Transport for NSW

# Thredbo River Culvert Rehabilitation

## Review of Environmental Factors

September 2024



NSW GOVERNMENT

transport.nsw.gov.au

# Acknowledgement of Country

Transport for NSW acknowledges the Monero-Ngarigo people, the traditional custodians of the land on which the Thredbo River culvert rehabilitation is proposed.

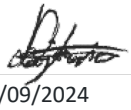
We pay our respects to their Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

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.



# Approval and authorisation

| | |
|---|---|
| Title | Thredbo River Culvert Rehabilitation |
| Accepted on behalf of Transport for NSW by: | Daniel Bojkovic |
| Signed |  |
| Date: | 24/09/2024 |

# Document review tracking

| Version | Date | Internal reviewer |
|---|---|---|
| Draft version 1 | June 2024 | CE |
| Draft version 2 | August 2024 | CE |
| Final version | September 2024 | AC |

# Executive summary

## The proposal

Transport for NSW (Transport) proposes to undertake culvert rehabilitation works on the Thredbo River, Alpine Way MR677 about 3km west of Thredbo (Figure 1-1). The work involves repairing the multi-cell pipe culvert and improving both the inlet and outlet. This will extend the culvert's lifespan, reduce the risk of erosion and damage, and ensure the road remains safe for future use.

Key features of the proposal include:

- Excavate and construct inlet apron to accommodate a new headwall and wingwalls.
- Build a new headwall and wingwall in front of the existing culvert inlet.
- Concrete line the existing corrugated steel culvert cells.
- Place riprap rock scour protection at the outlet end of the culvert.

The proposal is anticipated to involve the following key construction methodologies:

- Preparatory works:
  - Pre-clearance checks (relating to ecology and heritage) to define sensitive areas and site surveys to establish limit of works and levels for excavation.
  - Implementation of traffic guidance scheme in accordance with relevant Road Occupancy License (ROL) approval.
  - Establish a compound and stockpile site within the existing Cascade Hut Trail car park. Secondary compound sites are located on Alpine Way 3.5 km east of Thredbo Village and at the Pender Lea compound site, 25 km east of Thredbo Village.
- Inlet works:
  - Apron construction:
    - Install and test water diversion, sediment control and filtration system to divert clean water around the construction zone.
    - Excavate the accumulated sediment.
    - Transport waste to an appropriate offsite stockpile facility nearby (north of Thredbo Village).
    - Pour concrete blinding layer and construct half of the inlet apron.
    - Adjust the water diversion system to redirect water into the opposite pipe allowing for the remaining half of the inlet apron area to be dewatered.
    - Repeat methodology above.
  - Headwall and wingwalls construction:
    - Establish an additional water diversion barrier using the newly constructed concrete apron as a base.
    - Clean down and prepare one half of the existing headwall and construct new headwall and wingwall on one side of the inlet.
    - Adjust the water diversion system again to redirect water to allow for the construction of the remaining half of the inlet headwall and wingwall.
  - Culvert lining
    - Line existing steel culvert. This will occur as each half of the inlet headwall and wingwall are constructed in order to make use of the water diversion system.
- Outlet works:
  - Establish access to the outlet end, including installing temporary steps from the top embankment to the river level.

  - Place riprap material on outlet end.
- General site demobilising:
  - Remediate all work areas and access tracks.
  - Remove machinery and disestablish compound and stockpile sites at the Cascade Hut Trail car park. Remove remaining materials from site and dispose at a licenced premises.
  - Remove traffic control.

Construction is planned to be delivered over four months starting in February 2025 and completing prior to the start of the Winter season. If delays are encountered due to weather conditions the work will be completed in two stages. Stage 1 will be completed in February and March 2025 and any outstanding work will be completed in late 2025 or early 2026 (Stage 2).

## Need for the proposal

Transport has discovered a number of significant issues with the structural integrity of the existing culvert during recent inspections. These include cracking in the headwall, deformation of the steel pipes, and signs of scour damage on the outlet end. Due to these findings, it has become important to rehabilitate the culvert. Completing this work will extend the culvert's lifespan, reduce the risk of erosion and damage, and ensure the road remains safe for use.

There is a strategic need for the proposal under the *Draft South East and Tablelands Regional Plan 2041* (NSW DPE, 2022a) and the Transport for NSW standards – *Technical Manual Culvert Inspection and Risk Assessment Issue No.1:0* (Transport for NSW, 2022a). Objective 23 of the Regional Plan describes the importance of enhancing strategic transport links across the region. The proposal is in line with this objective because it would ensure safe usage of Alpine Way. The Transport technical manual outlines how the condition of culverts is to be assessed. The REF describes how the culverts have been assessed as containing structural integrity damage. The potential consequence of inaction and collapse of the culverts could lead to a void/sinkhole on the road, leading to possible accidents, repair costs and possible road closures. The proposal seeks to maintain safe road usage by avoiding this outcome.

The operational need for the proposal includes improving the safety for all users of Alpine Way.

## Proposal objectives

The objectives of the proposal include:

- ensure the stability of the culvert, embankments, and headwalls to provide a safe and structurally stable road environment
- prevent scouring, degradation, and reduce sediment loss in the river and receiving environment
- improve the durability of the culvert by using materials that will last for +100yrs
- maintain safe road usage of the Alpine Way (MR677).

The expected outcomes of the proposal are that the current rate of degradation would be halted, and the culvert would be rehabilitated for increased durability and longevity. The overall outcome is that the road would be structurally stable and safe for use.

## Options considered

Several options were suggested by Transport from information gathered from historical data, drainage investigations, and other specialist studies. Options ranged from reconstructing the existing asset with similar materials, restricting construction to only the culvert lining and outlet end, or rebuilding the entire culvert and road to new Transport specifications and AS/NZS standards.

The justification for the preferred options has been based upon the proposal objectives and the development criteria described in Section 2.3.2. The preferred option requires the construction of a new working apron in front of the culvert inlet, a new headwall and wingwalls to support the existing embankment, lining of existing culvert to strengthen the pipes from the forces of the road above, and introducing riprap rock to the outlet end to eliminate the risk of severe scour damage in the future.

## Statutory and planning framework

The proposal is for culvert rehabilitation works on the Thredbo River, Alpine Way MR677 and is to be carried out by Transport for NSW and can therefore be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act). Development consent from Snowy Monaro Regional Council is not required.

The State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) contains provisions for public authorities to consult with local councils and other public authorities before the commencement of certain types of development. Consultation, including consultation as required by SEPP (Transport and Infrastructure) (where applicable), is discussed in Chapter 5 of this REF.

This REF has included consideration (where relevant) of conservation agreements and plans of management under the *National Parks and Wildlife Act 1974* (NPW Act), *Fisheries Management Act 1994*, (consultation with the NSW Department of Primary Industries (Fisheries) is included in Section 5.5 and Appendix I), biodiversity stewardship sites under the *Biodiversity Conservation Act 2016* (BC Act), wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats, and other protected fauna and native plants. It has also considered potential impacts to Matters of National Environmental Significance (MNES) listed under the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* (EPBC Act).

The potential biodiversity impacts of the proposal have been assessed through a Biodiversity Assessment Report (BAR) (Appendix F) and an additional Ecology Desktop Assessment (Appendix H). It is considered that the proposal would be unlikely to cause a significant impacts to biodiversity. Therefore, it is not necessary for an environmental impact statement to be prepared nor approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report (BDAR) or Species Impact Statement (SIS) is not required.

The proposal is not likely to have a significant impact on matters of national environmental significance nor the environment of Commonwealth land within the meaning of the EPBC Act. A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

The heritage effects of the proposal have been assessed through an Aboriginal Archaeological Excavation Report (AAER) and an Aboriginal Cultural Heritage Assessment Report (ACHAR) (Appendix E). It is considered that harm to Aboriginal sites and artefacts cannot be avoided and an Aboriginal Heritage Impact Permit (AHIP) covering the proposal will need to be obtained from Heritage NSW, Department of Climate Change, Energy, the Environment and Water (Heritage NSW) before works commence.

## Community and stakeholder consultation

Consultation has occurred with stakeholders and government agencies throughout the development of the proposal. Consultation letters have been sent to the National Parks and Wildlife Service (NPWS) and NSW Department of Primary Industries and Regional Development (DPIRD - Fisheries) and their comments in response have been addressed in Section 5.6.

The Aboriginal community was consulted by Transport regarding the heritage management of the project throughout its lifespan. Consultation has been undertaken as per the process outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010a) (consultation requirements) and the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation (*PACHCI) (Transport for NSW, 2011).

Numerous Aboriginal organisations and individuals are now registered by Transport for consultation. The recommendations that resulted from consultation are to be implemented as the Stage 4 PACHCI. See Section 5.3 for further details.

Consultation with the Snowy Monaro Regional Council, Snowy Valleys Council has occurred in the form of letters to councils (Appendix M).

## Environmental impacts

The main environmental impacts of the proposal are:

**Surface water Issues**

Thredbo River flows through the study area from south to north. The endangered ecological community, *'The aquatic ecological community in the catchment of the Snowy River in NSW*,' as listed under the *Fisheries Management Act 1994* (FM Act) is present within the study area. The listing includes all native fish and aquatic invertebrates within all rivers, creeks and streams of the Snowy River catchment.

The inlet works includes the installation of sediment controls and a diversion system to direct water either into the eastern or western most pipes, depending on whether works are being undertaken in the east or west inlet apron area. The clean water diversion system will be adopted to manage water during construction. Sediment controls are required to prevent accumulated sediment and stockpiled material from entering the Thredbo River.

It is proposed to put rock riprap on the downstream end of the culvert. This would provide additional bank stability and reduce erosion which would ensure fish and aquatic invertebrates passage through this section of the river.

A positive outcome of the culvert rehabilitation is the reduced likelihood of continued erosion around the existing culvert which would also result in decreased sediment into the Thredbo River.

**Biodiversity Issues**

Clearing of native vegetation is a key threatening process listed under the BC Act and the EPBC Act. The proposal would result in the potential removal of 0.09 ha of native riparian vegetation. Remaining impacts to vegetation would be temporary, i.e. machinery and materials storage, moving across open, grassy areas. Some small shrubs would also be removed.

Avoidance and minimisation of impacts have been incorporated at the strategic design stage of planning. This has resulted in avoiding areas of high biodiversity value (where possible) and minimising the areas of impact in these areas (where not possible to avoid). The adverse environmental impacts would be minimal and largely temporary if safeguards and management measures are adhered to throughout the proposal.

The proposed work would result in the blockage of up to three cells to enable the lining of the culvert to occur, however during construction at least one culvert at all times would remain open and fish passage would be maintained. The establishment of the gravel pad for in-stream work may result in direct impacts to aquatic fauna without adequate supervision. The design of the process of work would ensure that the flow, and any impacts to fish passage are minimised. Post-construction, no barriers to fish passage would occur as a result of the proposed work.

Given the current detailed design, the proposal is unlikely to have a negative effect on the potential wildlife corridors or markedly increase habitat fragmentation.

This assessment has concluded that the proposal is 'unlikely' to have a significant effect on any listed threatened flora and fauna species, communities, and their habitats in accordance with the BC Act and FM Act. Additional assessment has also determined that the proposal is 'unlikely' to have a significant effect on any EPBC Act listed threatened and migratory biota and their habitats or other matters of national environmental significance. Therefore, a species impact statement is not required.

**Aboriginal Cultural Heritage Issues**

A significant Aboriginal cultural heritage pathway, the Bundian Way, intersects with the landscape which now contains Alpine Way. The Bundian Way is approximately 265km long extending from Targangal (Mount Kosciuszko) to Bilgalera (Eden). It was recognised by listing on the NSW State Heritage Register (SHR) in 2013 (SHR#01906). The Bundian Way is located next to the project boundary, and with appropriate identification and avoidance mitigation measures, would be protected throughout the proposal.

There is potential for development activities to impact Aboriginal sites and the identified areas of Potential Archaeological Deposit (PAD). The area of the proposal presents five previously unrecorded Aboriginal cultural heritage sites. Three of these may be subject to harm. It is expected that the potential of harm to Aboriginal archaeological sites from the project ranges from none to direct.

Impacts have been isolated to areas of existing disturbance where possible (Alpine Way and the Cascade Hut Trails car park), However, as direct impacts to Aboriginal sites cannot be avoided, an Aboriginal Heritage Impact Permit (AHIP) covering the

proposal will be obtained from Heritage NSW, Department of Climate Change, Energy, the Environment and Water (Heritage NSW) before impacts occur.

Consultation with Representative Aboriginal Parties (RAPs) would continue throughout the proposal and the advice and concerns given by the representatives properly addressed.

**Non-Aboriginal Heritage Issues**

The culvert contains four corrugated galvanised steel pipe cells which employ a built form typical of the 1950s and 1960s. The description of culvert B10155 is consistent with a type "4" of culvert types along a section of Alpine Way, which are identified as having heritage value, however in the assessment completed by Biosis (Biosis Research, 2011), the Thredbo River culvert B10155 was not included in the type "4"listings.

The culvert therefore is not currently heritage listed under:

- The Transport for NSW s170 register
- Local Environment Plans for Bombala Council, Cooma Monaro Shire Council or Snowy River Shire Council.

Despite this, it has been identified within a broader range of culverts as retaining heritage value and could be part of a sample for retention. When assessing the options for rehabilitating the culvert, it was decided that replacement of the culvert headwall, relining the culvert and installing new scour protection were the options that best met the proposal objectives and criteria and presented the most ideal outcome. This decision excludes the culvert from being selected for the Transport s170 Heritage and Conservation Register.

It was decided that works can proceed to culvert B10155 as proposed with no further heritage requirements. Record of this decision is contained withing the Heritage Impact letter of advice (Appendix L).

## Justification and conclusion

Alpine Way is an important route for road users travelling to and away from Thredbo and the surrounding region. There would be short-term impacts regarding social factors with the closure of the Cascade Hut Trail car park, and changed traffic conditions that may cause delays on the road. It is noted however, that these will present only minor impacts to the public.

Transport has found issues with the structural integrity of the existing culvert headwall, pipes becoming slightly deformed, and starting signs of scour damage on the outlet end. Due to these findings, it has become important to carry out maintenance on the culvert.

The benefits of undertaking the proposal are as follows:

- a halt to the current rate of degradation of the culvert
- improved stability of the culvert, embankments and headwalls, ensuring the long-term stability of Alpine Way
- improved durability of the culvert with materials that will endure 100+ years
- reduced likelihood of continued erosion around the existing culvert which would also result in decreased sediment into the Thredbo River
- additional bank stability and reduced erosion from rock riprap placed immediately downstream of the culvert and up to the batter edges, allowing for improved passage for fish and aquatic invertebrates
- safe road usage of Alpine Way.

It is considered that any adverse environmental impacts are balanced by the beneficial effects of the proposal, and is therefore justified.

## Publication of the review of environmental factors

This REF would not be placed on public display but will be published on Transport for NSW's website.

The documents are available as pdf files on the Transport for NSW website at https://www.transport.nsw.gov.au/

Transport will continue to consult with the community and relevant stakeholders prior to and during construction.

# Table of contents

**Executive summary** ..... **4**

**1. Introduction** ..... **14**

1.1 Proposal identification ..... 14
1.2 Purpose of the report ..... 18

**2. Need and options considered** ..... **19**

2.1 Strategic need for the proposal ..... 19
2.2 Limitations of existing infrastructure ..... 19
2.3 Proposal objectives and development criteria ..... 20
2.4 Alternatives and options considered ..... 20
2.5 Preferred option ..... 24
2.6 Design refinements ..... 24

**3. Description of the proposal** ..... **25**

3.1 The proposal ..... 25
3.2 Design ..... 27
3.3 Construction activities ..... 28
3.4 Ancillary facilities ..... 31
3.5 Public utility adjustment ..... 36
3.6 Property acquisition ..... 36

**4. Statutory and planning framework** ..... **37**

4.1 Environmental Planning and Assessment Act 1979 ..... 37
4.2 Other relevant NSW legislation ..... 39
4.3 Commonwealth legislation ..... 41
4.4 Confirmation of statutory position ..... 42

**5. Consultation** ..... **43**

5.1 Consultation strategy ..... 43
5.2 Community notification ..... 43
5.3 Aboriginal community involvement ..... 43
5.4 SEPP (Transport and Infrastructure) consultation ..... 45
5.5 Other Government agency and stakeholder involvement ..... 46
5.6 Ongoing or future consultation ..... 48

**6. Environmental assessment** ..... **49**

6.1 Soils ..... 49
6.2 Surface water and Groundwater ..... 51
6.3 Hydrology and flooding ..... 53
6.4 Biodiversity ..... 54
6.5 Aboriginal cultural heritage ..... 58
6.6 Non-Aboriginal heritage ..... 62

6.7 Traffic and transport ..... 63
6.8 Noise and vibration ..... 64
6.9 Socio-economic ..... 65
6.10 Landscape character and visual impacts ..... 66
6.11 Property and land use ..... 67
6.12 Other impacts ..... 68
6.13 Cumulative impacts ..... 69

**7. Environmental management ..... 71**

7.1 Environmental management plans (or system) ..... 71
7.2 Summary of safeguards and management measures ..... 72
7.3 Licensing and approvals ..... 79

**8. Conclusion ..... 80**

8.1 Justification ..... 80
8.2 Objects of the EP&A Act ..... 80
8.3 Conclusion ..... 83

**9. Certification ..... 84**

**10. EP&A Regulation publication requirement ..... 85**

**11. References ..... 86**

**Appendix A - Consideration of section 171 factors and matters of national environmental significance and Commonwealth land ..... 89**

**Appendix B - Statutory consultation checklists ..... 94**

**Appendix C –Detailed Designs ..... 98**

**Appendix D – Hydraulic Investigation ..... 99**

**Appendix E - Aboriginal Cultural Heritage Assessment Report (Stage 3 PACHCI) (ACHAR) ..... 101**

**Appendix F - Biodiversity Assessment Report (BAR) ..... 102**

**Appendix G – Biodiversity Assessment Review ..... 103**

**Appendix H – Ecology Desktop Assessment ..... 104**

**Appendix I – Consultation with NSW Department of Primary Industries (Fisheries) (DPI Fisheries) ..... 105**

**Appendix J – Consultation with National Parks and Wildlife Service (NPWS) ..... 106**

**Appendix K – Options Report ..... 107**

**Appendix L - Heritage Impact Letter of Advice..... 108**

**Appendix M – Consultation with Council ..... 109**

# Tables

Table 5-1: Summary of Transport's Procedure for Aboriginal Cultural Heritage Consultation and Investigation ..... 44
Table 5-2: Issues raised through Aboriginal community consultation ..... 44
Table 5-3: Issues raised through stakeholder consultation ..... 46
Table 5-5: Issues raised through stakeholder consultation ..... 48
Table 6-1 Soils safeguards and management measures ..... 50
Table 6-2 Surface water safeguards and management measures ..... 51
Table 6-3 Hydrology safeguards and management measures ..... 54
Table 6-4 Biodiversity safeguards and management measures ..... 57
Table 6-5 Aboriginal heritage safeguards and management measures ..... 61
Table 6-6 Non-Aboriginal heritage safeguards and management measures ..... 63
Table 6-7 Traffic and transport safeguards and management measures ..... 64
Table 6-8 Noise and vibration safeguards and management measures ..... 65
Table 6-9 Socio economic safeguards and management measures ..... 66
Table 6-10 Landscape character and visual safeguards and management measures ..... 67
Table 6-11 Property and land use safeguards and land use ..... 67
Table 6-12 Other potential impacts ..... 68
Table 6-13 Other impacts Safeguards and management measures ..... 68
Table 6-14: Past, present and future projects ..... 69
Table 6-15 Potential cumulative impacts ..... 69
Table 6-16 Cumulative safeguards and management measures ..... 70
Table 7-1: Summary of safeguards and management measures ..... 72
Table 7-2: Summary of licensing and approvals required ..... 79
Table 8-1 Objects of the Environmental Planning and Assessment Act 1979 ..... 80
Table 10-1 EP&A Regulation publication requirement ..... 85
Table 11-1 Terms and acronyms used in this REF ..... 87

# Figures

Figure 1-1 Location of the proposal ..... 16
Figure 1-2 The proposal ..... 17
Figure 3-1: Key features of the proposal ..... 26
Figure 3-2 Landmarks and Ancillary facilities ..... 32
Figure 3-3 Proposed compound area in Cascade Trail car park ..... 33
Figure 3-4 Proposed stockpile area in Cascade Trail car park ..... 33
Figure 3-5 Secondary compound site on Alpine Way for stockpile and material storage ..... 34
Figure 3-6 Secondary compound site dimensions ..... 34

Figure 3-7 Pender Lea compound site ..... 35
Figure 3-8 Pender Lea compound site dimensions ..... 35
Figure 6-1 Aboriginal sites within the study area and vicinity ..... 60

# 1. Introduction

This chapter introduces the proposal and provides context for the environmental assessment. In introducing the proposal, the objectives and project development history are detailed and the purpose of the report provided.

## 1.1 Proposal identification

Transport for NSW (Transport) proposes to carry out culvert rehabilitation works on the Thredbo River, Alpine Way MR677. The culvert over Thredbo River near the Cascade Trail is a steel corrugated pipe type culvert. The Bridge size culvert was built in 1977. This existing multi-cell pipe culvert has four cells with a diameter of 2250mm. The work involves rehabilitating the culvert and undergoing improvement works at the inlet and outlet. This would contribute to the ongoing durability of the culvert, assist with minimising the risk of scouring and degradation, and maintain safe road usage.

Key features of the proposal include:

- establish temporary compound and stockpile sites on existing parking area
- establish access to both sides of the inlet and outlet ends of the culvert
- install temporary water diversion
- excavate and construct inlet apron
- build a new headwall and wingwall in front of the existing headwall and wingwall
- concrete line the corrugated steel culvert
- place riprap rock scour protection at outlet.

There is a strategic need for the proposal as Transport has found issues with the structural integrity of the existing culvert headwall, pipes becoming slightly deformed, and starting signs of scour damage on the outlet end. Because of these findings it has become important to carry out maintenance on the culvert. This would ensure the safety of all road users.

The proposal is located within the Australian Alps Bioregion in the Snowy Monaro Regional Council LGA about 3km southwest of Thredbo. It is located within an area of native vegetation and is surrounded by one of the state's largest national parks, Kosciuszko National Park. The Thredbo River flows through the proposal from south to north. Cascade Trail is south of the proposal and Alpine Way is to the east and west. Water courses located in the vicinity include a tributary of the Thredbo River, Bogong Creek, which flows easterly to the north, and located about 500m south-west of the proposal is Dead Horse Creek. The State Heritage Register listed Bundian Way is located immediately to the south of the proposal. The footprint includes culvert B10155 MR 677 Thredbo River, and the compound and stockpile sites are contained in the nearby previously disturbed Cascade Hut Trail parking area. An offsite stockpile facility is available north of Thredbo Village. The location of the proposal is shown in Figure 1-1 and an overview of the proposal is provided in Figure 1-2. A more detailed location description is included in Chapter 6.

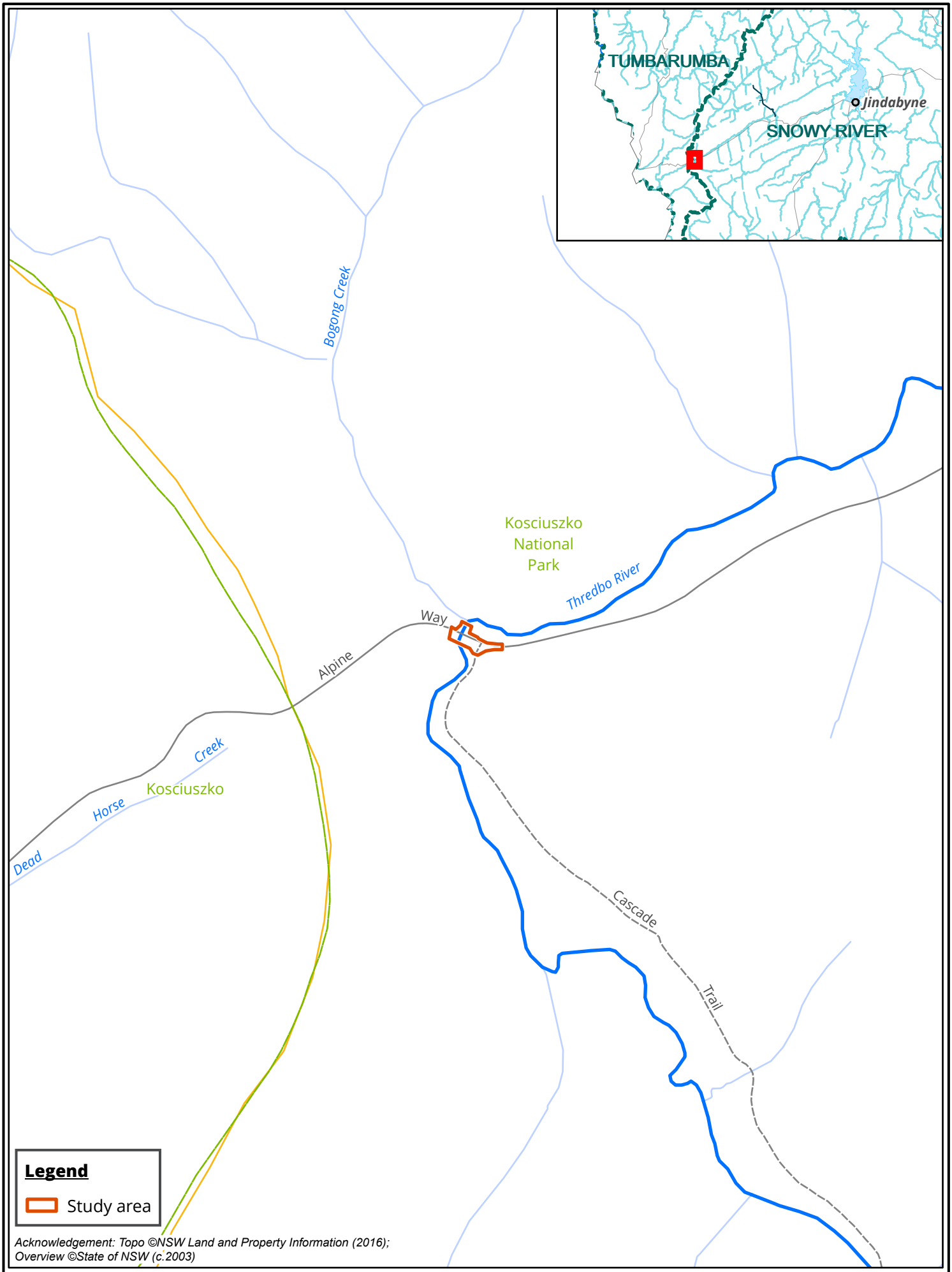
The major structural features included in this proposal are the culvert (inlet, outlet and internal lining), and the inlet headwall and wingwall. The proposal involves the construction of a new working apron in front of the culvert inlet, a new headwall and wingwalls to support the existing embankment, lining of existing culvert to strengthen the pipes them the forces of the road above, and introducing riprap to the outlet end to eliminate the risk of severe scour damage in the future. Chapter 3 describes the proposal in more detail.

Construction vehicles and machinery would access the proposal site using Alpine Way Highway and enter the proposal via designated access points. Construction plant would be restricted to the access track, compound site and stockpile areas within the Cascade Hut Trail car park. Light and heavy vehicles would be parked in the Cascade Hut Trail car park.

Thredbo River is a part of the endangered ecological community '*The aquatic ecological community in the catchment of the Snowy River in NSW*,' as listed under the FM Act. The listing includes all native fish and aquatic invertebrates within all rivers, creeks and streams of the Snowy River catchment. The proposal would result in the blockage of up to three pipes to enable the maintenance work to occur, however the works would be staged in a way that, during construction, at least one pipe would remain open at all times. The Thredbo River and the Bogong Creek are both watercourses mapped as key fish habitat and this method allows fish passage to be maintained throughout the proposal.

There were 16 threatened and migratory species identified that had a moderate to high likelihood of occurrence within the proposal. The Scarlet Robin was the only threatened species detected during the field survey and is listed as vulnerable under the NSW Biodiversity Conservation Act 2016. The proposal would impact a total of 0.09 ha of native riparian vegetation.

Construction is planned to start in February 2025 and would be delivered over 4 months. If delays are encountered due to weather conditions the work will be completed in two stages. Stage 1 will be completed in February and March 2025 and any outstanding work will be completed in late 2025 or early 2026 (Stage 2).



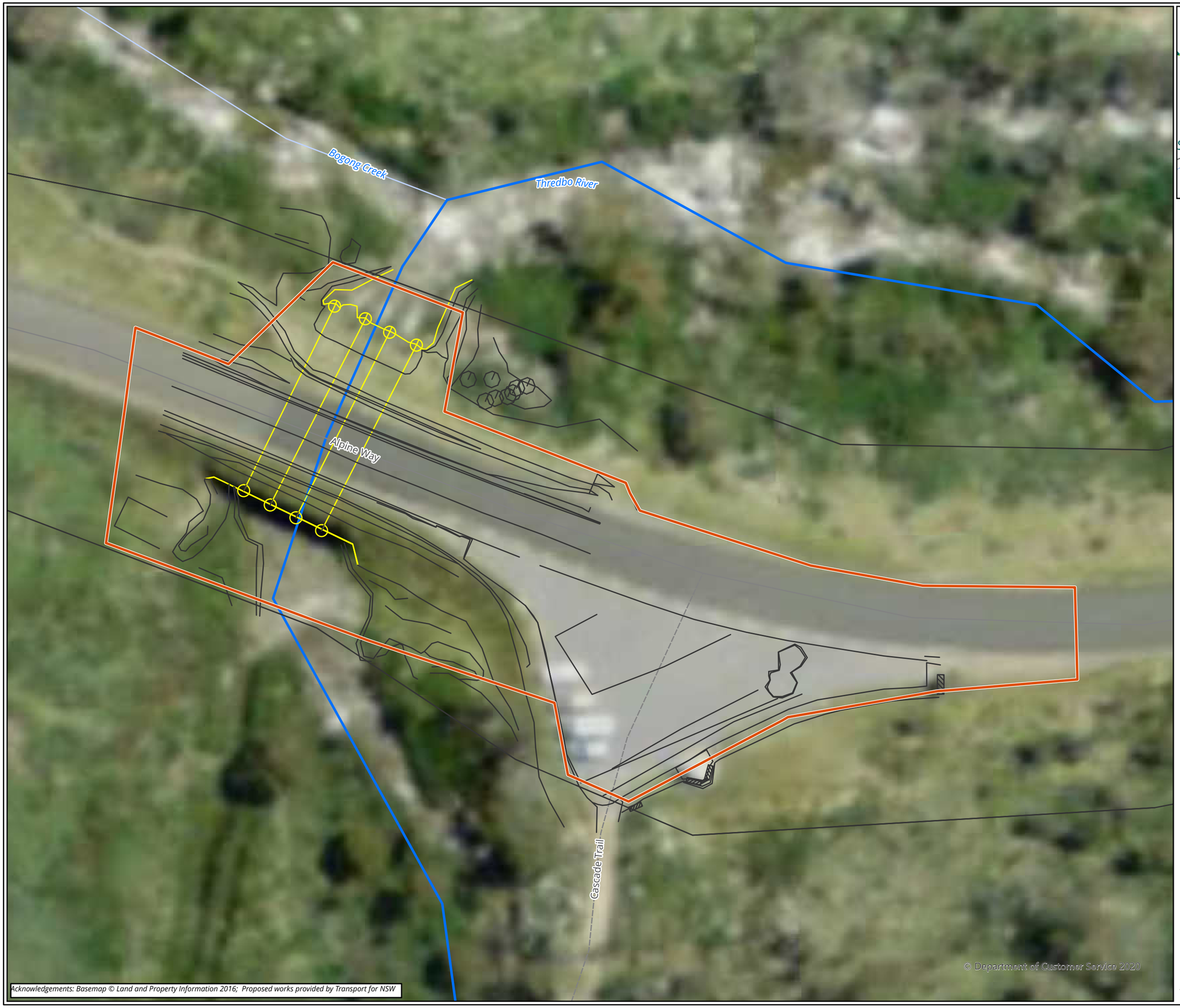

## Figure 1-1 Location of the proposal

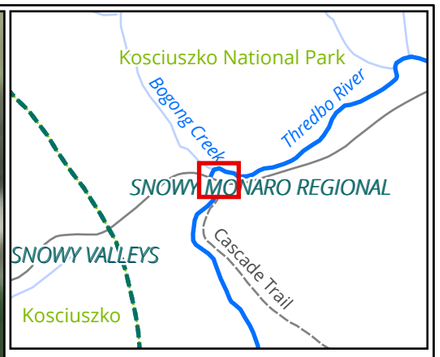
Matter: 40371
Date: 13 May 2024,
Checked by: SH, Drawn by: JET, Last edited by: jtownsend
Location:P:\40300s\40371\Mapping\40371_Thredbo_Ref

0 80 160 240 320 400
Metres

N

Scale 1:10,000 @ A4, GDA2020 MGA Zone 55




**Legend**

- Study area
- Culvert
- Proposed works

*Acknowledgements: Basemap © Land and Property Information 2016; Proposed works provided by Transport for NSW*

**Figure 1-2 The proposal**

0 3 6 9 12 15

Metres

Scale: 1:400 @ A3

*Coordinate System: GDA2020 MGA Zone 56*

N

Matter: 40371, Date: 14 June 2024,
Drawn by: JET, Checked by: SH, Last edited by: jtownsend
Layout: 40371_F2_StudyArea
Project: P:\40300s\40371\Mapping\
40371_Thredbo_Ref.aprx

## 1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by Biosis on behalf of Transport (Regional and Freight). For the purposes of these works, Transport is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act).

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

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of Section 171 of the Environmental Planning and Assessment Regulation 2021, the factors in *Guidelines for Division 5.1 assessments*, (DPE 2022), *Roads and Related Facilities EIS Guideline* (DUAP 1996), the *Biodiversity Conservation Act, 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *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 sought from the Minister for Planning 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 significance of any impact on nationally-listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and if offsets are required and able to be secured.

The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian 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 EPBC Act.

# 2. Need and options considered

This chapter describes the need for the proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

## 2.1 Strategic need for the proposal

**South East and Tablelands Regional Plan 2041**

The Snowy Monaro Regional Council is included in the *Draft South East and Tablelands Regional Plan 2041* (NSW DPE, 2022a) which is in the process of being reviewed. The Regional Plan is set a 20-year framework, vision and direction for strategic planning under Division 3.1 of the EP&A Act. Objective 23 describes the importance of enhancing strategic transport links across the region. It is important to ensure the safe usage of Alpine Way to maintain and enhance tourist and visitor movements in the area.

**Culvert Inspection and Risk Assessment Issue**

The proposal is required from a strategic perspective under the Transport for NSW standards – *Culvert Inspection and Risk Assessment Issue No.1:0* (Transport for NSW, 2022a). The standard outlines how culverts are to be assessed, and how issues are to be recorded. The structural integrity damage present in the existing culverts requires more attention than routine maintenance. Rehabilitation is required to prevent structural collapse. The standards state that structural collapse of a culvert could occur due to its deterioration leading to loss of strength (e.g. corrosion of metal pipes, corrosion of reinforcing steel, longitudinal cracking of concrete, corrosion/scour of the invert).. The potential consequence of inaction and collapse of the culverts could lead to a void/sinkhole on the road, leading to possible accidents, repair costs and possible road closures.

## 2.2 Limitations of existing infrastructure

Inspections of the culvert B10155 have found several limitations and defects in the existing infrastructure that require urgent attention. The issues include major cracking and movement in the stone headwall at the inlet, corrosion and deformation of the lower portion in the steel pipe culvert and starting signs of scour damage on the outlet end. The crack in the stone headwall is allowing water to pass in behind several of the steel pipes. Up to a height of 0.6 m of galvanising has been worn off the sides of the pipes in all cells. The stone wall has also broken away in some areas at the base of the pipes which has caused some erosion under and around them. The scour at the end of the pipes has resulted from the lack of a suitable outlet structure and has begun to undermine the toe of the road batter (See *B10155 Corrugated Steel Pipe Culvert over Thredbo River on Alpine Way, 4km South of Thredbo: Hydraulic Investigation – Pipe Relining of Existing 4 cells x 2250 mm Corrugated Steel Pipe Culvert* (Appendix D)).

Because of these findings it has become important to carry out maintenance and rehabilitation on the culvert to prevent more serious damage occurring to the road network and surrounding environment. This would contribute to their ongoing longevity, assist with minimising the risk of scouring and degradation, and secure the safety of motorists using the road. Options for rehabilitation were considered in the *MR677 Alpine Way Thredbo River Culvert Relining Options Report – version 2* (Appendix K).

