 625 m section of Putty Road, an estimated 0.9 ha of vegetation disturbance/removal is required; this including the clearing of 94 trees (nine of which are hollow-bearing).

Within the area investigated, no TECs or threatened flora or fauna species listed, or currently being considered for listing, under the EPBC or BC Acts were recorded. Similarly, considering the quality and structure of the PCTs and habitat present, no threatened flora were considered likely to occur and/or rely on the proposal area for any of their lifecycle requirements.

As hollow-bearing trees are present, the occupation of these by threatened hollow-dependent fauna was considered. Based on the identification of the hollow entrance diameters, species that could be present include microbats, small to medium sized birds and arboreal mammals and, within Tree 86, Slope 13, large forest owls.

Assessments referencing the criteria provided under Section 7.3 of the BC Act have been undertaken on hollow-dependent species.

In line with the guidelines provided by DPE on the Assessment of Significance (DECC 2007), due to the similarity of their habitat requirements, an assessment has been undertaken on hollow-dependent fauna as opposed to assessments being carried out on individual species.

The assessment concluded that the proposal would not have a significant effect on hollow-dependent fauna, or any areas of their habitats. As such, the preparation of a Species Impact Statement, or a Biodiversity Development Assessment Report, is not considered necessary.

To offset the loss of 94 trees, 456 trees would require re-planting and 27 artificial hollows would need to be installed (within the project boundary or on land adjacent or close to the project with landowner's consent) in line with TfNSW's *Tree and hollow replacement guidelines*. Alternatively, TfNSW may transfer $58,500 into the TfNSW Conservation Fund.

With reference to Chapter 4 of SEPP (Biodiversity and Conservation) 2021, the preparation of a Koala Plan of Management is not required.

Mitigation measures have been recommended in Section 6, to reduce any ecological impact as a result of the proposed work. Two primary measures include:

- Minimising impact through detailed design.
- Adhering to TfNSW's *Biodiversity Guidelines* (RTA 2011).

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

- Prepare an ESCP to minimise soil erosion and sediment transfer off-site
- Limit vegetation removal to the minimum required to successfully permit the proposal
- Replant 456 trees to replace the removal of 94 trees, and provide 27 artificial hollows to replace removal of nine hollow-bearing trees
    - Alternatively, TfNSW may opt to transfer $58,500 into the TfNSW Conservation Fund.

With adherence to those recommendations provided in this report, no ecological constraints to the proposal proceeding as planned were identified or considered likely to occur.

The adoption of the mitigation measures provided would ensure that the proposal is carried out in an ecologically sustainable manner.

9. Glossary

Term	Definition
Accredited person or assessor	Means as person accredited under section 6.10 (of the BC Act) to prepare reports in accordance with the BAM.
Biodiversity Assessment Method	The Biodiversity Assessment Method is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (State Government of NSW and DPIE 2020c).
BioNet Atlas	The DPE database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish.
BioNet Vegetation classification	Refers to the vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW.
Construction footprint	The area to be directly impacted by the proposal during construction activities. See also definition for subject land.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation). This includes impacts from activities related to the construction or operational phase of the proposal (State Government of NSW and DPIE 2020c).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (State Government of NSW and DPIE 2020c).
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (State Government of NSW and DPIE 2020c).
Landscape assessment area	The area which includes the subject land and a 1500 m buffer surrounding the outside edge of the boundary of the subject land or 500 m along each side of the centre line of a linear-shaped proposal.
Local population	The population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions: • The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and

	contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area. • The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. • The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time or return year to year.
Matter of national environmental significance	A MNES is any of the nine defined components protected by a provision of Part 3 of the EPBC Act.
Mitigation	Action to reduce the severity of an impact.
Native vegetation	Has the same meaning as in section 1.6 of the BC Act and section 60B of the LLS Act. In summary, a) trees (including any sapling or shrub or any scrub) b) understorey plants c) groundcover (being any type of herbaceous vegetation) d) plants occurring in a wetland. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act). Native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). Marine vegetation is covered by the provisions of the FM Act.
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (State Government of NSW and DPIE 2020c).
Operational footprint	The area that will be subject to ongoing operational impacts from the proposal. This includes the road, surrounding safety verges and infrastructure, fauna connectivity structures and maintenance access tracks and compounds.
Patch size	An area of native vegetation that: • occurs on the development site or biodiversity stewardship site • includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site (State Government of NSW and DPIE 2020c).
PlantNET	An online database of the flora of New South Wales which contains currently accepted taxonomy for plants found in the State, both native and exotic.
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020a).
Species credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits (State Government of NSW and DPIE 2020c). This is analogous with the definition of 'candidate species'.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection (State Government of NSW and DPIE 2020c).
Study area	The area directly affected by the proposal (subject land or construction footprint) and any additional areas likely to be affected by the proposal, either directly or indirectly.

Subject land	Land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the landscape assessment area which surrounds the subject land (i.e., the area of land in the 1500 m buffer zone around the subject land or 500m buffer zone for linear proposals). In the case of a biodiversity certification proposal, subject land includes the biodiversity certification assessment area (State Government of NSW and DPIE 2020c). See also definition for construction footprint.
Threatened Biodiversity Data Collection	A publicly assessable online database (registration required) which contains information for listed threatened species, populations and ecological communities (State Government of NSW and DPIE 2020c). Part of the BioNet database.
Tree	As per Australian Standard 4970-2009 a tree is considered to be a long-lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks (or as defined by the determining authority).
Vegetation integrity (score)	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT. The vegetation integrity score is the quantitative measure of vegetation condition calculated by the BAM-C (State Government of NSW and DPIE 2020c).
Vegetation zone	A relatively homogeneous area of native vegetation on a development site, clearing site, land to be biodiversity certified or biodiversity stewardship site that is the same PCT and has the same broad condition state (State Government of NSW and DPIE 2020c).

10. Abbreviations

Term	Definition
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
EEC	Endangered ecological community
EIS	Environmental Impact Statement
EP&A Act	*Environment Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FM Act	*Fisheries Management Act 1994* (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
KFH	Key Fish Habitat
KTP	Key Threatening Process
LGA	Local Government Area
mm/cm/m/m2/km/ha	Millimetres, centimetres, metres, square metres, kilometres, hectares
MNES	Matters of national environmental significance
NSW	New South Wales
PCT	Plant community type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened ecological communities (VECs, EECs and CEECs)
TfNSW	Transport for NSW
VIS	Vegetation Information System
WoNS	Weeds of National Significance

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Appendix A: Detailed Engineering Design Plans

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Appendix B: Likelihood of Occurrence

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey or has been recorded within the past five years (known from a reputable source).
High	A species is considered highly likely to occur in the study area if: • There are previous credible records on BioNet within the study area from the last 10 years and suitable habitat is present. OR • The species is highly mobile, is dependent on identified suitable habitat within the study area (i.e., for breeding or important life cycle periods such as winter flowering resources) and has been recorded recently (within five years) on BioNet in the locality. This also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	A species is considered moderately likely to occur in the study area if: • Any suitable habitat (e.g., foraging) is present in the study area, the species is highly mobile and has been recorded in the locality in the last 10 years on BioNet. The species may be unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area. OR • The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has been recorded in the locality in the last 10 years on BioNet. OR • For flora species that are associated with PCTs in the study area (see TBDC) or have been recorded in the locality in the last 10 years on BioNet – the associated PCT/habitat present in the study area is not degraded and the species was not targeted by surveys in accordance with the BAM and relevant survey guidelines. In addition, for flora species known to occur in disturbed areas (e.g., orchids), records from any time within the locality may warrant inclusion in this category.
Low	A species is considered to have a low likelihood of occurring in the study area if: • For highly mobile species, the species may be an occasional visitor, but habitat similar to the study area is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the study area and the species has not been recorded in the locality in the last 10 years on BioNet. OR • The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has not been recorded in the locality in the last 10 years on BioNet. OR • For flora species that are associated with PCTs in the study area (see TBDC) and the species was not identified following targeted surveys in accordance with the BAM and relevant survey guidelines. Flora species that have been recorded in the locality on BioNet at any time, associated suitable habitat (see the TBDC) is not present in the study area, though similar habitats of the same vegetation formation is present in the study area.
Unlikely	Suitable habitat for the species is absent from the study area.

Note: Species underlined are those which only the EPBC PMST predicted as having habitat in the search area. All other species have been recorded within 10 km of the study area.

Note: As these habitats are not present, no pelagic, estuarine, wetland or fish species have been included in the following table.

Given that the proposed work is not located within the Commonwealth marine area, this being from 3 to 200 nautical miles from the coast, no species listed as marine under the EPBC Act have been considered; nor has the marine status of any species been acknowledged.

Key

V – vulnerable E – endangered CE – critically endangered M – migratory

* - habitat requirements were generally extracted from DCCEEW (2022a), BioNet Atlas (DPE 2022b), Harden (1992-2002), Frith (2007), Churchill (2008), Cogger (2014) and Van Dyck and Strahan (2008) with other references used being identified in the bibliography.

Species	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
PLANTS						
Bynoe's Wattle *Acacia bynoeana*	V	E	Occurs in heath or dry sclerophyll forest on sandy soils.	Unlikely	PMST	None
Allocasuarina glareicola	E	E	Primarily restricted to the Richmond district, with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil. Found in open woodland.	Unlikely	PMST	None
Cymbidium canaliculatum population in the Hunter Catchment *Cymbidium canaliculatum*		E	Typically grows in the hollows, fissures, trunks and forks of trees in dry sclerophyll forest or woodland, where its host trees typically occur on Permian Sediments of the Hunter Valley floor. It usually occurs singly or as a single clump, which can form large colonies on trees, between two and six metres from the ground.	Unlikely	1 (Bionet)	None
White-flowered Waxplant *Cynanchum elegans*	E	E	Usually occurs on the edge of dry rainforest vegetation but also in littoral rainforest, coastal scrub and aligned open forest and woodland. Associated with PCT 3237.	Low	PMST	None
Dillwynia tenuifolia		V	At Yengo *D. tenuifolia* is reported to occur in disturbed escarpment woodland on Narrabeen sandstone. Associated tree species include *Eucalyptus eximia*, *E. punctata*, *E. sparsifolia* and *Callitris endlicheri*. The shrub layer is dominated by *D. tenuifolia*, *Leucopogon muticus*, *Leptospermum parvifolium* and *Pultenaea microphylla*	Unlikely	10 (Bionet)	None
Broken Back Ironbark *Eucalyptus fracta*		V	Locally common but restricted to the northern Broken Back Range near Cessnock, NSW. Occurs in dry eucalypt woodland in shallow soils. Associated species in slightly	Unlikely	2 (Bionet)	None

Species	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
			deeper soils include *Eucalyptus sparsifolia, E. punctata, Corymbia maculata* and *Angophora euryphylla*.			
Slaty Red Gum *Eucalyptus glaucina*	V	V	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils.	Unlikely	PMST	None
Eucalyptus sp. Howes Swamp Creek (M.Doherty 26)	E	E	E. sp. Howes Swamp Creek occurs within a small area of alluvium on Howes Swamp Creek in the Mellong Swamp Complex within Wollemi National Park.	Unlikely	1 (Bionet)	None
Euphrasia arguta	CE	CE	Euphrasia arguta was rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Prior to this, it had not been collected for 100 years. Historically, Euphrasia arguta has only been recorded from relatively few places within an area extending from Sydney to Bathurst and north to Walcha. Historic records of the species noted the following habitats: 'in the open forest country around Bathurst in sub humid places', 'on the grassy country near Bathurst', and 'in meadows near rivers'.	Unlikely	PMST	None
Fairy Bells *Homoranthus darwinioides*	V	V	Grows in in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand.	Unlikely	PMST	None
Grove's Paperbark *Melaleuca groveana*		V	Widespread, scattered populations in coastal districts north of Yengo National Park to southeast Queensland. Also found as a disjunct population near Torrington on the northern tablelands. Grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcropping granite, rhyolite and sandstone on rocky outcrops and cliffs. Also occurs in dry scrubby open forest and woodlands.	Unlikely	13 (Bionet)	None
Olearia cordata	V	V	Populations are typically small and scattered. Grows in dry open sclerophyll forest and open shrubland, on sandstone ridges.	Unlikely	3 (Bionet)	None
Hairy Geebung *Persoonia hirsuta*	E	E	Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Unlikely	PMST	None