Corrugated steel pipe culverts are generally no longer used in road construction projects carried out by Transport mostly because they tend to wear down over the long-term. Culvert B10155 is a good example of this. Transport are now invested in rehabilitating or replacing damaged steel culverts using modern materials that would meet the requirements for +100yr design life.

## 2.3 Proposal objectives and development criteria

### 2.3.1 Proposal objectives

The objectives of the proposal include:

- ensure the stability of the culvert, embankments, and headwalls to provide a safe and structurally stable road environment
- prevent scouring, degradation, and reduce sediment loss in the river and surrounding environment
- improve the durability of the culvert by using materials that will last for +100yrs
- maintain safe road usage of Alpine Way (MR677).

The expected outcomes of the proposal are that the current rate of degradation would be halted, and the culvert would be rehabilitated for increased durability and longevity. The overall outcome is that the road would be structurally stable and safe for future use.

### 2.3.2 Development criteria

The development criteria for the proposal include:

- prevent further degradation of the culvert
- long-term solutions to the issue
- +100yr design life required
- ensure safety for road users
- minimal environmental risk and impact
- no detraction from visual amenity of the surrounding environment
- ease of constructability
- no significant increase to the work footprint or construction timeframes
- cost effective
- retain the heritage value of the existing structure.

The methodology used to assess the proposal repair options against these criteria is discussed further in Section 2.4.

### 2.3.3 Urban design objectives

There are no urban design objectives for the proposal as the site is not in an urban area.

## 2.4 Alternatives and options considered

There were three primary issues identified of which options were considered for remediation:

1. major cracking and movement in the stone headwall at the inlet
2. corrosion and deformation of the steel pipe culvert. Intervention is required to prevent further deformation of the culvert and to avoid full replacement of the pipes in the future
3. scour at the outlet end of the culvert.

The options are described in *MR677 Alpine Way Thredbo River Culvert Relining Options Report – version 2* (Appendix K) and have been discussed in the sections below.

### 2.4.1 Methodology for selection of preferred option

Several options were presented for each of the three identified issues, and evaluated against the following development criteria:

- prevent further degradation of the culvert
- long-term solutions to the issue
- +100yr design life required
- ensure safety for road users
- minimal environmental risk and impact
- no detraction from visual amenity of the surrounding environment
- ease of constructability
- no significant increase to the work footprint or construction timeframes
- cost effective
- retain the heritage value of the existing structure.

It was unlikely that the options would meet every point of the above criteria. The methodology for selection involved finding the option that met the most points.

### 2.4.2 Identified options

The options identified below follow the options discussed in Transport for NSW's Options Report (Version 2) (Appendix K).

**Issue 1 – Major cracking and movement in the stone headwall at the inlet**

- Option 1: Localised repair of the cracks and holes in the inlet headwall and wingwalls by using similar materials.
- Option 2: Full demolition and reconstruction of the inlet headwall and wing walls using similar materials. This option requires benching above the headwall before any demolition works.
- Option 3: Construction of a new headwall using similar materials in front of the existing wall. This option would not require the existing headwall to be removed, which reduces the impact on the surrounding embankment.
- Option 4: New inlet structure in front of the existing with a stone pitching façade. This option includes construction of a new concrete headwall, wingwalls and apron with a stone façade like the existing.
- Option 5: Replacement with a new concrete headwall and wingwalls in front of the existing structure and a new concrete apron. This option includes construction of a new concrete headwall, wingwalls and apron on the inlet side of the culvert. The concrete headwall would be tapered into each of the pipes increasing the flowrate and capacity during high flow conditions.
- Option 6: No works beyond current maintenance. This option is a 'do nothing' approach and involves no remedial action beyond current maintenance.

**Issue 2 – Corrosion and deformation of the steel pipe culvert**

- Option 1: Repair the areas of corrosion in the culvert. This option involves removal of corrosion on sections of the pipe and protection with galvanising paint.
- Option 2: Remove and replace the culvert. Remove and replace techniques are similar to those generally used in the construction of new roads.
- Option 3: Relining the pipes with a suitable lining material. There are several methods/materials that can be used to effectively reline pipe culverts.
  - Option 3a – HDPE lined. Inserting HDPE (high-density polyethylene pipe) into the steel culvert. The joints are butt welded outside the culvert before being pushed or pulled into place along rails.
  - Option 3b – Spiral wound plastic structural lining. Using spiral wound plastic structural lining. These liners are formed by spirally winding a continuous strip of plastic into the deteriorated culvert and step-by-step locking or welding the edges of the strip together to form a pipe. The plastic strip is usually smooth on the inside and ribbed on the outside. For larger diameters, the plastic may be reinforced with steel in the ribs of the strips.
  - Option 3c – GRP slip liner. Using glass fibre reinforced (GRP) slip lining. It is similar to HDPE slip lining. Some GPR liners have been found to provide the required structural integrity and durability for the culvert.

  - Option 3d – Reinforced concrete lining. Using reinforced concrete lining around the entire circumference of the existing steel pipe. During construction, a temporary platform and formwork would be constructed to move through the culvert and install steel reinforcement and pour concrete progressively in sections. Each section of liner is then allowed to set before moving to the next section.

- Option 4: No works beyond current maintenance. This option is a 'do nothing' approach and involves no remedial action beyond current maintenance.

**Issue 3 – Scour at the outlet end of the culvert**

- Option 1: Install rock armouring at outlet. This option involves placement of various sized rocks around the outlet area. Large rocks would be installed by a crane from the road above with smaller size rocks placed by hand.
- Option 2: Stabilise batter using shotcrete, soil nails, stabilised sand, foam, no-fines concrete. This option involves the repair of the outlet batter, which would provide greater stability for the road in the long-term.
- Option 3: Extend pipes to a sufficient length so that the outlet will no longer affect the road batter. This option would extend the pipes and would require them to be placed on the riverbed.
- Option 4: Construction of a new concrete outlet structure including new concrete apron. This option includes construction of a new concrete headwall, wingwalls and apron.
- Option 5: No works beyond current maintenance. This option is a 'do nothing' approach and involves no remedial action beyond current maintenance.

### 2.4.3 Analysis of options

**Issue 1 – Major cracking and movement in the stone headwall at the inlet**

**Option 1** – Localised repair of the cracks and holes in the inlet headwall and wingwalls by using similar materials.

This option is not practicable for medium to long-term repair of the headwall and wingwalls as the localised repair would only provide a short-term fix. This option would not resolve any of the potential structural issues and could result in further cracking in the wall. This does not satisfy the need for the proposal as it doesn't contribute to a safe and structurally stable road environment. The wall cannot be effectively repaired without completely dismantling and rebuilding from similar materials.

**Option 2 –** Full demolition and reconstruction of the inlet headwall and wing walls using similar materials.

This would increase the impact on the surrounding road and embankment during construction. The road would likely need to be closed during the works to maintain the safety of the public. It would also require an increase in the worksite footprint to cater for excess spoil generated. This option is not desirable because the increase in the area of exposed soil is seen as a high environmental risk due to the works being close to the Thredbo River in a pristine national park.

**Option 3 –** Construction of a new headwall using similar materials in front of the existing wall.

This option wouldn't require the existing headwall to be removed, which reduces the impact on the surrounding embankment. The new headwall would retain the aesthetics of the original structure and the heritage value would also be preserved if it was constructed in a similar manner to the existing headwall. However, this option is likely not to meet the +100yr design life required by the proposal, based on the durability of the existing headwall. This is primarily due to freeze-thaw effects in this location which are exacerbated by the porous nature of the materials being used.

**Option 4 –** New inlet structure in front of the existing with a stone pitching façade

This option, although it does meet the 100yr design life required, was considered undesirable because the stone façade would likely fail sooner than the concrete structure. This could lead to delamination, which is a mode of failure where the material fractures into layers. Additional maintenance over the long-term could be required, however, this would not affect the overall performance of the structure. Due to the façade the structure would retain much of the existing aesthetics of the original headwall however, its heritage value would be reduced due to the introduction of the new concrete structure.

**Option 5 –** Replacement with a new concrete headwall and wingwalls in front of the existing structure and a new concrete apron.

This option would provide an inlet structure that meets the 100yr design life specified in the proposal. Construction timeframes and footprint would be minimised with this option and further reductions could be made with the use of pre-

cast elements. The headwall would be tapered into each of the pipes increasing the flowrate and capacity during high flow conditions which would reduce the risk and impact of potential flood events.

**Option 6 –** No works beyond current maintenance

This option is unacceptable as the movement in the stone headwall could eventually result in its' partial or full collapse. This option presents significant risk to any road users and the surrounding environment.

**Issue 2 – Corrosion and deformation of the steel pipe culvert**

**Option 1** – Repair the areas of corrosion in the culvert.

This option is not suitable as a long-term treatment as it would not address the structural damage and compression of the pipes.

**Option 2 –** Remove and replace the culvert.

This option is undesirable as replacement costs are higher than the rehabilitation of the existing culvert. The construction impacts to surrounding environment and road users would be significantly higher for a full replacement of the pipes.

**Option 3** – Relining the pipes with a suitable lining material.

This is a cost-effective way to extend the life of the culvert without undertaking a full replacement. The work can be undertaken in-situ with minimal impact on the surrounding environment. There are several methods/materials that can be used to effectively reline pipe culverts, however, not all methods would meet the 100yr durability requirement. The HDPE lining method is more suited to smaller sized pipes and therefore is not feasible for this culvert. The spiral wound plastic structural lining may be suitable for this project. Investigation with the manufacturer of the GRP slip liners revealed that this type of liner is not suitable for use in large culverts, and therefore not suitable for this site. Reinforced concrete lining (Option 3d) would provide superior strength and durability, however it is a more expensive and labor-intensive lining solution.

**Option 4 –** No works beyond current maintenance

This option is unacceptable as the pipes would continue to deform over time and could eventually result in their partial or full collapse. This option presents significant risk to any road users and the surrounding environment.

**Issue 3 – Scour at the Outlet end of the Culvert**

**Option 1 –** Install rock armouring at outlet.

This option would successfully reduce the rate of scouring around the outlet and therefore the rate of slumping in the batter. The solution would not fix the movement that has already occurred in the batter, however the placement of scour protection at the toe of the batter would slow the movement in the future. This option is relatively cost effective, simple to construct and has a very low impact on the surrounding environment.

**Option 2 –** Stabilise batter using shotcrete, soil nails, stabilised sand, foam, no-fines concrete.

This option would provide greater stability for the road in the long-term; however, construction would require a large footprint which increases the risk for impacts to the surrounding environment. The large area of concrete covering the batter would significantly detract from the visual amenity of the surrounding environment.

**Option 3 –** Extend pipes to a sufficient length so that the outlet will no longer affect the road batter.

This option would result in an increase in the durability of the batter; however, it could result in the pipes intruding on the national parks land. Over time the new outlet points would develop similar issues, potentially eroding the surrounding river embankments. The placement of the pipes on the riverbed would increase the work area and the risk of adverse impacts.

**Option 4 –** Construction of a new concrete outlet structure including new concrete apron.

This option would improve the durability of the structure and meet the 100yr design life specified and provide a minor extension of the culvert which would increase the stability of the batter and road above. However, the construction footprint and impacts to the surrounding environment would be significantly increased. Due to the steepness of the batter, providing vehicle access to the outlet would be very difficult and would require cutting a significant track in the existing batter about 80m in length. This would result in additional environmental impacts in the area.

**Option 6 –** No works beyond current maintenance

This option is unacceptable as the scouring of the outlet would continue over time leading to increased erosion of the streambed and bank. This is impactful to the surrounding environment and to the structural integrity of the culvert. This option presents significant risk to the surrounding environment.

## 2.5 Preferred option

The justification for the preferred options has been based upon the proposal objectives and the development criteria described in Section 2.3.2. Justification is also based on the principles of ecologically sustainable development (ESD) as defined in section 6(2) of the *Protection of the Environment Administration Act 1991* (PEA Act).

**Issue 1 – Major cracking and movement in the stone headwall at the inlet**

The preferred option for Issue 1 is **Option 5** - Replacement with a new concrete headwall and wingwalls in front of the existing structure and a new concrete apron. This involves replacement with a new concrete headwall and wingwalls in front of the existing structure and a new concrete apron. It is preferred because it would provide the best outcome for long-term durability by meeting the 100yr design life specified, with the lowest construction impacts. It does not require an increase in the worksite footprint, and therefore would cause less impact on the surrounding road and embankment during construction, compared with some of the alternative options. As it meets the 100yr design life, this option is the most cost effective for the long-term. It would provide a safe and structurally stable road environment.

**Issue 2 – Corrosion and deformation of the steel pipe culvert**

The preferred option for Issue 2 is **Option 3d** – reinforced concrete lining, using reinforced concrete lining around the entire circumference of the existing steel pipe. This option addresses the structural damage and compression of the pipes while providing a high level of structural integrity that would meet the +100yr durability specification. Although this option comes at a higher initial cost than some other options it is considered a cost-effective solution as it would not require the removal of the existing pipes. A full replacement of the pipes would have a significantly higher impact on the surrounding environment and road users. This option should provide excellent protection from the harsh environmental conditions in this area including freeze / thaw effects and should only require minimal maintenance throughout its lifecycle. Other benefits are that the reinforced concrete liner can more effectively be integrated with a new concrete inlet headwall and tapered to suit the existing outlet. The finished product would be a seamless concrete pipe culvert structure.

**Issue 3 – Scour at the Outlet end of the Culvert**

The preferred option for Issue 3 is **Option 1** – install rock armouring at the outlet which would provide a good level of protection around the toe of the batter by placing various sized rocks around the outlet area. This would reduce further scour and movement whilst avoiding any major issues with vehicle access to the outlet area. This option provides the smallest work footprint and therefore the lowest level of impact on the surrounding environment. This option is also the most cost-effective of the options presented. The rock riprap would provide scour protection for the stream bed and embankment at the culvert outlet. The existing slump in the batter would be monitored and further protective measures would be implemented as required.

## 2.6 Design refinements

The design provided by Northrop as seen in *Thredbo River Culvert Rehab: Detailed Designs* (Appendix C) are to be refined to 100% completetion before construction commences.

The design refinements would not influence the preferred options for rehabilitation.

# 3. Description of the proposal

This chapter describes the proposal and provides descriptions of existing conditions, the design parameters including major design features, the construction method and associated infrastructure and activities.

The current proposal is based on the Detailed Designs produced by Northrop (Appendix C). This design may be subject to change as the design progresses.

## 3.1 The proposal

Transport proposes to carry out culvert rehabilitation works on the Thredbo River, Alpine Way MR677. The work involves repairing the multi-cell pipe culvert and undergoing improvement works at the inlet and outlet. This would contribute to the ongoing durability of the culvert, assist with minimising the risk of scouring and degradation, and maintain safe road usage. The proposal is shown in Figure 1-2.

Key features of the proposal would include:

- Excavate and construct inlet apron to accommodate a new headwall and wingwalls
- Build a new headwall and wingwall in front of the existing culvert inlet
- Concrete line the existing corrugated steel culvert cells
- place riprap rock scour protection at the outlet end of the culvert

The pipes are 17 m in length and have an internal diameter of 2250 mm which would be reduced by 300 mm after the work is complete because of the thickness of the concrete liner (150 mm).

The work would mostly occur underneath and next to the road with some activities needing access from the road and above for access to materials and equipment. The proposed compound and stockpile areas are described in Section 3.4.

The proposal would result in the blockage of up to three pipes to enable the maintenance work to occur, however the works would be staged in a way that during construction at least one pipe would remain open to allow for clean water to be diverted around the construction area. This also allows fish passage to be maintained throughout the proposal.

Construction is planned to start in February 2025 and would be delivered over 4 months. If delays are encountered due to weather conditions the work will be completed in two stages. Stage 1 will be completed in February and March 2025 and any outstanding work will be completed in late 2025 or early 2026 (stage 2).

Figure 3-1 shows the key construction features of the proposal, including the construction footprint and the Cascade Hut Trail car park which provides the area for parking and ancillary facilities.




| | EASTING | NORTHING |
|---|---|---|
| 1 | 613149.718 | 5957341.667 |
| 2 | 613160.370 | 595736.732 |
| 3 | 613173.279 | 5957347.899 |
| 4 | 613188.104 | 5957341.138 |
| 5 | 613185.261 | 5957329.701 |
| 6 | 613205.934 | 5957320.107 |
| 7 | 613207.037 | 5957316.894 |
| 8 | 613226.947 | 5957309.156 |
| 9 | 613239.905 | 5957306.028 |
| 10 | 613257.652 | 5957304.775 |
| 11 | 613257.292 | 5957294.008 |
| 12 | 613238.779 | 5957239.554 |
| 13 | 613222.926 | 5957291.436 |
| 14 | 613204.053 | 5957282.875 |
| 15 | 613197.146 | 5957286.418 |
| 16 | 613196.080 | 5957294.910 |
| 17 | 613174.686 | 5957303.526 |
| 18 | 613147.889 | 5957331.850 |
| 19 | 613144.829 | 5957316.689 |

LEGEND

- State Heritage Register (SHR) (Bundian Way)
- Potential Archaeological Deposits (PADs)
- State Road Reserve Boundary Line
- Project Footprint

**Figure 3-1 Key features of the proposal**

## 3.2 Design

### 3.2.1 Design criteria

Specific design criteria have been developed for the proposal. Key criteria for the proposal include:

- New headwall and wingwalls to address structural issues
- Install concrete lining in the pipes to address structural issues
- Provide scour protection to the existing downstream area
- Introduce tapering to the new headwall to increase the flowrate and capacity during high flow conditions.

The current concept design would be further refined at the detailed design stage.

### 3.2.2 Engineering constraints

A number of constraints influence the proposal, including:

- Constructability given the site access constraints and steep embankments. Large plant and equipment cannot access the culvert without presenting a large environmental impact. Some activities would need access from the road and above for materials and equipment.
- The maintenance of the culvert must be designed and constructed with considerations to the structural intengrity of the road above throughout the work. Safe and efficient road usage must be maintained throughout the proposal.
- Limited area for the establishment of excavators and cranes.
- Water fluctuations would affect water diversions
- Staged construction is required.

### 3.2.3 Major design features

The major design features included in the project are the construction of a new headwall, wingwalls and concrete apron, the reinforced concrete lining around the circumference of the existing steel pipe, and the rock armouring at the outlet end of the culvert.

**New headwall, wingwalls and inlet apron**

A new concrete headwall and wingwalls would be constructed in front of the existing inlet structure, and a new concrete apron would be established. The concrete headwall would be tapered into each of the pipes increasing the flowrate and capacity during high flow conditions which would reduce the risk and impact of potential flood events. This inlet structure would meet the 100yr design life specified in the proposal. Construction of these design features includes installing formwork, fixing steel reinforcement, pouring concrete, and curing.

**Reinforced concrete lining**

The pipes would be relined using reinforced concrete lining around the entire circumference of the existing steel pipe. During construction, a temporary platform and formwork would be constructed to move through the culvert and install steel reinforcement and pour concrete progressively in sections. Each section of liner is then allowed to set before moving to the next section. The concrete lining would be installed using the methods described in Section 3.3.1.

**Culvert scour repair**

Rock armouring would be installed at the outlet, which involves placement of various sized rocks around the outlet area. The riprap material would be placed using excavator, cranes and outriggers from the road level above with smaller size rocks placed by hand. A riprap rock size $D_{50}$ =750 mm is proposed.

## 3.3 Construction activities

### 3.3.1 Work methodology

The proposal is anticipated to involve the following key construction stages:

- Site establishment
- Inlet works – this involves the construction of a new concrete headwall and wingwalls.
- Tunnel lining – involving the lining of the existing steel pipes with a tunnel lining system and filling the void with a concrete grout.
- Outlet works - placement of rock at the outlet end of the culvert.
- Demobilisation

Site establishment

- Pre-clearance checks to delineate and protect known heritage items and sensitive areas.
- Site surveys to establish limit of works and levels for excavation.
- Implementation of traffic guidance scheme in accordance with relevant ROL approval (see Section 3.3.6).
- Establish a compound and stockpile site within the confines of the existing Cascade Hut Trail car park.

Inlet works

- Establish access to the western embankment at the culvert inlet (cell 4) via the adjacent batter. Temporary steps would be installed to provide access for workers. A section of guardrail adjacent to the culvert would be removed to allow for a small excavator to track down the batter with the aid of metal ramps, grates and plastic excavator mats.
- Install clean water diversion, sediment control and filtration system to direct water into eastern most pipe (cell 1) in accordance with the approved Erosion and Sediment Control Plan (ESCP).
- Excavate the western side of the inlet apron area (cell 4 to 2) using a small excavator, with the assistance of a large excavator positioned on the road above. The small excavator would place the excavated material into the bucket of the large excavator which then loads this material into a truck for removal.
- Waste generated from the excavation would be primarily stored on site at the main site compound area within the Cascade Trail car park. Overflow material will be transported offsite to either the secondary compound site on Alpine Way 3.5 km east of Thredbo Village, or the Pender Lea compound site, 25 km east of Thredbo Village. Waste deposited here will be stored and processed before reusing or disposed in a timely manner to a licensed premises. Large sized rocks removed from the area may be stockpiled on site for reuse as scour protection at the outlet.
- Pour concrete blinding layer using a concrete boom.
- Construct western half of the inlet apron (cells 4 and 3) by installing formwork, fixing steel reinforcement, pouring concrete, and curing. A Truck mounted Hiab Crane would be used to assist by lowering the required materials down to the inlet area. Concrete would be placed with the use of a concrete boom pump. A suitable concrete washout bay would be provided in the site compound area, well away from the watercourse.
- Establish access to the eastern embankment at the culvert inlet (cell 1) via the adjacent batter.
- Excavate, pour concrete blinding, and construct the eastern half of the inlet apron similar to the western half as previously described.
- Establish an additional water diversion barrier using the newly constructed concrete apron as a base to seal off the eastern inlet apron area.
- Clean down and prepare existing headwall, including draping plastic sheeting, before building the new headwall in front of the existing.

- Construct new headwall and wingwall on the eastern side of the inlet (cells 1 & 2) in front of the existing headwall. The new headwall would require formwork installation, steel fixing, and concreting. Concrete pumps and trucks would stay on road level above.

Tunnel lining

- Line existing steel culvert in (cells 1 & 2) with an approved tunnel lining system including:
  - establish monitoring trucks and crane material down to working apron
  - prepare and clean the dry work area
  - install reinforcing steel
  - place mould made with plastic formwork
  - fully seal the mould
  - pump grout/concrete in the mould and wait for it to set
  - once set, mould can be removed in a day
  - install steel and move mould to next section of the culvert and until culvert is fully relined.

On completion of the eastern most culvert inlet works (headwall, wingwalls and tunnel lining), the clean water diversion system will be reconfigured so that clean water is able to flow through these recently completed culvert cells (Cells 1 and 2).

This will enable the western side of the culvert inlet works to be constructed as per the steps taken for the eastern side which will include cleaning and preparing the existing headwall, construct the new headwall and wingwall and tunnel line the remaining pipes (cells 3 and 4)

Outlet works:

- Establish access to the outlet end installing temporary steps from the top embankment to the river level.
- Place riprap material on outlet end using excavator, cranes and outriggers to move rocks on road level and move rocks to their positions on the outlet.

General site demobilising:

- Remediate all work areas and access tracks and reinstate removed guardrails.
- Remove machinery and disestablish compound and stockpile sites. Remove remaining materials from site and dispose at a licenced premises.
- Remove traffic control.

Detailed methodologies would be further refined during construction planning.

### 3.3.2 Construction workforce

The workforce would include both an internal and external crew. An external crew, still to be engaged, would be contracted to complete the lining work in the culvert. All other work is to be completed by a Transport for NSW bridge crew. The external crew would be contracted to work under the same environmental management plan as the internal crew.

The workforce is expected to fluctuate depending on the stage of the work.

### 3.3.3 Construction hours and duration

Construction is planned to start in February 2025 and would be delivered over 4 months. If delays are encountered due to weather conditions the work will be completed in two stages. Stage 1 will be completed in February and March 2025 and any outstanding work will be completed in late 2025 or early 2026 (stage 2).

The proposal would be conducted under standard construction hours with employees working from:

- Monday to Friday - 6am to 7pm
- Saturday - 6am to 1pm

### 3.3.4 Plant and equipment

The following is a list of the plant and equipment to be used for the proposal:

- small excavator
- large excavator
- water diversion, sediment control and filtration system:
- truck for the removal of accumulated sediment
- concrete trucks and boom pumps
- a truck mounted Hiab Crane and outriggers.

### 3.3.5 Earthworks

Earthworks would be required for the establishment of access track to the culvert. Temporary steps would be installed for workers and a section of guardrail next to the culvert would be removed to allow for a small excavator to track down the batter with the aid of metal ramps, grates, and plastic excavator mats. A temporary clean gravel pad would be placed within the construction area inside the waterway diversion to provide the pad for the excavator. The water would be diverted using a clean water diversion system and other various sediment controls as required.

A compound and stockpile site would be established within the confines of the existing Cascade Hut Trail car park. Overflow will be directed to a secondary compound site on Alpine Way 3.5 km east of Thredbo Village and the Pender Lea compound site, 25 km east of Thredbo Village.

The accumulated sediment in the inlet apron area would be excavated using a small excavator and a large excavator positioned on the road above. The small excavator would place the excavated material into the bucket of the large excavator which would then load it into a truck for removal. Precise cut and fill volumes would be identified during detailed design. The concrete binding layer would be poured as soon as possible after excavating to seal the exposed soil in the area. The waste generated from the excavation would be transported to an appropriate offsite stockpile facility nearby (north of Thredbo Village) to be stored and processed before reusing. Large sized rocks removed from the area may be stockpiled on site for reuse as scour protection at the outlet.

Temporary steps will be installed at the outlet end to establish access for workers from the top embankment to the river level. Riprap material would be placed using excavator, cranes, and outriggers to move rocks on road level and move rocks to their positions on the outlet. A riprap rock size $D_{50}$ =750mm would be used. The riprap up the batter slopes would be placed in 2 layers, and 1 layer at the outlet to match the existing rocks. The riprap up the slope would reach 1.9m high.

At the completion of the work, all construction areas and access tracks would be remediated. The compound and stockpile sites would be disestablished and any remaining materials from the site would be removed and disposed of at a licenced premises.

### 3.3.6 Traffic management and access

Construction vehicles and machinery would access the proposal site using Alpine Way Highway and enter the works area via designated access points.

Construction plant would be restricted to the access tracks, the temporary gravel pad, and the compound site and stockpile areas within the Cascade Hut Trail car park. Light and heavy vehicles would be parked in the Cascade Hut Trail car park. Vehicles would need to use Alpine Way to transport construction materials to the proposal and to transport waste materials from the site. Additional stockpiles and material storage would be available at the Transport stockpile site on Alpine Way north of Thredbo Village and construction vehicles would travel between these locations.

The traffic guidance scheme would be implemented in accordance with relevant ROL approval. This includes:

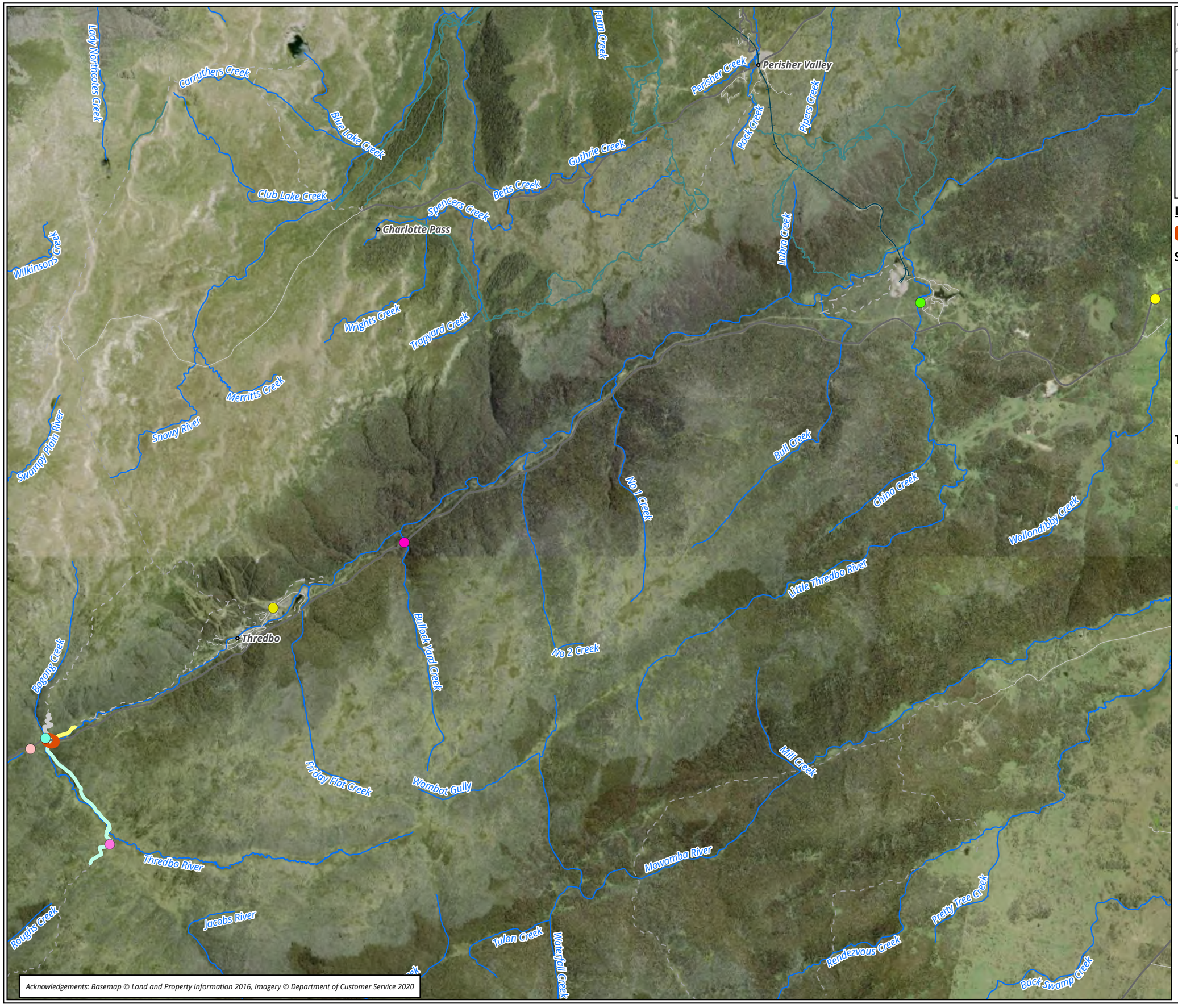
- Single lane closure with traffic signals as a minimum for the duration of works from 6am to 7pm weekdays and 6am to 1pm on Saturdays.
- 24/7 lane closure with traffic signals may be required during specific activities that require equipment to be in position overnight.

## 3.4 Ancillary facilities

The following facilities are proposed as part of the works:

- A temporary compound area would be established on the existing hardstand car park of the Cascade Trail (Figure 3-2 and 3-3). This would serve as the main site compound area and house the site facilities as well as storage of materials and equipment.
- A small stockpile area would be made available within the main site compound area (Figure 3-4). Additional stockpile and material storage would be required at a secondary compound site on Alpine Way 3.5 km east of Thredbo Village (Figure 3-2 and 3-5) and the Pender Lea compound site, 25 km east of Thredbo Village (Figure 3-2 and 3-7).
  - The secondary compound site encompasses 455.00 $m^2$ (Figure 3-6) and the Pender Lea compound site encompasses 508.15$m^2$ (Figure 3-8).
  - Stockpiles would be managed in accordance with and the *QA Specification R44 – Earthworks* and the *QA specification 3071 – Selected Material for Earthworks.*
  - Stockpiles are not expected to be associated with acid sulfate soils or contaminated waste.
- A suitable concrete washout bay would be provided in the site compound area well away from the watercourse.
- Crane, concrete pump, excavator, and trucks would also travel on road level above the culvert facilitating large tasks for easier execution and installation of features of the works.
- Light vehicle parking for workers would be available in site compound area.

Relevant landmarks and the locations of the additional compound sites are indicated on Figure 3-2.




**Legend**

Study area

**Sites**

- Cascade Hut Trail car park
- Dead Horse Gap car park
- Little Thredbo
- Penderlea compound site
- Secondary compound site
- Thredbo village
- AAWT Camping Area

**Tracks**

- Thredbo River track
- Dead Horse Gap track
- Cascade trail

## Figure 3 Landmarks and Ancillary Facilities

0 600 1,200 1,800 2,400 3,000

Metres

Scale: 1:66,000 @ A3

*Coordinate System: GDA2020 MGA Zone 55*

N

biosis APEM Group

Matter: 40371, Date: 30 August 2024 ,
Prepared for: SH, Prepared by: AA, Last edited by: aabid
Location: P:\40300s\40371\Mapping\
40371_Thredbo_River_Culvert_REF.aprx
Layout: 40371_F3_Landmarks_Ancillary_Facilities




Figure 3-3 Proposed compound area in Cascade Trail car park.

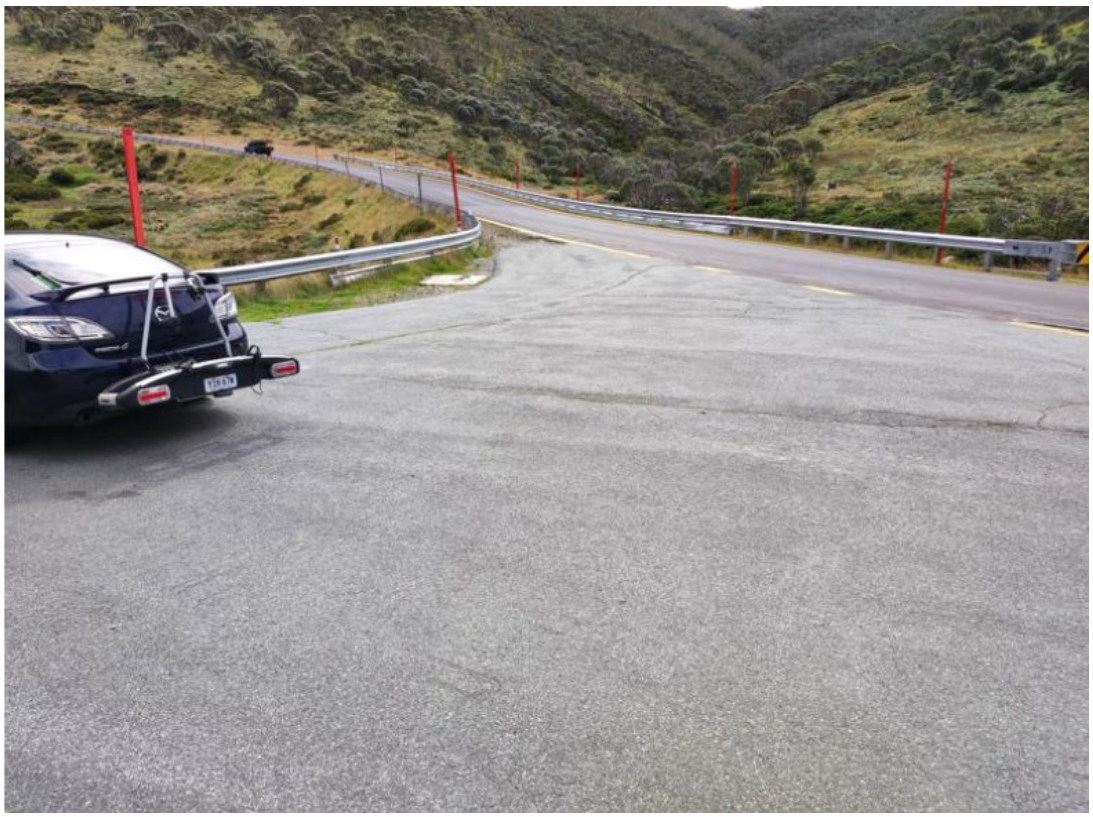


Figure 3-4 Proposed stockpile area in Cascade Trail car park.



Figure 3-5 Secondary compound site on Alpine Way for stockpile and material storage.