Species	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
Rufous Pomaderris *Pomaderris brunnea*	V	E	Found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines	Unlikely	PMST	None
Prasophyllum sp. Wybong (C.Phelps ORG 5269)	CE		Endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Known to occur in open eucalypt woodland and grassland.	Unlikely	PMST	None
Prostanthera cineolifera	V	V	Restricted to only a few localities near Scone, Cessnock and St Albans. Grows in open woodlands on exposed sandstone ridges.	Unlikely	PMST	None
Illawarra Greenhood *Pterostylis gibbosa*	E	E	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark *E. crebra*, Forest Red Gum and Black Cypress Pine *Callitris endlicheri*.	Unlikely	33 (Bionet)	None
Eastern Underground Orchid *Rhizanthella slateri*	E	V	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	Unlikely	PMST	None
Scrub Turpentine *Rhodamnia rubescens*	CE	CE	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. Associated with PCT 3237.	Low	1 (Bionet)	None
Heath Wrinklewort *Rutidosis heterogama*	V	V	Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	Unlikely	PMST	None
Austral Toadflax *Thesium australe*	V	V	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely	PMST	None
Wollemi Pine *Wollemia nobilis*	CE	CE	Restricted to remote canyons in the Wollemi National Park, north-west of Sydney. Little is known about the ecology of this recently-discovered species; ecological research is currently ongoing. Occurs in warm temperate rainforest and rain forest margins in remote sandstone canyons.	Unlikely	PMST	None
MAMMALS						
Spotted-tailed Quoll *Dasyurus maculatus*	E	V	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Low	23 (Bionet)	None
Koala *Phascolarctos cinereus*	E	V	Open eucalypt forest and woodland, containing a variety of 'preferred' food tree species.	Low	6 (Bionet)	None

Species	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
Parma Wallaby *Macropus parma*		V	Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	Unlikely	1 (Bionet)	None
Brush-tailed Rock-wallaby *Petrogale penicillata*	V	E	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	Unlikely	98 (Bionet)	None
Eastern Pygmy-possum *Cercartetus nanus*		V	Occupies a wide range of habitats from rainforest through to woodlands and heath lands in which it is solitary. Feeds mostly on the pollen and nectar from banksias, eucalypts and understorey plants and will also eat insects, seeds and fruit	Unlikely	1 (Bionet)	None
Yellow-bellied Glider *Petaurus australis*		V	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	High	30 (Bionet)	Yes – hollow-dependent species
Squirrel Glider *Petaurus norfolcensis*		V	Inhabits woodlands and dry sclerophyll forests, usually in diverse stands of shrubs and trees. Shelters and breeds in tree hollows, and is primarily an insectivorous animal but, has also been known to ingest plant exudates.	High	5 (Bionet)	Yes – hollow-dependent species
Greater Glider *Petauroides volans*	V		Largely restricted to eucalypt forests and woodlands, utilising tree hollows.	High	6 (Bionet)	Yes – hollow-dependent species
Long-nosed Potoroo (northern) *Potorous tridactylus tridactylus*	V	V	Inhabits coastal heath and dry and wet sclerophyll forests with dense cover which provides diurnal sheltering sites and protection from predators, while foraging in adjacent, open areas.	Unlikely	PMST	None
Grey-headed Flying-fox *Pteropus poliocephalus*	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Low	17 (Bionet)	None
Large-eared Pied Bat *Chalinolobus dwyeri*	V	V	Cave-roosting bat that forages in timbered woodland and dry sclerophyll forest.	Low	8 (Bionet)	None
Eastern False Pipistrelle *Falsistrellus tasmaniensis*		V	Prefers moist habitats, with trees taller than 20 m. Generally, roosts in hollow-bearing trees (eucalypts), but has also been found under loose bark on trees or in buildings.	High	3 (Bionet)	Yes – hollow-dependent species
Corben's Long-eared Bat *Nyctophilus corbeni*	V	V	Inhabits a variety of vegetation types, including mallee, bulloke and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	High	PMST	Yes – hollow-dependent species

Species	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
Greater Broad-nosed Bat *Scoteanax rueppellii*		V	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Usually roosts in tree hollows but also in buildings.	High	2 (Bionet)	Yes – hollow-dependent species
Large Bent-winged Bat *Miniopterus orianae oceanensis*		V	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Low	2 (Bionet)	None
Eastern Coastal Free-tailed Bat *Mormopterus norfolkensis*		V	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	High	4 (Bionet)	Yes – hollow-dependent species
Eastern Cave Bat *Vespadelus troughtoni*		V	Cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.Ffound in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW.	Low	1 (Bionet)	None
New Holland Mouse *Pseudomys novaehollandiae*	V		Open heathland, open woodland with a heathland understorey and vegetated sand dunes.	Low	PMST	None
BIRDS						
Black-necked Stork *Ephippiorhynchus asiaticus*		E	Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	Unlikely	1 (Bionet)	None
Australasian Bittern *Botaurus poiciloptilus*	E	E	Occupies shallow, vegetated freshwater or brackish swamps, usually dominated by tall, dense reed beds of *Typha* sp., *Juncus* sp. and *Phragmites* sp. Nests on platforms of reeds and rushes, usually built over water in dense cover.	Unlikely	PMST	None
Black Bittern *Ixobrychus flavicollis*		V	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	Unlikely	1 (Bionet)	None
White-throated Needletail *Hirundapus caudacutus*	V, M		Almost exclusively aerial. Takes insects on wing over a range of habitat types. Recorded most often above wooded areas, including open forest and rainforest.	Low	4 (Bionet)	None

Species	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
Grey Falcon *Falco hypoleucos*	V	E	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Unlikely	PMST	None
Red Goshawk *Erythrotriorchis radiatus*	V	CE	In NSW, preferred habitats include mixed subtropical rainforest, *Melaleuca* swamp forest and riparian *Eucalyptus* forest of coastal rivers. Not recorded in NSW since 2009.	Unlikely	PMST	None
Eastern Osprey *Pandion cristatus*	M	V	Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands.	Unlikely	PMST	None
Spotted Harrier *Circus assimilis*		V	Grassy open woodland including *Acacia* and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Unlikely	1 (Bionet)	None
White-bellied Sea-eagle *Haliaeetus leucogaster*		V	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia.	Unlikely	PMST	None
Australian Painted Snipe *Rostratula australis*	E	E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Unlikely	PMST	None
Gang-gang Cockatoo *Callocephalon fimbriatum*		V	Prefers tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests during summer, these being at higher altitudes. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, or in dry forest in coastal areas.	High	26 (Bionet)	Yes – hollow-dependent species
Glossy Black-cockatoo *Calyptorhynchus lathami*	V	V	Inhabits eucalypt woodland and feeds almost exclusively on Casuarina fruits.	High	22 (Bionet)	Yes – hollow-dependent species
Little Lorikeet *Glossopsitta pusilla*		V	Forages primarily in the open Eucalypt forest and woodland canopies, particularly along water courses; occasionally in Angophoras, Melaleucas and other tree species, also riparian habitats are used.	High	22 (Bionet)	Yes – hollow-dependent species
Turquoise Parrot *Neophema pulchella*		V	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	Unlikely	1 (Bionet)	None

Species	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
Swift Parrot *Lathamus discolor*	CE	E	Eucalypt forests. When over-wintering on the mainland, this species is dependent on winter-flowering eucalypt species.	Unlikely	PMST	None
Powerful Owl *Ninox strenua*		V	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.	High	6 (Bionet)	Yes – hollow-dependent species
Masked Owl *Tyto novaehollandiae*		V	Open forest with a sparse mid-storey layer, but with patches of dense low ground cover.	High	1 (Bionet)	Yes – hollow-dependent species
Sooty Owl *Tyto tenebricosa*		V	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	High	1 (Bionet)	Yes – hollow-dependent species
Grey-crowned babbler (eastern subsp.) *Pomatostomus temporalis temporalis*		V	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions.	Unlikely	6 (Bionet	None
Brown Treecreeper (eastern subsp) *Climacteris picumnus victoriae*		V	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species.	Unlikely	2 (Bionet	None
Speckled Warbler *Chthonicola Sagittata*		V	Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	Unlikely	14 (Bionet	None
Pilotbird *Pycnoptilus floccosus*	V		Found in wet forested areas and heathland in eastern Victoria and south-eastern New South Wales. Forages on the ground, turning over leaf litter using strong legs.	Unlikely	PMST	None
Regent Honeyeater *Anthochaera phrygia*	CE	CE	Inhabits dry open forest and woodland. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Unlikely	12 (Bionet	None
Painted Honeyeater *Grantiella picta*	V	V	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	Unlikely	1 (Bionet	None
Black-chinned Honeyeater (eastern subspecies) *Melithreptus gularis gularis*		V	Mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (Eucalyptus sideroxylon), White Box (E. albens), Inland Grey Box (E. microcarpa), Yellow Box (E. melliodora), Blakely's Red Gum (E. blakelyi) and Forest Red Gum (E. tereticornis).	Unlikely	6 (Bionet	None

Species	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
Varied Sittella *Daphoenositta chrysoptera*		V	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Unlikely	11 (Bionet	None
Dusky Woodswallow *Artamus cyanopterus cyanopterus*		V	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris.	Unlikely	16 (Bionet	None
Scarlet Robin *Petroica boodang*		V	Lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	Unlikely	3 (Bionet)	None
Diamond Firetail *Stagonopleura guttata*		V	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	Unlikely	1(Bionet)	None
REPTILES						
Striped Legless Lizard *Delma impar*	V	V	Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland.	Unlikely	PMST	None
Broad-headed Snake *Hoplocephalus bungaroides*	V	E	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.	Unlikely	PMST	None
AMPHIBIANS						
Giant Burrowing Frog *Heleioporus australiacus*	V	V	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	Unlikely	3 (Bionet)	None
Red-crowned Toadlet *Pseudophryne australis*		V	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	Unlikely	8 (Bionet)	None
Stuttering Frog *Mixophyes balbus*	V	E	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	Unlikely	PMST	None
Booroolong Frog *Litoria booroolongenis*	E	E	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses.	Unlikely	PMST	None

Species	Status		Primary habitat requirements	Likelihood of Occurrence	Number of records	Assessment required
	EPBC Act	BC Act				
Green and Golden Bell Frog *Litoria aurea*	V	E	Inhabits a variety of environments, including disturbed sites, ephemeral ponds, wetlands, marshes, dams and stream-sides, particularly those that contain one or more of the following aquatic plants: bullrush (*Typha* spp.), spikerush (*Eleocharis* spp.), *Juncus kraussii, Schoenoplectus littoralis* and *Sporobolus virginicus.*	Unlikely	PMST	None
FISH						
Macquarie Perch *Macquaria australasica*	E	E	Endemic to the southern tributaries of the Murray-Darling River System, and is also found in the Hawkesbury-Nepean and Shoalhaven river systems in the eastern drainage in New South Wales. Prefers clear water and deep, rocky holes with lots of cover.	Unlikely	PMST	None
Australian Grayling *Prototroctes maraena*	V	V	Spawning occurs in the lower freshwater reaches of rivers. Larvae drift/disperse into marine waters before migrating back into freshwaters; individuals then remain within freshwater habitats for the remainder of their lives. During freshwater phase of the life-cycle, inhabit both large rivers and smaller streams, and in relatively undisturbed/highly disturbed catchments.	Unlikely	PMST	None

Appendix C: Tree classification and removal

Trees to be removed

Site #	Tree ID	Chainage	Offset from guardrail (m)	Status	Species	DBH (cm)	Tree Size Category	Hollow-bearing	Action
3	1	20	8	Alive	Turpentine	10	Small		Removal
3	2	105	20	Alive	Round-leaved Gum	30	Medium		Removal
3	3	115	15	Alive	Round-leaved Gum	80	Large	No (nest)	Removal
3	4	+ 4 (140)	15	Alive	Round-leaved Gum	80	Large	Yes	Removal
4	5	10	10	Alive	Round-leaved Gum	80	Large		Removal
4	6	21	4	Alive	Round-leaved Gum	30	Medium		Removal
4	7	45	4	Alive	Round-leaved Gum	80	Large		Removal
4	8	45	10	Alive	Round-leaved Gum	80	Large		Removal
4	9	47	11	Alive	Round-leaved Gum	80	Large		Removal
4	10	72	8	Alive	Round-leaved Gum	80	Large		Removal
5	11	55	5	Alive	Round-leaved Gum	5	Small		Removal
5	12	62	5	Alive	Round-leaved Gum	30	Medium		Removal
5	13	65	12	Alive	Round-leaved Gum	25	Medium		Removal
6	14	-16	12	Alive	Round-leaved Gum	30	Medium		Removal
6	15	-13	5	Alive	Round-leaved Gum	45	Medium		Removal
6	16	-14	12	Alive	Round-leaved Gum	30	Medium		Removal
6	17	-12	13	Alive	Round-leaved Gum	30	Medium		Removal
7	18	-10	8	Alive	Gosford Wattle	5	Small		Removal
7	19	2	5	Alive	Round-leaved Gum	30	Medium		Removal
7	20	2	7	Alive	Round-leaved Gum	30	Medium		Removal
7	21	45	10	Alive	Round-leaved Gum	80	Large	Yes	Removal

Site #	Tree ID	Chainage	Offset from guardrail (m)	Status	Species	DBH (cm)	Tree Size Category	Hollow-bearing	Action
7	22	65	3	Alive	Rough-barked Apple	10	Small		Removal
7	23	72	2	Alive	Round-leaved Gum	10	Small		Removal
8	24	8	3	Alive	Round-leaved Gum	50	Large		Removal
8	25	11	5	Alive	Round-leaved Gum	30	Medium		Removal
8	26	13	6	Alive	Round-leaved Gum	50	Large		Removal
8	27	18	6	Alive	Round-leaved Gum	50	Large		Removal
8	28	48	3	Alive	Round-leaved Gum	50	Large		Removal
8	29	47	4	Alive	Rough-barked Apple	15	Small		Removal
8	30	49	6	Alive	Gosford Wattle	5	Small		Removal
8	31	51	8	Alive	Turpentine	30	Medium		Removal
8	32	54	4	Alive	Grey Gum	60	Large		Removal
8	33	68	2	Alive	Gosford Wattle	5	Small		Removal
8	34	71	2	Alive	Rough-barked Apple	10	Small		Removal
8	35	76	3	Alive	Smooth-barked Apple	35	Medium		Removal
8	36	81	3	Alive	Rough-barked Apple	30	Medium		Removal
9	37	5	9	Alive	Turpentine	50	Large		Removal
9	38	17	10	Alive	Round-leaved Gum	80	Large		Removal
9	39	9	4	Alive	Round-leaved Gum	80	Large		Removal
10	40	-3	8	Alive	Round-leaved Gum	10	Small		Removal
10	41	22	4	Alive	Rough-barked Apple	20	Medium		Removal
10	42	40	10	Alive	Round-leaved Gum	80	Large		Removal
10	43	48	4	Alive	Round-leaved Gum	5	Small		Removal
10	44	60	6	Alive	Round-leaved Gum	60	Large		Removal
11	45	-8	8	Alive	Round-leaved Gum	30	Medium		Removal
11	46	-7	2	Alive	Round-leaved Gum	7	Small		Removal
11	47	17	7	Alive	Rough-barked Apple	30	Medium		Removal

Site #	Tree ID	Chainage	Offset from guardrail (m)	Status	Species	DBH (cm)	Tree Size Category	Hollow-bearing	Action
11	48	18	6	Alive	Round-leaved Gum	70	Large		Removal
11	49	34	7	Alive	Round-leaved Gum	80	Large		Removal
11	50	39	4	Alive	Rough-barked Apple	30	Medium		Removal
11	51	+ 1	8	Alive	Forest Oak	20	Medium		Removal
11	52	+ 1	5	Alive	Red Ash	5	Small		Removal
11	53	+ 8	2	Alive	Red Ash	5	Small		Removal
11	54	-8	6	Alive	Round-leaved Gum	5	Small		Removal
11	55	-5	9	Alive	Ironbark	50	Large	Yes	Removal
11	56	-2	5	Alive	Coachwood	20	Medium		Removal
11	57	2	5	Alive	Coachwood	25	Medium		Removal
11	58	7	6	Alive	Rough-barked Apple	23	Medium		Removal
11	59	9	6	Alive	Round-leaved Gum	40	Medium		Removal
11	60	12	8	Alive	Rough-barked Apple	25	Medium		Removal
13	61	24	10	Alive	Stringybark	75	Large		Removal
13	62	25	8	Alive	Round-leaved Gum	60	Large	Yes	Removal
13	63	29	8	Alive	Stringybark	80	Large		Removal
13	64	31	7	Alive	Round-leaved Gum	50	Large	Yes	Removal
13	65	35	8	Alive	Stringybark	40	Medium		Removal
13	66	37	9	Alive	Round-leaved Gum	35	Medium		Removal
13	67	41	6	Alive	Round-leaved Gum	50	Large	Yes	Removal
13	68	45	10	Alive	Round-leaved Gum	50	Large	Yes	Removal
13	69	47	5	Alive	Rough-barked Apple	25	Medium		Removal
13	70	48	5	Alive	Rough-barked Apple	20	Medium		Removal
13	71	49	5	Alive	Rough-barked Apple	20	Medium		Removal
13	72	56	5	Alive	Round-leaved Gum	40	Medium		Removal
13	73	56	5	Alive	Round-leaved Gum	40	Medium		Removal

Site #	Tree ID	Chainage	Offset from guardrail (m)	Status	Species	DBH (cm)	Tree Size Category	Hollow-bearing	Action
13	74	58	7	Alive	Round-leaved Gum	50	Large		Removal
13	75	61	6	Alive	Round-leaved Gum	5	Small		Removal
13	76	64	4	Alive	Gosford Wattle	5	Small		Removal
13	77	64	4	Alive	Rough-barked Apple	25	Medium		Removal
13	78	67	3	Alive	Gosford Wattle	5	Small		Removal
13	79	69	7	Alive	Round-leaved Gum	70	Large		Removal
13	80	73	4	Alive	Rough-barked Apple	20	Medium		Removal
13	81	83	2	Alive	Blue-leaved Stringybark	60	Large	Yes	Removal
13	82	88	8	Alive	Rough-barked Apple	25	Medium		Removal
13	83	89	7	Alive	Round-leaved Gum	35	Medium		Removal
13	84	101	3	Alive	Rough-barked Apple	5	Small		Removal
13	85	102	2	Alive	Round-leaved Gum	60	Large		Removal
13	86	117	4	Alive	Round-leaved Gum	90	Large	Yes	Removal
13	87	126	2	Alive	Rough-barked Apple	5	Small		Removal
13	88	130	7	Alive	Rough-barked Apple	25	Medium		Removal
13	89	131	3	Alive	Rough-barked Apple	10	Small		Removal
13	90	132	6	Alive	Rough-barked Apple	30	Medium		Removal
13	91	134	3	Alive	Rough-barked Apple	10	Small		Removal
13	92	141	4	Alive	Rough-barked Apple	5	Small		Removal
13	93	142	8	Alive	Gosford Wattle	20	Medium		Removal
13	94	146	5	Alive	Rough-barked Apple	5	Small		Removal

Hollow-bearing Trees

					Number of tree hollows per entrance size			
Section	**Tree ID**	**Chainage**	**Offset from guardrail (m)**	**DBH (cm)**	**4-10**	**10-15**	**15-30**	**>30**
3	4	140 (plus 4)	15	80			4	
7	21	45	10	90		4		
11	55	-5	9	50			1	
13	62	25	8	60			1	
13	64	31	7	50	1			
13	67	41	6	50	1			
13	68	45	10	50			1	
13	81	117	4	90		3		
13	86	83	2	60				1

Appendix D: Photographic record of area investigated

 	Characteristics of roadside vegetation present at Slope #3.

	Character of road corridor requiring remediation, with cracks in road surface visible.
	Characteristics of vegetation present upslope of the study area.

	Character of vegetation and study area, looking towards Slope #4.
	Culverts present at proposal site. No fauna was found in these during the field investigation.

	Vegetated character of the downslope remediation areas, where the slope failures have occurred. Note extent of clearing post-fire adjacent to guardrail.
	Cracks in road surface caused by slope failure present in study area.

	Character of Terrys Creek and surrounding vegetation, approximately 20 m downslope of Putty Road.
	Character of vegetation present and slope at site #13.

Appendix E: Flora recorded

Key

* - introduced species

FAMILY	Scientific Name	Common Name
FILICOPSIDA - FERNS		
Cyatheaceae	*Cyathea australis*	Harsh Tree Fern
Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern
	Pteridium esculentum	Bracken
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern
MAGNOLIOPSIDA – FLOWERING PLANTS		
MAGNOLIIDAE - DICOTYLEDONS		
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax
Asteraceae	*Aster subulatus**	Bushy Starwort
	*Cirsium vulgare**	Scotch Thistle
	*Conyza sp**	Fleabane
	Sigesbeckia orientalis	Indian Weed
Bignoniaceae	*Pandorea pandorana*	Wonga-Wonga Vine
Cannabaceae	*Trema tomentosa*	Native Peach
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak
Convolvulaceae	*Dichondra repens*	Kidney Weed
Cunoniaceae	*Ceratopetalum apetalum*	Coachwood
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower
Elaeocarpaceae	*Elaeocarpus reticulatis*	Blueberry Ash
Fabaceae: Faboideae	*Kennedia rubicunda*	Dusky Coral Pea
	*Robinia pseudoacacia**	Black Locust
	*Vicia sp**	Vetch
Fabaceae: Mimosoideae	*Acacia parvipinnula*	Silver-stemmed Wattle
	Acacia prominens	Gosford Wattle
Geraniaceae	*Geranium homeanum*	
Malvaceae	*Adcalva fraseri*	Brush Kurrajong
Moraceae	*Ficus coronata*	Sandpaper Fig
	Maclura cochinchinensis	Cockspur Thorn
Myrtaceae	*Angophora costata*	Smooth-barked Apple
	Angophora floribunda	Rough-barked Apple
	Backhousia myrtifolia	Grey Myrtle
	Eucalyptus agglomerata	Blue-leaved Stringybark
	Eucalyptus deanei	Round-leaved Gum
	Syncarpia glomulifera	Turpentine
Oleaceae	*Ligustrum sinense**	Small-leaf Privet
Oxalidaceae	*Oxalis sp*	
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush
Phytolaccaceae	*Phytolacca octandra**	Ink Weed
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Polygonaceae	*Rumex sagittatus**	Turkey Rhubarb
Rhamnaceae	*Alphitonia excelsa*	Red Ash
Rosaceae	*Rubus moluccanus*	Molucca Bramble
	*Rubus ulmifolius** (*fruiticosus* spp. agg.)	Blackberry

FAMILY	Scientific Name	Common Name
Rutaceae	*Melicope micrococca*	Hairy-leaved Doughwood,
Solanaceae	*Solanum nigrum**	Blackberry Nightshade
Verbenaceae	*Verbena bonariensis**	Purple-top
Violaceae	*Viola hederacea*	Native Violet
Vitaceae	*Cayratia clematidea*	Slender Grape
	Cissus antarctica	Kangaroo Vine
	Cissus hypoglauca	Water Vive
LILIIDAE - MONOCOTYLEDONS		
Asphodelaceae	*Geitonoplesium cymosum*	Scrambling Lily
Commelinaceae	*Tradescantia fluminense**	Trad
Poaceae	*Austrostipa verticillata*	Slender Bamboo Grass
	Oplismenus imbecillis	Basket Grass
	*Panicum maximum**	Guinea Grass

Appendix F: Assessment of Significance

No threatened plants, animals or ecological communities were recorded within the proposed slope remediation areas surveyed. Nine hollow-bearing trees are present, these supporting a range of entrance diameters. Hollow-dependent fauna has been previously recorded in the study region, though it is highly likely the impact of the Black Summer Wildfire has had a significant impact on the presence of these species and their prey. Regardless, as targeted surveys for these animals were not undertaken, a precautionary approach has been adopted.

The potential impact associated with the proposal on hollow-dependent fauna and their local populations, is considered with reference to the assessment criteria provided under Section 7.3 of the BC Act (these commonly referred to as the 5-part test). These criteria are designed to determine whether there is likely to be a significant effect on these threatened species, or their habitats, and consequently whether a Species Impact Statement [or Biodiversity Development Assessment Report] is required.

In line with the guidelines provided by DPE on the Assessment of Significance (DECC 2007), due to the similarity of their habitat requirements, an assessment has been undertaken on hollow-dependent fauna as opposed to assessments being carried out on individual species.

The five-part test – Hollow-dependent fauna

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Hollow-bearing trees that support a range of hollows with various entrance diameters were observed adjacent to, beyond and surrounding the nine slopes surveyed. The hollow-bearing trees present on the nine slopes are not unique to the project areas, similar plants being seen in the study area. The loss of the nine hollow-bearing plants, plus some insect attracting vegetation, would not affect the viability of any local populations of hollow-dependent fauna, such that they would be placed at risk of extinction.

(b) *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity*:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable to fauna.

(c) *in relation to the habitat of a threatened species or ecological community*:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,

The proposed slope stabilisation work would result in the clearing of 94 trees, 9 of which are hollow-bearing, and a total of 0.9 ha of exotic and native vegetation.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity

The proposed slope stabilisation work conducted at nine sites would not fragment habitat. Extensive habitat will be retained within, and beyond, the study area.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The vegetation to be affected is not considered important to the long-term survival of hollow-dependent fauna. In proximity to the nine slopes surveyed, including immediately adjacent to a number of these, hollow-bearing trees and insect attracting plants were observed.

(d) *whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),*

No declared AOBV would be directly or indirectly affected by the proposal. The subject site is not listed as a declared AOBV under Part 3 of the BC Regulation 2017.

(e) *whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

Currently 36 KTP for mainland NSW are listed under Schedule 4 of the BC Act. Of these, 'clearing of native vegetation', loss of hollow-bearing trees and removal of dead wood and dead trees would be applicable to the proposal. While it is acknowledged that the proposal will result in clearing of 94 trees, 9 of which are hollow-bearing, and a total of 0.9 ha of exotic and native vegetation, it is not considered that this clearance will significantly contribute to these KTP such that the lifecycle requirements of hollow-dependent fauna will be compromised.