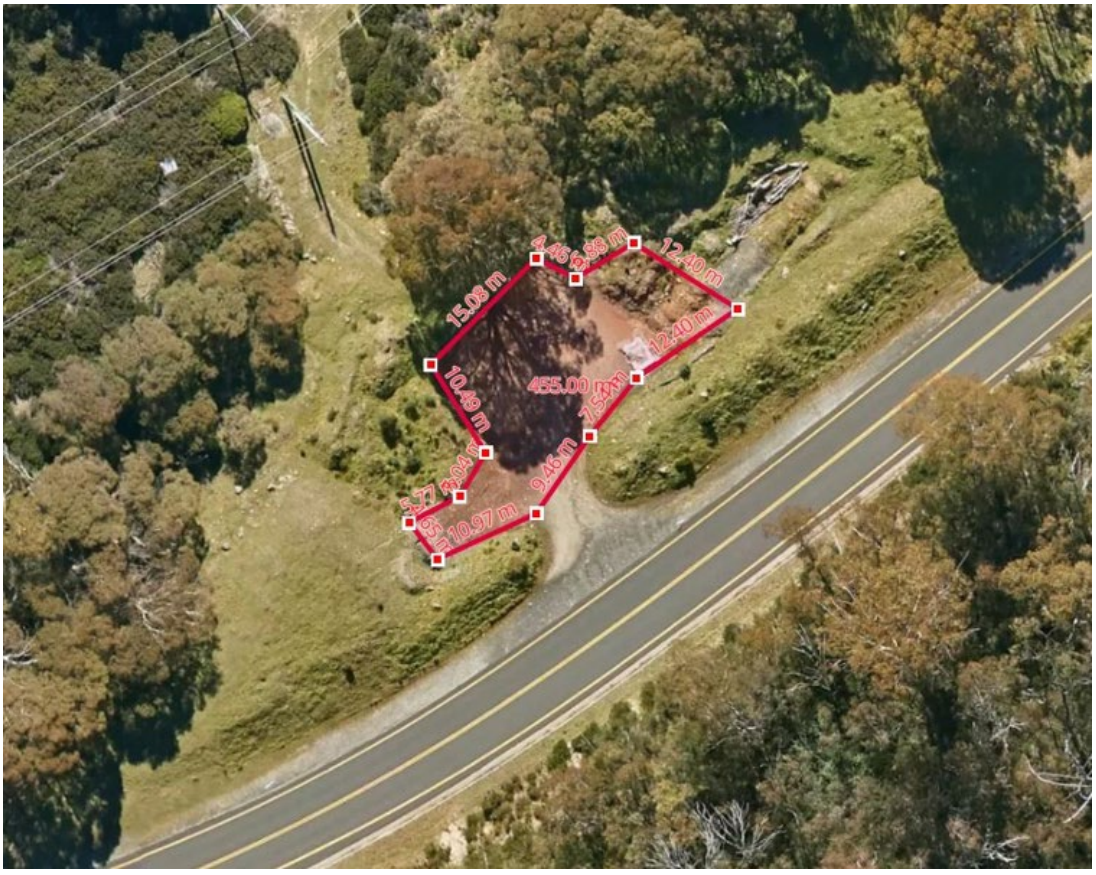



Figure 3-6 Secondary compound site dimensions.



Figure 3-7 Pender Lea compound site.




Figure 3-8 Pender Lea compound site dimensions.

## 3.5 Public utility adjustment

A Before You Dig Australia (BYDA) search did not reveal any public utilities in the vicinity of the proposal. The only utilities that would be impacted by the proposal are the waterways, the impacts of which are detailed throughout this REF.

## 3.6 Property acquisition

The proposal is located within the Australian Alps Bioregion in the Snowy Monaro Regional Council LGA about 3km southwest of Thredbo. It is located within an area of native vegetation and is surrounded by one of the state's largest national parks, Kosciuszko National Park. The Thredbo River flows through the proposal from south to north. The State Heritage Register listed Bundian Way is located immediately to the south of the proposal. The area of the proposal and works boundary is located entirely within the boundaries of Transport's Road corridor.

The proposal does not require any property acquisition (full or partial/strip) or modification.

# 4. Statutory and planning framework

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

## 4.1 Environmental Planning and Assessment Act 1979

Section 5.5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) requires 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. This REF document has been written to help fulfil that requirement and assess the environmental impacts of the proposal.

The following sections highlight the relevant State Environmental Planning Policies and the Local Environmental Plans under the EP&A Act that are relevant to the proposal.

### 4.1.1 State Environmental Planning Policies

The proposal is surrounded by the Kosciuszko National Park, however the proposal itself is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Planning Systems) 2021
- State Environmental Planning Policy (Precincts – Regional) 2021

**State Environmental Planning Policy (Transport and Infrastructure) 2021**

State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the State.

Section 2.10 to 2.15 of SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities before the commencement of certain types of development. Section 2.10 (1) (b) specifies that developments being carried out by a public authority without consent should consult with councils if the development is likely to generate traffic to an extent that will strain the capacity of the road system in a local government area. Consultation, including consultation as required by SEPP (Transport and Infrastructure) (where applicable), is discussed in Chapter 5 of this REF.

As the proposal is for the rehabilitation of the culvert and is to be carried out by Transport, it can be assessed under Division 5.1 of the EP&A Act. Development consent from Snowy Monaro Council is not required.

**State Environmental Planning Policy (Biodiversity and Conservation) 2021**

Under the Snowy River Local Environmental Plan 2013 (LEP), the proposal is zoned C1 National Parks and Nature Reserves. SEPP (Biodiversity and Conservation) 2021 contains no provisions regarding the clearing of native vegetation for that zoning.

**State Environmental Planning Policy (Planning Systems) 2021**

SEPP (Planning Systems) 2021 defines environmentally sensitive areas of State significance by several criteria. Land, places, buildings or structures listed on the State Heritage Register (SHR) under the Heritage Act 1977 is relevant to this proposal. A significant Aboriginal cultural pathway, the Bundian Way (SHR#01906), runs adjacent to the proposal. Further discussion on the potential impacts to Bundian Way are included in Section 6.5.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and therefore development consent or approval is not required under SEPP (Planning Systems) 2021.

**State Environmental Planning Policy (Precincts – Regional) 2021**

SEPP (Precincts - Regional) 2021 contains some provisions relating to earthworks in schedule 1E Complying Development – Chapter 3. The relevant provisions are as follows:

- The earthworks must preserve topsoil on site for reuse.
- Excavated material removed from the site must be disposed of in accordance with the *Protection of the Environment Operations (Waste) Regulation 2014.*

- Excavation must be carried out in accordance with *Excavation Work: Code of Practice* (SafeWork Australia, 2018).

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and therefore development consent or approval is not required under SEPP (Precincts - Regional) 2021.

### 4.1.2 Local Environmental Plans

**Snowy River Local Environmental Plan 2013 (LEP)**

This Plan aims to make local environmental planning provisions for land in that part of Snowy Monaro Regional local government area in accordance with the relevant standard environmental planning instrument under section 3.20 of the EP&A Act.

The entire proposal land is zoned C1 National Parks and Nature Reserves under the Snowy River LEP.

The relevant objectives of the Snowy River LEP are:

- To protect and enhance, for current and future generations, the ecological integrity, natural resources and environmental significance of Snowy River.
- To protect, preserve and enhance areas of high scenic landscape value and the open rural landscape, including maintaining separation between towns and villages.
- To value, protect and promote the natural, cultural and archaeological heritage of Snowy River by careful management.

The proposal is consistent with these objectives as the maintenance works on the culvert would ensure a stable and durable road system for future generations. It would also reduce the erosion entering the Thredbo River from the degradation of the culvert and help to protect the environmental significance of Snowy River. The work would temporarily impact native vegetation; however, the overall landscape value of the area would be preserved and those areas impacted will be rehabilitated on completion of the project.

The archaeological heritage of the area has been assessed in the *MR677 Thredbo River (Cascade) Culvert Relining Works: Aboriginal Archaeological Excavation report (*AAER) produced by Biosis on 21 May 2024 and the *Aboriginal Cultural Heritage Assessment Report (Stage 3 PACHCI)* (ACHAR) prepared by Biosis and dated 22 May 2024 (Appendix E). Careful management is to be utilised. This is discussed further in Section 6.5.

The objectives of the National Parks and Nature Reserves zoning are:

- To enable the management and appropriate use of land that is reserved under the *National Parks and Wildlife Act 1974* or that is acquired under Part 11 of that Act.
- To enable uses authorised under the *National Parks and Wildlife Act 1974*.
- To identify land that is to be reserved under the *National Parks and Wildlife Act 1974* and to protect the environmental significance of that land.

The proposal is not reserved under the *National Parks and Wildlife Act 1974*, so these objectives do not apply to the proposal. However, under this zoning the NPWS must be consulted. This is discussed in Section 5.6.

## 4.2 Other relevant NSW legislation

### 4.2.1 Roads Act 1993

*The Roads Act 1993* supports Transport's legal right to undertake roadworks on certain roads. Section 61 states that it is exclusively the function of Transport to make decisions as to what road work is to be carried out on any freeway, highway or metropolitan main road.

### 4.2.2 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides the basis for legal protection and management of Aboriginal sites within NSW, and for the management of National Parks. The Act includes provisions for the protection and preservation of Aboriginal objects and places of cultural and historic significance. Currently Aboriginal cultural heritage consists of objects and places which are protected under Part 6 of the Act.

It is specified in Section 90 of the NPW Act that the Director-General may issue an Aboriginal heritage impact permit in relation to a specified Aboriginal object, place, land, activity or person, or specified types or classes of these. An Aboriginal heritage impact permit (AHIP) may be issued subject to conditions, or unconditionally.

Aboriginal heritage impact permits must be obtained before the start of any project that would, or would be likely to, impact on Aboriginal objects or places. This REF concludes that there would be direct impacts to Aboriginal sites (Section 6.5) and an AHIP covering the proposal footprint will need to be obtained from Heritage NSW before impacts occur.

### 4.2.3 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) aims to is to maintain a healthy, productive, and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. Part 7 of the BC Act contains additional requirements with respect to assessments, consents, and approvals under the EP&A Act. section 7.2A and 7.3 of the BC Act includes an assessment of significance using a 5-part test, which uses five factors to assist in determining if the proposal 'is likely to significantly affect threatened species or ecological communities, or their habitats'. These five factors must be considered by a consent or determining authority when considering a development proposal. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Director-General's requirements, or a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM).

Additionally, if a development is likely to significantly affect threatened species the Biodiversity Offsets Scheme under the BC Act is triggered. Activities under Division 5.1 of the EP&A Act are likely to significantly affect threatened species if:

- The 5-part test under the BC Act is applied and shows that the development is likely to significantly affect threatened species, or ecological communities, or their habitats (section 7.2A and 7.3)
- Or the activity is proposed to be carried out in an area of outstanding biodiversity value (section 7.2 and part 3)

Clearing of native vegetation is a key threatening process listed under BC Act. The proposal would result in the clearing of 0.09 ha of native vegetation. Dieback caused by Phytophthora and infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis are both listed as key threatening processes under the BC Act and without appropriate mitigation measures could inadvertently be transported into the proposal area by construction machinery and vehicles.

The potential for impacts on ecology have been considered in Section 6.4. The assessment concludes that the proposal would be unlikely to have a significant impact on any threatened species, populations or ecological communities listed under the BC Act. A species impact statement is therefore not required. The proposal also does not occur in an area of outstanding biodiversity value, so the Biodiversity Offset scheme is not triggered.

### 4.2.4 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations including conserving fish stocks and fish habitat and promoting ecologically sustainable development.

Part 7A contains additional requirements with respect to assessments, consents, and approvals under the EP&A Act. Part 7A requires that the significance of the impact on threatened species, and endangered ecological communities is assessed using a seven-part test. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in

accordance with the Director-General's requirements, or a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM).

Impacts to threatened species, populations and communities listed under the FM Act must be assessed through the AoS process under section 5A of the EP&A Act. Under the FM Act, an assessment of whether threatened species of fish and marine vegetation, populations or ecological communities are likely to be impacted by the proposal is required. If a significant impact is likely, a species impact statement must be completed and consultation with the NSW Department of Primary Industries (Fisheries) is required.

One of the objectives of the FM Act is to conserve key fish habitats. To achieve this, DPI Fisheries has identified aquatic habitats that are important to the sustainability of the recreational and commercial fishing industries, the maintenance of fish populations, and the survival and recovery of threatened aquatic species. The Thredbo River and the Bogong Creek are both watercourses mapped as key fish habitat.

Thredbo River is a part of the endangered ecological community 'The aquatic ecological community in the catchment of the Snowy River in NSW', as listed by the FM Act. The listing includes all native fish and aquatic invertebrates within all rivers, creeks and streams of the Snowy River catchment. The proposal would result in the blockage of up to three pipes and the diversion of water to enable the maintenance work to occur, however the works would be staged in a way that during construction at least one culvert always would remain open. This allows fish passage to be maintained throughout the proposal. A temporary clean gravel pad would be placed within the construction area inside the waterway diversion to provide the pad for the excavator. The water would be diverted using a combination of sandbags, water diversion barriers, pumps, filtration unit and other various sediment controls as required. It is important that the excavator pad and water diversions are managed in such a way that there are no significant impacts to aquatic species and / or habitat.

The proposal is not considered likely to result in significant impacts to marine vegetation or completely block fish passage and therefore permits would not be required under sections 205 and 219 respectively of the FM Act. The significant impact statements for the threatened species and ecological community listed under the FM Act are detailed in the *Culvert lining work at Thredbo River on Alpine Way (MR677): Biodiversity Assessment Report* (BAR) produced by EnviroKey for Transport in December 2020 (Appendix F), and the Ecology Desktop Assessment produced by Biosis in May 2024 (Appendix H). Details of the consultation with DPI Fisheries are in Section 5.5 (Appendix I).

### 4.2.5 Heritage Act 1977

The Heritage Act 1977 (Heritage Act) is concerned with all aspects of heritage conservation ranging from promoting an understanding of the state's heritage, identification and protection of items, through to restoration and enhancement.

Heritage places and items of particular importance to the people of NSW are listed on the State Heritage Register. Only those heritage items that are of State significance are listed on the State Heritage Register. A significant Aboriginal cultural heritage pathway, the Bundian Way, intersects with this landscape which now contains Alpine Way. The Bundian Way is approximately 265km long extending from Targangal (Mount Kosciuszko) to Bilgalera (Eden). It was recognised by listing on the NSW State Heritage Register (SHR) in 2013 (SHR#01906). The Bundian Way is located next to the project boundary, and with appropriate identification and avoidance mitigation measures, would be protected throughout the proposal. This is discussed further in Section 6.5.

Given appropriate mitigation measures in place, approval under section 60 of the Heritage Act is not required for impacts to a listed heritage item.

The Heritage Act also protects 'relics', which can include archaeological material, features and deposits. Under section 139 of the Heritage Act, NSW Heritage Council approval is required before the disturbance or excavation of land if a project will, or is likely to result in, disturbance to a relic. Culvert B10155 is not identified as a heritage item, as discussed in the *Thredbo Culvert Assessment B10155 Heritage Impact Letter of Advice* prepared by Transport on 19 June 2024 (Appendix L). It is not currently heritage listed under the Transport for NSW s170 Register, or Local Environmental Plans for Bombala Council, Cooma Monaro Shire Council or Snowy River Shire Council. This is discussed further in Section 6.6.

### 4.2.6 Protection of the Environment Operations Act 1997

*The Protection of the Environment Operations Act 1997* (POEO Act) aims to protect, restore and enhance the quality of the environment in the State. It establishes the procedures for issuing of licenses for environmental protection in relation to aspects such as waste, air, water and noise pollution control.

The proposal would not involve any scheduled activities listed under Schedule 1 of the POEO Act, therefore an application for an environment protection license under section 48 or 49 is not required.

With appropriate erosion and sediment controls implemented, the proposal is unlikely to cause water pollution. Therefore, an environment protection license under the POEO Act is not required.

The POEO Act creates a few pollution offences. If an incident occurred during the proposal with the potential to cause 'material harm' to the environment, Council would be obliged to notify the NSW Environment Protection Authority (EPA) immediately.

### 4.2.7 Water Management Act 2000

The *Water Management Act 2000* aims to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. It controls the carrying out of activities in or near water sources in NSW. 'Water sources' are defined as a river, lake, estuary, place where water occurs naturally on or below the surface of the ground or NSW coastal waters.

The proposal is exempt from the requirement to obtain a controlled activity approval under section 41 of the *Water Management (General) Regulation 2018* for work on waterfront land as it is being conducted by a public authority.

Under section 91B of the Water Management Act 2000, a water supply work approval authorises its holder to construct and use a specified water supply work at a specified location. No extraction of water is required for the proposal, therefore a water supply work approval would not be required.

## 4.3 Commonwealth legislation

### 4.3.1 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 (MNES) or the environment of Commonwealth land. These are considered in Appendix A and Chapter 6 of the REF.

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.

As a result, Transport proposals assessed via an REF:

- must address and consider potential impacts on nationally listed threatened species, populations, ecological communities and migratory species, including application of the "avoid, minimise, mitigate and offset" hierarchy
- do not require referral to the Federal Department of the Environment for these matters, even if the activity is likely to have a significant impact.

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

Potential impacts to these biodiversity matters are also considered as part of Chapter 6 of the REF.

No MNES were recorded during the field survey, however the BAR (Appendix F) and Ecology Desktop Assessment (Appendix H) provided 4 and an additional 4 species respectively that have a moderate or high likelihood of occurring within the proposal. Significant impact assessments for those species are included in the reports. It was determined that the proposal is unlikely to have a significant impact on threatened or migratory biota as listed by the EPBC Act.

There are no wetlands of international importance within the direct vicinity of the proposal. The proposal is located within 10 km of Blue Lake, a RAMSAR wetland on the Main Range. This is well clear of the proposal.

Clearing of native vegetation is a key threatening process listed under EPBC Act. The proposal would result in the clearing of 0.09 ha of native vegetation. Dieback caused by *Phytophthora* and infection of frogs by amphibian chytrid fungus causing the disease *chytridiomycosis* are both listed as key threatening processes under the EPBC Act and without appropriate mitigation measures could inadvertently be transported into the proposal area by construction machinery and vehicles.

The assessment of the proposal's impact on nationally listed threatened species, populations, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant MNES. Chapter 6 of the REF describes the safeguards and management measures to be applied.

### 4.3.2 Native Title Act 1993

The *Native Title Act 1993* recognises and protects native titles. The Act covers actions affecting native title and the processes for determining whether native title exists and compensation for actions affective native title. It establishes the Native Title Registrar, the National Native Title Tribunal, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements, and the National Native Title Register. Under the NT Act, a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search of the National Native Title Tribunal website was undertaken, with no Native Title holders/claimants identified.

## 4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of road infrastructure facilities and is being carried out by or on behalf of a public authority. Under Division 17, Sub-division 1 Roads and Infrastructure Facilities of SEPP (Transport and Infrastructure) the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

Transport is the determining authority for the proposal. This REF fulfils Transport's obligation under section 5.5 of the EP&A Act including to 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 assessment of the proposal's impact on EPBC listed threatened species, populations, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant MNES. Based on this, referral to the Commonwealth Minister is not warranted

Under the NPW Act, an AHIP covering the proposal footprint will need to be obtained from Heritage NSW before impacts occur.

# 5. Consultation

This chapter discusses the consultation undertaken to date for the proposal and the consultation proposed for the future.

## 5.1 Consultation strategy

Consultation has occurred with stakeholders and government agencies throughout the development of the proposal. The purpose of consultation has been to:

- Communicate with the Aboriginal communities regarding heritage management of the proposal throughout its lifespan, in accordance with the requirements of the *Transport's Procedure for Cultural Heritage Consultation and Investigation* (PACHCI).
- Advise government agencies and stakeholders of the proposal and its possible impacts, and to respond to relevant concerns.

Consultation letters have been sent to National Parks and Wildlife Service (NPWS) (Appendix J) and DPI Fisheries (Appendix I). Letters have also been sent to the General Managers of both the Snowy Monaro Regional Council and the Snowy Valleys Council, which could be impacted by the work.

Consultation is relevant post construction to ensure the design has minimal environmental impacts. It is important to continue consultation throughout the proposal to inform the community, stakeholders, and government agencies of progress and any unforeseen issues or developments.

The REF will not be going on public display.

## 5.2 Community notification

A Community Notification Letter will be sent to relevant community and business stakeholders to inform them of the upcoming work and any impacts the work may have on them. The notification includes:

- Planned work
- Location of the proposal
- The construction period and working hours
- Impacts on the community, including visual impacts, noise impacts, changed traffic conditions, and closure of the Cascade Hut Trail car park.

The letter will include an email that the community can use to sign up to the Thredbo River Culverts email list to receive updates on the project directly.

## 5.3 Aboriginal community involvement

Biosis was commissioned by Transport to undertake an Aboriginal Cultural Heritage Assessment Report (ACHAR) (Stage 3 of *the Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Transport for NSW 2011). A Stage 2 PACHCI was undertaken by Biosis for Transport in 2022.

The Aboriginal community was consulted by Transport regarding the heritage management of the project throughout its lifespan. Consultation has been undertaken as per the process outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010a) (consultation requirements) and the PACHCI (Transport for NSW, 2011). The appropriate government bodies were notified, and advertisements placed in newspapers regarding the project (22 February 2023).

This resulted in numerous Aboriginal organisations and individuals being registered by Transport for consultation, listed in the *Aboriginal Cultural Heritage Assessment Report (Stage 3 PACHCI)* (ACHAR) prepared by Biosis and dated 22 May 2024 (Appendix E).

An initial Aboriginal Focus Group (AFG) meeting was held on 19 April 2023. Representatives from two Representative Aboriginal Parties (RAPs) attended the AFG, Eden Local Aboriginal Land Council (LALC) and Ngarigo and Djiringanj Peoples. Transport presented information on the proposed works within the study area and Biosis presented the proposed archaeological excavation methodology. A range of comments were contributed by the RAPs during both discussions and are appended to the ACHAR.

All RAP groups were invited to submit an ASO application to participate in the test excavations. Test excavations were conducted with a team of two Biosis archaeologists and two Aboriginal Site Officers. During this time, the entire landscape was considered significant by the ASOs.

The draft ACHAR and AAER were sent to RAPs on 29 February 2024, along with an invitation to attend an AFG on 15 March 2024. Representatives of Guntawang Aboriginal Resources Incorporated were present at the meeting. It was the wish of some RAPs that could not be present at the meeting that all efforts should be made to salvage as many artefacts as possible before construction begins.

The outcome of the consultation process was that the RAPs considered the proposal and wider landscape to have a high level of cultural significance.

The following recommendations resulted from consultation:

- Transport to continue consultation with the registered Aboriginal parties
- Application for an Aboriginal Heritage Impact Permit (AHIP)
- Community surface collection of AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 (see Section 6.5).
- No further archaeological work required once an AHIP is obtained from Heritage NSW and community collection is complete.
- Further archaeological assessment is required within Alpine Way Culvert PAD 1 if impacts cannot be avoided.
- Fencing of the study area during construction.
- Stop work provision for any potential heritage sites identified during construction.
- Stop work provision for any potential discovery of human remains.
- Heritage induction.

These recommendations are to implemented as the Stage 4 PACHCI.

Further details and copies of correspondence between Transport and the RAPs are appended to the ACHAR (Appendix E).

Table 5-1: Summary of Transport's Procedure for Aboriginal Cultural Heritage Consultation and Investigation

| Stage | Description |
|---|---|
| Stage 1 | Initial assessment by Transport. |
| Stage 2 | Site survey and further assessment. |
| Stage 3 | Formal consultation and preparation of a cultural heritage assessment report. |
| Stage 4 | Implement environmental impact assessment recommendations. |

Table 5-2: Issues raised through Aboriginal community consultation

| Group | Issue raised | Response / where addressed in REF |
|---|---|---|
| Guntawang Aboriginal Resources Incorporated | • The entire area is classified as disturbed | • Addressed in Section 6.5. |
| RAPs | • Potential harm to Aboriginal sites discovered. | • Addressed in detail in Section 6.5. |

| | | |
|---|---|---|
| Yurwang Gundana Consultancy Cultural Heritage Services. | • Potential harm to Aboriginal sites during construction. | • Identified Aboriginal sites should be salvaged of surface artefacts via community collection. Discussed further in Section 6.5. |
| RAPs | • Confirmed harm to Aboriginal sites | • An AHIP covering the proposal footprint will be obtained. |
| RAPs | • Impacts to Alpine Way Culvert PAD 1 | • The proposal will be fenced off and secured. Discussed further in Section 6.5. |

## 5.4 SEPP (Transport and Infrastructure) consultation

Section 2.10 to 2.15 of SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities before the commencement of certain types of development.

Section 2.10 (b) specifies that developments being carried out by a public authority without consent should consult with councils if the development is likely to generate traffic to an extent that will strain the capacity of the road system in a local government area.

Section 2.15 (2 a and b) specifies that development being carried out on land adjacent to land reserved under the NPW Act or land zoned as C1 National Parks and Nature Reserves, NPWS must be consulted. In accordance with this clause, a letter was sent from Transport to NPWS on 5 June 2024 (Appendix J) to provide information on the proposal and request any comments. This is discussed further in Section 5.6.

Appendix B contains a SEPP (Transport and Infrastructure) consultation checklist that documents how SEPP (Transport and Infrastructure) consultation requirements have been considered.

Consultation with the Snowy Monaro Regional Council and Snowy Valleys Council has occurred (Appendix M) under section 2.10 (b) of SEPP (Transport and Infrastructure) as the proposal will have an impact on Council related infrastructure and services. Transport has issued a letter to both councils outlining the work involved with the proposal, and the changed traffic conditions that will occur as a result.

**National Parks and Wildlife Service**

NSW National Parks and Wildlife Service (NPWS) is part of Environment and Heritage in the Department of Climate Change, Energy, the Environment and Water (DCCEEW). NPWS are responsible for managing protected areas in NSW including national parks, nature reserves, flora reserves, World Heritage areas, rainforests, beaches, alpine areas and sites of great cultural and historic significance. Consultation with NPWS is necessary under section 2.15 of SEPP (Transport and Infrastructure).

A letter was sent from Transport to NPWS on 5 June 2024 to provide information on the proposal and request any comments (Appendix J). A response was produced by NPWS on 14 June 2024 in the form of an email, and consultation has since been ongoing (Appendix J).

A main concern from NPWS is that February is peak fire season and February / March is peak visitation season for the area where the proposal is to occur. NPWS made the following requests:

- *Limited parking maintained in the Cascade Hut Trail car park and access through to Cascades Fire Trail for:*
  - *walkers and mountain bike riders wishing to access the Pilot Wilderness Area, Dead Horse Gap and the Thredbo River Walk*
  - *emergency response (including bushfire and search and rescue)*
  - *pest animal control work*
  - *commercial Tour operators*
  - *significant fire trail works accessed via the car park.*
- *Use of the Cascade Hut Trail car park to fly out of for track works on the Dead Horse Gap track and Thredbo River Walk. This would occur for a couple of hours at a time.*

- *Access maintained through Alpine Way during closure periods for emergency response, including bush fire and search and rescue (if possible)*
- *Where possible be given advanced warning of when road closures will be, so they are able to:*
  - *advise commercial tour operators who have clients travelling to Tom Groggin and Geehi and using Alpine Way*
  - *advise campers who have booked to alter their travel arrangements.*
  - *The Cascade Hut Trail car park will be closed to vehicles throughout the construction period.*

Arrangements will be made NPWS to accommodate visitors to this part of Kosciuszko NP wishing to access the Cascades Hut Trail and nearby walking trails.

Table 5-3: Issues raised through stakeholder consultation

| Agency | Issue raised | Response / where addressed in REF |
|---|---|---|
| NPWS | • Limited parking made available in the Cascade Hut Trail car park. | • Transport will continue to work collaboratively with the NSW National Parks in facilitating operational and tourist outcomes within this area including access to the Cascades Fire Trail and to other areas of interest. This is discussed further in section 6.11. |
| NPWS | • Maintained access through Alpine Way during closure periods for emergency responses. | • Transport will not close Alpine Way. Full closure as a management measure is not likely to be needed and it would significantly impact the travelling public as well as local and regional stakeholders. |
| NPWS | • Advanced warning of closures for tourism purposes. | • Transport will not close Alpine Way. Full closure as a management measure is not likely to be needed and it would significantly impact the travelling public as well as local and regional stakeholders. Warning is therefore not required. |

## 5.5 Other Government agency and stakeholder involvement

**NSW Department of Primary Industries (Fisheries)**

DPI Fisheries is a division of NSW Department of Primary Industries and Regional Development (DPIRD) and is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats. They ensure that developments comply with the requirements of the FM Act *(*namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act, respectively), and the associated Policy and Guidelines for Fish Habitat Conservation and Management (2013). Additionally, DPI Fisheries is responsible for ensuring the sustainable management of commercial, recreational and Aboriginal cultural fishing, aquaculture and marine protected areas within NSW.

The aquatic health of the Thredbo River and its tributaries is of particular importance to DPI Fisheries. The rivers, creeks and streams of the Snowy River Catchment are a part of 'The aquatic ecological community in the catchment of the Snowy River in NSW', as listed by the FM Act. This includes the Thredbo River and Little Thredbo River and their tributaries. Threats to the Snowy River Aquatic EEC include the degradation of riparian vegetation, the loss of in-stream aquatic vegetation and instream structures preventing migration of aquatic species. The Thredbo River is considered Type 1 Key Fish Habitat and is known and/or potential habitat for the Alpine Redspot Dragonfly listed by the FM Act.

An assessment of the impacts to fish passage from the alteration to structures and a test of significance or '7-part test' on the potential impact of the works on the Snowy River Aquatic EEC is included in the BAR (Appendix F) and discussed in Section 6.4. In accordance with section 219 of the FM Act, the works on the culvert must be designed to facilitate fish passage through the structures. The '7-part test' in regard to the Alpine Redspot Dragonfly is included in the Ecology Desktop Assessment (Appendix H).

In accordance with section 199 of the FM Act, a letter was sent from Transport to DPI Fisheries on 5 June 2024 to provide information on the proposal and request any comments (Appendix I). Transport is required to take into consideration any response to the letter within 21 days after the notice was given. A response was received by DPI Fisheries on 11 June 2024 (Appendix I). DPI Fisheries has no objections to the works being undertaken as described and provided the following matters for considerations in accordance with section 199 of the FM Act:

*All relevant approval documentation should be maintained by the proponent or their contractor operating on site so a DPI Compliance Officer can check that the works are being undertaken in accordance with those approvals.*

- *The works must be consistent with the proposal outlined in the referral (Appendix I).*
- *Erosion and sediment mitigation devices are to be erected in a manner consistent with currently accepted Best Management Practice to prevent the entry of sediment into the waterway. These are to be maintained in good working order for the duration of the works and until the site has been stabilised.*
- *Stockpiles should be located away from adjacent water land, riparian and aquatic vegetation.*
- *Dewatering at the site is to be undertaken in accordance with accepted Best Management Practice including the use of mitigation controls (i.e. sediment fence between the sump water release outlet and the waterway).*
- *Works should be undertaken during periods of low flows in the waterway, and where possible during clear, dry weather.*
- *For Instream works:*
    - *Machinery should only enter or work from the waterway in accordance with best management practice and an agreed work method statement.*
    - *Machinery is appropriately cleaned, degreased and serviced prior to use at the site and entry into the waterway.*
    - *Emergency Spill Kits appropriate for containing and cleaning up petroleum and solvent product spills within waterways are available on site at all times during works.*
    - *Large woody debris is not to be realigned, relocated, or removed without prior consultation with and agreement from DPI Fisheries.*
- *For armouring works:*
    - *Only clean rock (no fines) should be used at the site.*
    - *Rock is to be of suitable size to not be displaced by high velocity flows.*
- *For waterway crossings scour protection must border the surface edge of the crossing at the same level to ensure there is no drop in elevation at the join.*
- *To protect riparian and aquatic vegetation riparian and aquatic vegetation should be identified and appropriately delineated on water land as "no-go" areas.*
- *On completion of the works the site should be rehabilitated by:*
    - *removal from the site of construction materials and temporary structures (other than silt fences and other erosion and sediment control devices) installed during the course of the proposal.*
    - *Removal of all imported material that formed temporary crossing and side track.*
    - *Reinstatement of the side track footprint to a stable grade generally consistent with the upstream and downstream bank profile and re-established with native endemic riparian and aquatic vegetation.*
    - *Appropriate maintenance of erosion and sediment control devices undertaken until the vegetation has successfully established and the site has stabilised.*
- *Observations of dead or distressed fish should be immediately reported to DPI Fisheries. If a fish kill occurs, works would cease until the cause of the kill is identified and rectified.*

Table 5-4: Issues raised through stakeholder consultation

| Agency | Issue raised | Response / where addressed in REF |
|---|---|---|
| DPI Fisheries | • Erosion and sediment mitigation measures must prevent the entry of sediment into the waterway. | • Suitable mitigation measures will be adopted. This is discussed further in Section 6.1 and 6.2. |
| DPI Fisheries | • Impacts to fish passage may occur | • The proposal is designed to allow for continual fish passage. This is addressed in the methodology (Section 3.3) and in Section 6.4. |
| DPI Fisheries | • Potential impact of the works on the Snowy River Aquatic EEC | • Addressed in the appended BAR (Appendix F) and Section 6.4. |
| DPI Fisheries | • Water quality of the Thredbo River must not be adversely affected | • The proposal is designed to avoid any activities that would affect the water quality of the Thredbo River. Mitigation measures will be in place and are discussed in Section 6.2. |
| DPI Fisheries | • Impacts on aquatic habitats and the riparian zone must be minimised | • Mitigation measures will be in place and are discussed in Section 6.4. |

## 5.6 Ongoing or future consultation

The following ongoing consultation would be carried out by Transport:

- Ongoing consultation with RAPs as required
- The community will be informed of the proposal, including the planning phase and construction period
- Ongoing consultation with community stakeholders as required
- Ongoing consultation with DPI Fisheries to inform them of progress of works
- Ongoing consultation with NPWS to inform them of progress of works
- AHIP covering the proposal footprint needs to be obtained from Heritage NSW
- Publication of this REF is to occur.

# 6. Environmental assessment

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

- Potential impacts on matters of national environmental significance under the EPBC Act.
- The factors specified in the Guideline for Division 5.1 assessments (NSW DPE, 2022b) and as required under section 171 of the *Environmental Planning and Assessment Regulation 2021* and the *Roads and Related Facilities EIS Guideline* (DUAP 1996). The factors specified in section 171 of the *Environmental Planning and Assessment Regulation 2021* are also considered in Appendix A.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

## 6.1 Soils

### 6.1.1 Methodology

The methodology for assessing soil and earthwork impacts is included partially in the ACHAR (Appendix E) and the *B10155 Corrugated Steel Pipe Culvert over Thredbo River on Alpine Way, 4km South of Thredbo: Hydraulic Investigation – Pipe Relining of Existing 4 cells x 2250 mm Corrugated Steel Pipe Culvert* (Appendix D). Geotechnical engineers were involved in the design process for the proposal.

### 6.1.2 Existing environment

The study area is located within the Australian Alps Bioregion which contains the highest section of the Great Dividing Range and Australia's highest mountain, Mount Kosciusko at 2,228 m. Much of the surrounding landscape is characterised by peaked ranges and broad forested valleys.

Geologically, the area is underlain by Late Silurian Biotite granodiorite and tonalite. This is commonly present as gravels and cobbles in addition to outcrops on tors, crests, and steeper slopes. Quartz veins also occur within the bedrock.

Soil landscapes are defined by a combination of soils, topography, vegetation, and weathering conditions. The study area contains two soil landscapes:

- Main Range Sub-Alpine Mitchell soil landscape, and
- Chimneys Ridge Sub-Alpine soil landscape.

The Main Range Sub-Alpine Mitchell Soil Landscape is characterised by alpine humus and transitional alpine humus soils (Mitchell, 2002). Steep slopes are also noted to have stonier profiles over deeply weathered bedrock. The Chimneys Ridge Sub-alpine soil landscape is characterised by high plateaus and block faulted ranges on Silurian-Devonian gneissic granite and areas of Devonian rhyolite below the tree line with general elevation from 1500 to 1800m (Mitchell, 2002). Peaks and tor covered rounded hills stand above the plateaus, and valley swamps occur in the dendritic drainage network with a local relief 300m. Alpine humus and transitional alpine humus soils and peat with abundant organic matter exist in this soil landscape. Similar to the Main Range Sub-Alpine Mitchell Soil Landscape, the steep slopes have stonier profiles over deeply weathered bedrock.

A search for contaminated soil sites was conducted using the EPA 'Contaminated Land: Record of Notices' (NSW EPA, 2024). This search did not find any sites issued with regulatory notices, or any sites notified to the EPA, located in or near the proposal.

### 6.1.3 Potential impacts

**Construction**

- Temporary steps would be installed for workers to gain access to the culvert and metal ramps, grates, and plastic excavator mats will be used to allow a small excavator to track down the road batter to the culvert. These actions have the potential to loosen the topsoil and release sediment into the surrounding environment and the Thredbo River.