Expected impact on the Hollow-dependent fauna

The proposal would not disturb, remove, modify or fragment any habitats critical to the lifecycle requirements of any species of hollow-dependent fauna. It is considered that the proposal would not significantly affect the potential occurrence of any hollow-dependent species, or areas of their habitat. As such, the preparation of a Species Impact Statement [or Biodiversity Development Assessment Report] that further considers the impact of the proposed slope remediation works on hollow-dependent species is not required.

NSW GOVERNMENT

Appendix D: Database searches

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : PR Terrys Creek 2

Client Service ID : 774468

bd infrastructure

Level 10 66 Clarence Street
Sydney New South Wales 2000

Attention: Stuart Hill

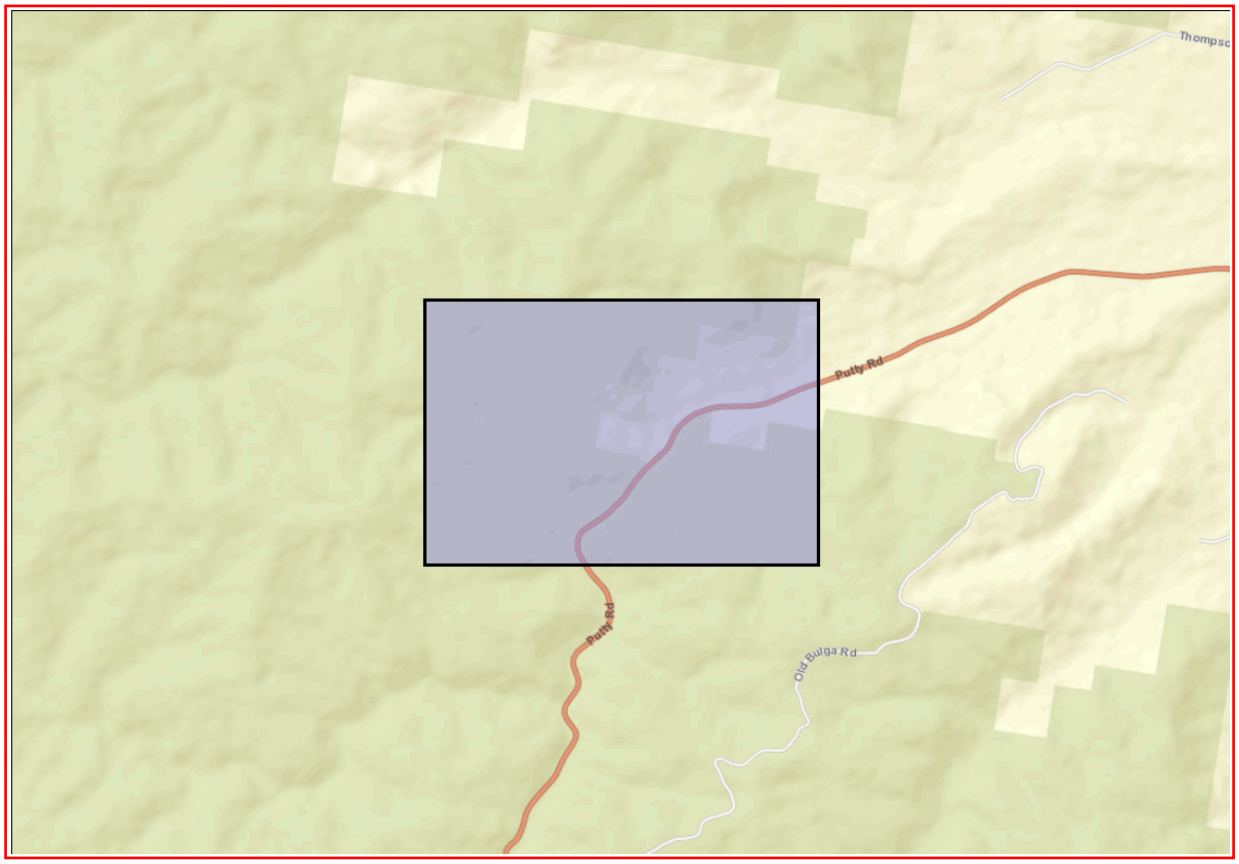
Email: stuart.hill@bdinfrastructure.com

Date: 20 April 2023

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -32.7144, 150.933 - Lat, Long To : -32.6964, 150.964, conducted by Stuart Hill on 20 April 2023.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Level 6, 10 Valentine Ave, Parramatta 2150
Locked Bag 5020 Parramatta NSW 2124
Tel: (02) 9585 6345

ABN 34 945 244 274
Email: ahims@environment.nsw.gov.au
Web: www.heritage.nsw.gov.au

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : PR Terrys Ck 1

Client Service ID : 774466

bd infrastructure

Level 10 66 Clarence Street
Sydney New South Wales 2000

Attention: Stuart Hill

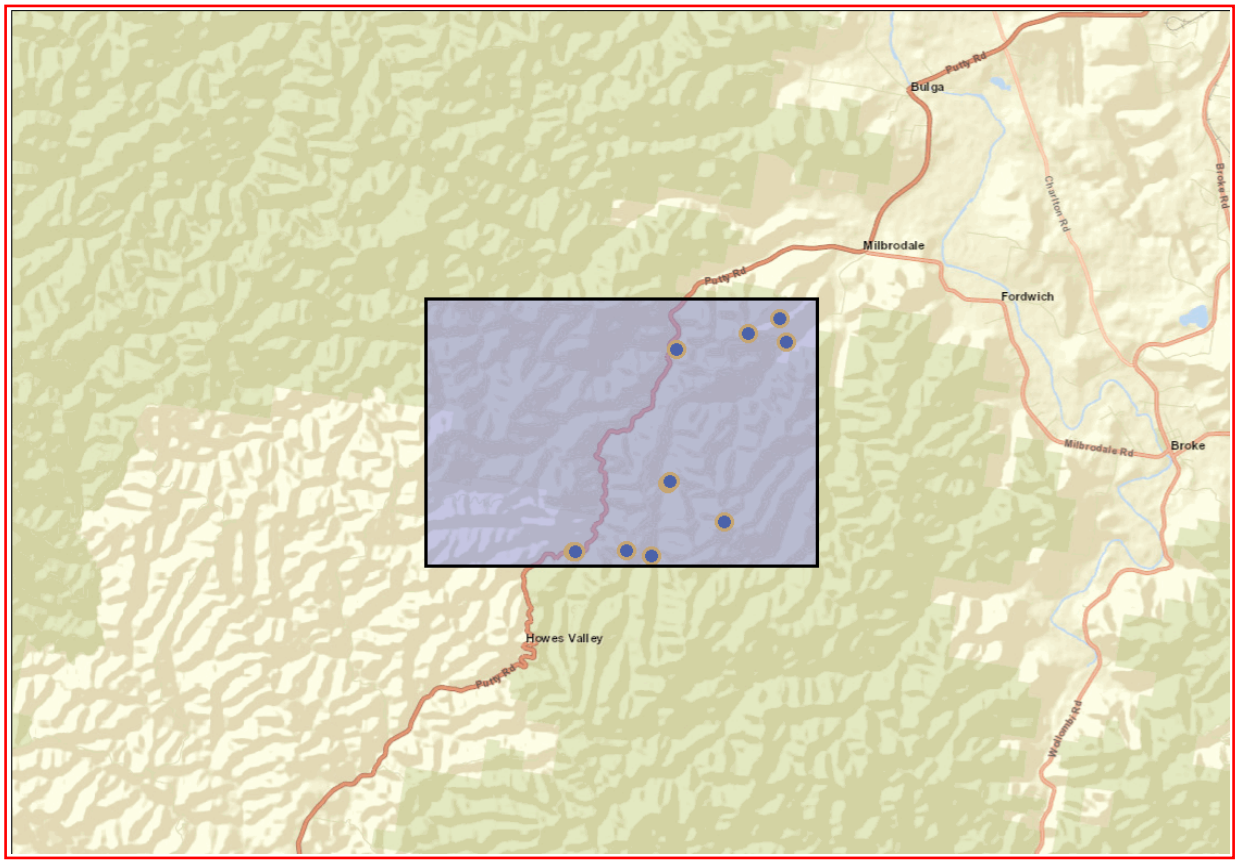
Email: stuart.hill@bdinfrastructure.com

Date: 20 April 2023

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -32.7809, 150.8675 - Lat, Long To : -32.7087, 150.9913, conducted by Stuart Hill on 20 April 2023.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

11	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

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- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
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- This search can form part of your due diligence and remains valid for 12 months.

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Web: www.heritage.nsw.gov.au

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : PR Terrys Ck 1

Client Service ID : 774466

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-5-0209	Darkey Creek; SWA	GDA	56	304663	6371465	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	
	Contact	**Recorders**	I Webb,Ms.Collette Douchkov					**Permits**		
37-5-0151	Darkey Creek;	AGD	56	304600	6371300	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	Warren Bluff					**Permits**		
38-2-0072	Bulga Point	AGD	56	309600	6377940	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	2418
	Contact	**Recorders**	Mr.Matthew Barber					**Permits**		
37-5-0936	PARSONS CK TWO BIG SWA	GDA	56	307597	6377620	Closed site	Valid	Art (Pigment or Engraved) : -		
	Contact	**Recorders**	Ms.Collette Douchkov					**Permits**		
37-5-0612	Old Bulga Road	GDA	56	306230	6371527	Open site	Valid	Grinding Groove : 2		
	Contact	**Recorders**	Mr.Richard Harris					**Permits**		
37-5-0931	BULGA CK CORNER SWA	GDA	56	307413	6373573	Closed site	Valid	Art (Pigment or Engraved) : -		
	Contact	**Recorders**	Ms.Collette Douchkov					**Permits**		
37-5-0785	Partridge Creek Branch	GDA	56	309106	6372474	Open site	Valid	Grinding Groove : 8		
	Contact	**Recorders**	Mr.Shayne Forty					**Permits**		
37-5-0021	Milbrodale;Bundabah Station;	AGD	56	310740	6377706	Open site	Valid	Modified Tree (Carved or Scarred) : -, Ceremonial Ring (Stone or Earth) : -	Bora/Ceremonial,Carved Tree	
	Contact	**Recorders**	ASRSYS					**Permits**		
37-5-0154	Yowie Man;Bulga Creek;	GDA	56	306986	6371381	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	1286
	Contact	**Recorders**	Doctor.Jo McDonald,Ms.Collette Douchkov					**Permits**		
37-5-0929	BULGA CK WATERLOGGED SWA	GDA	56	307481	6373637	Closed site	Valid	Art (Pigment or Engraved) : -		
	Contact	**Recorders**	Ms.Collette Douchkov					**Permits**		
37-5-0935	BULGA TRIBUTARY MAN CAMP SWA	GDA	56	310634	6378604	Closed site	Valid	Art (Pigment or Engraved) : -		
	Contact	**Recorders**	Ms.Collette Douchkov					**Permits**		

**** 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 20/04/2023 for Stuart Hill for the following area at Lat, Long From : -32.7809, 150.8675 - Lat, Long To : -32.7087, 150.9913. Number of Aboriginal sites and Aboriginal objects found is 11

Appendix E: Aboriginal cultural hertage advice

5 December 2022

Michael Coyte
Project manager
Transport for NSW

Dear Michael,

Preliminary assessment results for Terrys Creek MR503 Putty Road based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (the procedure).

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

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area.
- The study area does contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Transport for NSW procedure, however, the cultural heritage potential of the study area appears to be reduced due to past disturbance in the form of the construction of Putty Road.

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

If the scope of your project changes you must contact me and your regional Environment Officer Kai Neville to reassess any potential impacts on Aboriginal cultural heritage.

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

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

Transport for NSW

T 0428 683 845 | **E** lee.davison@transport.nsw.gov.au

Yours sincerely

Lee Davison

Lee Davison
Aboriginal Community and Heritage Partner

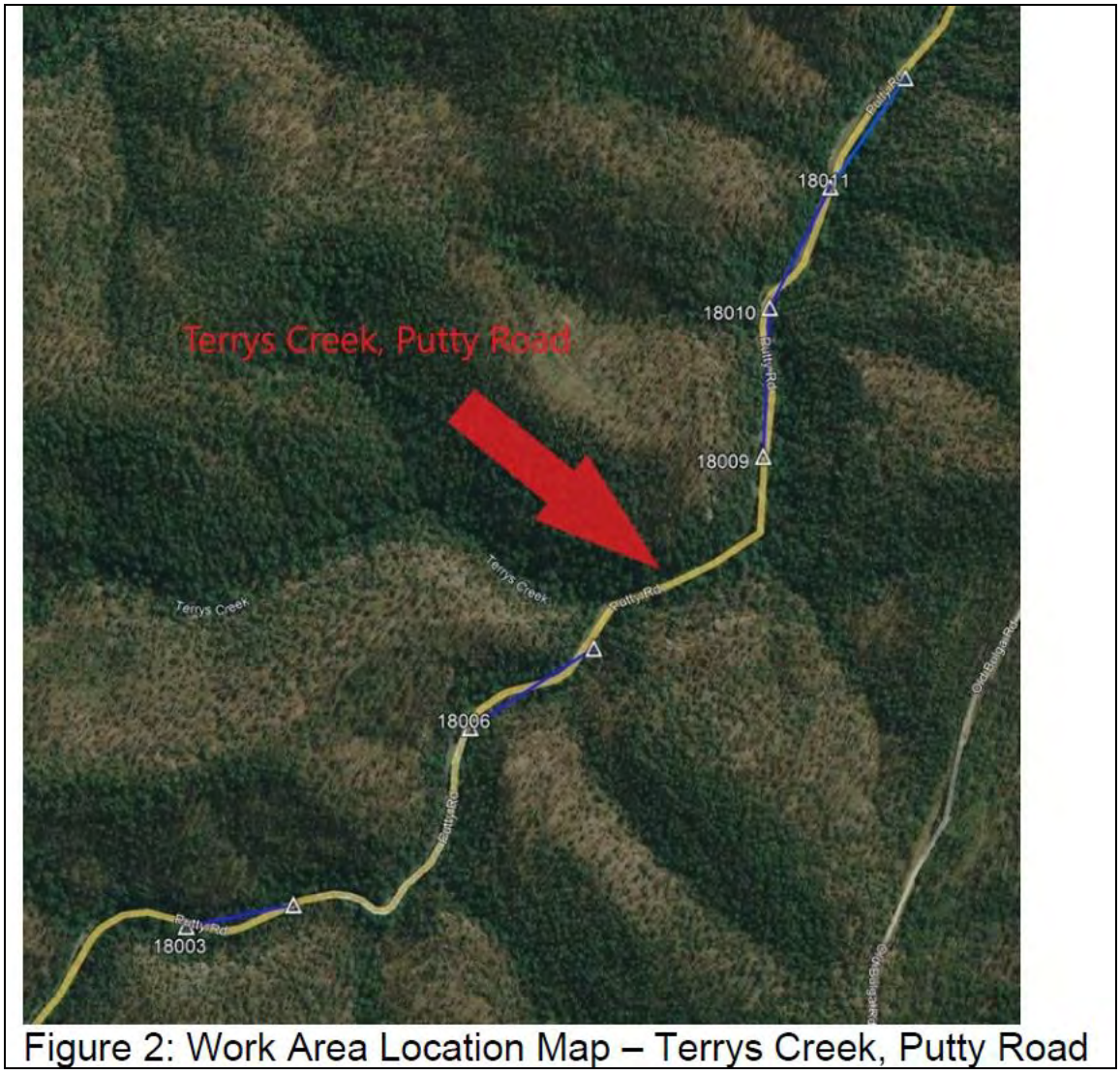


Figure 2: Work Area Location Map – Terrys Creek, Putty Road

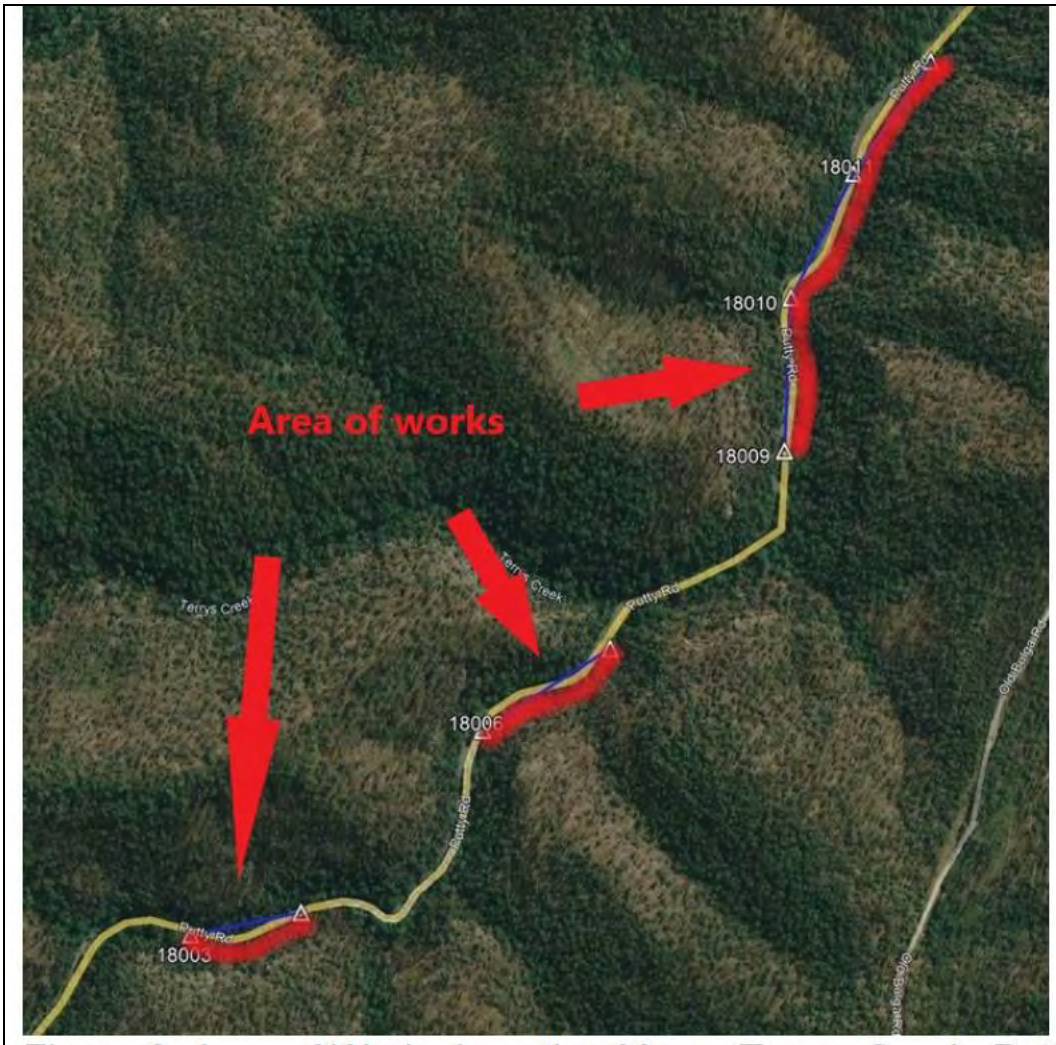


Figure 3: Area of Works Location Map – Terrys Creek, Putty Road

Appendix F: NPWS correspondence

30 March 2023

Phil Bryant
Manager, Wollemi - Yengo Area
National Parks and Wildlife Service

Via email: npws.wollemiyengo@environment.nsw.gov.au

Consultation regarding proposed slope remediation, Putty Road, Terrys Creek

Transport for NSW (Transport) is proposing to carry out slope remediation works along the Putty Road near Terrys Creek, Howes Valley (the proposal). The remediation works are needed to address slope failures adjacent to the southbound lane which were the result of a storm event in July 2023 . The subject section of Putty Road is currently restricted to one lane with 24/7 traffic control in place on the southbound lane until remediation works are complete.

Under section 2.15 of State Environmental Planning Policy (Transport and Infrastructure) 2021, Transport is required to consult the National Parks and Wildlife Service (NPWS) in relation to works proposed on and land adjacent to reserved land under the *National Parks and Wildlife Act 1974*.

The proposal sites are located immediately adjacent to both the Wollemi and Yengo National Parks however it is noted there are various small sections of the proposal area which may be located within the NPWS Estate according to the NSW Government database (Refer Figures 1-5). Considering initial investigation (Figures 1-5) indicate proposal sites encroach on Wollemi and Yengo National Park boundaries, Transport for NSW engaged an external contractor to reconfirming.

Referring to Attachment A, Transport for NSW has undertaken further site-based survey investigation which reconfirms the requirement to discuss the proposed works and information the project has on known boundaries. External surveying organisation engaged to confirm boundaries have confirmed there is nil historical data on Putty Road to accurately plot the boundaries on Putty Road. Further discussions with NPWS will therefore be needed regarding requirements in relation to these aspects.

A description of the proposed slope remediation works is provided in Attachment B to this letter.

Any comments provided by NPWS will be considered in the Review of Environmental Factors (REF) that is currently being prepared to address the requirements of Part 5 of the *Environmental Planning and Assessment Act 1979*.It would be appreciated if you could provide any comments on this proposal by **9 May 2023.**

Transport for NSW would be pleased to provide further information if required. In this regard I may be contacted on 0491 800 128 or by email - michael.coyte2@transport.nsw.gov.au .

Yours faithfully

Michael Coyte
Project/Contract Manager
Natural Disaster Recovery
Regional and Outer Metropolitan
Transport for NSW