- As the accumulated sediment is excavated from the inlet apron area it can be accidently introduced to the receiving environment and/or waterways.
- Loose soil in the area of work or the stockpile may be eroded during rainfall events by runoff. Erosion of earthworks could cause sedimentation into the surrounding environment and the Thredbo River.
- The impacts to soil are expected to be low due to the limited amounts of excavation required for the proposal.

**Operation**

- There are minor impacts to the soil and geology through the operation of the proposal. The stockpile is to be removed after the work is concluded. The remaining materials would be removed from site and disposed of at a licenced premises.
- Maintenance activities during operation could disturb soils and landforms through cleaning and inspection of the culvert.

### 6.1.4 Safeguards and management measures

Table 6-1 Soils safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Contaminated land | If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination.<br>All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport for NSW Senior Environment and Sustainability Officer. | Transport Project Manager or Contractor | Construction | Section 4.2 of QA *G36 Environment Protection* |
| Sedimentation of the surrounding environment | Erosion and sediment control measures are to be implemented and maintained to:<br>• Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets<br>• Reduce water velocity and capture sediment on site<br>• Minimise the amount of material transported from site to surrounding pavement surfaces<br>• Divert clean water around the site.<br>(in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book)). | Contractor or Transport Project Manager | Construction | *QA G38 Soil and Water Management*<br><br>ESCP |
| Sedimentation of the surrounding environment | 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. | Transport Project Manager | Construction | *QA G38 Soil and Water Management*<br><br>ESCP |
| Sedimentation of the surrounding environment | The waste generated from the excavation will be transported to an appropriate offsite stockpile facility nearby to be stored and processed before reusing. Large sized rocks removed from the area will be stockpiled on site for reuse as scour protection at the outlet. | Transport Project Manager or Contractor | Construction / Post construction | Section 143 of the POEO Act |

Other safeguards and management measures to address soil impacts are identified in Sections 6.2 and 6.3 in relation to surface water and groundwater, and hydrology and flooding.

## 6.2 Surface water and Groundwater

### 6.2.1 Methodology

Assessments of surface water have been undertaken with guidance from the BAR (Appendix F).

### 6.2.2 Existing environment

The Thredbo River flows north-easterly through the centre of the proposal. Water courses located in the vicinity include a tributary of the Thredbo River, Bogong Creek, which flows easterly to the north of the proposal. Dead Horse Creek is located about 500m south-west of the proposal (Figure 1-1).

The river is highly disturbed and modified in the area of the existing culvert, however, both upstream and downstream, the in-stream and riparian habitats are in good condition. The stream is between 3-7m wide. Substrates are dominated by gravel and rock.

### 6.2.3 Potential impacts

**Construction**

- The proposal would result in the blockage of up to three pipes and the diversion of water to enable the maintenance work to occur. A temporary gravel pad would also be placed within the construction area inside the waterway diversion to provide the pad for the excavator. These actions have the potential to reduce the natural flow of the river.
- Increased rates of erosion and sedimentation from the work. This includes increased erosion of the banks and also sedimentation from materials such as concrete. This can cause adverse impacts to water quality, such as increased turbidity.
- Water quality impacts through uncontrolled release of rinse water from plant washing and concrete slurries.
- Stormwater run off from the stockpile site in the Cascade Hut Trail car park can enter the Thredbo River and impact the water quality.
- Introduced dirt or plant material into the waterways through placement of riprap.
- Chemical pollution of the waterways from fuels, chemicals or liquids used in plant and equipment.
- The proposal would not involve any major earthworks which are likely to impact the local groundwater system.

**Operation**

- A slight change in the natural flow after the work is complete due to the narrowing of the culvert diameter size.

### 6.2.4 Safeguards and management measures

Table 6-2 Surface water safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Water quality | Water quality control measures are to be used to prevent any materials (e.g. concrete, grout, sediment etc.) entering drain inlets or waterways. | Transport Project Manager | Construction | Section 2.2 and 3.5 of *QA G38 Soil and Water Management* |
| Waterways and water quality | Aquatic habitat will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Transport for NSW, 2024) and *Section 3.3.2 Standard precautions and mitigation measures* of the *Policy and guidelines for fish habitat conservation and management Update 2013* (DPI, 2013). | Transport Project Manager | During construction. | |

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Waterways and water quality | A clean water diversion will be established to separate clean from dirty water during the construction phase of the project.<br>The work will be staged in a way that during construction at least one culvert at all times will remain open. | Transport Project Manager | Construction | |
| Waterways and water quality | Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls. | Transport Project Manager | Construction | |
| Sedimentation of the waterway | Erosion and sediment controls will be used when diverting the water to ensure no sediment is introduced during the process. They will be erected in a manner consistent with currently accepted Best Management Practice (Blue Book) to prevent the entry of sediment into the waterway. These are to be maintained in good working order for the duration of the works and until the site has been stabilised. | Transport Project Manager | Construction | Section 3.1 of *QA G38 Soil and Water Management*<br><br>Consultation with DPI Fisheries (Appendix I) |
| Sedimentation of the waterway | Rock for the temporary work platform and rock riprap will be clean and free of dirt or plant material including seeds (no fines) prior to its use within the waterway.<br>Rock is to be of suitable size to not be displaced by high velocity flows. | Transport Project Manager | Construction | Consultation with DPI Fisheries (Appendix I) |
| Chemical pollution and accidental spill | Machinery will only enter or work from the waterway in accordance with best management practice and an agreed work method statement.<br>Machinery will be appropriately cleaned, degreased, and serviced prior to use at the site and entry into the waterway. | Transport Project Manager | Construction | Consultation with DPI Fisheries (Appendix I) |
| Chemical pollution and accidental spill | A suitable concrete washout bay will be provided in the site compound or stockpile area well away from the watercourse. | Transport Project Manager | Construction | |
| Impacts to aquatic habitats | To protect riparian and aquatic vegetation, these areas should be identified and appropriately delineated on water land as “no-go” areas.<br>On completion of the works the site will be rehabilitated by:<br>• removal from the site of construction materials and temporary structures (other than silt fences and other erosion and sediment control devices) installed during the course of the proposal.<br>• Removal of all imported material that formed temporary crossing and side track. | Transport Project Manager or Contractor | Post-Construction | Consultation with DPI Fisheries (Appendix I) |

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| | • Reinstatement of the side track footprint to a stable grade generally consistent with the upstream and downstream bank profile and re-established with native endemic riparian and aquatic vegetation.<br>• Appropriate maintenance of erosion and sediment control devices undertaken until the vegetation has successfully established and the site has stabilised. | | | |

## 6.3 Hydrology and flooding

### 6.3.1 Methodology

The methodology for determining the hydrology of the area was a desktop survey with the results documented in the report *B10155 Corrugated Steel Pipe Culvert over Thredbo River on Alpine Way, 4km South of Thredbo: Hydraulic Investigation – Pipe Relining of Existing 4 cells x 2250 mm Corrugated Steel Pipe Culvert* (Appendix D) prepared by Transport in April 2020.

Catchment data, and input location with latitude -36.523 and longitude 148.264 were entered into the Regional Flood Frequency Estimation Model (RFFE) 2016v1 to determine the peak flow discharges at the culvert site for the range of storms from 2 year to 100-year Average Recurrence Interval (ARI).

The HY-8 Culvert Analysis Program Version 7.40 was used for the hydraulic assessment. The assessment of the culvert was based on the site visit in November 2019 and data from the Asset Brief 2019-03.

### 6.3.2 Existing environment

The existing culvert at Thredbo River has a catchment on the southern side of Alpine Way. The calculated catchment bed slope is about 0.0258m/m or 2.58%. The adopted calculated pipe slope used in this analysis is 0.03m/m or 3%. The calculated catchment area for the proposal is 20.34 $km^2$.

The existing four cell pipe culvert has been identified as having significant defects. Several options were considered to address the defects and are outlined above in Section 2.4.

The existing 4 cells at 2250mm corrugated steel culvert have a hydraulic capacity of a 1% AEP. (1 in 100 ARI). The flood level for the existing 1% AEP event is RL 1562.10. The current flood level results in no overtopping of the road. The velocity at the outlet for the 1% AEP event is about 3.85m/s.

### 6.3.3 Potential impacts

**Construction**

- The proposal would result in the blockage of up to three pipes and the diversion of water into the remaining pipe to enable the rehabilitation work to occur. This would impact on flow rates through the open culvert and subsequent water levels.
- During a flood event, stormwater run-off may introduce sediment into the river from the stockpile site or from exposed areas of construction. Stormwater run-off may also introduce chemical (hydrocarbon) pollution from equipment or plant.
- The internal diameter would be reduced by 300 mm after the work is complete because of the thickness of the concrete liner (150 mm). The increase in velocity would cause some scour of the creek and banks.

**Operation**

- The preferred option for the corrosion and deformation of the steel pipe culvert is to use reinforced concrete lining around the entire circumference of the existing steel pipe. This will reduce the internal diameter by 300mm and reduce the hydraulic capacity. The velocity is predicted to increase from 3.85 m/s to 7.00 m/s. The increase in velocity of the outlet will cause some scour of the creeks and banks.

### 6.3.4 Safeguards and management measures

Table 6-3 Hydrology safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Scour of the creeks and banks | Scour protection of the stream bed and embankment at the culvert inlet and outlet will be achieved by using rock riprap. A riprap rock size $D_{50}$ = 750 mm is proposed. | Transport | During construction | Section 3.1 of *QA G38 Soil and Water Management* |

## 6.4 Biodiversity

### 6.4.1 Methodology

The methodology is detailed in the *Culvert lining work at Thredbo River on Alpine Way (MR677): Biodiversity Assessment Report* (BAR) produced by EnviroKey for Transport in December 2020 (Appendix F).

The study area of the BAR covers the area of construction and all areas where impacts to the vegetation are of concern. This study area was then extended as part of the Aboriginal Heritage survey (artefact recovery) and to cover the Cascade Hut Trail car park. The legislation and listings have changed in the 3 years since the original BAR was produced. A Biodiversity Assessment Review was produced by Biosis on 27 March 2024 (Appendix G) to address the gaps in the original report. An additional Ecology Desktop Assessment was then produced by Biosis to address the identified gaps (Appendix H).

Section 7.3 of the BC Act details five factors which are to be considered when determining if a proposed development or activity 'is likely to have a significant effect on the threatened species, ecological communities, or their habitats.' In the FM Act, there are seven factors which are to be considered. These factors must be taken into account by consent or determining authorities when considering a development proposal or development application. This enables a decision to be made as to whether there is likely to be a significant effect on the species.

5-part assessment for the threatened species listed under the BC Act are detailed in the BAR and Ecology Desktop Assessment. 7-part assessments for the threatened species and ecological community listed under the FM Act are detailed in the BAR and Ecology Desktop Assessment. These assessments tested:

- Whether the proposal is likely to have an adverse effect on the life cycle of the threatened species or an endangered population, such that a viable local population of the species is likely to be placed at risk of extinction.
- Whether the proposal is likely to have an adverse effect on the extent of the ecological community, or 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.
- Whether the proposal is likely to remove the habitat of the threatened species, fragment or isolate the habitat of the threatened species, and the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species.
- Whether the proposal is likely to have an adverse effect on any declared area of outstanding biodiversity value or critical habitat (either directly or indirectly).
- Whether the proposal constitutes or is part of a key threatening process or is likely to increase the impact of a key threatening process.
- Whether the proposal is consistent with the objectives or actions of a recovery plan or threat abatement plan.

### 6.4.2 Existing environment

The proposal is located within an area of native vegetation within one of the state's largest national parks, Kosciuszko National Park. Much of the surrounding landscape is characterised by peaked ranges and broad forested valleys. Thredbo River flows through the study area from south to north. Two plant community types were recorded within the study area:

- PCT 641 Alpine grassland/herbfield and open heathlands in Kosciuszko National Park, Australian Alps Bioregion
- PCT 644 Alpine Snow Gum - Snow Gum shrubby woodland at intermediate altitudes in northern Kosciuszko NP, South Eastern Highlands Bioregion and Australian Alps Bioregion.

The aquatic habitat within the proposal is of varying condition, largely due to the construction of the culvert for Alpine Way formation. The stream is highly disturbed around the existing culvert, however, both upstream and downstream, the habitats are in good condition. No aquatic macrophytes were recorded.

Thredbo River is a part of the threatened ecological community 'The aquatic ecological community in the catchment of the Snowy River in NSW', as listed by the Fisheries Management Act 1994. The listing includes all native fish and aquatic invertebrates within all rivers, creeks and streams of the Snowy River catchment. The Thredbo River and the Bogong Creek are both watercourses mapped as key fish habitat under the FM Act.

The Scarlet Robin was the only threatened species detected during the field survey and is listed as vulnerable under the NSW Biodiversity Conservation Act 2016. The BAR identified 14 threatened and migratory species that had a moderate to high likelihood of occurrence within the proposal. The Ecology Desktop Assessment revealed that there are two additional listed species that are considered to have a moderate or higher likelihood of occurrence.

The species listed under the EPBC Act, BC Act and FM Act that underwent significance assessments are as follows:

- Diamond Firetail *Stagonopleura guttata* (EPBC Act and BC Act)
- Dusky Woodswallow *Artamus cyanopterus cyanopterus* (BC Act)
- Flame Robin *Petroica phoenicea* (BC Act)
- Gang-gang Cockatoo *Callocephalon fimbriatrum* (EPBC Act and BC Act)
- Hooded Robin *Melanodryas cucullate cucullate* (BC Act)
- Rainbow Bee-eater *Merops ornatus* (EPBC Act)
- Scarlet Robin *Petroica boodang* (BC Act)
- Speckled Warbler *Chthonicola sagittate* (BC Act)
- Varied Sittella *Daphoenositta chrysoptera* (BC Act)
- Little Eagle *Hieraaetus morphnoides* (BC Act)
- Broad-toothed Rat *Mastacomys fuscus* (EPBC Act and BC Act)
- Mountain Pygmy-possum *Burramys parvus* (EPBC Act and BC Act)
- Spotted-tailed Quoll *Dasyurus maculatus* (EPBC Act and BC Act)
- Hoary Sunray *Leucochrysum albicans var.tricolor* (EPBC Act and BC Act)
- Alpine Redspot Dragonfly *Austropetalia tonyana* (FM Act).
- Mountain Skink *Liopholis montana* (EPBC Act and BC Act)
- Alpine Bog Skink *Pseudemoia cryodroma* (EPBC Act)

One migratory species was found to have a moderate to high potential or was known to occur within the vicinity of the proposal (Rainbow Bee-eater *Merops ornatus)*. Under the EPBC Act, an action is likely to have a significant impact on a migratory species if it substantially modifies, destroys or isolates an area of 'important habitat' for the species. The proposal is not considered to comprise 'important habitat' for the species as discussed in the BAR. Therefore, it is considered that the proposal would not significantly impact the Rainbow Bee-eater or any migratory species.

No threatened flora species were recorded within the proposal area. Given the previous disturbance from the construction of the road, it was considered unlikely that other threatened flora species known from the region would be found in further surveys during other seasons. Effort was made towards searching for the threatened flora which had been recorded in the area previously.

There were no areas of outstanding biodiversity value (as listed on the Register of Declared Areas of Outstanding Biodiversity Value) present in the proposal or in the Snowy Monaro Regional LGA. Similarly, no Matters of National Environmental Significance (MNES) listed under the EPBC Act were recorded during the field survey.

Across the proposal weed species are relatively rare, apart from the existing highly disturbed road reserve that contains a number of weeds including the Priority Weed St John's Wort (*Hypericum perforatum*). St John's Wort occurs across the proposal and was not mapped due to being present only in the existing clear zone and around the car park boundary.

### 6.4.3 Potential impacts

**Construction**

- The proposed work would result in both temporary and permanent impact on both terrestrial and aquatic habitat.
- The proposal would result in the blockage of up to three pipes and the diversion of water through the remaining pipe to enable the rehabilitation work to occur. A temporary gravel pad would also be placed within the construction area inside the waterway diversion to provide the pad for the excavator. These actions have the potential to impact on natural fish passage through the culvert and reduce the natural flow of the river.
- The establishment of the gravel pad for in-stream work may result in direct impacts to aquatic fauna without adequate supervision.
- The proposal would result in the removal of native vegetation which is a key threatening process listed under the BC Act and the EPBC Act. The area of impact has been calculated using GIS. This includes 0.05 ha of the Alpine grassland/herbfield and open heathlands in Kosciuszko National Park, Australian Alps Bioregion (641) PCT and 0.04 hectares of the Alpine Snow Gum – Snow Gum shrubby woodland at intermediate altitudes in northern Kosciuszko National Park, South Eastern Highlands Bioregion and Australian Alps Bioregion (644) PCT. This equates to 0.09 ha of vegetation removal in total.
- Removal of the area of riparian vegetation presents permanent impacts to vegetation. The remaining impacts to vegetation would be temporary, i.e. machinery and materials storage, moving across open, grassy areas. Some small shrubs would also be removed.
- There is potential for vegetation to be accidentally cleared outside of the 0.09 ha assessed for the proposal
- Threatened fauna species that underwent significance assessments (listed above) that utilise Alpine grassland/herbfield and open heathlands in Kosciuszko National Park, Australian Alps Bioregion (641) PCT and Alpine Snow Gum – Snow Gum shrubby woodland at intermediate altitudes in northern Kosciuszko National Park, South Eastern Highlands Bioregion and Australian Alps Bioregion (644) PCT, as habitat, would have their habitats impacted by the proposal.
- Weed establishment in areas of native vegetation can occur from incoming construction equipment and incoming fill materials such as the rock for the temporary pad and rock riprap used in scour protection. This is most likely to occur when construction vehicles and machinery first enter the proposal from elsewhere and when fill is unloaded at the site.
- Pulse disturbance over the construction period is likely which may lead to avoidance behaviour. This is most likely to have an impact on fish migration through disruption of movement at key stages of their life cycle (This is discussed further in Section 6.8 of this report).
- Pathogens result in disease in flora and fauna and can be found living in organisms such as fungus, bacteria and virus. Two pathogens are known from the region and these are listed as key threatening processes. Without appropriate mitigation measures, both pathogens could inadvertently be transported into the proposal by construction machinery and vehicles. These being:
  - Dieback caused by Phytophthora (BC Act and EPBC Act)
  - Infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis (BC Act and EPBC Act).
- Within Thredbo River, pulse disturbance over the construction period is likely which may lead to avoidance behaviour. This is most likely to have an impact on fish migration through disruption of movement at key stages of their life cycle.
- For species that vocalise frequently such as birds and amphibians there is some potential for negative effects over the long-term.

**Operation**

- Post-construction, no barriers to fish passage would occur as a result of the proposed work. Given the current detailed design, the proposal is unlikely to have a negative effect on the potential wildlife corridors or markedly increase habitat fragmentation.

**Conclusion on significance of impacts**

Avoidance and minimisation of impacts to biodiversity have been incorporated at the strategic design stage of planning. This has resulted in avoiding areas of high biodiversity value (where possible) and minimising the areas of impact in these areas

(where not possible to avoid). The amount of vegetation removal to occur is 0.09 ha. This does not cross the threshold for clearing so the Biodiversity Offset Scheme doesn't apply.

The loss of habitat for threatened fauna with a moderate to high potential to occur within the proposal was assessed in the BAR (Appendix F) and the Ecology Desktop Assessment (Appendix H). In all cases it was determined that as the proposal will impact on only a very small area of potential habitat, surrounded by large swathes of similar habitat (including Kosciuszko National Park), it is not likely to significantly impact the species identified to occur within this area.

The proposal itself, with the adoption of mitigation measures outlined within Section 6.4.4 and further consideration of potential impact, is considered low risk. Based on this, referral to the Commonwealth Minister is not required.

The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act, 2016* or *Fisheries Management Act 1994* and therefore a *Species Impact Statement* or Biodiversity Development Assessment Report is not required.

While there is no recovery plan for threat abatement plan for the endangered ecological community 'The aquatic ecological community in the catchment of the Snowy River in NSW', the proposed work would be considered consistent with one should it exist as it aims to improve the structural integrity of existing road infrastructure that would lead to long-term benefits including improvements to fish passage and minimising erosion and sediment flowing into Thredbo River from the erosion currently occurring around the culvert.

The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the EPBC Act.

### 6.4.4 Safeguards and management measures

A series of mitigation measures are proposed that have been developed with specific regard to the proposal using the Transport Biodiversity Guidelines: Protecting and Managing Biodiversity on TfNSW projects and site specific safeguards to minimise potential impact to biodiversity.

Table 6-4 Biodiversity safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Biodiversity | Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible. | Transport Project Manager | Detailed design / pre-construction | |
| Removal of native vegetation | The limit of works (including compounds and parking areas) must be clearly indicated with flagging/fencing or similar. | Transport Project Manager | Pre-construction / construction | Section 2.4 of *QA G40 Clearing and Grubbing* |
| Impacts to Fish passage | The proposed design and construction methodology will not impact on fish passage. A clean water diversion to be installed to separate clean water from dirty water and to maintain fish passage at all times during the construction phase. | Transport Project Manager | Construction | Section 3.7.2 of *QA G38 Soil and Water Management* |
| Injury to aquatic species | Observations of dead or distressed fish should be immediately reported to DPI Fisheries.<br>If a fish kill occurs, works would cease until the cause of the kill is identified and rectified.<br>Should any fish kills be observed during construction, the Transport Environmental Manager must be notified immediately for urgent action. | Transport Project Manager | Construction | Consultation with DPI Fisheries (Appendix I) |
| Injury to wildlife onsite | Fauna will be managed in accordance with *Guide 9: Fauna handling of the Biodiversity Guidelines:* | Transport Project Manager | Construction | |

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| | *Protecting and managing biodiversity on RTA projects* (Transport for NSW, 2024). | | | |
| Biodiversity | If unexpected, threatened fauna or flora species are discovered, stop works immediately and follow the Transport's Unexpected Threatened Species Find Procedure | Transport Project Manager | Construction | |
| Disturbed vegetation | Disturbed areas must be progressively stabilised with a method appropriate for the location and slope. Riparian zones should be rehabilitated based on recommendations of DPI Policy and guidelines for fish habitat conservation and management (DPI, 2013). Endemic native riparian vegetation or similar should be considered in the design to stabilise the waterway and minimise the re-establishment of weeds. | Transport Project Manager | Construction / post-construction | *QA R178 Vegetation*<br>Section 4.16 of *QA G36 Environment Protection* |
| Disturbed vegetation | All vehicles and equipment used for construction will use the access tracks, existing roads and exclusion areas outlined in the traffic management plan (TMP).<br>Parking will be limited to the existing Cascade Hut Trail car park and the road shoulder to the east of the compound area. | Transport Project Manager | Construction | |

### 6.4.5 Biodiversity offsets

Where an activity is likely to have a significant impact on NSW listed threatened species or threatened ecological communities a Biodiversity Development Assessment Report (BDAR) would need to be prepared and any required offsets calculated in accordance with the Biodiversity Assessment Method. A development that is likely to significantly affect threatened species will trigger the Biodiversity Offsets Scheme under the BC Act is triggered.

It has been concluded that the proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the BC Act, FM Act or EPBC Act. As the amount of native vegetation removal is limited, biodiversity offsetting is not required.

## 6.5 Aboriginal cultural heritage

### 6.5.1 Methodology

The methodology for Aboriginal heritage assessments are included in the *MR677 Thredbo River (Cascade) Culvert Relining Works: Aboriginal Archaeological Excavation report (*AAER) produced by Biosis on 21 May 2024, and the *MR677 Thredbo River (Cascade) Culvert Relining Works: Aboriginal Cultural Heritage Assessment Report (Stage 3 PACHCI)* (ACHAR) (Appendix E) produced by Biosis on 22 May 2024 for the proposal. The ACHAR also contains detailed consultation notes with the Representative Aboriginal Parties (RAPs). The potential impacts to the significant Aboriginal cultural heritage pathway, the Bundian Way, have been additionally assessed in the *Thredbo Culvert Assessment B10155 Heritage Impact Letter of Advice* prepared by Transport on 19 June 2024 (Appendix L). An archaeological survey was conducted on the 5 May 2022 which identified five previously unrecorded Aboriginal cultural heritage sites.

Text excavations were conducted to characterise the extent, nature, and archaeological value of potential Aboriginal cultural heritage within two areas of potential archaeological deposit (PAD).

The AAER provides details for Aboriginal sites identified during the archaeological assessment. This report documents the findings of the archaeological survey conducted as part of the assessment, as required under section 2.3 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010b) (the Code) and Stage 3 of the PACHCI guidelines.

The ACHAR and AAER provide evidence about the material traces and cultural significance of Aboriginal land use to support the conclusions and management recommendations. These reports will inform the following assessment of impacts.

### 6.5.2 Existing environment

A previous PACHCI was completed in 2022 for Transport, but before this there were no Aboriginal cultural heritage sites registered with the Aboriginal Heritage Information Management System (AHIMS) register within the study area or in the vicinity. Twenty-two Aboriginal sites have been registered within 5 km of the proposal. The nearest recorded site is AHIMS 61-6-0007/Dead Horse Gap, located 250 m west of the study area.

The proposal is located within a lower slope and terrace landform unit within the Australian Alps Bioregion next to Thredbo River. The river is a perennial fresh water source that would have provided Aboriginal people with a variety of resources.

The location of the proposal at the meeting of the Thredbo River and Bogong Creek, and along a known cultural pathway (Bundian Way), indicates that suitable landforms next to Thredbo River may contain evidence of Aboriginal occupation.

The Bundian Way is listed on the State Heritage Register (SHR#01906). The Bundian Way is of State significance as a rare surviving ancient pathway approximately 265 km long used by Aboriginal people over thousands of years linking the high country at from Targangal (Mount Kosciuszko) to Bilgalera (Eden). It is associated with seasonal gatherings of Aboriginal tribes on the Snowy River for Bogong moth collection and on the Eden Coast during whale migration. The Bundian Way continues to be an important place of education and cultural activity in the Aboriginal community.

The climate data detailed in the ACHAR (Appendix E) suggests the proposal is associated with a cool oceanic climate likely to have been occupied on a seasonal basis by local Aboriginal populations. The area is likely to have been used more often in warmer seasons when resources were more available. This environment would have provided a wide range of plant and animal resources based on seasonal availability.

Generally, the site was highly disturbed and not associated with intact archaeological deposits. Low density artefact sites dominated by quartz were identified within slope/crest landforms, which is consistent with the local region.

An archaeological survey was conducted on the 5 May 2022 which identified five previously unrecorded Aboriginal cultural heritage sites. These consisted of one artefact scatter (AHIMS 61-6-0135/Alpine Way Culvert AS 1), two isolated artefacts (AHIMS 61-6-0137/Alpine Way Culvert ISO 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2) and two areas of potential archaeological deposit (PAD) (Alpine Way Culvert PAD 1 and Alpine Way Culvert PAD 2).

Text excavations were conducted to characterise the extent, nature, and archaeological value of potential Aboriginal cultural heritage within portions of Alpine Way Culvert PAD 1 and Alpine Way Culvert PAD 2. No subsurface deposits were identified in either PAD. A fourth surface artefact scatter was identified when revisiting the site during the testing program (AHIMS 61-6-0140/Alpine Way Culvert AS 2), identified on the edge of the Cascade Hut Trail car park. It is possible that further artefact sites may be identified near the Cascade Hut Trail car park and potentially beneath its surface, however, no further assessment will be required as no upgrades to the Cascade Hut Trail car park are proposed.

It is considered likely that AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0140/Alpine Way Culvert AS 2 may be representative of a single site complex within the slope/crest landform on the eastern side of Thredbo River. The sites identified during the survey were considered likely to be representative of temporary living sites.

There is no further assessment required unless updates to the design lead to impacts within PAD outside of the current proposal.

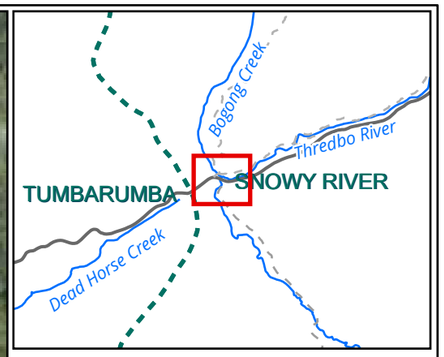
### 6.5.3 Potential impacts

There is potential for development activities to impact Aboriginal sites and the identified areas of PAD (Alpine Way Culvert PAD 1 and Alpine Way Culvert PAD 2). The area of the proposal presents five previously unrecorded Aboriginal cultural heritage sites. Three of these may be subject to harm. It is expected that the potential of harm to Aboriginal archaeological sites from the project ranges from none to direct.

Impacts have been isolated to areas of existing disturbance where possible (Alpine Way and the Cascade Hut Trail car park). If the proposal should receive an update to the construction footprint, further archaeological assessment would be required within Alpine Way Culvert PAD 1.

PAD sites are included in Figure 6-1.




**Legend**

- Study area
- Survey tracks
- Surface artefacts
- AHIMS
- PAD

*Acknowledgements: Basemap © Land and Property Information 2016; public_NSW_Imagery: © Department of Customer Service 2020*

**Figure 6-1 Aboriginal sites within the study area and vicinity**

0 10 20 30 40 50

Metres

Scale: 1:2,000@ A3

*Coordinate System:*
*GDA 1994 MGA Zone 55*

N

biosis

Matter: 38538, Date: 15 January 2024,
Drawn by: JET, Checked by: CA, Last edited by: jtownsend
Location: P:\38500s\38538\Mapping\
38538_AlpineWay, Layout: 38538_ACHA_F3_Sites

**Construction**

- Heavy vehicle and equipment movement within study area with potential compaction of surface and subsurface soils can cause direct harm to aboriginal sites and artefacts.
- Heavy vehicle and equipment movement may occur outside of the designated area for the proposal and cause harm to Alpine Way Culvert PAD 1 or the Bundian Way (SHR#01906).
- Incorrect handling of discovered sites or artefacts.

**Operation**

- Operation will present no further impacts beyond the current impacts.

### 6.5.4 Safeguards and management measures

Table 6-5 Aboriginal heritage safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Aboriginal heritage | The *Standard Management Procedure - Unexpected Heritage Items* (Transport, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, are found during construction.<br>This applies where Transport does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place.<br>Work will only re-commence once the requirements of that Procedure have been satisfied. | Transport Project Manager or Contractor | Detailed design / Pre-construction | Section 4.9 of QA *G36 Environment Protection* |
| Impacts to Aboriginal sites | If suspected human remains are discovered during the proposal, all work will stop immediately. The remains will be left and protected from damage. The Coroner's Office and NSW Police will be notified immediately. Depending on the discovered origins of the remains, the Aboriginal parties and/ or Heritage NSW will be notified. | Transport Project Manager or Contractor | Construction | Section 146 of the Heritage Act |
| Impacts to Aboriginal sites | As direct impacts to Aboriginal sites cannot be avoided, an AHIP covering the proposal footprint will be obtained from Heritage NSW before impacts occur.<br>An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places, or that cause land to be disturbed for the purposes of discovering an Aboriginal object. The AHIP should be for a term of 5 years and cover the entire proposal.<br>The AHIP will also need to allow for community salvage collection so that direct impacts to this site can be mitigated.<br>No further archaeological investigation of these sites is required. | Transport | Pre-construction | Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act). |
| Impacts to Alpine Way Culvert PAD 1 | The proposal will be fenced off and secured to ensure that Alpine Way Culvert PAD 1 is not harmed by the work. Refer to Figure 6-1. | Transport Project Manager or Contractor | Pre-construction and construction | ACHAR (Appendix E) |

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| | This fencing will remain throughout the construction phase. | | | |
| Impacts to Aboriginal sites | Heritage inductions will occur for all site workers and contractors to prevent any unintentional harm to unexpected Aboriginal objects or sites, or Aboriginal sites or objects located within proximity to the proposal. The heritage induction will include the following items:<br>• Relevant legislation.<br>• Location of identified Aboriginal heritage sites, areas of archaeological potential, and areas of archaeological sensitivity.<br>• Basic identification skills for Aboriginal and non-Aboriginal artefacts and human remains.<br>• Procedure to follow in the event of an unexpected heritage item find during construction works.<br>• Procedure to follow in the event of the discovery of human remains during construction works.<br>• Penalties and non-compliance. | Project Manager to delegate | Pre-construction | ACHAR (Appendix E) |
| Impacts to Bundian Way (SHR#01906) | The Bundian Way occurs outside of the proposal area. Avoidance and protection of the Bundian Way will be ensured by delineating the area as a "no-go" zone. The most appropriate delineation will be confirmed with the RAPs, mapped from the SHR geospatial coordinates, and included in the CEMP. The "no-go" zone will be established before any work can commence. | Transport Project Manager, Archaeologist and RAPs | Pre-construction | Heritage Impact letter of advice (Appendix L). |

## 6.6 Non-Aboriginal heritage

### 6.6.1 Methodology

Non-Aboriginal Heritage has been assessed in the *Thredbo Culvert Assessment B10155 Heritage Impact Letter of Advice* prepared by Transport on 19 June 2024 (Appendix L) with references to a Historical Heritage Assessment Report prepared by Biosis for KMH Environmental in August 2011 (Biosis Research, 2011).

### 6.6.2 Existing environment

The culvert contains four corrugated galvanised steel pipe cells which are built with random rubble cemented stone headwalls facing both sides of the river. The design uses local materials, with other examples found on Alpine Way, employing other temporary techniques like sandbags filled with cement, which were typical of the 1950s and 1960s.

The assessment completed by Biosis (Biosis Research, 2011) describes a type "4" of culvert types along a section of Alpine Way. These type 4 culverts demonstrated local significance under criteria for association with Alpine Way, and Snowy Mountains Scheme, and representative values, for those types of culverts built on Alpine Way. The description of culvert B10155 is consistent with type 4, however in the 197 examples of type 4 culverts identified by Biosis along part of Alpine Way, the Thredbo river culvert B10155 was not included.

The culvert therefore is not currently heritage listed under:

- The Transport for NSW s170 register

- Local Environment Plans for Bombala Council, Cooma Monaro Shire Council or Snowy River Shire Council.

Despite this, it has been identified within a broader range of culverts as retaining heritage value and could be part of a sample for retention. When assessing the options for rehabilitating the culvert, it was considered whether it would be possible to retain B10155 as part of the broader type 4 culvert sample on Alpine Way for inclusion on the s170 register. Given the defects and degrading condition issues identified with the culvert, it was decided that replacement of the culvert headwall, relining the culvert and installing new scour protection were the options that best met the proposal objectives and criteria and presented the most ideal outcome. This decision excludes the culvert from being selected for the Transport s170 Heritage and Conservation Register.

It was decided that works can proceed to culvert B10155 as proposed with no further heritage requirements. Record of this decision is contained withing the Heritage Impact letter of advice (Appendix L)).

### 6.6.3 Potential impacts

**Construction**

- Construction will present no impacts to non-Aboriginal heritage.

**Operation**

- Operation will present no further impacts beyond the current impacts.

### 6.6.4 Safeguards and management measures

Table 6-6 Non-Aboriginal heritage safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Non-Aboriginal heritage | Transport has committed to selecting an appropriate sample of Alpine Way Type 4 and 6 culverts (identified by Biosis in their 2011 report) which represent the best original condition for inclusion on the s170 Heritage and Conservation Register, within 12 months of REF approval.<br>If following review, condition issues associated with their construction mean a smaller sample of these culvert types is identified, this will be documented. | Transport Project Manager | Within 12 months of REF approval. | Heritage Impact letter of advice (Appendix L). |
| Non-Aboriginal heritage | A short online brochure outlining the history of Alpine Way including its construction methods seen in these culverts, should be produced within this timeframe to explain the relationship and social significance of Alpine Way to the nationally significant Snowy Hydro scheme. | Transport Project Manager | Within 12 months of REF approval. | Heritage Impact letter of advice (Appendix L). |

## 6.7 Traffic and transport

### 6.7.1 Methodology

The impacts on traffic and transport have been assessed through consultation with Transport.

### 6.7.2 Existing environment

Construction vehicles and machinery would access the proposal site using Alpine Way and enter the proposal via designated access points. Vehicles would need to use Alpine Way to transport construction materials to and from the proposal site. Additional stockpiles and material storage will be available at the Transport stockpile site on Alpine Way north of Thredbo Village and construction vehicles would travel between these locations.

Additional stockpile and material storage will be available at a secondary compound site on Alpine Way 3.5 km east of Thredbo Village and the Pender Lea compound site, 25 km east of Thredbo Village. Construction vehicles would travel between these locations.

The existing road network is indicated in Figure 3-2.

### 6.7.3 Potential impacts

**Construction**

- Travel time will be increased on Alpine Way for the duration of the construction work.
- The Cascade Hut Trail car park will be closed to vehicles throughout the construction period, which may inconvenience drivers or those wishing to access the Cascade Hut Trail.

**Operation**

- There are no impacts to traffic and transport through the operation of the culvert.

### 6.7.4 Safeguards and management measures

Table 6-7 Traffic and transport safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Traffic and Transport | A traffic control plan will be prepared in accordance with the *Transport for NSW Traffic control at work sites manual (TS 05492), version 6.1* (Transport for NSW, 2022b). | Contractor | Pre-construction | |
| Traffic and transport | Access to the Cascades Fire Trail will be allowed during construction to facilitate:<br>• walkers and mountain bike riders<br>• emergency responders<br>• pest animal control workers<br>• commercial Tour operators<br>• contractors undertaking works on National Park estate | Transport | Construction | Consultation with NPWS (Section 5.5) |

## 6.8 Noise and vibration

### 6.8.1 Methodology

Considerations for noise impacts to the general public are limited to Thredbo Resort, the Australian Alps Walking Track (AAWT) camping area and any walkers of the Cascade Trail.

### 6.8.2 Existing environment

Noise and vibration impacts already exist on Alpine Way from vehicular movements and so, potential impacts are restricted to the construction period.

### 6.8.3 Potential impacts

**Construction**

- There are no dwellings in the vicinity of the proposal. The Thredbo Resort is about 3km to the east and the AAWT camping area is within about 2.5km to the south of the proposal.

**Operation**

- There are no impacts from noise and vibration outside the normal operation of the culvert.

### 6.8.4 Safeguards and management measures

Table 6-8 Noise and vibration safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Noise | All construction plant and equipment used on Site must be:<br>• maintained in an efficient condition<br>• operated in a proper and efficient manner. | Transport Project Manager or Contractor | Construction | Section 4.6 of QA *G36 Environment Protection* |
| Noise and vibration impacts | Works to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays must have measures in place to minimise noise impacts. | Transport | Construction | |

## 6.9 Socio-economic

### 6.9.1 Methodology

As the proposed location for the proposal is relatively remote, a socio-economic assessment has been made for the Thredbo region.

### 6.9.2 Existing environment

The Thredbo resort provides visitors with a year-round alpine destination for either snow activities in the winter or in the summer activities such as hiking, mountain bike riding and fishing.

The 2021 Census (ABS, 2021) provides the following demographic information about Thredbo:

- Thredbo at the time of the Census had a population of 405 people with a median age of 37
- There were 224 people aged 15 and over reported as being in the labour force, with 124 of those working full-time
- 30.3% of those people worked in accommodation, 14.2% in cafes and restaurants, and 14.2% in sports and physical recreation venues
- The median weekly income was $1,031
- 51.4% of people in the labour force walked to work and 14.2% travelled in a car. The remaining rode by bike, worked at home, or did not go to work. This may indicate that 51.4% of people in the labour force live within the Thredbo village whilst the remaining workforce would reside in Jindabyne or nearby areas.
- There were 557 private dwellings in the region with an average of 1.5 motor vehicles per dwelling.

Alpine Way is the major road that connects Thredbo to northern towns such as Khancoban and Corryong.

There will be no disruptions to vehicles travelling from Jindabyne to Thredbo which is the main travelling route for daily commuting as most off resort residents live nearby in Jindabyne or surrounding areas.

### 6.9.3 Potential impacts

Potential impacts are limited to the construction period of the proposal. The proposal in the long-term presents an overall benefit to the resort by ensuring stability of Alpine Way.

**Construction**

- There will be no public access to Cascade Hut Trail car park resulting in some inconvenience accessing the trail.

**Operation**

- There are no socio-economic impacts through normal operation of the culvert.

### 6.9.4 Safeguards and management measures

Table 6-9 Socio economic safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Socio-economic | Transport will inform the community and relevant stakeholders of the proposed works including the following details:<br>• planned works<br>• location of the proposal<br>• the construction period and working hours<br>• implications for the community, including visual impacts, noise impacts, changed traffic conditions, and closure of the Cascade Hut Trail car park.<br>The notice will include an email that the community can use to sign up to the Thredbo River Culverts email list. | Transport | Pre-construction | |

## 6.10 Landscape character and visual impacts

### 6.10.1 Methodology

The landscape and visual character assessment has been conducted for the area surrounding the proposal extending to the Thredbo resort 3km to the northeast. Other receivers of the area are the general public that use Alpine Way or are walking on the Cascade Trail.

### 6.10.2 Existing environment

The landscape and visual character is attributed to the natural environment and the historic nature of the culvert. The proposal is surrounded by pristine native vegetation within Kosciusko National Park. The landscape is primarily a natural environment of little disturbance.

### 6.10.3 Potential impacts

**Construction**

- Short-term impacts will occur to the visual character with the installation of construction fencing, machinery and plant presence, establishing compound and stockpile site, and by the road work signage.
- Short-term impacts to the natural character of the landscape and may impact the experience of those using the Cascade Trail.
- Potential long-term impact of disturbance due the vegetation removal.
- Potential visual impacts from altering the heritage design of the stone pitched culvert, to a concrete headwall and wingwalls.

**Operation**

- There are no landscape character and visual impacts through normal operation of the culvert.

### 6.10.4 Safeguards and management measures

Table 6-10 Landscape character and visual safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Landscape character - heritage | Transport has committed to selecting an appropriate sample of Alpine Way Type 4 and 6 culverts (identified by Biosis in their 2011 report) which represent the best original condition for inclusion on the s170 Heritage and Conservation Register, within 12 months of REF approval. | Transport Project Manager | Within 12 months of REF approval. | Heritage Impact letter of advice (Appendix L). |

## 6.11 Property and land use

### 6.11.1 Methodology

The property and land use assessment has been conducted for the area surrounding the proposal extending to the Thredbo resort 3km to the northeast.

### 6.11.2 Existing environment

The proposal is to occur completely within the road reserve and there is no impact to private property. The Impacts considered in this section are limited to the surrounding Kosciuszko National Park and the Cascade Trail. The area is an important tourist destination with Thredbo Resort close and hiking, biking and camping opportunities throughout the National Park.

The land is zoned C1 National Parks and Nature Reserves under the Snowy River LEP. The land has high environmental significance, high scenic landscape value, and valued cultural and archaeological heritage.

### 6.11.3 Potential impacts

**Construction**

- Potential impacts for public utilising the walking track and camping ground in terms of noise and vibration, visual amenity, increased truck and vehicle movement on Alpine Way and the full closure of the Cascade Hut Trail car park.

**Operation**

- There are no property and land use impacts through normal operation of the culvert, provided the works were contained within the designated work footprint within the road reserve.

### 6.11.4 Safeguards and management measures

Table 6-11 Property and land use safeguards and land use

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Land use | The Cascade Hut Trail car park will be closed to vehicles throughout the construction period.<br>Arrangements will be made with the NSW National Parks and Wildlife Service (NPWS) to accommodate visitors to this part of Kosciuszko NP wishing to access the Cascades Hut Trail and nearby walking trails. Parking will be provided at the nearby Dead Horse Gap car park (approximately 100 metres uphill from the Cascades Trail car par) and pedestrian movement facilitated from this alternate parking area to the entrance to the Cascades trail, which is adjacent to the Cascades Trail car park | Transport | Construction | Consultation with NPWS (Section 5.4) |

## 6.12 Other impacts

### 6.12.1 Existing environment and potential impacts

Table 6-12 Other potential impacts

| Environmental factor | Existing environment | Potential impacts |
|---|---|---|
| Air Quality | The proposal is surrounded by the Kosciuszko National Park and so sources of air pollution are minimal.<br>Sources of air pollution are increased motor vehicle and plant emissions on Alpine Way, exposed soils and stockpiles, and potential dust from concrete works and application of rock riprap at the culvert outlet. | • Air pollution from machinery and construction vehicles emitting exhaust fumes.<br>• Excess dust from exposed soils and stockpiles polluting the air, particularly during transport and handling of soils and materials. |
| Waste | Waste generated during the proposal is likely to include:<br>• Green waste from vegetation clearing<br>• Excess spoil from the construction of the access points<br>• Concrete waste from construction of the inlet apron, headwall and wingwalls<br>• Roadside materials (fencing etc)<br>• General waste from contractors and staff (lunch packaging etc). | • Excess green waste, debris, and spoil may enter waterways.<br>• Concrete waste or general waste from contractors may enter the surrounding environment outside of the impact area.<br>• Roadside materials can cause disruptions to native fauna and flora if not removed. |
| Hazards and Risk Management | Chemicals and fuel will be used onsite to facilitate use of plant and equipment. | • Chemical pollution of the surrounding environment from fuels, chemicals or liquids used in plant and equipment. |
| Hazards and Risk Management | Existing hazards and risks in the area are associated with operation of the existing road network. | • Changed traffic conditions could lead to incidents. |

### 6.12.2 Safeguards and management measures

Table 6-13 Other impacts Safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Air quality | Vehicles and vessels transporting waste or other materials that may produce odours or dust are to be covered during transportation. | Transport Project Manager | Construction | Section 3.5 of *QA G38 Soil and Water Management* |
| Air quality | 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). | Transport Project Manager | Construction | |
| Waste | The site will be inspected post-construction to ensure all waste, construction equipment, and materials are removed. | Transport Project Manager | Construction / post-construction | |
| Hazards and Risk Management | All fuels, chemicals and liquids are to be stored in an impervious bunded area a minimum of 50 metres away from: | Transport Project Manager | Pre-construction / Construction | Section 4.3 of *QA G36 Environment Protection* |

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| | • Rivers, creeks or any areas of concentrated water flow<br>• Flooded or poorly drained areas<br>• Slopes above 10%. | | | |
| Hazards and Risk Management | Refueling of plant and equipment is to occur in impervious bunded areas located a minimum of 50 metres from drainage lines or waterways. | Transport Project Manager | Pre-construction / Construction | Section 4.3 of *QA G36 Environment Protection* |
| Hazards and Risk Management | An emergency spill kit must be always kept on site and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances at the work site.<br>All workers will be advised of the location of the spill kit and trained in its use. | Transport Project Manager | Pre-construction / Construction | Section 4.3 of *QA G36 Environment Protection* |
| Hazards and Risk Management | Vehicles and plant must be properly maintained and regularly inspected for fluid leaks. | Transport Project Manager | Pre-construction / Construction | Section 4.3 of *QA G36 Environment Protection* |

## 6.13 Cumulative impacts

### 6.13.1 Study area

The cumulative impact assessment considers the surrounding area of the Kosciuszko National Park, Alpine Way, the Cascade Trail, and Thredbo.

The proposed work is considered relatively minor in the context of the existing landscape and the proposal design, therefore, cumulative impacts are minimal from the proposal.

### 6.13.2 Broader program of work

There are no other projects being considered within the vicinity of the proposal. The only cumulative impacts foreseen are those involved in routine maintenance work on the road and culvert, which are not assessable at this time. There are no proposed maintenance works to occur in the vicinity at the same time as the proposal.

### 6.13.3 Other projects and developments

Table 6-14: Past, present and future projects

| Project | Construction impacts | Operational impacts |
|---|---|---|
| • Monaro Highway and Kosciuszko Road – new overtaking lane sand improved safety | There are no construction impacts to the proposal as the works were completed in 2019. | There are no negative operational impacts identified from this past project. Positive operational impacts from the project include improved safety and usage of nearby roads. |

### 6.13.4 Potential impacts

Table 6-15 Potential cumulative impacts

| Environmental factor | Construction impacts | Operational impacts |
|---|---|---|
| Noise | There are no cumulative construction impacts from machinery and equipment being utilised at the same time. | There are no cumulative impacts from noise outside the normal operation of the culvert. |

| Environmental factor | Construction impacts | Operational impacts |
|---|---|---|
| Traffic | The proposal has the potential to occur at the same time as maintenance work in the broader region. This may result in cumulative traffic delays on the Alpine Way. | There are no cumulative impacts for traffic expected. |

### 6.13.5 Safeguards and management measures

Table 6-16 Cumulative safeguards and management measures

| Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|
| Cumulative traffic impacts | Advanced warning of changes to traffic will be provided to the community and relevant stakeholders. | Transport | Pre-construction | Consultation with NPWS (Section 5.4) |

# 7. Environmental management

This chapter describes how the proposal would be managed to reduce potential environmental impacts during detailed design, construction and operation. A framework for managing potential impacts is provided. A summary of site-specific environmental safeguards is provided and the license and/or approval requirements required before construction are listed.

## 7.1 Environmental management plans (or system)

Safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Construction Environmental Management Plan (CEMP) would be prepared to describe the safeguards and management measures identified. The CEMP would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The CEMP would be prepared before construction of the proposal and must be reviewed and certified by the Transport for NSW Environment and Sustainability Officer, South Region, before any on-site works begin. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed 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*, *QA Specification – R44 Earthworks,* and *QA Specification R178 – Vegetation*

## 7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarized in Table 7-1.

Table 7-1: Summary of safeguards and management measures

| No. | Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|---|
| 1 | General – minimise environmental impacts during construction | A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Senior Environment and Sustainability Officer before commencement of the activity. As a minimum, the CEMP will address the following:<br>• any requirements associated with statutory approvals<br>• details of how the project will implement the identified safeguards outlined in the REF<br>• issue-specific environmental management plans<br>• roles and responsibilities<br>• communication requirements<br>• induction and training requirements<br>• procedures for monitoring and evaluating environmental performance, and for corrective action<br>• reporting requirements and record-keeping<br>• procedures for emergency and incident management<br>• procedures for audit and review.<br>The endorsed CEMP will be implemented during the undertaking of the activity. | Contractor / Transport Project Manager | Pre-construction / detailed design | |
| 2 | General – notification | The general community and key stakeholders affected by the lane closures will be notified before the works start.<br>A traffic control plan will be prepared in accordance with the *Transport for NSW Traffic control at work sites manual (TS 05492), version 6.1* (Transport for NSW, 2022b). | Transport Project Manager | Pre – construction | Section 4.8 of QA *G36 Environment Protection*<br>Section 2.2 of *QA G10 Traffic Management* |
| 3 | General – environmental awareness | All contractors and staff on site will receive training to ensure awareness of the environmental protection requirements to be implemented during the proposal. This will include up-front site induction and regular “toolbox” style briefings.<br>A heritage induction will take place before any ground disturbing works start. | Transport Project Manager | Pre – construction | |
| 4 | Contaminated land | If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. | Transport Project Manager or Contractor | Construction | Section 4.2 of QA *G36 Environment Protection* |

| No. | Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|---|
| | | All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport for NSW Senior Environment and Sustainability Officer. | | | |
| 5 | Sedimentation of the surrounding environment | Erosion and sediment control measures are to be implemented and maintained to:<br>• Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets<br>• Reduce water velocity and capture sediment on site<br>• Minimise the amount of material transported from site to surrounding pavement surfaces<br>• Divert clean water around the site.<br>(in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book)). | Contractor or Transport Project Manager | Construction | *QA G38 Soil and Water Management*<br><br>ESCP |
| 6 | Sedimentation of the surrounding environment | 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. | Transport Project Manager | Construction | *QA G38 Soil and Water Management*<br><br>ESCP |
| 7 | Sedimentation of the surrounding environment | The waste generated from the excavation will be transported to an appropriate offsite stockpile facility nearby to be stored and processed before reusing. Large sized rocks removed from the area will be stockpiled on site for reuse as scour protection at the outlet. | Transport Project Manager or Contractor | Construction / Post construction | Section 143 of the POEO Act |
| 8 | Water quality | Water quality control measures are to be used to prevent any materials (e.g. concrete, grout, sediment etc.) entering drain inlets or waterways. | Transport Project Manager | Construction | Section 2.2 and 3.5 of *QA G38 Soil and Water Management* |
| 9 | Waterways and water quality | Aquatic habitat will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Transport for NSW, 2024) and *Section 3.3.2 Standard precautions and mitigation measures* of the *Policy and guidelines for fish habitat conservation and management Update 2013* (DPI, 2013). | Transport Project Manager | During construction. | |
| 10 | Waterways and water quality | A clean water diversion will be established to separate clean from dirty water during the construction phase of the project.<br>The work will be staged in a way that during construction at least one culvert at all times will remain open. | Transport Project Manager | Construction | |
| 11 | Waterways and water quality | Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls. | Transport Project Manager | Construction | |

| No. | Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|---|
| 12 | Sedimentation of the waterway | Erosion and sediment controls will be used when diverting the water to ensure no sediment is introduced during the process. They will be erected in a manner consistent with currently accepted Best Management Practice (Blue Book) to prevent the entry of sediment into the waterway. These are to be maintained in good working order for the duration of the works and until the site has been stabilised. | Transport Project Manager | Construction | Section 3.1 of *QA G38 Soil and Water Management*<br><br>Consultation with DPI Fisheries (Appendix I) |
| 13 | Sedimentation of the waterway | Rock for the temporary work platform and rock riprap will be clean and free of dirt or plant material including seeds (no fines) prior to its use within the waterway.<br>Rock is to be of suitable size to not be displaced by high velocity flows. | Transport Project Manager | Construction | Consultation with DPI Fisheries (Appendix I) |
| 14 | Chemical pollution and accidental spill | Machinery will only enter or work from the waterway in accordance with best management practice and an agreed work method statement.<br>Machinery will be appropriately cleaned, degreased, and serviced prior to use at the site and entry into the waterway. | Transport Project Manager | Construction | Consultation with DPI Fisheries (Appendix I) |
| 15 | Chemical pollution and accidental spill | A suitable concrete washout bay will be provided in the site compound or stockpile area well away from the watercourse. | Transport Project Manager | Construction | Chemical pollution and accidental spill |
| 16 | Impacts to aquatic habitats | To protect riparian and aquatic vegetation, these areas should be identified and appropriately delineated on water land as “no-go” areas.<br>On completion of the works the site will be rehabilitated by:<br>• removal from the site of construction materials and temporary structures (other than silt fences and other erosion and sediment control devices) installed during the course of the proposal.<br>• Removal of all imported material that formed temporary crossing and side track.<br>• Reinstatement of the side track footprint to a stable grade generally consistent with the upstream and downstream bank profile and re-established with native endemic riparian and aquatic vegetation.<br>• Appropriate maintenance of erosion and sediment control devices undertaken until the vegetation has successfully established and the site has stabilised. | Transport Project Manager or Contractor | Post-Construction | Consultation with DPI Fisheries (Appendix I) |
| 17 | Scour of the creeks and banks | Scour protection of the stream bed and embankment at the culvert inlet and outlet will be achieved by using rock riprap. A riprap rock size $D_{50}$ = 750 mm is proposed. | Transport | During construction | Section 3.1 of *QA G38 Soil and Water Management* |
| 18 | Biodiversity | Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible. | Transport Project Manager | Detailed design / pre-construction | |

| No. | Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|---|
| 19 | Removal of native vegetation | The limit of works (including compounds and parking areas) must be clearly indicated with flagging/fencing or similar. | Transport Project Manager | Pre-construction / construction | Section 2.4 of *QA G40 Clearing and Grubbing* |
| 20 | Impacts to Fish passage | The proposed design and construction methodology will not impact on fish passage. A clean water diversion to be installed to separate clean water from dirty water and to maintain fish passage at all times during the construction phase. | Transport Project Manager | Construction | Section 3.7.2 of *QA G38 Soil and Water Management* |
| 21 | Injury to aquatic species | Observations of dead or distressed fish should be immediately reported to DPI Fisheries.<br>If a fish kill occurs, works would cease until the cause of the kill is identified and rectified.<br>Should any fish kills be observed during construction, the Transport Environmental Manager must be notified immediately for urgent action. | Transport Project Manager | Construction | Consultation with DPI Fisheries (Appendix I) |
| 22 | Injury to wildlife onsite | Fauna will be managed in accordance with *Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Transport for NSW, 2024). | Transport Project Manager | Construction | |
| 23 | Biodiversity | If unexpected, threatened fauna or flora species are discovered, stop works immediately and follow the Transport's Unexpected Threatened Species Find Procedure | Transport Project Manager | Construction | |
| 24 | Disturbed vegetation | Disturbed areas must be progressively stabilised with a method appropriate for the location and slope. Riparian zones should be rehabilitated based on recommendations of DPI Policy and guidelines for fish habitat conservation and management (DPI, 2013). Endemic native riparian vegetation or similar should be considered in the design to stabilise the waterway and minimise the re-establishment of weeds. | Transport Project Manager | Construction / post-construction | *QA R178 Vegetation*<br>Section 4.16 of *QA G36 Environment Protection* |
| 25 | Disturbed vegetation | All vehicles and equipment used for construction will use the access tracks, existing roads and exclusion areas outlined in the traffic management plan (TMP).<br>Parking will be limited to the existing Cascade Hut Trail car park and the road shoulder to the east of the compound area. | Transport Project Manager | Construction | |
| 26 | Aboriginal heritage | The *Standard Management Procedure - Unexpected Heritage Items* (Transport, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, are found during construction.<br>This applies where Transport does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place.<br>Work will only re-commence once the requirements of that Procedure have been satisfied. | Transport Project Manager or Contractor | Detailed design / Pre-construction | Section 4.9 of QA *G36 Environment Protection* |
| 27 | Impacts to Aboriginal sites | If suspected human remains are discovered during the proposal, all work will stop immediately. The remains will be left and protected from damage. The Coroner's Office and NSW Police will be notified immediately. Depending on the discovered origins of the remains, the Aboriginal parties and/ or Heritage NSW will be notified. | Transport Project Manager or Contractor | Construction | Section 146 of the Heritage Act |

| No. | Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|---|
| 28 | Impacts to Aboriginal sites | As direct impacts to Aboriginal sites cannot be avoided, an AHIP covering the proposal footprint will be obtained from Heritage NSW before impacts occur.<br>An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places, or that cause land to be disturbed for the purposes of discovering an Aboriginal object. The AHIP should be for a term of 5 years and cover the entire proposal.<br>The AHIP will also need to allow for community salvage collection so that direct impacts to this site can be mitigated.<br>No further archaeological investigation of these sites is required. | Transport | Pre- construction | Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act). |
| 29 | Impacts to Alpine Way Culvert PAD 1 | The proposal will be fenced off and secured to ensure that Alpine Way Culvert PAD 1 is not harmed by the work. Refer to Figure 6-1.<br>This fencing will remain throughout the construction phase. | Transport Project Manager or Contractor | Pre-construction and construction | ACHAR<br>(Appendix E) |
| 30 | Impacts to Aboriginal sites | Heritage inductions will occur for all site workers and contractors to prevent any unintentional harm to unexpected Aboriginal objects or sites, or Aboriginal sites or objects located within proximity to the proposal. The heritage induction will include the following items:<br>• Relevant legislation.<br>• Location of identified Aboriginal heritage sites, areas of archaeological potential, and areas of archaeological sensitivity.<br>• Basic identification skills for Aboriginal and non-Aboriginal artefacts and human remains.<br>• Procedure to follow in the event of an unexpected heritage item find during construction works.<br>• Procedure to follow in the event of the discovery of human remains during construction works.<br>• Penalties and non-compliance. | Project Manager to delegate | Pre-construction | ACHAR<br>(Appendix E) |
| 31 | Impacts to Bundian Way (SHR#01906) | The Bundian Way occurs outside of the proposal area. Avoidance and protection of the Bundian Way will be ensured by delineating the area as a “no-go” zone. The most appropriate delineation will be confirmed with the RAPs, mapped from the SHR geospatial coordinates, and included in the CEMP. The “no-go” zone will be established before any work can commence. | Transport Project Manager, Archaeologist and RAPs | Pre-construction | Heritage Impact letter of advice (Appendix L). |
| 32 | Non-Aboriginal heritage | Transport has committed to selecting an appropriate sample of Alpine Way Type 4 and 6 culverts (identified by Biosis in their 2011 report) which represent the best original condition for inclusion on the s170 Heritage and Conservation Register, within 12 months of REF approval.<br>If following review, condition issues associated with their construction mean a smaller sample of these culvert types is identified, this will be documented. | Transport Project Manager | Within 12 months of REF approval. | Heritage Impact letter of advice (Appendix L). |

| No. | Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|---|
| 33 | Non-Aboriginal heritage | A short online brochure outlining the history of Alpine Way including its construction methods seen in these culverts, should be produced within this timeframe to explain the relationship and social significance of Alpine Way to the nationally significant Snowy Hydro scheme. | Transport Project Manager | Within 12 months of REF approval. | Heritage Impact letter of advice (Appendix L). |
| 34 | Traffic and Transport | A traffic control plan will be prepared in accordance with the *Transport for NSW Traffic control at work sites manual (TS 05492), version 6.1* (Transport for NSW, 2022b). | Contractor | Pre-construction | |
| 35 | Traffic and transport | Access to the Cascades Fire Trail will be allowed during construction to facilitate:<br>• walkers and mountain bike riders<br>• emergency responders<br>• pest animal control workers<br>• commercial Tour operators<br>• contractors undertaking works on National Park estate | Transport | Construction | Consultation with NPWS (Section 5.4) |
| 36 | Noise | All construction plant and equipment used on Site must be:<br>• maintained in an efficient condition<br>• operated in a proper and efficient manner. | Transport Project Manager or Contractor | Construction | Section 4.6 of QA *G36 Environment Protection* |
| 37 | Noise and vibration impacts | Works to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays must have measures in place to minimise noise impacts. | Transport | Construction | |
| 38 | Socio-economic | Transport will inform the community and relevant stakeholders of the proposed works including the following details:<br>• planned works<br>• location of the proposal<br>• the construction period and working hours<br>• implications for the community, including visual impacts, noise impacts, changed traffic conditions, and closure of the Cascade Hut Trail car park<br>The notice will include an email that the community can use to sign up to the Thredbo River Culverts email list. | Transport | Pre-construction | |
| 39 | Landscape character - heritage | Transport has committed to selecting an appropriate sample of Alpine Way Type 4 and 6 culverts (identified by Biosis in their 2011 report) which represent the best original condition for inclusion on the s170 Heritage and Conservation Register, within 12 months of REF approval. | Transport Project Manager | Within 12 months of REF approval. | Heritage Impact letter of advice (Appendix L). |
| 40 | Land use | The Cascade Hut Trail car park will be closed to vehicles throughout the construction period. | Transport | Construction | Consultation with NPWS (Section 5.4) |

| No. | Impact | Environmental safeguards | Responsibility | Timing | Reference |
|---|---|---|---|---|---|
| | | Arrangements will be made with the NSW National Parks and Wildlife Service (NPWS) to accommodate visitors to this part of Kosciuszko NP wishing to access the Cascades Hut Trail and nearby walking trails. Parking will be provided at the nearby Dead Horse Gap car park (approximately 100 metres uphill from the Cascades Trail car par) and pedestrian movement facilitated from this alternate parking area to the entrance to the Cascades trail, which is adjacent to the Cascades Trail car park. | | | |
| 41 | Air quality | Vehicles and vessels transporting waste or other materials that may produce odours or dust are to be covered during transportation. | Transport Project Manager | Construction | Section 3.5 of *QA G38 Soil and Water Management* |
| 42 | Air quality | 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). | Transport Project Manager | Construction | |
| 43 | Waste | The site will be inspected post-construction to ensure all waste, construction equipment, and materials are removed. | Transport Project Manager | Construction / post-construction | |
| 44 | Hazards and Risk Management | All fuels, chemicals and liquids are to be stored in an impervious bunded area a minimum of 50 metres away from:<br>• Rivers, creeks or any areas of concentrated water flow<br>• Flooded or poorly drained areas<br>• Slopes above 10%. | Transport Project Manager | Pre-construction / Construction | Section 4.3 of *QA G36 Environment Protection* |
| 45 | Hazards and Risk Management | Refueling of plant and equipment is to occur in impervious bunded areas located a minimum of 50 metres from drainage lines or waterways. | Transport Project Manager | Pre-construction / Construction | Section 4.3 of *QA G36 Environment Protection* |
| 46 | Hazards and Risk Management | An emergency spill kit must be always kept on site and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances at the work site.<br>All workers will be advised of the location of the spill kit and trained in its use. | Transport Project Manager | Pre-construction / Construction | Section 4.3 of *QA G36 Environment Protection* |
| 47 | Hazards and Risk Management | Vehicles and plant must be properly maintained and regularly inspected for fluid leaks. | Transport Project Manager | Pre-construction / Construction | Section 4.3 of *QA G36 Environment Protection* |
| 48 | Cumulative traffic impacts | Advanced warning of changes to traffic will be provided to the community and relevant stakeholders. | Transport | Pre-construction | Consultation with NPWS (Section 5.5) |

## 7.3 Licensing and approvals

Table 7-2: Summary of licensing and approvals required

| Instrument | Requirement | Timing |
|---|---|---|
| *National Parks and Wildlife Act 1974* (s90) | Aboriginal heritage impact permit | Prior to start of the activity. |

# 8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in section 193 of the *Environmental Planning and Assessment Regulation 2021.*

## 8.1 Justification

This REF has assessed the potential impacts of the proposed Thredbo River Culvert rehabilitation and works along Thredbo River within the Snowy Monaro Regional Council LGA. The REF has identified potential impacts relating to aquatic biodiversity, cultural heritage, water, traffic and socio-economic impacts.

A range of safeguards have been developed for the potential impacts identified. These would ensure that the potential negative impacts of the proposal are prevented, mitigated or limited as much as is practical. It is the general recommendation of this REF that the safeguards herein included should be implemented through appropriate design and management strategies, including the development of a Construction Environmental Management Plan for the proposal.

The potential negative impacts of the proposal are considered to be justified in terms of its potential benefits. These include improved safety for road users and reduced requirement for ongoing maintenance and repair. These would have clear social and environmental benefits, in keeping with the principles of ecologically sustainable development.

The proposed works would not result in a significant impact on any declared critical habitat, threatened species, populations or ecological communities or their habitats. Therefore, a Species Impact Statement (SIS) is not required.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal, as described in the REF, best meets the project objectives but would still result in some impacts on aquatic biodiversity, cultural heritage, traffic and socio-economic considerations. On balance, the proposal is considered justified.

## 8.2 Objects of the EP&A Act

Table 8-1 Objects of the Environmental Planning and Assessment Act 1979

| Instrument | Requirement |
|---|---|
| 1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources. | The proposal would benefit the community and road users by ensuring long-term stability of Alpine Way. |
| 1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment. | Ecological sustainable development is discussed in Section 8.2.1. |
| 1.3(c) To promote the orderly and economic use and development of land. | Transport has undertaken environmental investigations and continues to undertake the consultation required to properly design and develop the proposal without unnecessary impacts on the local economy.<br>The proposal would benefit the community and road users by ensuring long-term stability of Alpine Way. |
| 1.3(d) To promote the delivery and maintenance of affordable housing. | Not relevant to the project. |
| 1.3(e) To protect the environment, including the conservation of threatened and other species of native | The proposal would require the removal of 0.09 ha of native vegetation. This vegetation represents habitat for numerous threatened fauna species. Impacts to threatened species and |

| Instrument | Requirement |
|---|---|
| animals and plants, ecological communities and their habitats. | communities from the proposal have been properly assessed and have been considered unlikely to be significant.<br>This is further discussed in Sections 6.1 and 6.2. |
| 1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage). | The Aboriginal sites present in the proposal have been assessed and it has been stated that direct impacts to these sites cannot be avoided.<br>As such, an AHIP will be applied for and mitigations measures adhered to in order to manage the artefacts and sites with care. |
| 1.3(g) To promote good design and amenity of the built environment. | The culvert currently presents major cracking and movement in the stone headwall at the inlet, corrosion, and deformation of the steel pipes, and scouring at the outlet end. The repairs to the culvert would result in a new inlet apron, headwall and wingwalls, reinforced concrete lining in the existing steel pipe, and protection for the outlet area with rock riprap.<br>The repairs to the culvert have been designed with materials that would last for +100 years to improve durability and ensure stability. |
| 1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants. | Not relevant for this project. |
| 1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State. | Not relevant to the project. |
| 1.3(j) To provide increased opportunity for community participation in environmental planning and assessment. | Transport has consulted with stakeholders regarding the proposal as described in Section 5.<br>Community consultation is planned to occur regarding the changes to traffic conditions. Issues raised during consultation in relation to the proposal would be addressed in the environmental planning and assessment process. |

### 8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

**The precautionary principle**

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle was considered during route options development (see Section 2.4 and 2.5). The precautionary principle has guided the assessment of environmental impacts for this REF and the development of mitigation measures.

Issues that may cause serious or irreversible environmental damage as a result of the proposal have been identified. The best available technical information, environmental standards and measures have been used to minimise environmental risks. Specialist studies were incorporated to gain a detailed understanding of the existing environment. ‘Do nothing’ scenarios were considered while assessing environmental impact.

The preferred option that would achieve long-term durability and stability while presenting low construction impacts to the environment, was selected.

Mitigation measures have been proposed to minimise any potential impacts. These will be implemented during the construction of the proposal. A CEMP would be prepared before the works begin which would ensure the mitigation measures are adhered to and the impacts to the environment remain low.

**Intergenerational equity**

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

The propsal would benefit future generations by reducing the long-term environmental impacts that would occur if it did not take place. By using materials that promote long-term durability of the culvert, the proposal would reduce the need for costly repairs in the future, and would minimise potential impacts by implementing appropriate mitigation measures.

Avoidance and minimisation of impacts have been incorporated at the strategic design stage of planning. This has resulted in avoiding areas of high biodiversity value (where possible) and minimising the areas of impact in these areas (where not possible to avoid). Water quality and hydrological measures were included into the design to ensure that the impacts to sensitive flora, fauna and ecological communities are minimised both in the short and long-term. This allows for important ecological areas to be conserved for future generations.

An Aboriginal cultural heritage assessment, including consultation with the local Aboriginal community, was carried out as part of the design process and during the environmental assessment phase to avoid or minimise the potential for irreparable damage to occur to Aboriginal cultural heritage during construction.

If the proposal was not to occur, the principle of intergenerational equity may be compromised as future generations would inherit the damaged culvert with the potential to collapse, which could cause significant impacts to the road surface and disruptions to the travelling public. This could cause accidents, repair costs and potentially a road closure.

**Conservation of biological diversity and ecological integrity**

Conservation of biological diversity and ecological integrity has been a fundamental consideration and has shaped the project, assessment and mitigation measures.

Areas of high biological value have been avoided where possible and design options that posed the least risk to the environment have been the preferred choice for the proposal. Impacts to the environment have been identified through specialist studies, and mitigation measures have been recommended in order to minimise the impacts. These methods have been used to ensure biological diversity in the local area is maintained.

Design features that would allow safe movement of aquatic species throughout the proposal were incorporated.

The proposal would involve the removal of 0.09 ha of native vegetation and habitat. The loss of this vegetation is unlikely to significantly impact any threatened species likely to occur in the area, and there would be limited impact to connectivity and key species corridors.

The conservation of biological diversity and ecological integrity has been a fundamental consideration in the assessment of the proposal and impacts on fauna or flora have been assessed as not significant.

**Improved valuation, pricing and incentive mechanisms**

The principle of internalising environmental costs into decision making requires consideration of all environmental resources that may be affected by the carrying out of a project, including air, water, land and living things. This principle also requires that environmental factors be involved in the valuation of assets and service.

The Thredbo River and its tributaries are a key environmental resource for the area. Mitigation measures are in place to ensure that impacts to the river are minimised throughout the proposal. The proposal itself will ultimately improve the quality of the river as it would reduce the level of erosion entering the water.

Environmental issues were considered as key matters in the option selection process and in the economic and financial feasibility assessments for the project. The environmental goals have been pursued in a way that is both sensitive to the environment and cost effective.

Mitigation measures for the avoidance, reuse, recycling and management of waste during construction and operation are to be implemented.

The value of the project to the community in terms of improved safety was recognised. Additionally, in taking action with the proposal, economic impacts into the future would be reduced.

## 8.3 Conclusion

The proposed culvert rehabilitation works on the Thredbo River, Alpine Way MR677 is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats, and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal, as described in the REF, best meets the project objectives but would still result in some minor impacts on:

- Aboriginal heritage sites and artefacts
- Delays to traffic during construction
- Modification of habitat for listed fauna under the BC Act, FM Act and EPBC Act
- Potential soil and water impacts during construction
- Closure of the Cascade Hut Trail car park during construction

Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve the stability and durability of the culvert, and therefore Alpine Way. On balance, the proposal is considered justified and the following conclusions are made.