M 0403 868 412
Level 6, 6 Stewart Avenue Newcastle West NSW 2302

NSW GOVERNMENT | Transport for NSW

Figure 1 – Aerial detailing sites 3, 4, 5

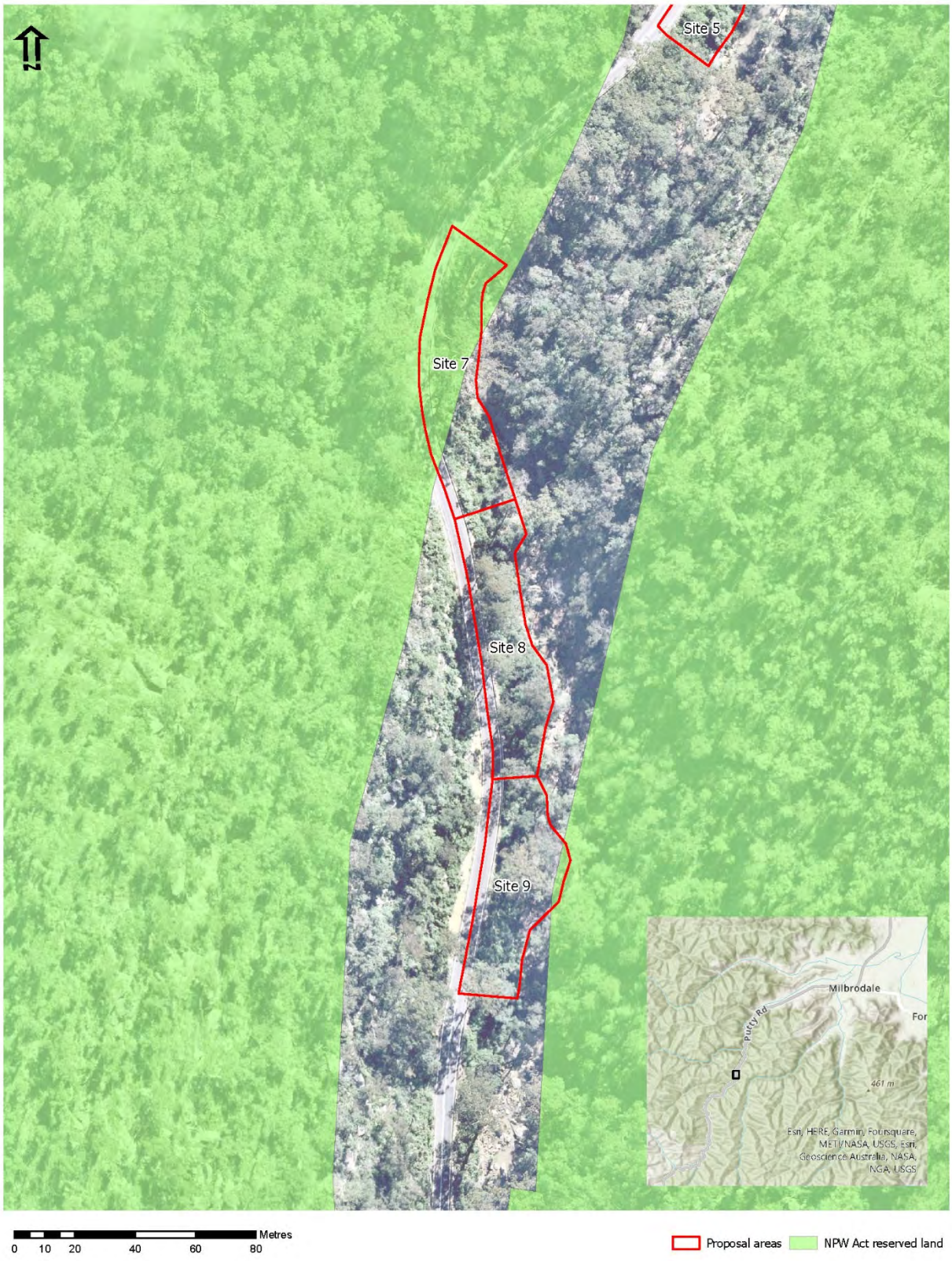


Figure 2 – Aerial detailing sites 7, 8, 9

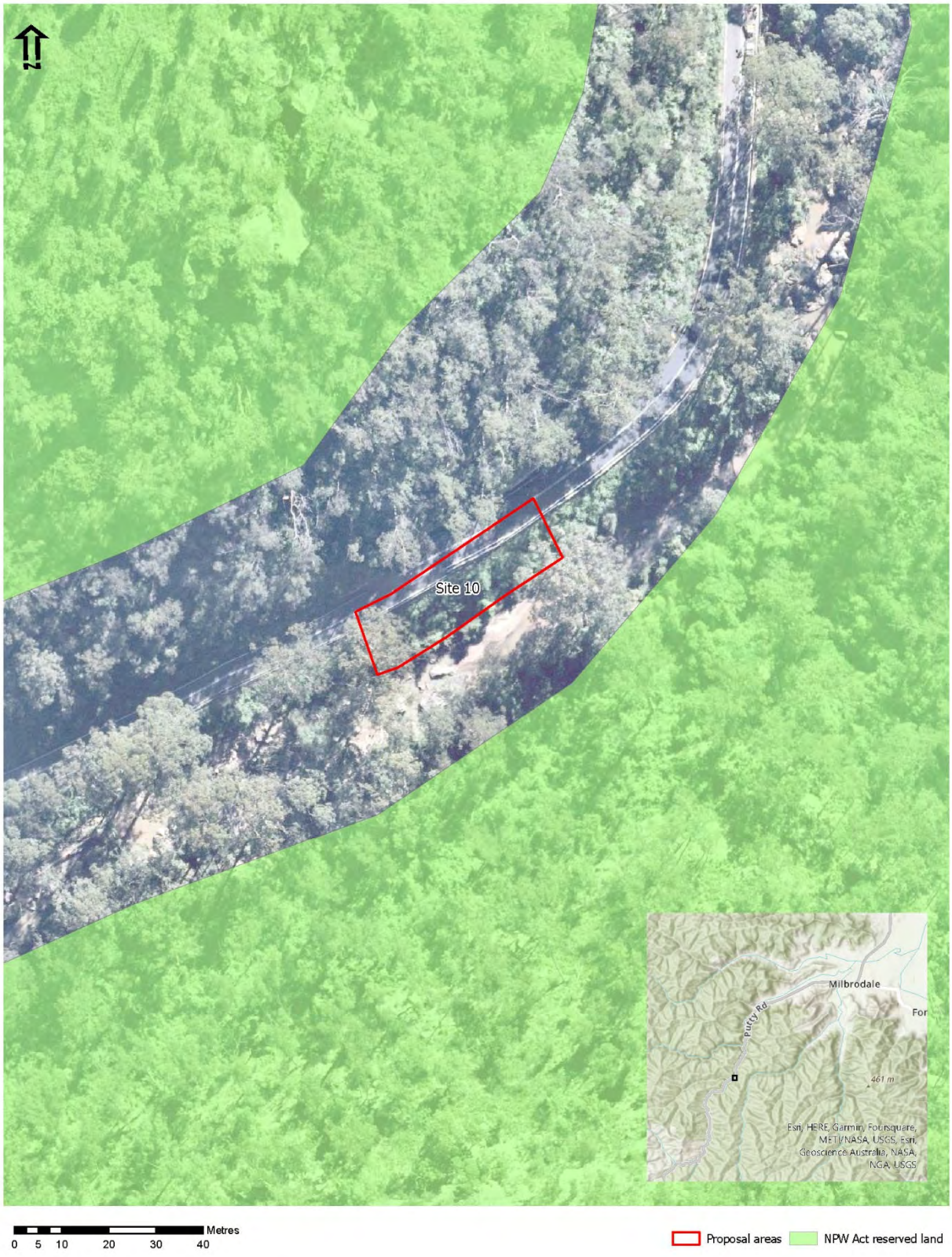


Figure 3 – Aerial detailing site 10

Figure 4 – Aerial detailing site 11

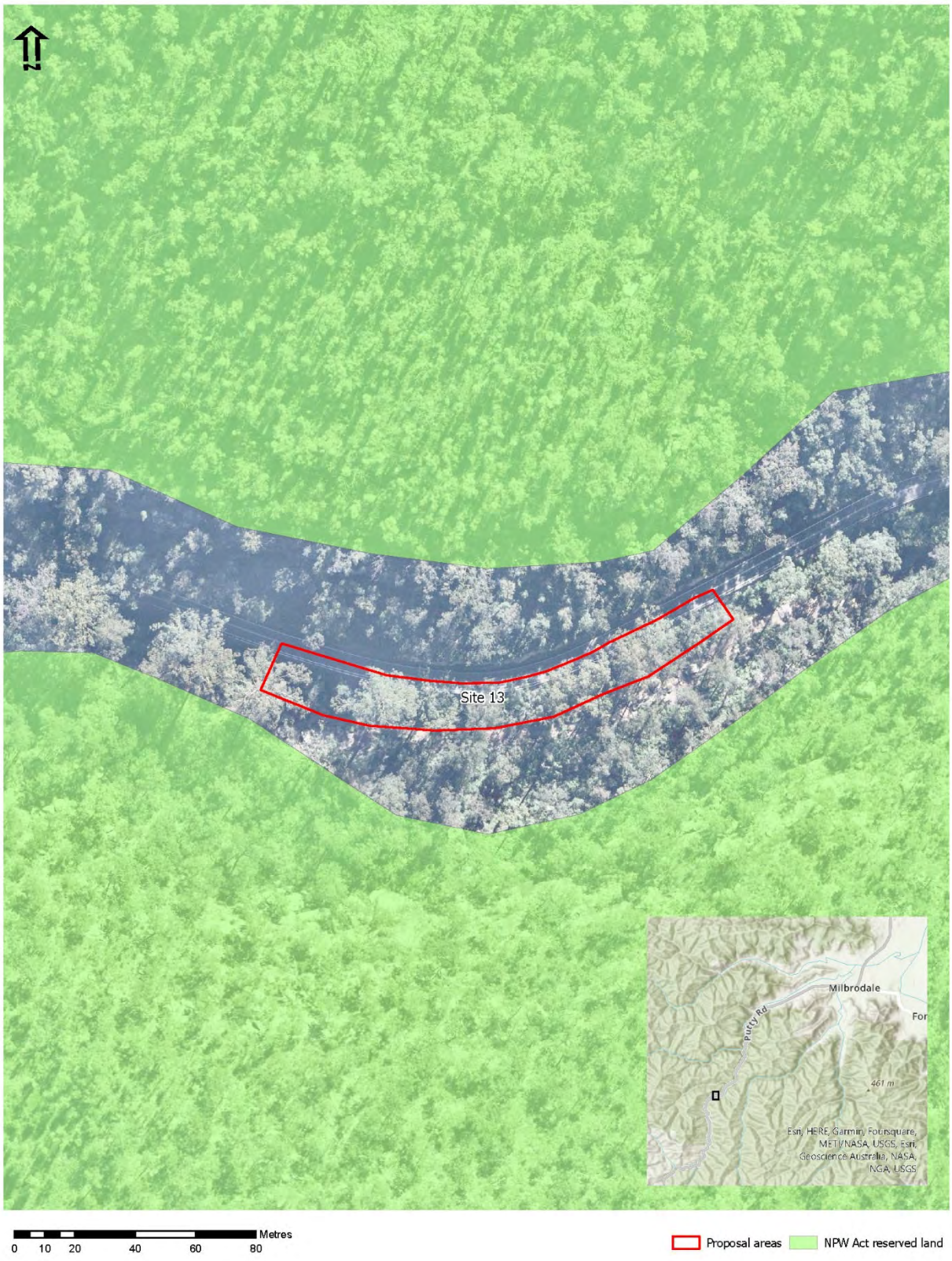


Figure 5 – Aerial detailing site 13

Michael Coyte

From: David Sullivan <d.sullivan@monteathpowys.com.au>
Sent: Friday, 3 February 2023 11:00 AM
To: Michael Coyte
Subject: RE: 220581 - Putty Road Milbrodale
Attachments: DP1205533.pdf

Michael,

I've had a really good investigation of the boundary situation on site and it's fair to say the general area doesn't have extensive survey behind it.

I'll outline all the methodology in my survey report in more detail, however I thought I'd give you a heads up with respect to what I've found, and what assumptions I've made.

In short the lot comprising the Putty Road has no survey information behind it (plan attached). The lot is a departmental plan prepared over a piece of Crown Land, which in itself also has no prior survey. To the west of the road is Crown Land (no survey). To the east is Darkey Creek, which looking through the historical parish maps only has loose survey information at best. I can coordinate the lot on the eastern side of Putty Road to the north of project area, which sits adjacent to most of the areas of topographic investigation. Using this I can then position the Putty Road parcel, however its linework originates from the state Digital Cadastral Database (DCDB), which is an approximate plot only. Most of the parish maps make reference to the road as "Road in good state of construction" with no road plan underpinning it.

On this basis I'm happy to show the plot of the boundary information on the surveys for Sites 3, 4, 5, 7, 8 and 11, with this information layered accordingly to indicate its origin being the DCDB. Heading further south for Site 10 and 13/13a, I have little confidence in the position of the DCDB parcel in this area, so I'm planning on not showing the lot information for the plots of these sites.

Given the purpose of these surveys is for providing you topographic data, the boundary information derived from our survey investigations is fit for overlay purposes.

To lock down the boundary position further would probably require a status search of the site, but I'd question whether the cost and effort associated with this would be worthwhile. In the end it may not reveal anything further from what our investigations of the site have shown.

Appreciate this is a bit of information to digest. If you have any queries give me a call.

Regards,

David Sullivan
Registered Surveyor
P (02) 4926 1388 | M 0431 376 353
E d.sullivan@monteathpowys.com.au
monteathpowys.com.au
PLANNING PROJECT MANAGEMENT SURVEYING 3D SPATIAL

DP 1205533

Registered: 24.2.2015

Title System: CROWN LAND

Purpose: CROWN LAND CONVERSION

Ref. Map: PARISH

Last Plan: ————

C.A. 173649

PLAN OF CROWN LAND

Lengths are in metres. Reduction Ratio - NTS

Sheet 1 of 1 sheets

L.G.A.: SINGLETON

LOCALITY: HOWES VALLEY

PARISH: POPPONG

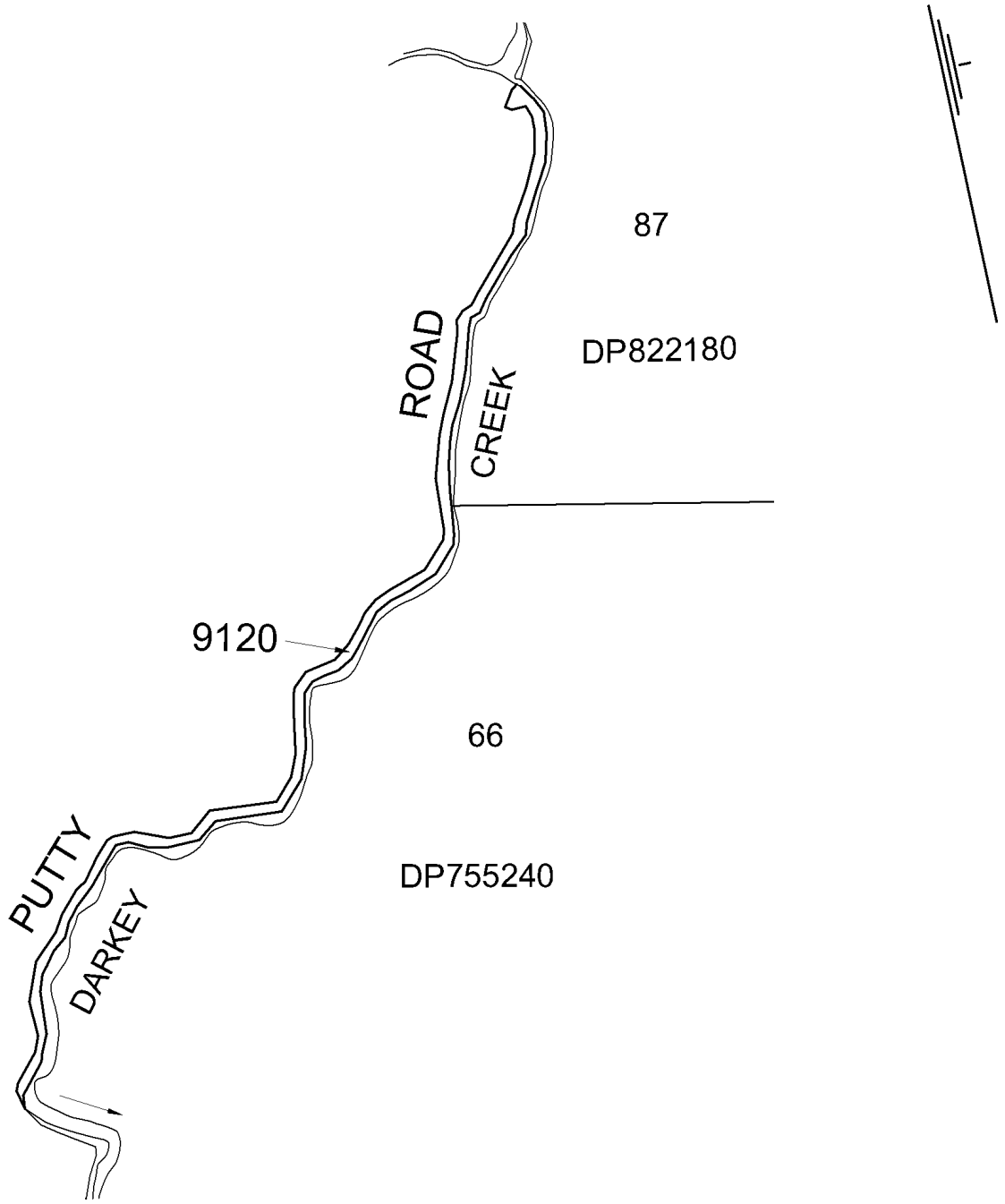
COUNTY: HUNTER (44)

THIS PLAN WAS PREPARED SOLELY TO
IDENTIFY THE LAND ABOVE
AND THE BOUNDARIES HAVE NOT BEEN
INVESTIGATED BY THE REGISTRAR GENERAL

THIS PLAN IS NOT A CURRENT PLAN IN TERMS OF
S.7A CONVEYANCING ACT 1919.