**Significance of impact under NSW legislation**

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared nor approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

**Significance of impact under Australian legislation**

The proposal is not likely to have a significant impact on matters of national environmental significance nor the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

This REF has been prepared to meet the requirements of the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* strategic assessment approval for Transport Division 5.1 road activities. A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

# 9. Certification

This review of environmental factors 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.

| | |
|---|---|
| Name: | Siobhan Heenan |
| Position: | Graduate Environmental Planner |
| Company name: | Biosis |
| Date: | 20/09/2024 |

I certify that I have reviewed and endorsed the contents of this 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 accept it on behalf of Transport for NSW.

| | |
|---|---|
| Name: | Daniel Bojkovic |
| Position: | Project Contract Manager |
| Transport region/program: | Project Services South, Regional and Outer Metropolitan |
| Date: | 24/09/2024 |

# 10. EP&A Regulation publication requirement

Table 10-1 EP&A Regulation publication requirement

| Requirement | Yes/No |
|---|---|
| Does this REF need to be published under section 171(4) of the EP&A Regulation? | Yes |

# 11. References

ABS, 2021. Australian Bureau of Statistics [WWW Document]. Australian Bureau of Statistics. URL https://abs.gov.au/census/find-census-data/quickstats/2021/SAL13868 (accessed 6.25.24).

Biosis Research, 2011. Historical Heritage Assessment - Alpine Way Culverts. Report prepared for KMH Environmental. Author: O'Brien, L, Biosis Research Pty Ltd. Sydney, NSW. Project no 13086.

DECCW, 2010a. Aboriginal Cultural Heritage Consultation Requirements for Proponents. New South Wales Government Department of Environment and Climate Change., Sydney, NSW.

DECCW, 2010b. Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW.

DoE, 2013. Matters of National Environmental Significance Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999. Department of the Environment, Canberra, ACT.

DPI, 2013. Policy and Guidelines for Fish Habitat Conservation and Management (2013 Update) (Policy and Guidelines). NSW Department of Primary Industries.

Mitchell, P., 2002. NSW (Mitchell) Landscapes (Version 2 2002).

NSW DPE, 2022a. Draft South East and Tablelands Regional Plan.

NSW DPE, 2022b. Guidelines for Division 5.1 assessments.

NSW EPA, 2024. Contaminated Land Record [WWW Document]. NSW Environment Protection Authority. URL https://app.epa.nsw.gov.au/prclmapp/searchregister.aspx (accessed 6.17.24).

SafeWork Australia, 2018. Safe Work Australia Excavation Work Code of Practice.

Transport for NSW, 2024. Biodiversity Management Guideline – Protecting and managing biodiversity on Transport for NSW projects. Guide 8: Artifical hollows.

Transport for NSW, 2022a. Technical Manual: Culvert Inspection and Risk Assessment - Road.

Transport for NSW, 2022b. Technical Manual: Traffic control at work sites. Issue no. 6.1.

Transport for NSW, 2011. Procedure for Aboriginal Cultural Heritage Consultation and Investigation.

# Terms and acronyms used in this REF

Table 11-1 Terms and acronyms used in this REF

| Term / Acronym | Description |
|---|---|
| AAER | Aboriginal Archaeological Excavation Report |
| AAWT | Australian Alps Walking Track |
| ACHAR | Aboriginal Cultural Heritage Assessment Report |
| AFG | Aboriginal Focus Group |
| AHIP | Aboriginal Heritage Impact Permit |
| AHIMS | Aboriginal Heritage Information Management System |
| AHMP | Aboriginal Heritage Management Plan |
| AoS | Assessment of Significance |
| AQMP | Air Quality Management Plan |
| ARI | Average Recurrence Interval |
| ASO | Aboriginal Site Officer |
| BAM | Biodiversity Assessment Method |
| BAR | Biodiversity Assessment Report |
| BC Act | *Biodiversity Conservation Act 2016 (NSW)* |
| BDAR | Biodiversity Development Assessment Report |
| BYDA | Before You Dig Australia |
| CEMP | Construction environmental management plan |
| CP | Communication Plan |
| DCCEEW | Department of Climate Change, Energy, the Environment and Water |
| DPE | NSW Department of Planning & Environment |
| DPI Fisheries | NSW Department of Primary Industries (Fisheries) |
| EEC | Endangered Ecological Community |
| EIA | Environmental impact assessment |
| EP&A Act | *Environmental Planning and Assessment Act 1979 (NSW).* Provides the legislative framework for land use planning and development assessment in NSW |
| EPA | Environmental Protection Agency |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*. Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process |
| ESCP | Erosion and Sediment Control Plan |
| ESD | Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased |
| FM Act | *Fisheries Management Act 1994 (NSW)* |
| GFR | glass fibre reinforced |
| Heritage Act | *Heritage Act 1977 (NSW)* |
| Heritage NSW | Heritage NSW, Department of Climate Change, Energy, the Environment and Water |
| HDPE | High-density polyethylene |

| | |
|---|---|
| HRMP | Hazard and Risk Management Plan |
| ICNG | Interim Construction Noise Guideline |
| KTP | Key Threatening Process |
| LALC | Local Aboriginal Land Council |
| LEP | Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act. |
| LGA | Local Government Area |
| MNES | Matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* |
| NPW Act | *National Parks and Wildlife Act 1974 (NSW)* |
| NPWS | National Parks and Wildlife Service |
| NVMP | Noise and Vibration Management Plan |
| OEH | Office of Environment and Heritage within the Department of Planning and Environment. |
| PACHCI | Procedure for Aboriginal Cultural Heritage Consultation and Investigation |
| PAD | Potential Archaeological Deposit |
| PEA Act | *Protection of the Environment Administration Act 1991.* |
| POEO Act | *Protection of the Environment Operations Act 1997* |
| QA Specifications | Specifications developed by Transport for use with road work and bridge work contracts let by Transport. |
| RAP | Representative Aboriginal Party |
| RFFE | Regional Flood Frequency Estimation Model |
| RMS | NSW Roads and Maritime Services, now Transport for NSW |
| ROL | Road Occupancy License |
| SEPP | State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act. |
| SEPP (Biodiversity and Conservation) | State Environmental Planning Policy (Biodiversity and Conservation) 2021 |
| SEPP (Planning Systems) | State Environmental Planning Policy (Planning Systems) 2021 |
| SEPP (Precincts – Regional) | State Environmental Planning Policy (Precincts – Regional) 2021 |
| SEPP (Resilience and Hazards) | State Environmental Planning Policy (Resilience and Hazards) 2021 |
| SEPP (Transport and Infrastructure) | State Environmental Planning Policy (Transport and Infrastructure) 2021 |
| SHR | State Heritage Register |
| SIS | Species Impact Statement |
| SWMP | Soil and Water Management Plan |
| Transport | Transport for NSW |
| TMP | Traffic Management Plan |
| WMP | Waste Management Plan |

# Appendix A - Consideration of section 171 factors and matters of national environmental significance and Commonwealth land

## Section 171 Factors

In addition to the requirements of the Guideline for Division 5.1 assessments (DPE 2022) and the Roads and Related Facilities EIS Guideline (DUAP 1996) as detailed in the REF, the following factors, listed in section 171 of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

| Factor | | Impact |
|---|---|---|
| a | Any environmental impact on a community?<br>The proposal would impact the local community primarily because of traffic disruptions. The proposal would also result in the closure of the Cascade Hut Trail car park which may limit community visitation of the walking track.<br>The benefits to the community would be long-term however as the maintenance on the culvert would ensure stability of Alpine Way. | • Short – term<br>• Negative<br>• Moderate |
| b | Any transformation of a locality?<br>The proposal would not transform the character of the landscape as the culvert after construction would be visually like the current conditions. The proposal would keep with the current road environment and would benefit the area visually as the culvert would no longer appear to be degrading. | • Long - term<br>• Positive<br>• Minor |
| c | Any environmental impact on the ecosystems of the locality?<br>The proposal would impact the ecosystems through vegetation removal and altered passage for aquatic species. The proposal would remove 0.09 ha of native vegetation, which includes potential habitat for listed fauna species. Impacts on listed biota are unlikely to be significant, as detailed in Section 6.4.<br>The benefits would be long-term impacts through reduced erosion entering the Thredbo River by degradation of the culvert. Safeguards for these impacts are included in Section 6.4. | • Short - term<br>• Negative<br>• Moderate |
| d | Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?<br>During construction the aesthetic of the area would be affected by the presence of construction vehicles, equipment, traffic movements, and potential dust and waste generation.<br>The recreational quality of the area may be affected by delays traveling to and from Thredbo resort, and the closure of the Cascade Hut Trail car park.<br>The proposal would not transform the character of the landscape as the culvert after construction would be visually like the current conditions. | • Short - term<br>• Negative<br>• Minor |
| 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?<br>The proposal is likely to cause some harm to Aboriginal heritage in the area and consequently an AHIP will be required for the work. Safeguards and mitigation measures are included in Section 6.5. | • Potentially Long – term<br>• Negative<br>• Moderate |
| f | Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)?<br>The proposal would impact the ecosystems through vegetation removal and altered passage for aquatic species. The proposal would remove 0.09 ha of native vegetation, which includes potential habitat for listed fauna species. Impacts on listed biota are unlikely to be significant. Safeguards and mitigation measures are included in Section 6.4. | • Short - term<br>• Negative<br>• Moderate |
| g | Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? | • Potentially Long - term |

| Factor | | Impact |
|---|---|---|
| | The proposed work would result in both temporary and permanent impact on both terrestrial and aquatic habitat.<br>There is potential for vegetation to be accidentally cleared outside of the 0.09 ha assessed for the proposal<br>Fauna injury or mortality can occur during construction either during the site establishment phase or during the proposed work.<br>Safeguards and mitigation measures are included in Section 6.4. | • Negative<br>• Moderate |
| h | Any long-term effects on the environment?<br>The proposal would result in permanent impacts to terrestrial and aquatic habitats.<br>Weeds may establish in areas of native vegetation from incoming construction equipment and incoming fill materials such as the rock for the temporary pad and riprap.<br>Pathogens could inadvertently be transported into the proposal by construction machinery and vehicles.<br>Aboriginal sites may endure long-term harm from the earthworks.<br>Safeguards and mitigation measure are included in Section 6.4 and 6.5<br>The benefits of the proposal include long-term stability and durability of the culvert and reduced erosion entering the Thredbo River by degradation of the culvert. | • Long - term<br>• Negative<br>• Moderate |
| i | Any degradation of the quality of the environment?<br>The proposal would result in permanent impacts to terrestrial and aquatic habitats. Safeguards and mitigation measures are included in Section 6.4. | • Long - term<br>• Negative<br>• Minor |
| j | Any risk to the safety of the environment?<br>There is potential for road safety to be affected during construction due to changed traffic conditions along Alpine Way. Traffic management safeguards described in Section 6.7.<br>The benefits of the proposal include long-term stability and durability of the culvert and Alpine Way and an increase in safety overall. | • Short – term<br>• Negative<br>• Minor |
| k | Any reduction in the range of beneficial uses of the environment?<br>The proposal would result in minor traffic impacts during construction, including an increase in the volume of heavy vehicles, and temporary changes in the speed limit. Traffic management safeguards described in Section 6.7.<br>The proposal would also result in the closure of the Cascade Hut Trail car park which may limit community visitation of the walking track.<br>The benefits of the proposal include long-term stability and durability of the culvert and Alpine Way and an increase of safety overall. | • Short – term<br>• Negative<br>• Moderate |
| l | Any pollution of the environment?<br>The proposal could result in pollution into the Thredbo river through chemical spills, erosion, soil or waste. Pollution impacts to the area include construction noise, visual impacts and potentially dust.<br>Safeguards in place to protect the Thredbo river are included in Section 6.2. Noise and vibration safeguards are included in Section 6.8. Safeguards for waste are included in Section 6.12. | • Short – term<br>• Negative<br>• Moderate |
| m | Any environmental problems associated with the disposal of waste?<br>Waste streams generated during construction are common and should pose little difficulty in their disposal. Waste would be recycled wherever possible.<br>Safeguards for waste are included in Section 6.12. | • Short – term<br>• Negative<br>• Minor |

| Factor | | Impact |
|---|---|---|
| n | Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?<br>All resources required for the proposal are readily available and are not in short supply, nor are they likely to become in short supply. | Nil |
| o | Any cumulative environmental effect with other existing or likely future activities?<br>There are no other projects being considered within the vicinity of the proposal. The only cumulative impacts foreseen are those involved in routine maintenance work on the road and culvert, which are not assessable at this time. There are no proposed maintenance works to occur in the vicinity at the same time as the proposal. | Nil |
| p | Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?<br>The proposal is not located within a coastal area and would not cause any impact on coastal processes and coastal hazards. | Nil |
| q | Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,<br>The Snowy Monaro Regional Council is included in the *Southeast and Tablelands Regional Plan 2041* which is in the process of being finalized. Objective 23 describes the importance of enhancing strategic transport links across the region. It is important to ensure the safe usage of Alpine Way in order to enhance tourist and visitor movements in the area. | |

## Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Department of Climate Change, Energy, the Environment and Water .

A referral is not required for proposed actions that may affect nationally-listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

| **Factor** | | Impact |
|---|---|---|
| a | Any impact on a World Heritage property?<br>The proposal would not have any impact on a World Heritage property as there are no World Heritage properties within 10 km of the proposal. | Nil |
| b | Any impact on a National Heritage place?<br>The Australian Alps National Parks and Reserves, which includes Kosciuszko National Park, is a National Heritage place in the locality of the proposal.<br>Impacts surrounding Kosciuszko National Park are only likely to occur if construction occurs outside of the assessed area. Any impacts are not likely to be significant. | Unlikely to be significant. |
| c | Any impact on a wetland of international importance?<br>No wetlands of international importance are located near the study area. | Nil |
| d | Any impact on a listed threatened species or communities?<br>The proposal would impact the ecosystems through vegetation removal and altered passage for aquatic species. The proposal would remove 0.09 ha of native vegetation, which includes potential habitat for listed fauna species. Impacts on listed biota are unlikely to be significant, as detailed in Section 6.4. | Unlikely to be significant. |

| Factor | | Impact |
|---|---|---|
| e | Any impacts on listed migratory species?<br>One migratory species was found to have a moderate to high potential or was known to occur within the vicinity of the proposal (Rainbow Bee-eater *Merops ornatus*). The proposal is not considered to comprise 'important habitat' for the species as discussed in the BAR (Appendix F). Therefore, it is considered that the proposal would not significantly impact the Rainbow Bee-eater or any migratory species. | Unlikely to be significant. |
| f | Any impact on a Commonwealth marine area?<br>The proposal is not located near a marine area. | Nil |
| g | Does the proposal involve a nuclear action (including uranium mining)?<br>The proposal does not involve a nuclear action (including uranium mining). | Nil |
| h | Additionally, any impact (direct or indirect) on the environment of Commonwealth land?<br>The proposal would not have an impact (direct or indirect) on Commonwealth land. | Nil |

# Appendix B - Statutory consultation checklists

## Transport and Infrastructure SEPP

**Certain development types**

| Development type | Description | Yes / No | If 'yes' consult with | SEPP (Transport and Infrastructure) Section |
|---|---|---|---|---|
| Car Park | Does the project include a car park intended for the use by commuters using regular bus services? | No | | Section 2.110 |
| Bus Depots | Does the project propose a bus depot? | No | | Section 2.110 |
| Permanent road maintenance depot and associated infrastructure | Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities? | No | | Section 2.110 |

**Development within the Coastal Zone**

| Development type | Description | Yes / No | If 'yes' consult with | SEPP (Transport and Infrastructure) Section |
|---|---|---|---|---|
| Development with impacts on certain land within the coastal zone | Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land? | No | | Section 2.14 |

Note: See interactive map at ***Planning Portal NSW spatial viewer - find a property***. Note the coastal vulnerability area has not yet been mapped.

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

**Council related infrastructure or services**

| Development type | Potential impact | Yes / No | If 'yes' consult with | SEPP (Transport and Infrastructure) Section |
|---|---|---|---|---|
| Stormwater | Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council? | No | | Section 2.10 |
| Traffic | 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 | Snowy Monaro Regional Council | Section 2.10 |
| Sewerage system | Will the works involve connection to a council owned sewerage system? If so, will | No | | Section 2.10 |

| Development type | Potential impact | Yes / No | If 'yes' consult with | SEPP (Transport and Infrastructure) Section |
|---|---|---|---|---|
| | this connection have a *substantial* impact on the capacity of any part of the system? | | | |
| Water usage | 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? | No | | Section 2.10 |
| Temporary structures | 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 | Snowy Monaro Regional Council | Section 2.10 |
| Road & footpath excavation | Will the works involve more than *minor* or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance? | No | | Section 2.10 |

**Local heritage items**

| Development type | Potential impact | Yes / No | If 'yes' consult with | SEPP (Transport and Infrastructure) Section |
|---|---|---|---|---|
| Local heritage | Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential? | No | | Section 2.11 |

**Flood liable land**

| Development type | Potential impact | Yes / No | If 'yes' consult with | SEPP (Transport and Infrastructure) Section |
|---|---|---|---|---|
| Flood liable land | Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent? | No | | Section 2.12 |

| | | | | |
|---|---|---|---|---|
| Flood liable land | Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance? | No | | Section 2.13 |

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

**Public authorities other than councils**

| Development type | Potential impact | Yes / No | If 'yes' consult with | SEPP (Transport and Infrastructure) Section |
|---|---|---|---|---|
| National parks and reserves | Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act? | Yes | Environment and Heritage Group, DPE | Section2.15 |
| National parks and reserves | Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone? | Yes | Environment and Heritage Group, DPE | Section 2.15 |
| Navigable waters | Do the works include a fixed or floating structure in or over navigable waters? | No | Transport for NSW - Maritime | Section 2.15 |
| Bush fire prone land | Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land? | No | Rural Fire Service (RFS)<br>[Refer to the NSW RFS publication: *Planning for Bush Fire Protection (2006)*] | Section 2.15 |
| Artificial light | Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory) | No | Director of the Siding Spring Observatory | Section 2.15 |
| Defence communications buffer land | Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in section 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011. | No | Secretary of the Commonwealth Department of Defence | Section 2.15 |
| Mine subsidence land | Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*? | No | Mine Subsidence Board | Section 2.15 |

# Appendix C –Detailed Designs

# THREDBO RIVER CULVERTS

## FOUR CELL - 2250mm CORRUGATED STEEL PIPES

### SCHEDULE OF DRAWINGS


| | |
|---|---|
| S00.00 | COVER SHEET |
| S01.11 | GENERAL ARRANGEMENT- SHEET 1 |
| S01.15 | WINGWALL - SHEET 1 |
| S01.21 | SLAB - SHEET 1 |
| S01.31 | HEADWALL - SHEET 1 |
| S01.32 | HEADWALL - SHEET 2 |
| S01.34 | BAR BENDING GUIDE |


**DESIGN STANDARDS AND SPECIFICATIONS:**
AS4678-2002 - EARTH RETAINING STRUCTURES
AS5100-2017 - BRIDGE DESIGN
TFNSW QA SPECIFICATION R11 - STORMWATER DRAINAGE
TFNSW QA SPECIFICATION B30 - EXCAVATION AND BACKFILL FOR BRIDGE WORKS
TFNSW QA SPECIFICATION B80 - CONCRETE WORK FOR BRIDGES

**TRAFFIC LOADING: SM1600**

**EARTHQUAKE LOADING: AS5100.2-2017**
IMPORTANCE FACTOR: LEVEL 2
PROBABILITY FACTOR: 1.3
HAZARD FACTOR: 0.08
SITE SUBSOIL CLASS: Ce
DESIGN CATEGORY: BEDC II
PERFORMANCE FACTOR: 0.77
DUTILITY FACTOR: 1
MONONOBE-OKABE METHOD UTILISED FOR EARTHQUAKE LOADING

**REFERENCE REPORTS: 231489 - 01**

| AMD | DESCRIPTION | DESIGNER SIGN./DATE | VERIFIED SIGN./DATE | APPROVED SIGN./DATE |
|---|---|---|---|---|
| 1 | 80% DETAILED DESGIN ISSUE | C.R 08/07/24 | | C.R 08/07/24 |

CO-ORDINATE SYSTEM: tbCoordSys | HEIGHT DATUM: tbHghtDatum | SCALE:


NORTHROP
Wollongong
Level 1, 57 Kembla Street, Wollongong, N.S.W. 2500
Ph: (02) 4226 3333 Email: southcoast@northrop.com.au
ABN 81 094 433 100



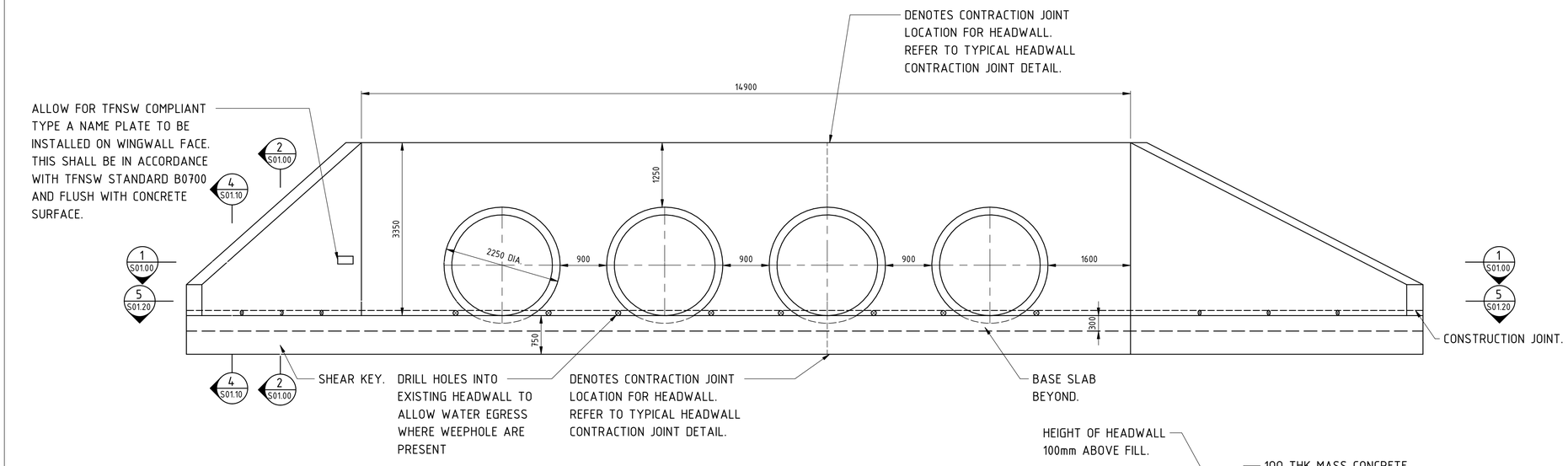
This drawing and the related information have been prepared by, or at the request of, Transport for New South Wales (TfNSW) for a specific purpose and may not be used for any purpose other than the purpose intended by TfNSW. TfNSW does not provide any warranties and accepts no liability arising out of the use of this drawing or any of the related information for any purpose other than the intended purpose. This drawing is protected by copyright and no part of this drawing may be reproduced in any form without the express written permission of TfNSW.


DRAWN: T.AH TONG
DESIGNED: C.REYNOLDS
DRG CHECK: C.REYNOLDS
DESIGN CHECK:
APPROVED:

**THREDBO RIVER CULVERTS**
**FOUR CELL - 2250 CORRUGATED STEEL PIPES**
**COVER SHEET**

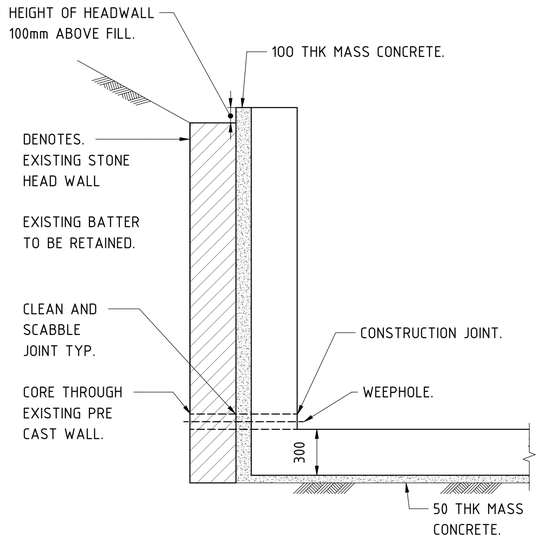
FILE No: **231489** | SHEET: | A1
STATUS: **NOT FOR CONSTRUCTION** | ©
DRG No: **S00** | - | EDMS No: - | **1**

Plotted by



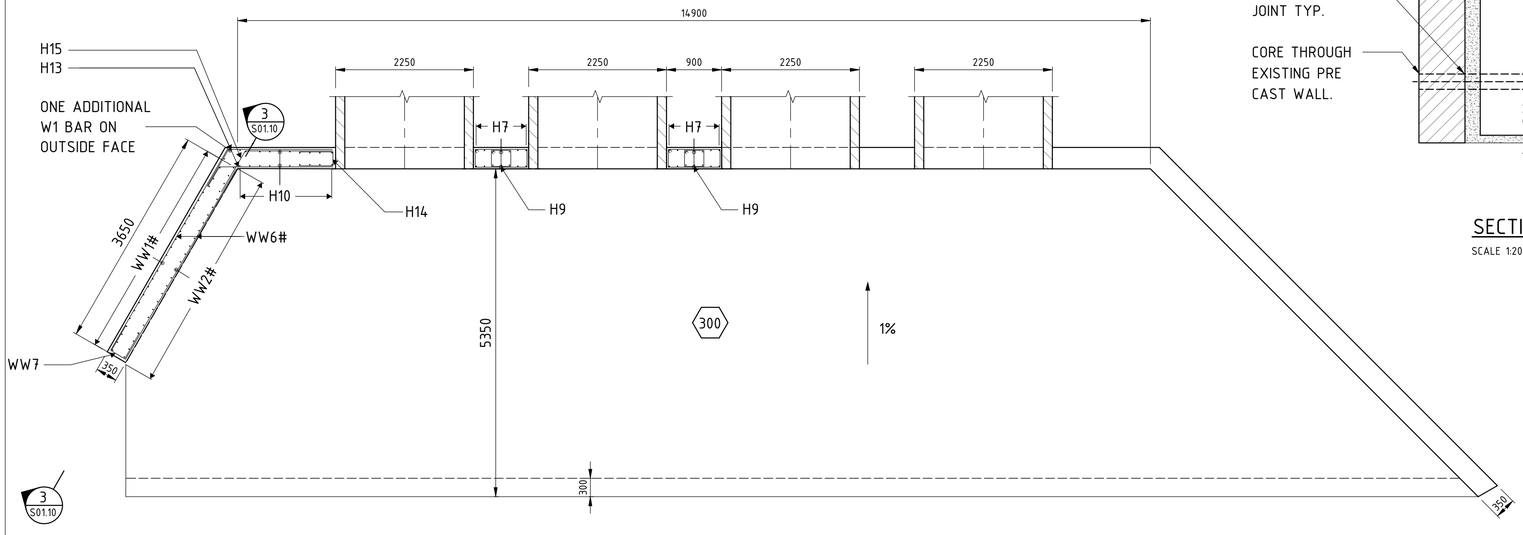

## ELEVATION

SCALE 1:50




## SECTION 2 S01.00

SCALE 1:20




## SECTION 1 S01.00

SCALE 1:50

### ASSUMPTIONS:

1. EXISTING SOIL AND FILL HAVE A SATURATED DENSITY OF 22.5KN/M$^3$.
2. ACTIVE PRESSURE (Ka = 0.71) AND PRESSURE AT REST (KO = 0.43) DETERMINED THROUGH USE OF COULOMB THEORY.
3. FRICTION ANGLE = 45 DEGREES
4. FOUNDATION ALLOWABLE BEARING CAPACITY OF 150kPa MIN.
5. BACKFILL BEHIND HEADWALL AND WINGWALL SHALL BE ADEQUATELY COMPACTED WITH FREE DRAINING GRANULAR MATERIAL AS PER TFNSW B30.
6. TRAFFIC BARRIERS INTERFACING WITH THE CULVERT HEADWALL HAVE NOT BEEN DESIGNED FOR.
7. AGGRESSIVE SOILS HAVE NOT BEEN CONSIDERED WITHIN THE DESIGN
8. SURCHARGE LOADS 10kPa LIVE

### GENERAL NOTES:

G1. WEEP HOLES ARE TO BE PROVIDED AT 1800 CENTERS (MAXIMUM)
G2. REINFORCEMENT SHOWN DIAGRAMMATICALLY.
G3. SCOUR PROTECTION TO BE PROVIDED BY OTHERS.
G4. HW OR H = HEADWALL
WW OR W = WINGWALL
BS OR B = BASESLAB

### CONCRETE NOTES:

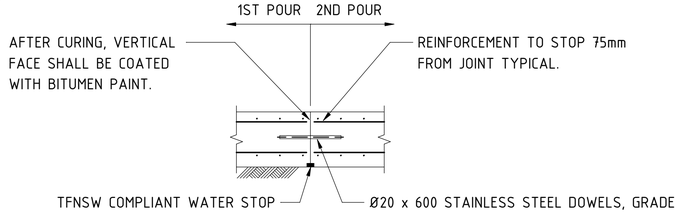
C1. CARRY OUT ALL CONCRETE WORK IN ACCORDANCE WITH TFNSW QA SPECIFICATION B80 - CONCRETE WORK FOR BRIDGES (PREFERABLY DRY WEATHER PERIOD).
C2. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 40MPa.
C3. COVER SHALL BE:
- 75MM WHERE IN CONTACT WITH THE GROUND.
- 45MM ELSEWHERE.
ASSUMED EXPOSURE CLASSIFICATION OF B1 TO AS5100.5-2017.
C4. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF MASS CONCRETE SHALL BE 20MPa.
C5. CURING OF CONCRETE SHALL BE IN AS5100.5 TABLE 4.4.1 (A).
C6. PRIOR TO CONSTRUCTION, THE FOUNDATION CONDITIONS SHALL BE CONFIRMED ON SITE BY A QUALIFIED GEOTECHNICAL ENGINEER. THE CONSTRUCTION CONTRACTOR SHALL ENSURE THAT ALL NECESSARY FOUNDATION TREATMENT SHALL BE COMPLETED PRIOR TO COMMENCING BASE SLAB POUR.
C7. ASSUMED FOUNDATIONS CONDITIONS TO BE MEDIUM DENSE OR BETTER FOR GRANULAR SOILS OR STIFF OR BETTER FOR COHESIVE SOILS. ANY UNSUITABLE MATERIAL MUST BE REMOVED AND REPLACED WITH SELECT FILL IN ACCORDANCE WITH TFNSW B30/ R44/ 3071.

### REINFORCEMENT NOTES:

R1. ALL REINFORCEMENT SHALL BE OF GRADE D500N TO AS4671-2019.
R2. MESH LAPS SHALL BE MADE SO THAT THE TWO OUTERMOST WIRES OF ONE FABRIC OVERLAP THE TWO OUTERMOST WIRES OF THE SHEET BEING LAPPED.

| LAP SCHEDULE | MEMBER THICKNESS | | <300mm | >300mm |
|---|---|---|---|---|
| | N10 | (mm) | 400 | 550 |
| | N12 | (mm) | 450 | 600 |
| | N16 | (mm) | 600 | 800 |
| | N20 | (mm) | 800 | 1050 |
| | N24 | (mm) | 1050 | 1400 |
| | N28 | (mm) | 1350 | 1800 |

R3. CLEAR DISTANCE BETWEEN LAPPED BARS SHALL NOT EXCEED 3X THE BAR DIAMETER.
R4. # DENOTES VARIABLE BAR LENGTH.




## TYPICAL CONTRACTION JOINT DETAIL

| AMD | DESCRIPTION | DESIGNER SIGN./DATE | VERIFIED SIGN./DATE | APPROVED SIGN./DATE |
|---|---|---|---|---|
| 1 | 80% DETAILED DESGIN ISSUE | C.R 08/07/24 | | C.R 08/07/24 |

CO-ORDINATE SYSTEM: tbCoordSys | HEIGHT DATUM: tbHghtDatum | SCALE: NTS

NSW GOVERNMENT Transport for NSW

NORTHROP
Wollongong
Level 1, 57 Kembla Street, Wollongong, N.S.W. 2500
Ph: (02) 4226 3333 Email: wouhouse@northrop.com.au
ABN 81 094 433 100

This drawing and the related information have been prepared by, or at the request of, Transport for New South Wales (TFNSW) for a specific purpose and may not be used for any purpose other than the purpose intended by TFNSW. TFNSW does not provide any warranties and accepts no liability arising out of the use of this drawing or any of the related information for any purpose other than the intended purpose. This drawing is protected by copyright and no part of this drawing may be reproduced in any form without the express written permission of TFNSW.

DRAWN: T.AH TONG
DESIGNED: C.REYNOLDS
DRG CHECK: C.REYNOLDS
DESIGN CHECK:
APPROVED:

# THREDBO RIVER CULVERTS

**FOUR CELL - 2250 CORRUGATED STEEL PIPES**

**GENERAL ARRANGEMENT**

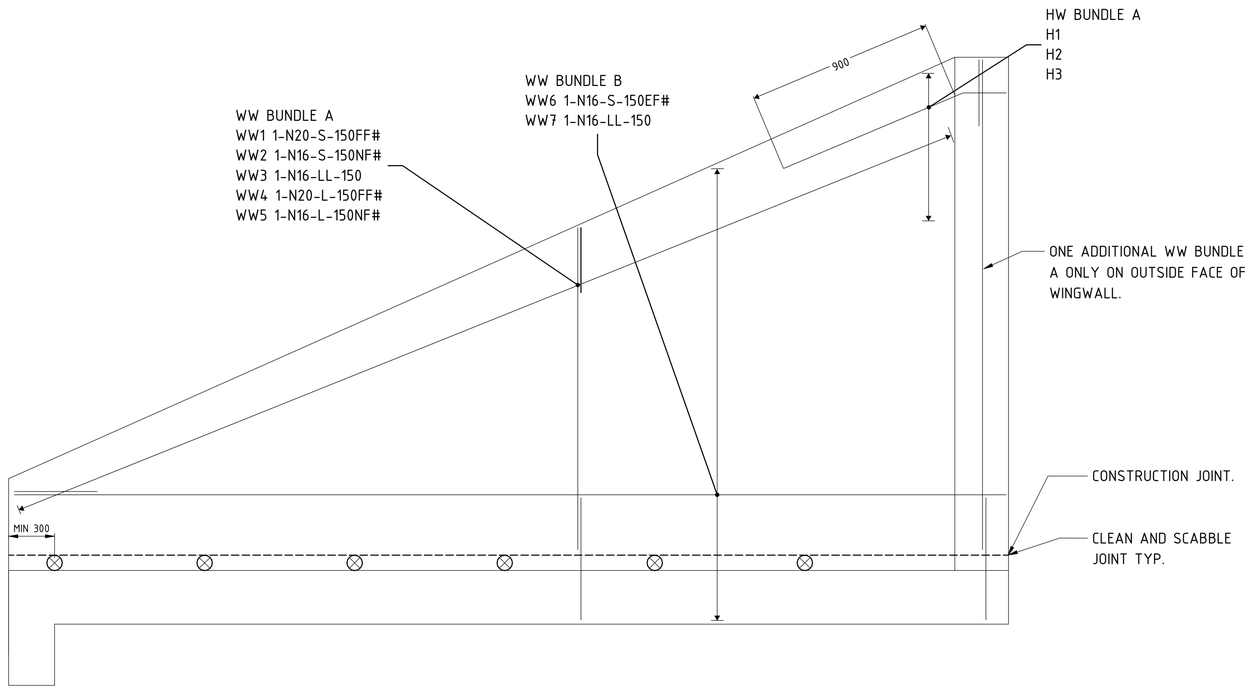
FILE No: **231489** | SHEET: RMS SheetNo - | A1
STATUS: **NOT FOR CONSTRUCTION** ©
DRG No: **S01.00** | - | EDMS No: - | **1**

Plotted by

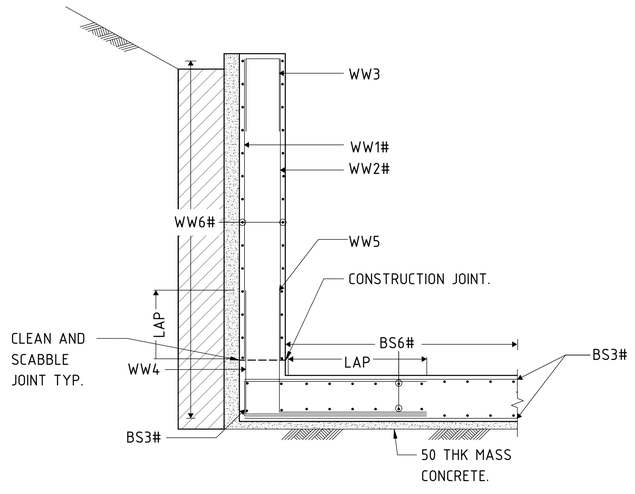
DF 801554

W:\#jobs\2023\231489 - Thredbo River Culvert Rehab\D-Drawings\E-Structural\6-REVIT MODEL\231489-ST-R22-THREDBO RIVER CULVERT REHAB COMPLETE SET-A1.rte

8/07/2024 4:56:10 AM




SECTION 3
SCALE 1:20 S01.00




SECTION 4
SCALE 1:20 S01.00

ASSUMPTIONS:

1. EXISTING SOIL AND FILL HAVE A SATURATED DENSITY OF 22.5KN/M$^3$.
2. ACTIVE PRESSURE (Ka = 0.71) AND PRESSURE AT REST (KO = 0.43) DETERMINED THROUGH USE OF COULOMB THEORY.
3. FRICTION ANGLE = 45 DEGREES
4. FOUNDATION ALLOWABLE BEARING CAPACITY OF 150kPa MIN.
5. BACKFILL BEHIND HEADWALL AND WINGWALL SHALL BE ADEQUATELY COMPACTED WITH FREE DRAINING GRANULAR MATERIAL AS PER TFNSW B30.
6. TRAFFIC BARRIERS INTERFACING WITH THE CULVERT HEADWALL HAVE NOT BEEN DESIGNED FOR.
7. AGGRESSIVE SOILS HAVE NOT BEEN CONSIDERED WITHIN THE DESIGN
8. SURCHARGE LOADS 10kPa LIVE

GENERAL NOTES:

G1. WEEP HOLES ARE TO BE PROVIDED AT 1800 CENTERS (MAXIMUM)
G2. REINFORCEMENT SHOWN DIAGRAMMATICALLY.
G3. SCOUR PROTECTION TO BE PROVIDED BY OTHERS.
G4. HW OR H = HEADWALL
WW OR W = WINGWALL
BS OR B = BASESLAB

CONCRETE NOTES:

C1. CARRY OUT ALL CONCRETE WORK IN ACCORDANCE WITH TFNSW QA SPECIFICATION B80 - CONCRETE WORK FOR BRIDGES (PREFERABLY DRY WEATHER PERIOD).
C2. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 40MPa.
C3. COVER SHALL BE:
- 75MM WHERE IN CONTACT WITH THE GROUND.
- 45MM ELSEWHERE.
ASSUMED EXPOSURE CLASSIFICATION OF B1 TO AS5100.5-2017.
C4. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF MASS CONCRETE SHALL BE 20MPa.
C5. CURING OF CONCRETE SHALL BE IN AS5100.5 TABLE 4.4.1 (A).
C6. PRIOR TO CONSTRUCTION, THE FOUNDATION CONDITIONS SHALL BE CONFIRMED ON SITE BY A QUALIFIED GEOTECHNICAL ENGINEER. THE CONSTRUCTION CONTRACTOR SHALL ENSURE THAT ALL NECESSARY FOUNDATION TREATMENT SHALL BE COMPLETED PRIOR TO COMMENCING BASE SLAB POUR.
C7. ASSUMED FOUNDATIONS CONDITIONS TO BE MEDIUM DENSE OR BETTER FOR GRANULAR SOILS OR STIFF OR BETTER FOR COHESIVE SOILS. ANY UNSUITABLE MATERIAL MUST BE REMOVED AND REPLACED WITH SELECT FILL IN ACCORDANCE WITH TFNSW B30/ R44/ 3071.