DCDB CADID 100079120

LPI Ref. : TCB60/69



AREA AND DIMENSIONS NOT AVAILABLE

N

LEGEND

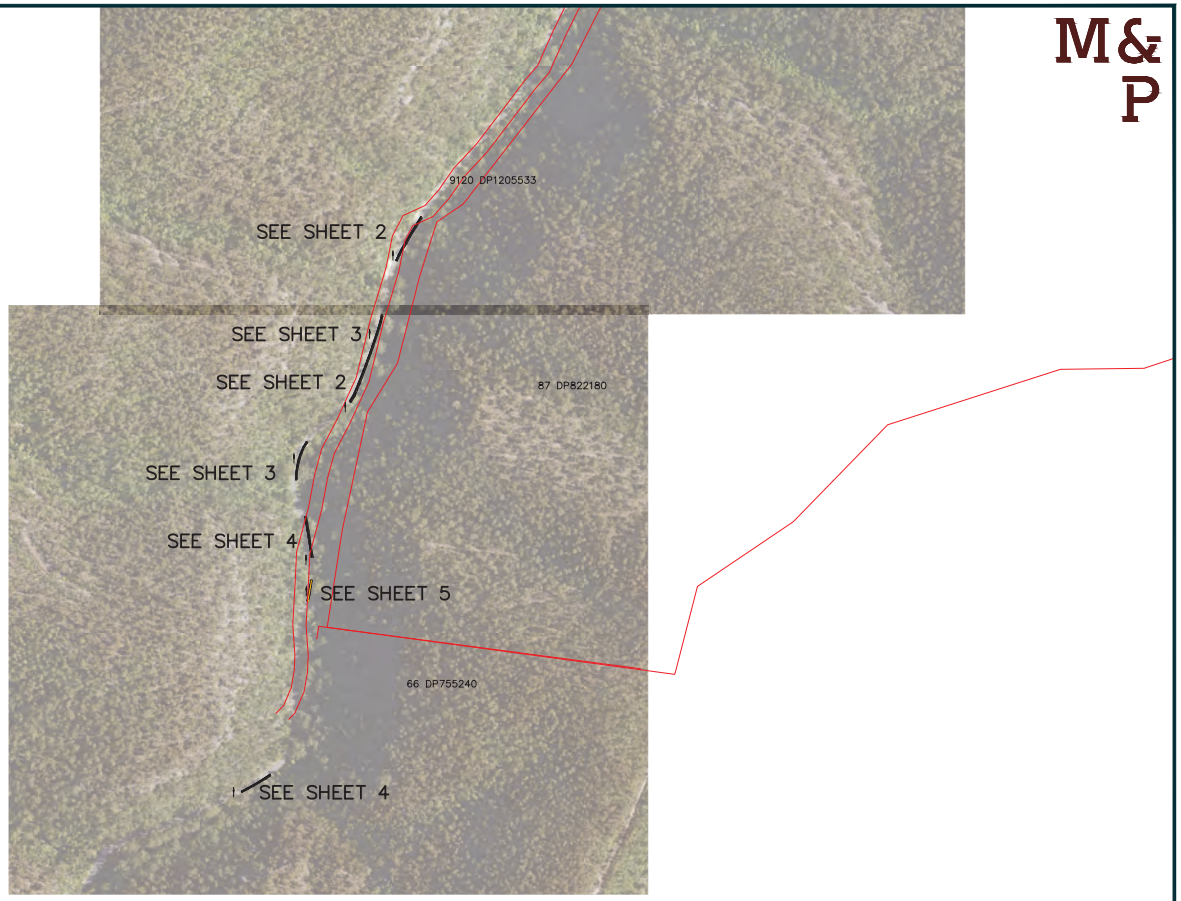
STRUCTURE
SGN SIGN POST

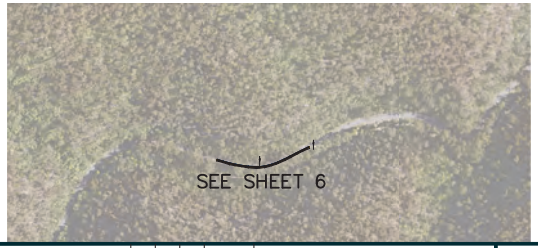
LINE TYPES

- LINE MARKING UNBROKEN
- GUARD RAIL
- EDGE OF FORMATION
- EDGE OF PAVEMENT
- NATURAL SURFACE

NOTE:

CADASTRAL FOR LOT 9120 DP 1205533 HAS BEEN SOURCED FROM THE NSW DIGITAL CADASTRAL DATABASE (DCDB) AND IS APPROXIMATE ONLY.





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REDUCTION RATIO – 1:8000 (A3)

REVISIONS						
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No	REVISION	SVY	DFT	CHK	DATE	

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P (02) 4926 1388

NEWCASTLE SYDNEY GUNNEDAH MUSWELLBROOK

Surveyed	Drafted	Checked
M&P	CK	DS

REGISTERED SURVEYOR

@A1 : 1:4000
@A3 : 1:8000

DO NOT SCALE

Original Size: A1

Client: TRANSPORT FOR NSW

Title: TERRYS CREEK NATURAL DISASTER RECOVERY
PUTTY ROAD
MILBRODALE

CAD File: 220581A_01 | Ref No: 22/0581 | Date: 15/02/2023

Sheet No. 1/6

Revision 1

REVISIONS						
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No	REVISION	SVY	DFT	CHK	DATE	

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Surveyed	Drafted	Checked
M&P	CK	DS

REGISTERED SURVEYOR

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DO NOT SCALE

Original Size: A1

Client: TRANSPORT FOR NSW

Title: TERRYS CREEK NATURAL DISASTER RECOVERY
PUTTY ROAD
MILBRODALE

CAD File: 220581A_01 | Ref No: 22/0581 | Date: 15/02/2023

Sheet No. 2/6

Revision 1

REVISIONS

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No	REVISION	SVY	DFT	CHK	DATE

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Surveyed	Drafted	Checked
M&P	CK	DS

REGISTERED SURVEYOR

@A1 : 1:100
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Original Size: A1

DO NOT SCALE

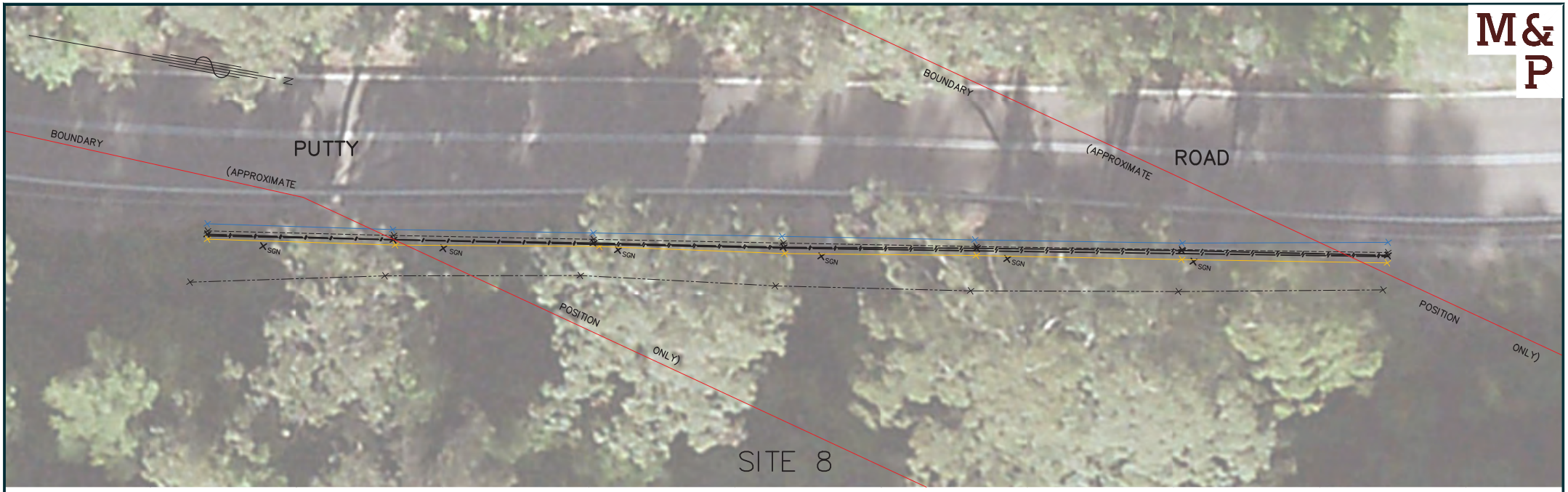
Client: TRANSPORT FOR NSW

Title: TERRYS CREEK NATURAL DISASTER RECOVERY
PUTTY ROAD
MILBRODALE

CAD File: 220581A_01 | Ref No: 22/0581 | Date: 15/02/2023

Sheet No. 3/6

Revision 1



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M&P	CK	DS

REGISTERED SURVEYOR

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DO NOT SCALE

Original Size
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Client
TRANSPORT FOR NSW

Title
TERRYS CREEK NATURAL DISASTER RECOVERY
PUTTY ROAD
MILBRODALE

CAD File: 220581A_01 | Ref No: 22/0581 | Date: 15/02/2023

Sheet No.
4/6

Revision
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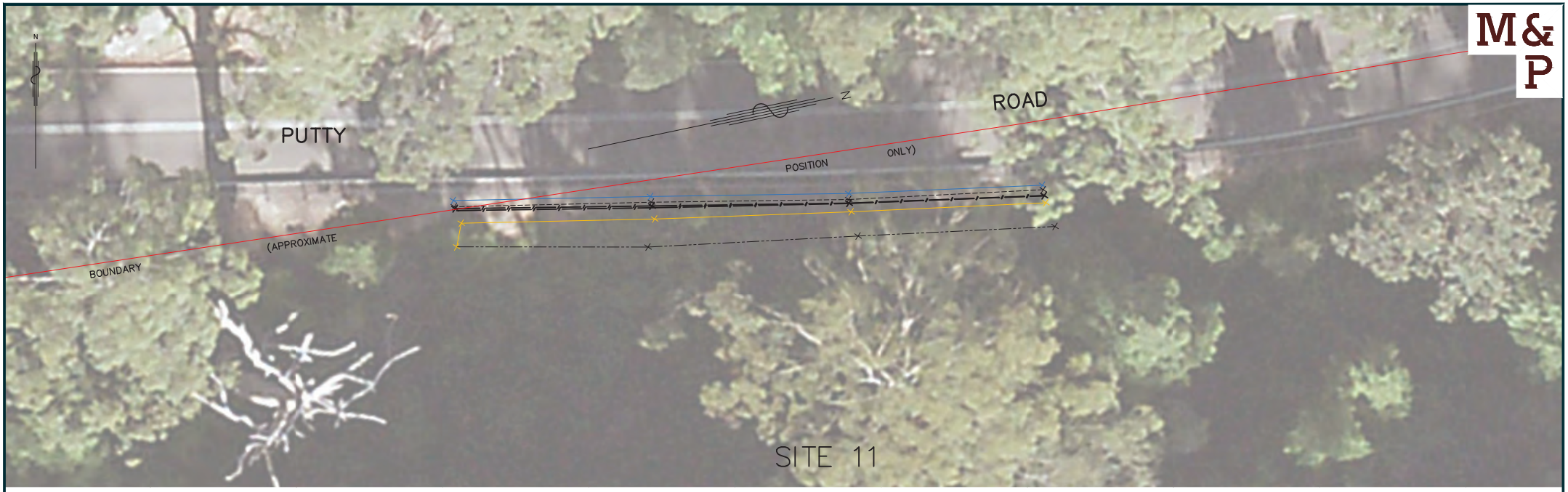

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REDUCTION RATIO – 1:200 (A3)

REVISIONS

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1	ISSUE TO CLIENT	M&P	CK	DS	16.02.23

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Surveyed	Drafted	Checked
M&P	CK	DS