REINFORCEMENT NOTES:

R1. ALL REINFORCEMENT SHALL BE OF GRADE D500N TO AS4671-2019.
R2. MESH LAPS SHALL BE MADE SO THAT THE TWO OUTERMOST WIRES OF ONE FABRIC OVERLAP THE TWO OUTERMOST WIRES OF THE SHEET BEING LAPPED.

| LAP SCHEDULE | MEMBER THICKNESS | | <300mm | >300mm |
|---|---|---|---|---|
| | N10 | (mm) | 400 | 550 |
| | N12 | (mm) | 450 | 600 |
| | N16 | (mm) | 600 | 800 |
| | N20 | (mm) | 800 | 1050 |
| | N24 | (mm) | 1050 | 1400 |
| | N28 | (mm) | 1350 | 1800 |

R3. CLEAR DISTANCE BETWEEN LAPPED BARS SHALL NOT EXCEED 3X THE BAR DIAMETER.
R4. # DENOTES VARIABLE BAR LENGTH.

| AMD | DESCRIPTION | DESIGNER SIGN./DATE | VERIFIED SIGN./DATE | APPROVED SIGN./DATE |
|---|---|---|---|---|
| 1 | 80% DETAILED DESGIN ISSUE | C.R 08/07/24 | | C.R 08/07/24 |

CO-ORDINATE SYSTEM: tbCoordSys | HEIGHT DATUM: tbHghtDatum | SCALE: NTS

NSW GOVERNMENT Transport for NSW

NORTHROP
Wollongong
Level 1, 57 Kembla Street, Wollongong, N.S.W. 2500
Ph (02) 4226 3333 Email: out.4connect@northrop.com.au
ABN 81 094 433 100

This drawing and the related information have been prepared by, or at the request of, Transport for New South Wales (TfNSW) for a specific purpose and may not be used for any purpose other than the purpose intended by TfNSW. TfNSW does not provide any warranties and accepts no liability arising out of the use of this drawing or any of the related information for any purpose other than the intended purpose. This drawing is protected by copyright and no part of this drawing may be reproduced in any form without the express written permission of TfNSW.

DRAWN: T.AH TONG
DESIGNED: C.REYNOLDS
DRG CHECK: C.REYNOLDS
DESIGN CHECK:
APPROVED:

# THREDBO RIVER CULVERTS

## FOUR CELL - 2250 CORRUGATED STEEL PIPES

## WINGWALL

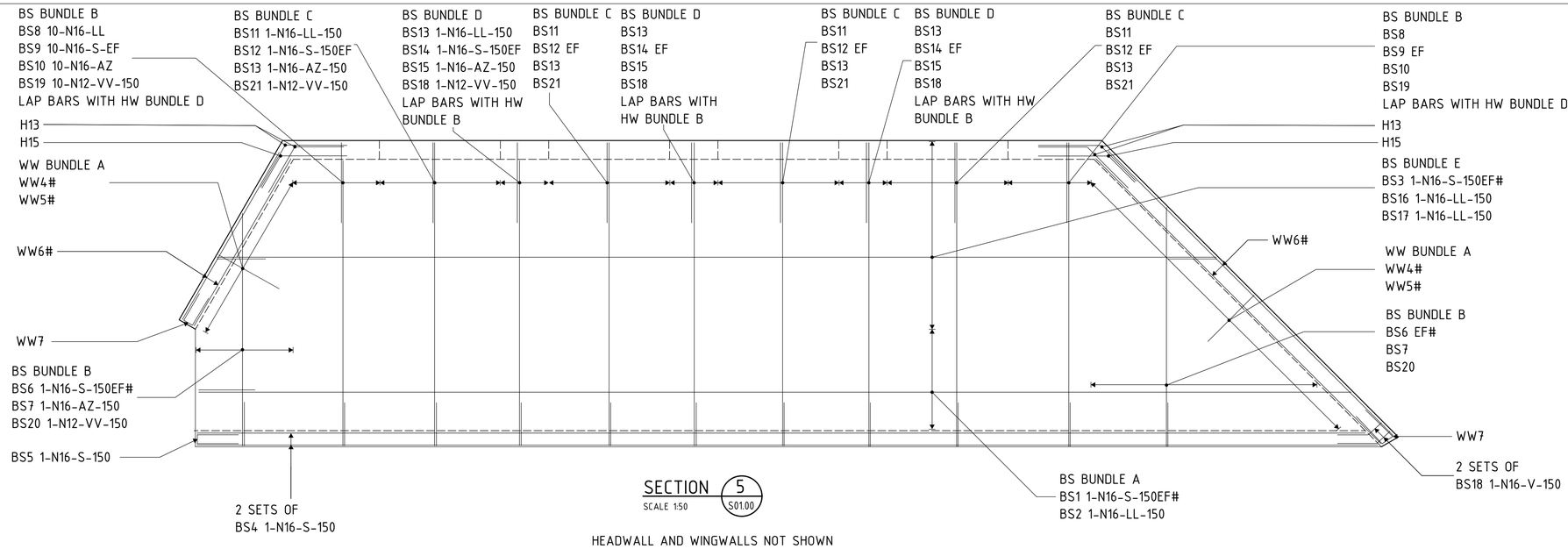
FILE No: **231489** | SHEET: RMS SheetNo - | A1
STATUS: **NOT FOR CONSTRUCTION** ©
DRG No: **S01.10** | - | EDMS No: - | **1**

DF 801554

Plotted by

W:\#jobs\2023\231489 - Thredbo River Culvert Rehab\D-Drawings\E-Structural\6-REVIT MODEL\231489-ST-R22-THREDBO RIVER CULVERT REHAB COMPLETE SET-A1.rte

8/07/2024 4:56:10 AM




SECTION 5 S01.00
SCALE 1:50

HEADWALL AND WINGWALLS NOT SHOWN
REFER TO OTHER SHEETS FOR FURTHER INFORMATION ON REINFORCEMENT INTERACTIONS BETWEEN STRUCTURAL ELEMENTS

ASSUMPTIONS:

1. EXISTING SOIL AND FILL HAVE A SATURATED DENSITY OF 22.5KN/M$^3$.
2. ACTIVE PRESSURE (Ka = 0.71) AND PRESSURE AT REST (KO = 0.43) DETERMINED THROUGH USE OF COULOMB THEORY.
3. FRICTION ANGLE = 45 DEGREES
4. FOUNDATION ALLOWABLE BEARING CAPACITY OF 150kPa MIN.
5. BACKFILL BEHIND HEADWALL AND WINGWALL SHALL BE ADEQUATELY COMPACTED WITH FREE DRAINING GRANULAR MATERIAL AS PER TFNSW B30.
6. TRAFFIC BARRIERS INTERFACING WITH THE CULVERT HEADWALL HAVE NOT BEEN DESIGNED FOR.
7. AGGRESSIVE SOILS HAVE NOT BEEN CONSIDERED WITHIN THE DESIGN
8. SURCHARGE LOADS 10kPa LIVE

GENERAL NOTES:

G1. WEEP HOLES ARE TO BE PROVIDED AT 1800 CENTERS (MAXIMUM)
G2. REINFORCEMENT SHOWN DIAGRAMMATICALLY.
G3. SCOUR PROTECTION TO BE PROVIDED BY OTHERS.
G4. HW OR H = HEADWALL
WW OR W = WINGWALL
BS OR B = BASESLAB

CONCRETE NOTES:

C1. CARRY OUT ALL CONCRETE WORK IN ACCORDANCE WITH TFNSW QA SPECIFICATION B80 - CONCRETE WORK FOR BRIDGES (PREFERABLY DRY WEATHER PERIOD).
C2. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 40MPa.
C3. COVER SHALL BE:
- 75MM WHERE IN CONTACT WITH THE GROUND.
- 45MM ELSEWHERE.
ASSUMED EXPOSURE CLASSIFICATION OF B1 TO AS5100.5-2017.
C4. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF MASS CONCRETE SHALL BE 20MPa.
C5. CURING OF CONCRETE SHALL BE IN AS5100.5 TABLE 4.4.1 (A).
C6. PRIOR TO CONSTRUCTION, THE FOUNDATION CONDITIONS SHALL BE CONFIRMED ON SITE BY A QUALIFIED GEOTECHNICAL ENGINEER. THE CONSTRUCTION CONTRACTOR SHALL ENSURE THAT ALL NECESSARY FOUNDATION TREATMENT SHALL BE COMPLETED PRIOR TO COMMENCING BASE SLAB POUR.
C7. ASSUMED FOUNDATIONS CONDITIONS TO BE MEDIUM DENSE OR BETTER FOR GRANULAR SOILS OR STIFF OR BETTER FOR COHESIVE SOILS. ANY UNSUITABLE MATERIAL MUST BE REMOVED AND REPLACED WITH SELECT FILL IN ACCORDANCE WITH TFNSW B30/ R44/ 3071.

REINFORCEMENT NOTES:

R1. ALL REINFORCEMENT SHALL BE OF GRADE D500N TO AS4671-2019.
R2. MESH LAPS SHALL BE MADE SO THAT THE TWO OUTERMOST WIRES OF ONE FABRIC OVERLAP THE TWO OUTERMOST WIRES OF THE SHEET BEING LAPPED.

| LAP SCHEDULE | MEMBER THICKNESS | | <300mm | >300mm |
|---|---|---|---|---|
| | N10 | (mm) | 400 | 550 |
| | N12 | (mm) | 450 | 600 |
| | N16 | (mm) | 600 | 800 |
| | N20 | (mm) | 800 | 1050 |
| | N24 | (mm) | 1050 | 1400 |
| | N28 | (mm) | 1350 | 1800 |

R3. CLEAR DISTANCE BETWEEN LAPPED BARS SHALL NOT EXCEED 3X THE BAR DIAMETER.
R4. # DENOTES VARIABLE BAR LENGTH.

| AMD | DESCRIPTION | DESIGNER SIGN./DATE | VERIFIED SIGN./DATE | APPROVED SIGN./DATE |
|---|---|---|---|---|
| 1 | 80% DETAILED DESGIN ISSUE | C.R 08/07/24 | | C.R 08/07/24 |

CO-ORDINATE SYSTEM: tbCoordSys | HEIGHT DATUM: tbHghtDatum | SCALE: NTS

NSW GOVERNMENT Transport for NSW

NORTHROP
Wollongong
Level 1, 57 Kembla Street, Wollongong, N.S.W. 2500
Ph (02) 4226 3333 Email: out.of.town@northrop.com.au
ABN 81 094 433 100

This drawing and the related information have been prepared by, or at the request of, Transport for New South Wales (TfNSW) for a specific purpose and may not be used for any purpose other than the purpose intended by TfNSW. TfNSW does not provide any warranties and accepts no liability arising out of the use of this drawing or any of the related information for any purpose other than the intended purpose. This drawing is protected by copyright and no part of this drawing may be reproduced in any form without the express written permission of TfNSW.

DRAWN: T.AH TONG
DESIGNED: C.REYNOLDS
DRG CHECK: C.REYNOLDS
DESIGN CHECK:
APPROVED:

# THREDBO RIVER CULVERTS

## FOUR CELL - 2250 CORRUGATED STEEL PIPES

## SLAB

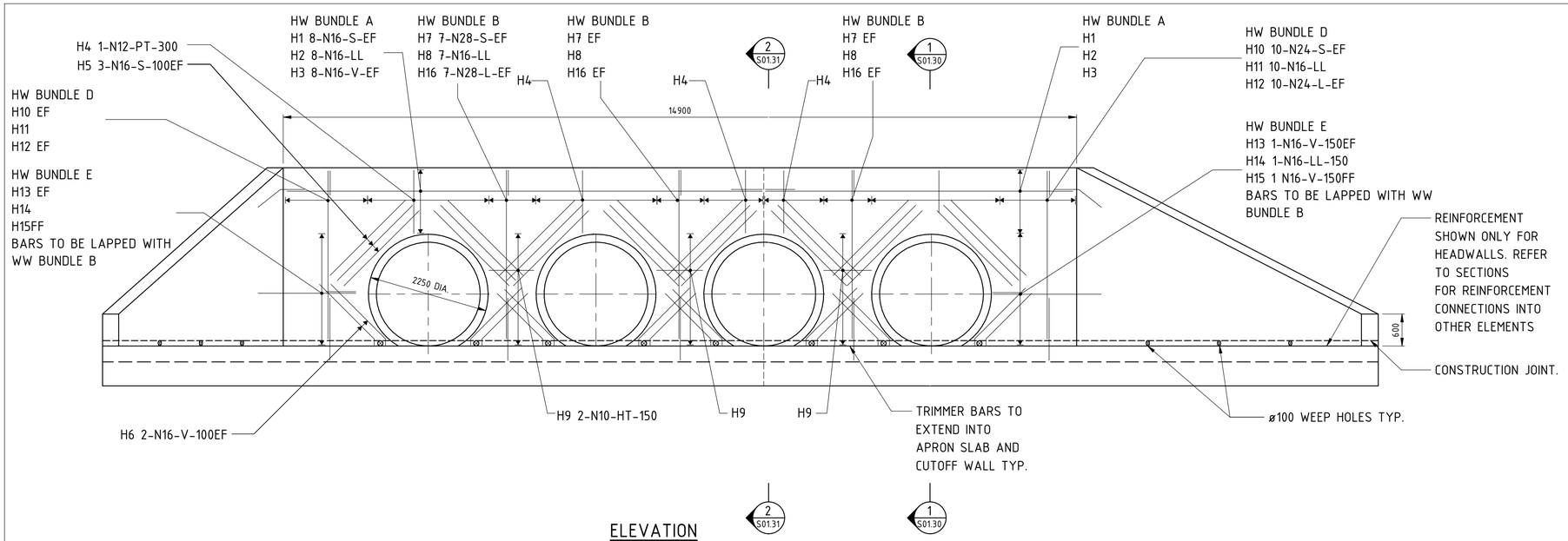
FILE No: **231489** | SHEET: RMS SheetNo – | A1
STATUS: **NOT FOR CONSTRUCTION** ©
DRG No: **S01.20** | – | EDMS No: – | **1**

Plotted by

DF 801554

W:\#jobs\2023\231489 - Thredbo River Culvert Rehab\D-Drawings\E-Structural\6-REVIT MODEL\231489-ST-R22-THREDBO RIVER CULVERT REHAB COMPLETE SET-A1.rte

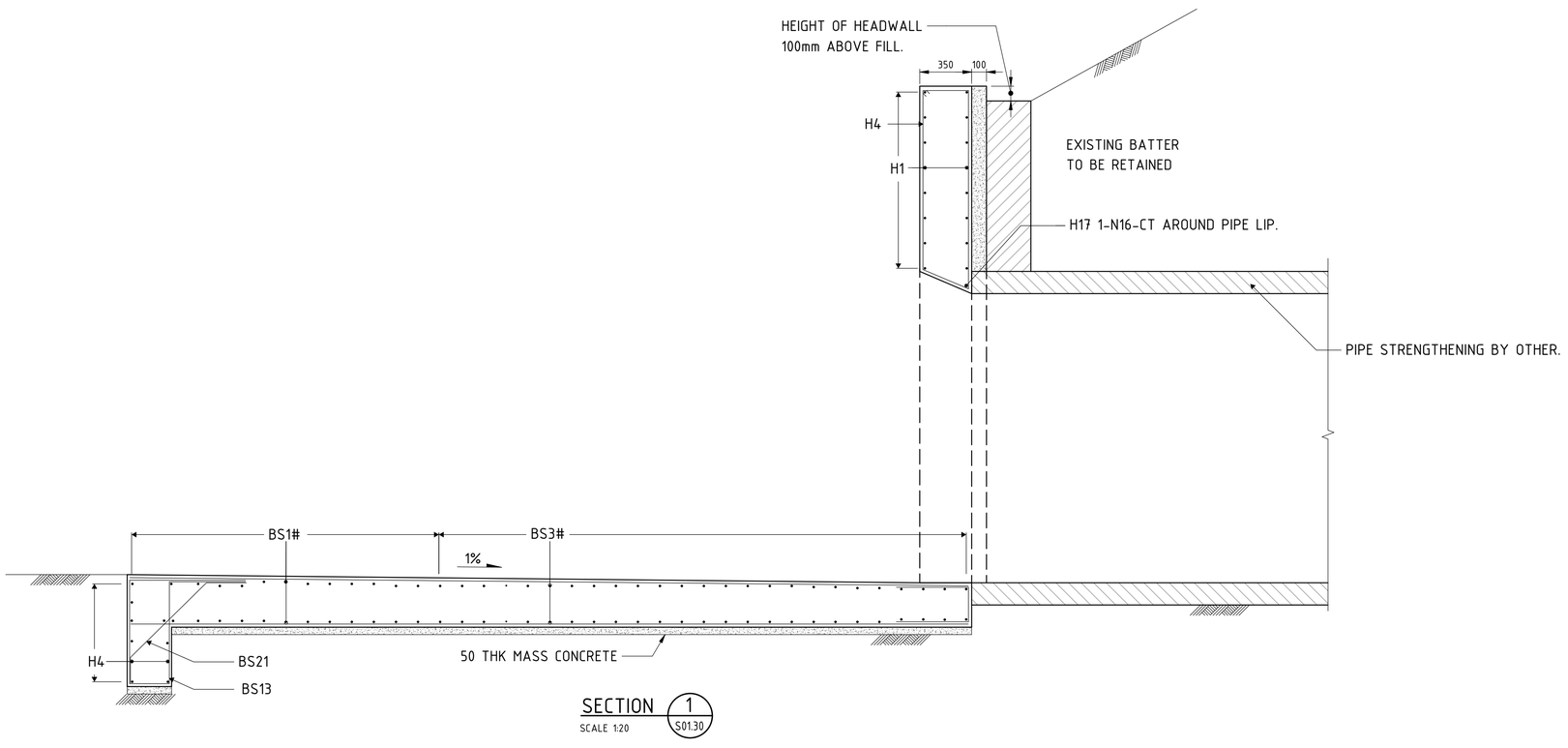
8/07/2024 4:56:11 AM




## ELEVATION

SCALE 1:50

REFER TO OTHER SHEETS FOR FURTHER INFORMATION ON REINFORCEMENT INTERACTIONS BETWEEN STRUCTURAL ELEMENTS.




## SECTION 1 / S01.30

SCALE 1:20

ASSUMPTIONS:

1. EXISTING SOIL AND FILL HAVE A SATURATED DENSITY OF 22.5KN/M$^3$.
2. ACTIVE PRESSURE (Ka = 0.71) AND PRESSURE AT REST (KO = 0.43) DETERMINED THROUGH USE OF COULOMB THEORY.
3. FRICTION ANGLE = 45 DEGREES
4. FOUNDATION ALLOWABLE BEARING CAPACITY OF 150kPa MIN.
5. BACKFILL BEHIND HEADWALL AND WINGWALL SHALL BE ADEQUATELY COMPACTED WITH FREE DRAINING GRANULAR MATERIAL AS PER TFNSW B30.
6. TRAFFIC BARRIERS INTERFACING WITH THE CULVERT HEADWALL HAVE NOT BEEN DESIGNED FOR.
7. AGGRESSIVE SOILS HAVE NOT BEEN CONSIDERED WITHIN THE DESIGN
8. SURCHARGE LOADS 10kPa LIVE

GENERAL NOTES:

G1. WEEP HOLES ARE TO BE PROVIDED AT 1800 CENTERS (MAXIMUM)
G2. REINFORCEMENT SHOWN DIAGRAMMATICALLY.
G3. SCOUR PROTECTION TO BE PROVIDED BY OTHERS.
G4. HW OR H = HEADWALL
WW OR W = WINGWALL
BS OR B = BASESLAB

CONCRETE NOTES:

C1. CARRY OUT ALL CONCRETE WORK IN ACCORDANCE WITH TFNSW QA SPECIFICATION B80 - CONCRETE WORK FOR BRIDGES (PREFERABLY DRY WEATHER PERIOD).
C2. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 40MPa.
C3. COVER SHALL BE:
- 75MM WHERE IN CONTACT WITH THE GROUND.
- 45MM ELSEWHERE.
ASSUMED EXPOSURE CLASSIFICATION OF B1 TO AS5100.5-2017.
C4. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF MASS CONCRETE SHALL BE 20MPa.
C5. CURING OF CONCRETE SHALL BE IN AS5100.5 TABLE 4.4.1 (A).
C6. PRIOR TO CONSTRUCTION, THE FOUNDATION CONDITIONS SHALL BE CONFIRMED ON SITE BY A QUALIFIED GEOTECHNICAL ENGINEER. THE CONSTRUCTION CONTRACTOR SHALL ENSURE THAT ALL NECESSARY FOUNDATION TREATMENT SHALL BE COMPLETED PRIOR TO COMMENCING BASE SLAB POUR.
C7. ASSUMED FOUNDATIONS CONDITIONS TO BE MEDIUM DENSE OR BETTER FOR GRANULAR SOILS OR STIFF OR BETTER FOR COHESIVE SOILS. ANY UNSUITABLE MATERIAL MUST BE REMOVED AND REPLACED WITH SELECT FILL IN ACCORDANCE WITH TFNSW B30/ R44/ 3071.

REINFORCEMENT NOTES:

R1. ALL REINFORCEMENT SHALL BE OF GRADE D500N TO AS4671-2019.
R2. MESH LAPS SHALL BE MADE SO THAT THE TWO OUTERMOST WIRES OF ONE FABRIC OVERLAP THE TWO OUTERMOST WIRES OF THE SHEET BEING LAPPED.

| LAP SCHEDULE | MEMBER THICKNESS | | <300mm | >300mm |
|---|---|---|---|---|
| | N10 | (mm) | 400 | 550 |
| | N12 | (mm) | 450 | 600 |
| | N16 | (mm) | 600 | 800 |
| | N20 | (mm) | 800 | 1050 |
| | N24 | (mm) | 1050 | 1400 |
| | N28 | (mm) | 1350 | 1800 |

R3. CLEAR DISTANCE BETWEEN LAPPED BARS SHALL NOT EXCEED 3X THE BAR DIAMETER.
R4. # DENOTES VARIABLE BAR LENGTH.

| AMD | DESCRIPTION | DESIGNER SIGN./DATE | VERIFIED SIGN./DATE | APPROVED SIGN./DATE |
|---|---|---|---|---|
| 1 | 80% DETAILED DESGIN ISSUE | C.R 08/07/24 | | C.R 08/07/24 |

CO-ORDINATE SYSTEM: tbCoordSys | HEIGHT DATUM: tbHghtDatum | SCALE: NTS

NSW GOVERNMENT Transport for NSW

NORTHROP
Wollongong
Level 1, 57 Kembla Street, Wollongong, N.S.W. 2500
Ph (02) 4226 3333 Email: southcoast@northrop.com.au
ABN 81 094 433 100

This drawing and the related information have been prepared by, or at the request of, Transport for New South Wales (TfNSW) for a specific purpose and may not be used for any purpose other than the purpose intended by TfNSW. TfNSW does not provide any warranties and accepts no liability arising out of the use of this drawing or any of the related information for any purpose other than the intended purpose. This drawing is protected by copyright and no part of this drawing may be reproduced in any form without the express written permission of TfNSW.

DRAWN: T.AH TONG
DESIGNED: C.REYNOLDS
DRG CHECK: C.REYNOLDS
DESIGN CHECK:
APPROVED:

# THREDBO RIVER CULVERTS

## FOUR CELL - 2250 CORRUGATED STEEL PIPES

## HEADWALL - SHEET 1

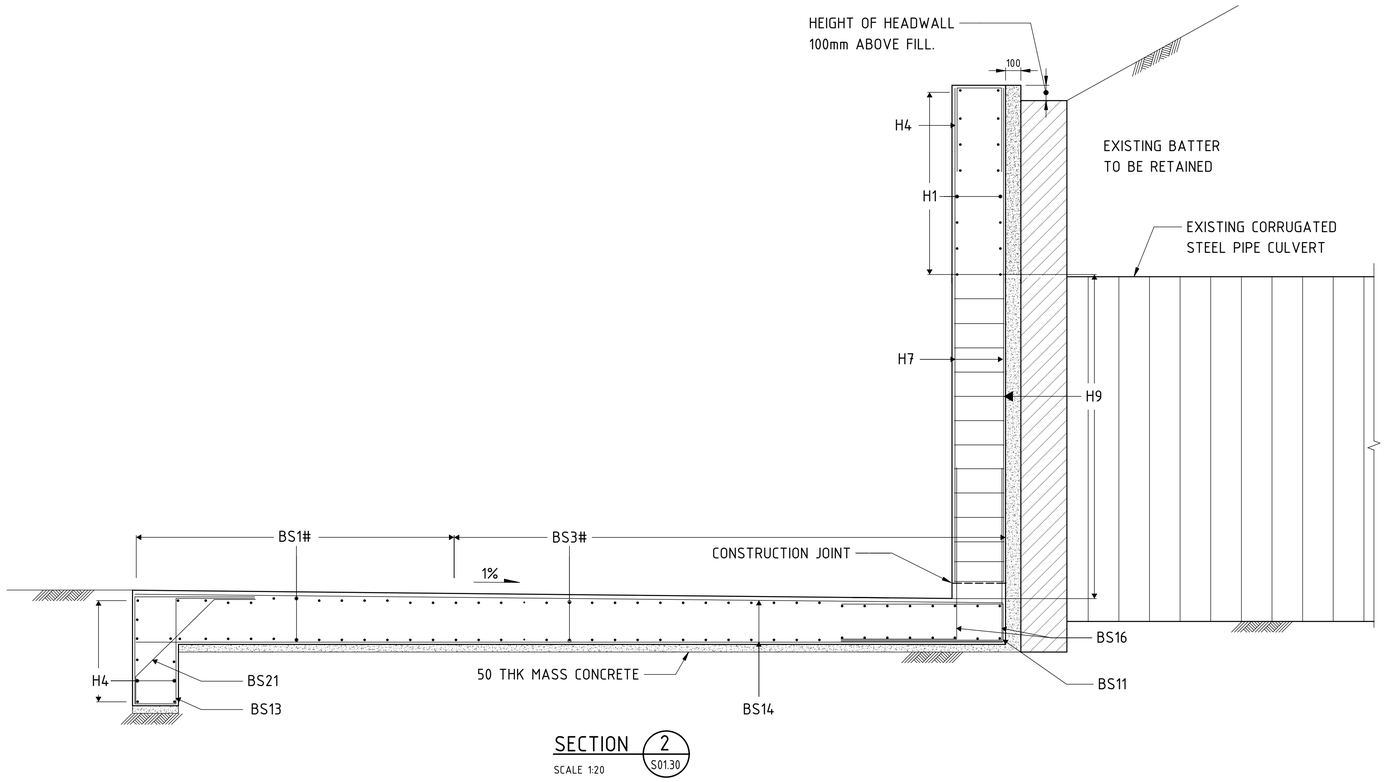
FILE No: **231489** | SHEET: RMS SheetNo - | A1
STATUS: **NOT FOR CONSTRUCTION** | ©
DRG No: **S01.30** | - | EDMS No: - | **1**

DF 801554

Plotted by

W:\#jobs\2023\231489 - Thredbo River Culvert Rehab\D-Drawings\E-Structural\6-REVIT MODEL\231489-ST-R22-THREDBO RIVER CULVERT REHAB COMPLETE SET-A1.rte

8/07/2024 4:56:12 AM




SECTION 2 S01.30

SCALE 1:20

ASSUMPTIONS:

1. EXISTING SOIL AND FILL HAVE A SATURATED DENSITY OF 22.5KN/M$^3$.
2. ACTIVE PRESSURE (Ka = 0.71) AND PRESSURE AT REST (KO = 0.43) DETERMINED THROUGH USE OF COULOMB THEORY.
3. FRICTION ANGLE = 45 DEGREES
4. FOUNDATION ALLOWABLE BEARING CAPACITY OF 150kPa MIN.
5. BACKFILL BEHIND HEADWALL AND WINGWALL SHALL BE ADEQUATELY COMPACTED WITH FREE DRAINING GRANULAR MATERIAL AS PER TFNSW B30.
6. TRAFFIC BARRIERS INTERFACING WITH THE CULVERT HEADWALL HAVE NOT BEEN DESIGNED FOR.
7. AGGRESSIVE SOILS HAVE NOT BEEN CONSIDERED WITHIN THE DESIGN
8. SURCHARGE LOADS 10kPa LIVE

GENERAL NOTES:

G1. WEEP HOLES ARE TO BE PROVIDED AT 1800 CENTERS (MAXIMUM)
G2. REINFORCEMENT SHOWN DIAGRAMMATICALLY.
G3. SCOUR PROTECTION TO BE PROVIDED BY OTHERS.
G4. HW OR H = HEADWALL
WW OR W = WINGWALL
BS OR B = BASESLAB

CONCRETE NOTES:

C1. CARRY OUT ALL CONCRETE WORK IN ACCORDANCE WITH TFNSW QA SPECIFICATION B80 - CONCRETE WORK FOR BRIDGES (PREFERABLY DRY WEATHER PERIOD).
C2. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 40MPa.
C3. COVER SHALL BE:
- 75MM WHERE IN CONTACT WITH THE GROUND.
- 45MM ELSEWHERE.
ASSUMED EXPOSURE CLASSIFICATION OF B1 TO AS5100.5-2017.
C4. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF MASS CONCRETE SHALL BE 20MPa.
C5. CURING OF CONCRETE SHALL BE IN AS5100.5 TABLE 4.4.1 (A).
C6. PRIOR TO CONSTRUCTION, THE FOUNDATION CONDITIONS SHALL BE CONFIRMED ON SITE BY A QUALIFIED GEOTECHNICAL ENGINEER. THE CONSTRUCTION CONTRACTOR SHALL ENSURE THAT ALL NECESSARY FOUNDATION TREATMENT SHALL BE COMPLETED PRIOR TO COMMENCING BASE SLAB POUR.
C7. ASSUMED FOUNDATIONS CONDITIONS TO BE MEDIUM DENSE OR BETTER FOR GRANULAR SOILS OR STIFF OR BETTER FOR COHESIVE SOILS. ANY UNSUITABLE MATERIAL MUST BE REMOVED AND REPLACED WITH SELECT FILL IN ACCORDANCE WITH TFNSW B30/ R44/ 3071.

REINFORCEMENT NOTES:

R1. ALL REINFORCEMENT SHALL BE OF GRADE D500N TO AS4671-2019.
R2. MESH LAPS SHALL BE MADE SO THAT THE TWO OUTERMOST WIRES OF ONE FABRIC OVERLAP THE TWO OUTERMOST WIRES OF THE SHEET BEING LAPPED.

| LAP SCHEDULE | MEMBER THICKNESS | | <300mm | >300mm |
|---|---|---|---|---|
| | N10 | (mm) | 400 | 550 |
| | N12 | (mm) | 450 | 600 |
| | N16 | (mm) | 600 | 800 |
| | N20 | (mm) | 800 | 1050 |
| | N24 | (mm) | 1050 | 1400 |
| | N28 | (mm) | 1350 | 1800 |

R3. CLEAR DISTANCE BETWEEN LAPPED BARS SHALL NOT EXCEED 3X THE BAR DIAMETER.
R4. # DENOTES VARIABLE BAR LENGTH.

| AMD | DESCRIPTION | DESIGNER SIGN./DATE | VERIFIED SIGN./DATE | APPROVED SIGN./DATE |
|---|---|---|---|---|
| 1 | 80% DETAILED DESGIN ISSUE | C.R 08/07/24 | | C.R 08/07/24 |

CO-ORDINATE SYSTEM: tbCoordSys | HEIGHT DATUM: tbHghtDatum | SCALE: NTS

NSW GOVERNMENT Transport for NSW

NORTHROP
Wollongong
Level 1, 57 Kembla Street, Wollongong, N.S.W. 2500
Ph (02) 4226 3333 Email: out.wollongong@northrop.com.au
ABN 81 094 433 100

This drawing and the related information have been prepared by, or at the request of, Transport for New South Wales (TfNSW) for a specific purpose and may not be used for any purpose other than the purpose intended by TfNSW. TfNSW does not provide any warranties and accepts no liability arising out of the use of this drawing or any of the related information for any purpose other than the intended purpose. This drawing is protected by copyright and no part of this drawing may be reproduced in any form without the express written permission of TfNSW.