REGISTERED SURVEYOR

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DO NOT SCALE

Original Size: A1

Client: TRANSPORT FOR NSW

Title: TERRYS CREEK NATURAL DISASTER RECOVERY
PUTTY ROAD
MILBRODALE

CAD File: 220581A_01 | Ref No: 22/0581 | Date: 15/02/2023

Sheet No. 5/6

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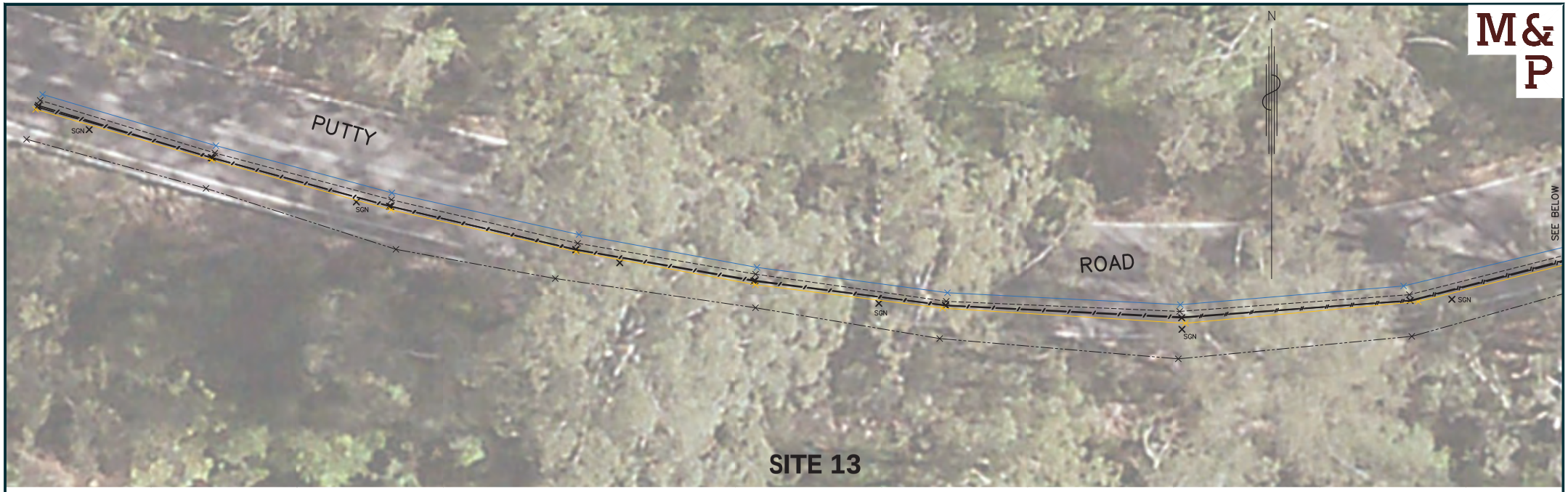

SITE 13

SITE 13A

REVISIONS						
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No	REVISION	SVY	DFT	CHK	DATE	

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M&P	CK	DS

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Client
TRANSPORT FOR NSW

Title
TERRYS CREEK NATURAL DISASTER RECOVERY
PUTTY ROAD
MILBRODALE

CAD File: 220581A_01 | Ref No: 22/0581 | Date: 15/02/2023

Sheet No.
6/6

Revision
1

Attachment B- Description of Proposed Works

The proposal includes embankment treatment using soil and rock nails to reinforce the subject slopes and establish a 2m wide road shoulder with no fines concrete backfill, and 3-5m of vertical shotcrete finish at all nine locations (Figure 1-2 below).

Road pavement resurfacing and reinstallation of guardrailing is proposed in damaged areas. Additional riprap rock may also be installed on the lower part of the embankments if conditions permit.

Key features of the proposal include:

- Proposed works are slightly off the shoulder of the existing road
- Clear minimal vegetation and remove loose materials along the embankments.
- Excavate a bench for reinforced shotcrete footing along base of proposed walls.
- Install vertical strip drains to exit below or through base of shotcrete walls to remove any hydrostatic pressure from behind the shotcrete walls.
- Place 50mm thick shotcrete blinding layer to stabilise existing slope surface for drilling.
- Drill and install soil nails.
- Install sacrificial formwork along crest for existing road shoulder and place no fines concrete to allow for widening of road shoulder.
- Install face reinforcement mesh and spray with shotcrete to form walls.
- Form widened road shoulder (to 2m wide) and crest area with associated widening of asphalt pavement to crest of wall.
- Reconstruct road pavement in sections affected by cracking a deformation within the current southbound lane.
- Re-locate and re-establish guardrail where required.

The site locations are shown on the aerial map detailed in Figure 2 (below). Using google maps as reference, the proposed sites:

- Start here -32.72900730613878, 150.94295921865574
- Finish here -32.74478247608492, 150.92862549481308

Biodiversity surveys of the proposal site conducted in February 2023 identified the following:

- Vegetation at the site conforms to Plant community Type 3237 Hunter Range Blue Gum Gully Forest (which is not associated with any threatened ecological community listed by the *Biodiversity Conservation Act 2016* or the *Environment and Biodiversity Conservation Act 1999*
- No threatened flora or fauna species were detected.
- Checks of those culverts present did not reveal any sheltering microbats, or any evidence of site occupation.
- Fauna habitats on each of the slopes surveyed were like those present in the adjacent National Park.
- A small number of hollow-bearing trees will need to be cleared. As such all trees and hollows removed as part of this proposal would meet the offsetting requirements identified within the Transport for NSW's Biodiversity and No Net Loss Policy.

Considering the presence of hollow bearing trees, the hollow-diameters available, the findings of previous surveys and in consultation of standard publicly available databases, several species of threatened hollow-depended fauna could occur. An assessment referencing the criteria provided under Section 7.3 of the *Biodiversity Conservation Act 2016* has therefore been undertaken for hollow-dependent species. Significance assessments for other threatened species were not required based on an evaluation of their likelihood of occurrence at the proposal site.

The significance assessment carried out found that proposal would not disturb, remove, modify or fragment any habitats critical to the lifecycle requirements of any species of hollow-dependent fauna and concluded that the proposal would not have a significant impact on threatened hollow-dependent fauna.

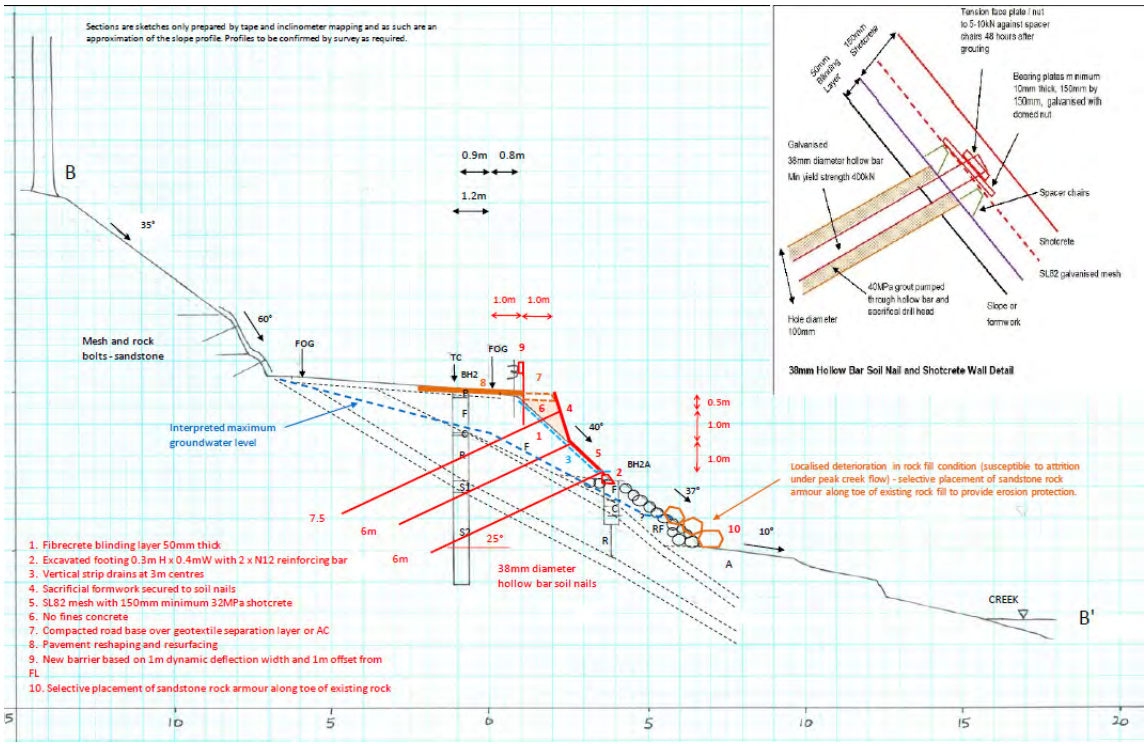

Figure 1 – Typical cross section detailing proposed works

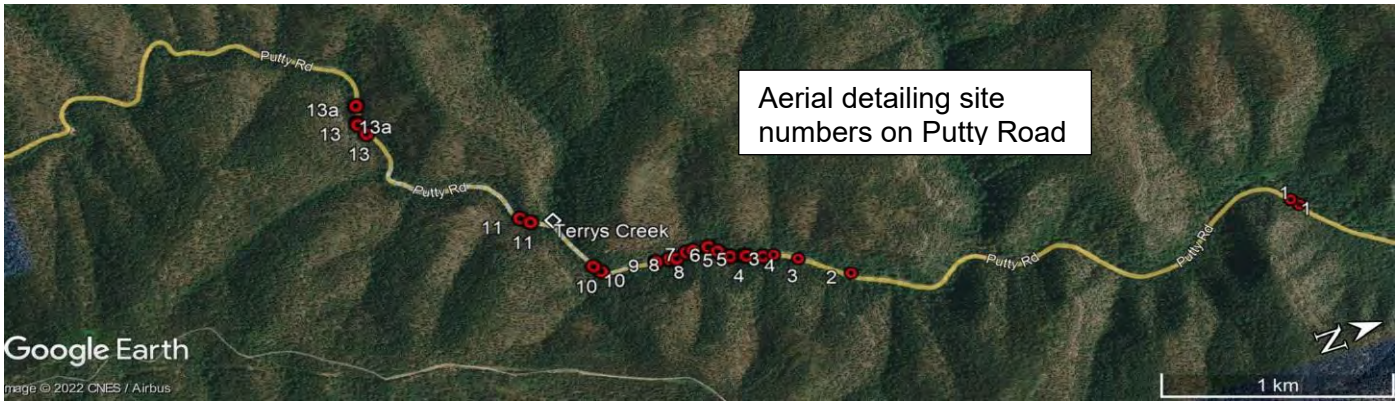

Figure 2 – Aerial showing the site locations on Putty Road

Michael Coyte

From: Ian Rhodes <ian.rhodes@environment.nsw.gov.au>
Sent: Monday, 8 May 2023 1:58 PM
To: Michael Coyte
Cc: Sandy Grace; Mary Temple; Shayne Forty; Phil Bryant
Subject: RE: Consultation regarding proposed slope remediation, Putty Road, Terrys Creek
Attachments: Attachment B_Description of Proposed Works.pdf; 20230330 _TerrysCreek_TISEPP_NPWS.pdf; Attachment A_Survey Information.pdf

Hi Michael,
Apologies for the delay in reply here, I've been on annual leave and Sandy has started in NPWS Wollemi Yengo Area as Team Leader Rangers (copied above).

Thanks for the opportunity to comment re the above. Based on the survey attached, the planned works are almost wholly located within the road reserve. In previous advice to Kai Neville on another Putty Rd embankment stabilisation project, we asked that if any hollow bearing trees are identified as requiring either partial or full removal, preference be given to only partial removal thus leaving the hollow in situ where possible. If not possible, trees with hollows that are to be completely felled be left onsite nearby for potential re-occupation rather than being removed from site.

Please let me know if you have any queries with this and for future works please contact Sandy in the first instance.

Regards,

Ian

NSW GOVERNMENT

Ian Rhodes
Project Officer
Wollemi Yengo Area
Blue Mountains Branch
NSW National Parks & Wildlife Service

9 Walkers Ridge Rd BUCKETTY 2250
T 02 8289 6831
M 0499 433309
W nationalparks.nsw.gov.au

From: Michael Coyte <Michael.Coyte2@transport.nsw.gov.au>
Sent: Tuesday, 2 May 2023 2:33 PM
To: Ian Rhodes <ian.rhodes@environment.nsw.gov.au>
Cc: Kai Neville <Kai.Neville@transport.nsw.gov.au>; Jodi Hale <jodi.k.hale@transport.nsw.gov.au>; Mary Temple <Mary.Temple@environment.nsw.gov.au>; Shayne Forty <Shayne.Forty@environment.nsw.gov.au>
Subject: RE: Consultation regarding proposed slope remediation, Putty Road, Terrys Creek

Hi Team,

Just touching base on the consultation letter issued for proposed works on Putty Road, Terrys Creek?

Thank you,

NSW GOVERNMENT