DRAWN: T.AH TONG
DESIGNED: C.REYNOLDS
DRG CHECK: C.REYNOLDS
DESIGN CHECK:
APPROVED:

# THREDBO RIVER CULVERTS

## FOUR CELL - 2250 CORRUGATED STEEL PIPES

## HEADWALL - SHEET 2

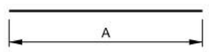
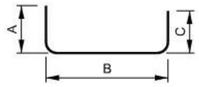
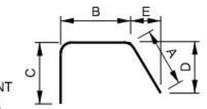
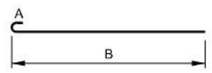
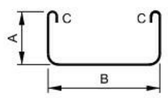
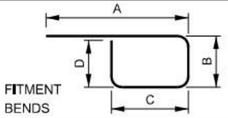
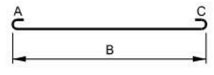
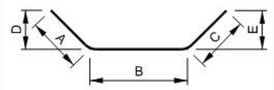
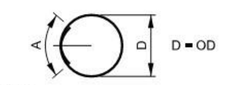
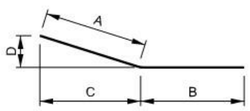
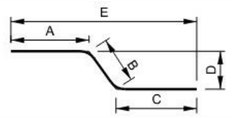
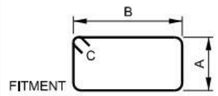
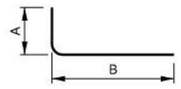
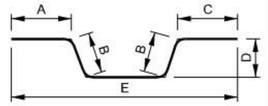
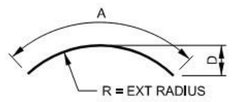
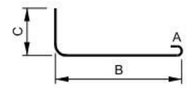
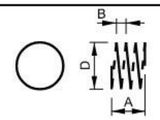
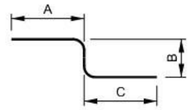
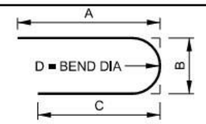
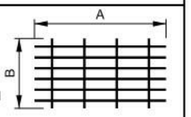
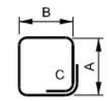
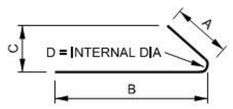
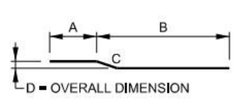
FILE No: **231489** | SHEET: RMS SheetNo - | A1
STATUS: **NOT FOR CONSTRUCTION** ©
DRG No: **S01.31** | - | EDMS No: - | **1**

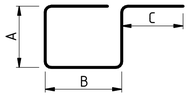
DF 801554

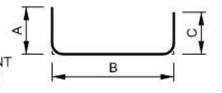
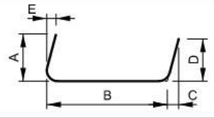
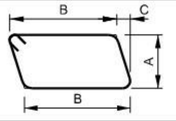
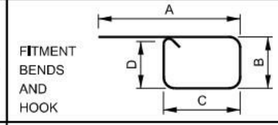
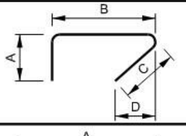
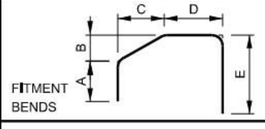
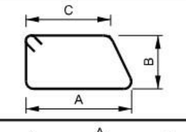
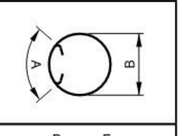
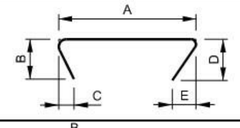
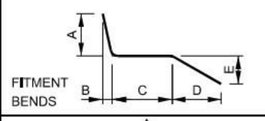
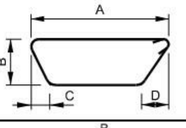
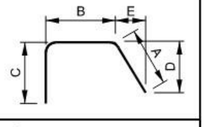
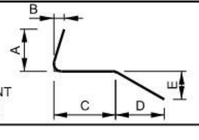
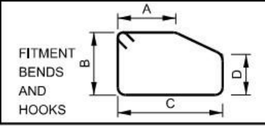
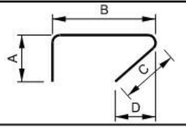
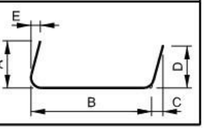
Plotted by

W:\#jobs\2023\231489 - Thredbo River Culvert Rehab\D-Drawings\E-Structural\6-REVIT MODEL\231489-ST-R22-THREDBO RIVER CULVERT REHAB COMPLETE SET-A1.rte

8/07/2024 4:56:12 AM

| SHAPE CODE | AUSTRALIAN STANDARD SHAPE | SHAPE CODE | AUSTRALIAN STANDARD SHAPE | SHAPE CODE | AUSTRALIAN STANDARD SHAPE | SHAPE CODE | AUSTRALIAN STANDARD SHAPE |
|---|---|---|---|---|---|---|---|
| S |  | LL |  | VL |  | H |  |
| SH |  | XT |  | HH |  | VV |  |
| CT |  | V |  | J |  | HT |  |
| L |  | JJ |  | R |  | LH |  |
| SP |  | RC |  | U |  | F |  |
| T |  | A |  | CC |  | | |

| SHAPE CODE | NON-STANDARD SHAPE | SHAPE CODE | NON-STANDARD SHAPE |
|---|---|---|---|
| AZ |  | EZ | |
| BZ | | FZ | |
| CZ | | GZ | |
| DZ | | HZ | |

| SHAPE CODE | ROADS AND MARITIME SERVICES STANDARD SHAPE | SHAPE CODE | ROADS AND MARITIME SERVICES STANDARD SHAPE | SHAPE CODE | ROADS AND MARITIME SERVICES STANDARD SHAPE | SHAPE CODE | ROADS AND MARITIME SERVICES STANDARD SHAPE |
|---|---|---|---|---|---|---|---|
| LF |  | AV |  | TT |  | XH |  |
| LA |  | LG |  | PT |  | ST |  |
| AA |  | KH |  | QT |  | VF |  |
| KL |  | GT |  | KF |  | AF |  |

## BAR MARKING LEGEND

THE METHODE USED TO LABEL REINFORCEMENT ON THE DRAWINGS IS AS FOLLOWS:

A1 10-N16-S-300EF

- INFORMATION FOR PLACING
- SPACING ALONG LIMIT LINE
- BAR SHAPE CODE
- BAR SIZE IN MILLIMETRES
- BAR STRUCTURAL PROPERTIES
- NUMBER OF BARS IN THE SET
- BAR NUMBER IN SEQUENCE
- STRUCTURE ELEMENT DENOTATION

## REINFORCEMENT NOTES

1. AUSTRALIAN STANDARD BAR SHAPES ARE IN ACCORDANCE WITH AS1100.501.
2. BAR SIZE IS THE NOMINAL DIAMETER IN MILLIMETRES, OR THE AS/NZS 4671 FABRIC NUMBER.
3. THE GRADE OF REINFORCEMENT, IF NOT STATED ON THE DRAWINGS, SHALL BE D500N TO AS/NZS 4671.
4. DIMENSIONS SHOWN ON BAR SHAPES DIAGRAMS ARE MEASURED FORM THE OUTSIDE FACES OF THE BARS AND ARE IN MILLIMETRES.
5. THE INCLUDED ANGLE OF ANY BEND SHALL BE A RIGHT ANGLE IF NO DIMENSIONS ARE SHOWN.
6. BARS OF DIAMETER GREATER THAN 24mm SHALL NOT BE REBENT.
7. BAR BENDING AND HOOK DETAILS SHALL BE IN ACCORDANCE WIT SECTION 5.13 OF AS5100-BRIDGE DESIGN.

| AMD | DESCRIPTION | DESIGNER SIGN./DATE | VERIFIED SIGN./DATE | APPROVED SIGN./DATE |
|---|---|---|---|---|
| 1 | 80% DETAILED DESGIN ISSUE | C.R 08/07/24 | | C.R 08/07/24 |

CO-ORDINATE SYSTEM: tbCoordSys | HEIGHT DATUM: tbHghtDatum | SCALE: NTS

NSW GOVERNMENT Transport for NSW

NORTHROP
Wollongong
Level 1, 57 Kembla Street, Wollongong, N.S.W. 2500
Ph (02) 4226 3033 Email: southcoast@northrop.com.au
ABN 81 094 433 100

This drawing and the related information have been prepared by, or at the request of, Transport for New South Wales (TfNSW) for a specific purpose and may not be used for any purpose other than the purpose intended by TfNSW. TfNSW does not provide any warranties and accepts no liability arising out of the use of this drawing or any of the related information for any purpose other than the intended purpose. This drawing is protected by copyright and no part of this drawing may be reproduced in any form without the express written permission of TfNSW.

DRAWN: T.AH TONG
DESIGNED: C.REYNOLDS
DRG CHECK: C.REYNOLDS
DESIGN CHECK:
APPROVED:

# THREDBO RIVER CULVERTS

## FOUR CELL - 2250 CORRUGATED STEEL PIPES

## BAR BENDING GUIDE

FILE No: **231489** | SHEET: RMS SheetNo - | A1

STATUS: **NOT FOR CONSTRUCTION** ©

DRG No: **S01.40** | - | EDMS No: - | **1**

Plotted by

DF 801*554

W:\#jobs\2023\231489 - Thredbo River Culvert Rehab\D-Drawings\E-Structural\6-REVIT MODEL\231489-ST-R22-THREDBO RIVER CULVERT REHAB COMPLETE SET-A1.rte

8/07/2024 4:56:13 AM

# Appendix D – Hydraulic Investigation

# B10155 Corrugated Steel Pipe Culvert over Thredbo River on Alpine Way, 4km South of Thredbo

## Hydraulic Investigation – Pipe Relining of Existing 4 cells x 2250mm Corrugated Steel Pipe Culvert

Transport for NSW | April 2020

NSW GOVERNMENT

# Summary

Transport for NSW has identified some deterioration at the inlet and outlet of the existing steel corrugated pipe culvert. Inspection revealed the stone wall between cell No. 3 and 4 at the inlet end has broken away which has allowed water to seepage under the pipes. Up to a height of 0.6m of galvanising has been worn off the sides of the ARMCO pipes in all cells. Some parts of the stone wall have also broken away in areas at the base of the pipes which has caused some erosion under and around the pipes.

The existing four cells corrugated steel pipe culverts have been identified as having significant defects. A series of options were considered for the strengthening of the subject structure. The options included a number of strengthening and replacement options.

The preferred option as detailed in the project brief is Option 1 tunnel lining (new concrete culvert). The concrete lining would reduce the diameter by at least 300mm.

The increase in velocity would cause some scour of the creek and banks. It is proposed to protect the outlet with rock rip rap. A riprap rock size $D_{50}$ =1050mm is proposed.

The upstream area of the culvert is mostly National Park. Therefore the proposed option should have no impacts to properties upstream.

A summary of the hydraulic investigation is shown below.

| | Pipe Size | Road Level RL | 1% AEP Flood Level | Afflux (mm) | Flood Immunity | 1% AEP Flood velocity at Outlet (m/sec) | Flood Overtopping Road? |
|---|---|---|---|---|---|---|---|
| **Existing** | 4 x 2250mm Ø | RL 1564 | RL 1562.12 | n/a | 1 in 100 | 3.85 | No |
| **Proposed (Option 1)** | 4 x 1950mm Ø | | RL 1562.52 | 400 | Just above 1 in 50 | 7.00 | |

# Table of Contents


Section 1: Background ..... 4
1.1 Existing Culvert Configuration ..... 4
Section 2: Hydrology ..... 6
2.1 Catchment Area ..... 6
2.2 Regional Flood Frequency Estimation Model (RFFE) Method ..... 7
2.3 Adopted Design Flows ..... 7
Section 3: Hydraulics ..... 8
3.1 Hydraulic Input Data ..... 8
3.2 Existing ..... 8
3.2 Hydraulic Analysis using HY-8 ..... 9
3.2.1 Proposed ..... 9
3.3 Culvert Inlet Modifications ..... 11
3.3 Upstream Impacts ..... 12
Section 4: Sizing Rock Rip Rap at Culvert Outlet ..... 13
Section 5: Discussion & Recommendation ..... 14
Attachments: ..... 15
Attachment 1 Hydraulic Results for Existing and Proposed Option (Figure 6) ..... 16

# Section 1: Background

The existing steel corrugated pipe culvert (B10155) over Thredbo River near the Cascade Track is located about 4 km south west of Thredbo on the Alpine Way. The Thredbo River is a tributary of the Snowy River catchment. A site visit between Regional Maintenance Delivery Southern and Bridge Engineering was completed in November 2019.

The existing bridge size culvert was built in 1977. This existing multi-cell pipe culvert has four cells with a diameter of 2250mm.

Inspection revealed the stone wall between cell No. 3 and 4 at the inlet end has broken away which allows water passage getting under the pipes. Up to a height of 0.6m of galvanising has been worn off the sides of the ARMCO pipes in all cells. Rust nodes and minor surface pitting on the bottom section in cell No. 1, 2, 3 and 4 were also visible. Some parts of the stone wall have broken away in areas at the base of the pipes which is eroding fill from around the pipe.

This hydraulic investigation will consider the hydraulic capacity of the 4 cells x 2250mm.




**Figure 1: Culvert Location Plan**

## 1.1 Existing Culvert Configuration

The existing culvert at Thredbo Creek has a catchment on the southern side of Alpine Way. The calculated catchment bed slope is has been taken over a distance of 250m from RL 1800 to RL 1550. The calculated slope is about 0.0258m/m or 2.58%.

The adopted pipe slope has been calculated over a distance of 30m from RL 1560 to RL 1559.1. The adopted calculated pipe slope used in this analysis is 0.03m/m or 3%.

The work-as-executed drawings of the existing culvert were not available from Objective.

# Section 2: Hydrology

## 2.1 Catchment Area

A 20m contour map was generated and this was used to calculate the catchment size. The calculated catchment area for the site is 20.34km$^2$.

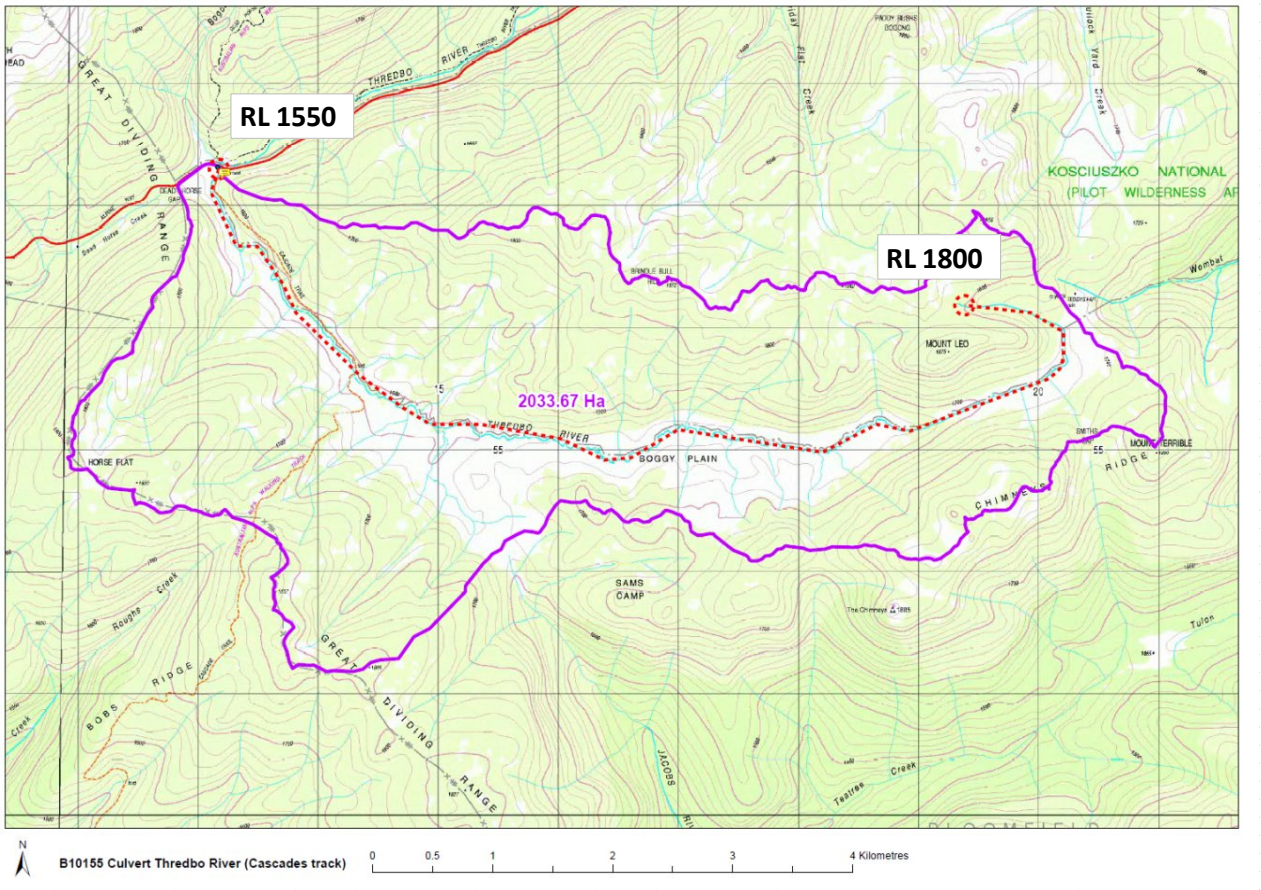



**Figure 2: Catchment Map**

## 2.2 Regional Flood Frequency Estimation Model (RFFE) Method

Input location with latitude -36.523 and longitude 148.264 and catchment data was entered into the Regional Flood Frequency Estimation Model 2016v1. The peak flow discharges at the culvert site were calculated for the range of storms from 2 year to 100 year ARI.

A range of shape factors were tested to determine the sensitivity of the peak flow. A larger value shape factor indicates a narrower shape, whilst a lower factor indicates a rounder shape.

For this site, a shape factor of 0.88 was adopted since the shape is closely represented by the catchment area.

| Peak Flows Summary | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Shape Factor | 1.04 | 0.88 | 0.70 | 0.53 |
| | | | | Peak Flow (m3/sec) | | | |
| Catchment Area ($km^2$) | Catchment Area (ha) | AEP (%) | ARI | RFFE Model | | | |
| 20.3367 | 2033.67 | 50 | 2 | 4.96 | 8.43 | 8.77 | 10.2 |
| | | 20 | 5 | 9.6 | 16.3 | 17.0 | 19.8 |
| | | 10 | 10 | 13.7 | 23.2 | 24.1 | 28.2 |
| | | 5 | 20 | 18.4 | 31.1 | 32.4 | 37.8 |
| | | 2 | 50 | 25.7 | 43.5 | 45.3 | 52.9 |
| | | 1 | 100 | 32.1 | 54.5 | 56.7 | 66.2 |
| | | | Unit Runoff ($m^3/sec/km^2$) | 1.6 | 2.7 | 2.8 | 3.3 |

**Table 1: Peak Flow Summary**

## 2.3 Adopted Design Flows

The peak flow values for a shape factor of 0.88 were adopted as the design flow for this investigation is shown below.

| Peak Flows Summary | | | |
|---|---|---|---|
| | | Shape Factor | 0.88 |
| | | | Peak Flow (m3/sec) |
| Catchment Area ($km^2$) | AEP (%) | ARI | RFFE Model |
| 20.3367 | 50 | 2 | 8.43 |
| | 20 | 5 | 16.3 |
| | 10 | 10 | 23.2 |
| | 5 | 20 | 31.1 |
| | 2 | 50 | 43.5 |
| | 1 | 100 | 54.5 |

**Table 2: Adopted Peak Flows**

# Section 3: Hydraulics

## 3.1 Hydraulic Input Data

The existing culvert inlet and outlets is shown below. The existing culvert is 4 cells x 2250mm diameter corrugated steel pipes.

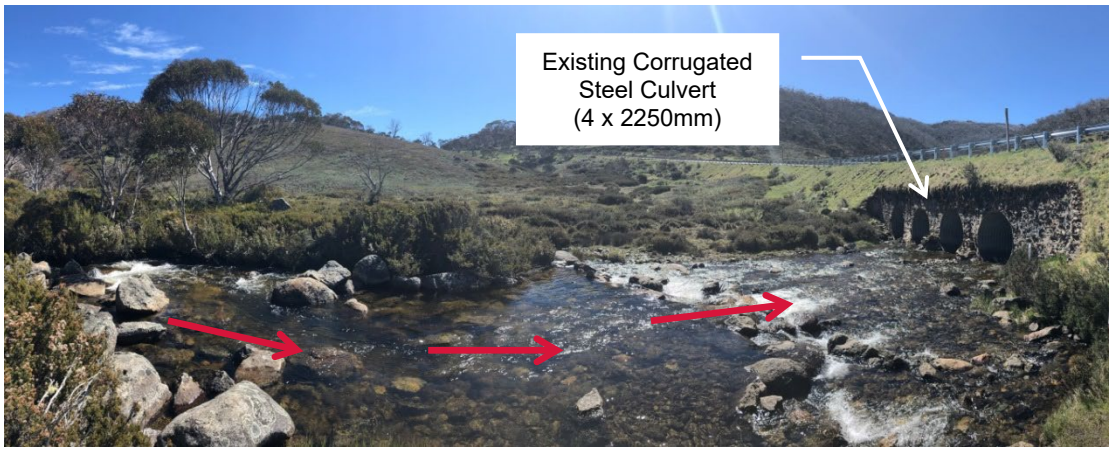



**Figure 3: Existing Culvert Inlet**



**Figure 4: Existing Culvert Outlet**

## 3.2 Existing

The input data for hydraulic analysis used in this investigation for the existing culvert is summarised below in Table 3. The existing culvert configuration has a flood immunity of 1% AEP.

| **Exsiting Culvert (4 x 2250mm)** | | |
|---|---|---|
| Road Level | 1564.0 | mAHD |
| Pipe Diameter | 2.250 | m |
| Depth of fill | 2.5 | m |
| Pipe Invert Level | 1560.0 | mAHD |

**Table 3: Existing Culvert Summary Data**

## 3.2 Hydraulic Analysis using HY-8

### 3.2.1 Proposed

The HY-8 Culvert Analysis Program Version 7.40 was used in this hydraulic assessment. In the absence of survey data for the culvert and surrounding area, assessment of the culvert was based on the site visit and data from the Asset Brief 2019-03.

The existing four cell pipe culverts have been identified as having significant defects. A series of options were considered for the strengthening of the structure. The options included a number of strengthening and replacement options. The broad options considered for the Proposal are summarised in Table 5 below.

| Proposed Option | Description |
|---|---|
| 1 | Tunneline (new concrete culvert) |
| 2 | HDPE lined (with grout backfill) |
| 3 | Corrugated HDPE lined (with grout backfill) |
| 4 | Shotcrete lined |
| 5 | Remove and replace |
| 6 | New Bridge |

**Table 4: Proposed Options Summary**

As described in the project brief Option 1 Tunneline (new concrete culvert) was selected based on a number of factors including ease of construction, durability (will provide a 100 year design life span), minimum impact to the hydraulic capacity of the culvert and traffic. The proposed concrete lining, 150mm thick, would reduce the diameter by at least 300mm.

| Pipe Size | No. of Cells | Diameter (m) | Available Waterway Area ($m^2$) |
|---|---|---|---|
| Existing | 4 | 2.25m | 15.90 |
| Proposed (Option 1) | 4 | 1.95m | 11.95 |

**Table 5: Existing and Proposed Culvert Summary**

In the absence of work-as-executed drawings and survey data, using the contour map, the road level was assumed to be RL 1564m.

| Proposed Culvert (4 x 1950mm) | | |
|---|---|---|
| Road Level | 1564.0 | mAHD |
| Pipe Diameter | 1.950 | m |
| Depth of fill | 2.5 | m |
| Pipe Invert Level | 1560.0 | mAHD |

**Table 6: Proposed Culvert Arrangement**

The assessment of proposed option 1 shows flood immunity just above 2% AEP. The proposed option has a 400mm afflux. A summary of the results is shown in Figure 4.

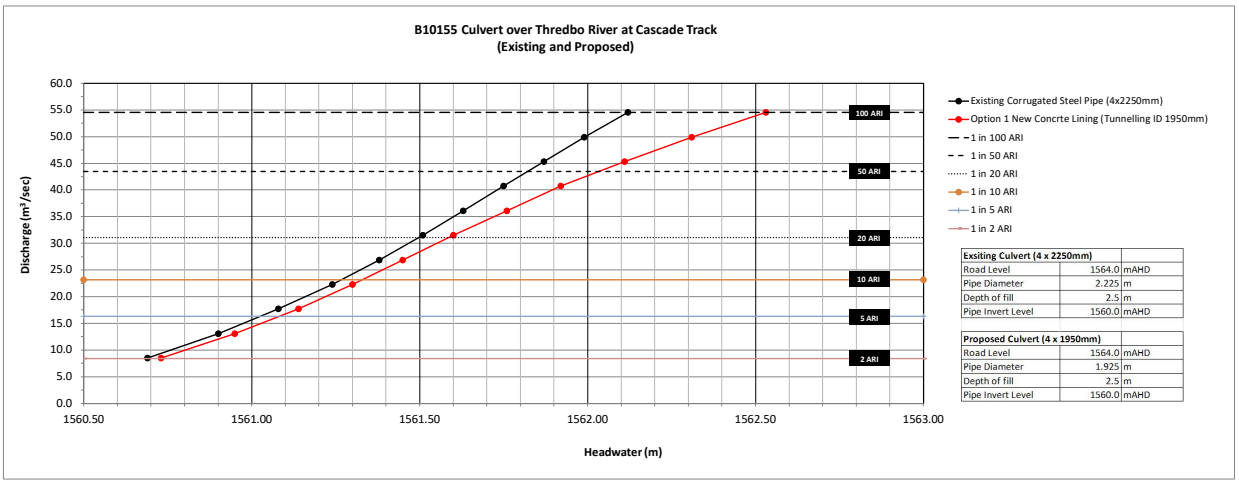



**Figure 5: Hydraulic Results for Existing and Proposed Option**

The chart on figure 5 and table 7 summarises the hydraulic investigation for the existing and proposed culvert. The black-line represents the existing culvert The existing culvert is 4 cells x 2250mm diameter.

The road level is RL 1564.0. Each ARI event with corresponding discharge flows are are shown on the y-axis. The x-axis show the flood level.

The existing hydralic capacity indicates the hydraulic capacity is above the 1% AEP event (1 in 100 ARI). The flood level for the existing 1% AEP event is RL 1562.10. There is no overtopping of the road.

The proposed, red-line, option 1 reduces the internal diamter by 300mm is 4 cells x 1950mm diameter. The proposed hydraulic capacity is flatter in grade and below the existing hydraulic capacity, indicating it has a reduced capacity. The flood level for the proposed 1% AEP event is RL 1562.53. Option 1 reduces the existing hydrauliuc capacity for the 1% AEP event (54.5m$^3$/sec) to about just above the 2% AEP (45m$^3$/sec) under the proposed condition. However, there is no overtopping of the road.

The velocity at the outet for the 1% AEP event is about 3.85m/s, under the proposed condition, the outlet velocity is increased to 7m/s. The increase in velocity would cause some scour of the creek and banks. It is proposed to protect the outlet with rock rip rap.
A riprap rock size $D_{50}$ =1050 mm is proposed.

| | ARI | | | | | |
|---|---|---|---|---|---|---|
| | **2** | **5** | **10** | **20** | **50** | **100** |
| | **Flood Level RL** | | | | | |
| **Existing** | 1560.70 | 1561.00 | 1561.26 | 1561.50 | 1561.83 | 1562.12 |
| **Proposed** | 1560.73 | 1561.07 | 1561.34 | 1561.60 | 1562.04 | 1562.52 |
| **Afflux (mm)** | 30 | 70 | 80 | 100 | 210 | 400 |
| | **ARI Flow (m$^3$/sec)** | | | | | |
| **Existing** | 8.4 | 16.3 | 23.2 | 31.1 | 43.5 | 54.5 |
| **Proposed** | ~6.0 | 15.0 | 20.0 | 27.5 | 37.5 | 45.0 |
| **Proposed (Approximate ARI)** | <2 | <5 | 5-10 | Just above 20 | 20-50 | Just above 1 in 50 |
| | **Velocity (m/sec)** | | | | | |
| **Existing** | 2.35 | 2.81 | 2.98 | 3.28 | 3.60 | 3.85 |
| **Proposed** | 5.16 | 5.60 | 5.90 | 6.32 | 6.66 | 6.98 |

**Table 7: Hydraulic Analysis Summary**

## 3.3 Culvert Inlet Modifications

Figure 6 below shows the normal pipe culvert inlet. The inlet lip is square edged to the headwall.



**Figure 6: Pipe Culvert Showing Normal Inlet Lip**

Figure 7 below shows the improved pipe culvert inlet chamfered to the headwall. This example was used in the Campbelltown culverts.

Hydraulic analysis carried out for the Campbelltown culverts has indicated that the inlet modification would improve the inlet hydraulic capacity by 15%.



**Figure 7: Pipe Culvert Showing Improved Inlet Lip**

## 3.3 Upstream Impacts

There would be up to 400 mm afflux for the 1% AEP event due to the proposed lining of the existing culvert. However, from aerial mapping, it appears the upstream area is mostly National Park. The increase in afflux should have no impacts to the upstream area.




**Figure 8: Upstream of Culvert Aerial View**

# Section 4: Sizing Rock Rip Rap at Culvert Outlet

The required size of stone for riprap at the culvert outlet was determined using Equation 47 from the "Guide to Bridge Technology Part 8: Hydraulic Design of Waterway Structures".

$$d_{50} = \frac{0.692(V_{des})^2}{(S_g - 1)2g}$$

Where:

| | | |
|---|---|---|
| $D_{50}$ | = | particle size for which 50% is finer by weight, (m) |
| $V_{des}$ | = | design velocity, for local conditions at the culvert outlet, (m/s) |
| $S_g$ | = | specific gravity of riprap (usually taken as 2.65) |
| g | = | acceleration due to gravity, (9.81 m/s$^2$) |

Using the above equation and the range in design outlet stream velocity, the rock size $D_{50}$ is calculated. A riprap rock size $D_{50}$ =1050mm is adopted.

| $V_{des}$ (m/s) | $D_{50}$ (mm) | Rock Size (mm) |
|---|---|---|
| 4.0 | 350 | |
| 5.0 | 550 | |
| 6.0 | 770 | |
| 7.0 | 1050 | Adopt $D_{50}$ = 1050mm |
| 8.0 | 1400 | |
| 9.0 | 1700 | |

**Table 8: Rock Size**

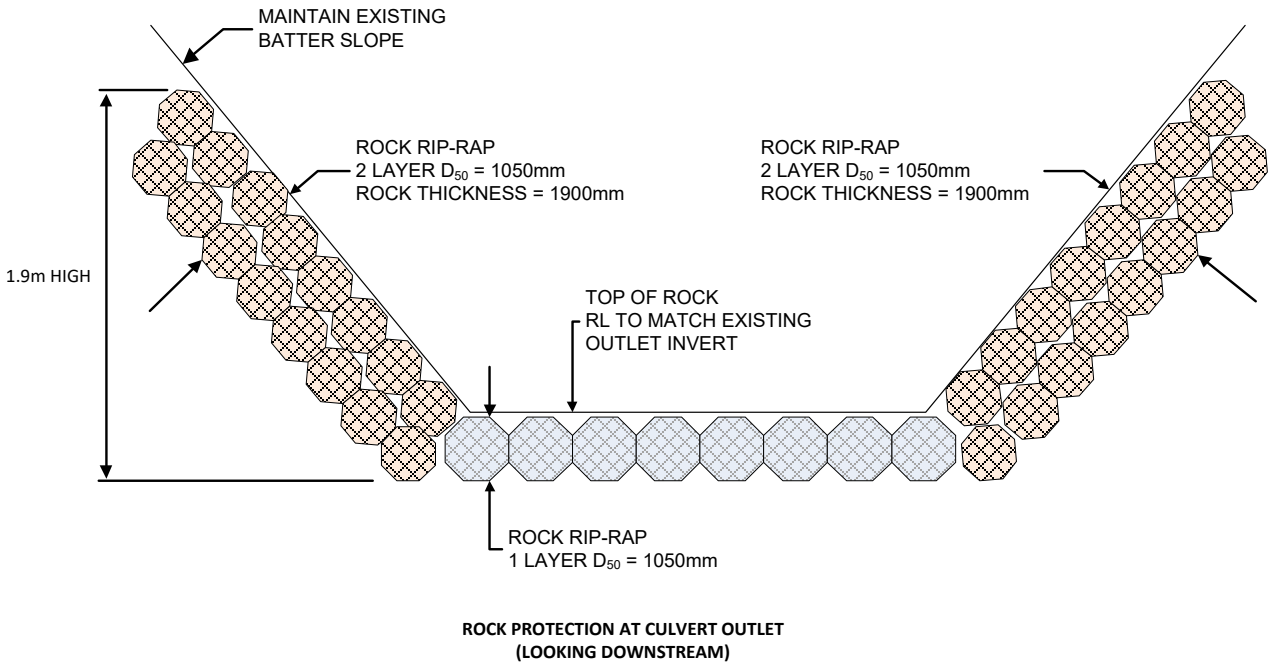


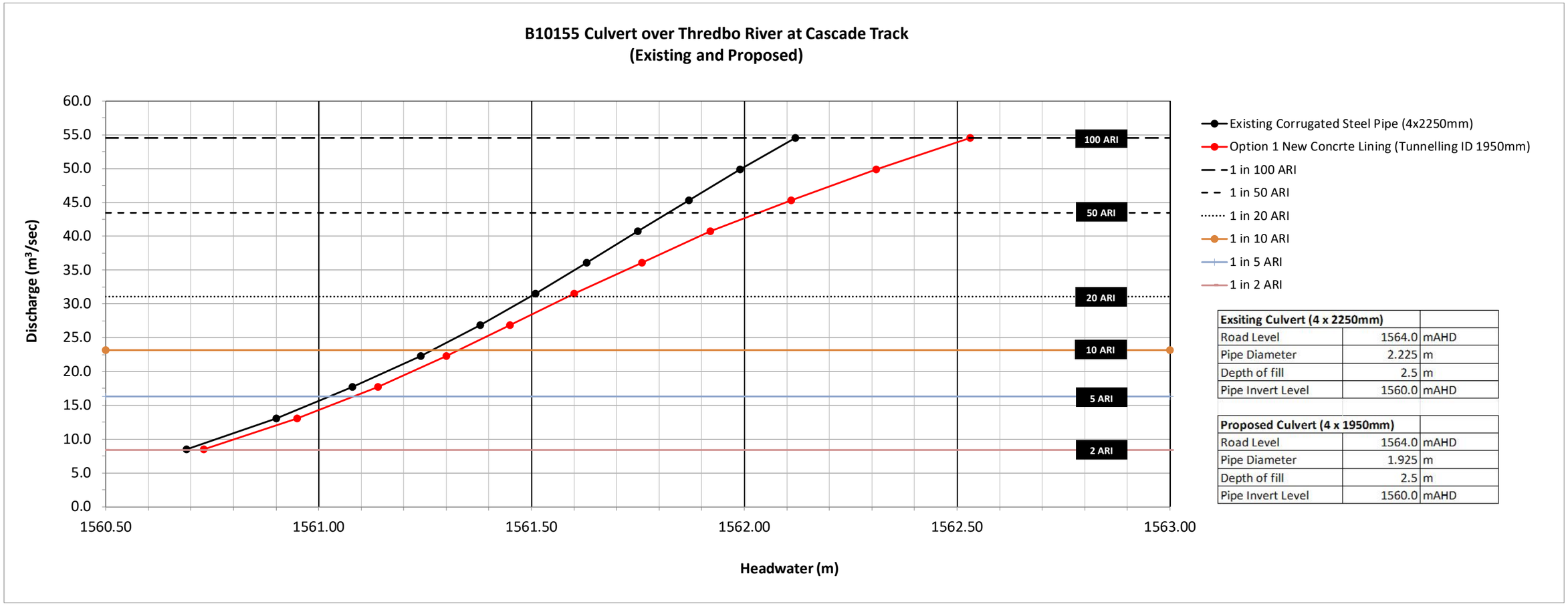

**Figure 9: Rock Protection at Culvert Outlet (Looking Downstream)**

# Section 5: Discussion & Recommendation

1. The existing 4 cells x 2250mm Ø corrugated steel culvert have a hydraulic capacity of a 1% AEP.
2. The proposed 4 cells x 1950mm Ø Tunneline (Option 1) have a hydraulic capacity of just above 1 in 50 (2% AEP). Option 1 has an afflux of about 400mm.
3. Increase in inlet capacity by 15% could be achieved by incorporating the improved inlet design of the face by chamfering of the pipe inlet
4. Increase in velocity from 3.85 to 7.00m/sec is predicted
5. Provide scour protection of the stream bed and embankment at the culvert outlet.
6. A riprap rock size $D_{50}$ =1050mm is proposed at the culvert outlet
7. Road is not overtopped for floods up to 1 in 100 ARI.

# Attachments:

# Attachment 1 Hydraulic Results for Existing and Proposed Option (Figure 6)




| Exsiting Culvert (4 x 2250mm) | | |
|---|---|---|
| Road Level | 1564.0 | mAHD |
| Pipe Diameter | 2.225 | m |
| Depth of fill | 2.5 | m |
| Pipe Invert Level | 1560.0 | mAHD |

| Proposed Culvert (4 x 1950mm) | | |
|---|---|---|
| Road Level | 1564.0 | mAHD |
| Pipe Diameter | 1.925 | m |
| Depth of fill | 2.5 | m |
| Pipe Invert Level | 1560.0 | mAHD |



rms.nsw.gov.au/autorenew



13 22 13



Customer feedback
Roads and Maritime
Locked Bag 928,
North Sydney NSW 2059

**April 2020**
RMS XX.XXX
ISBN: XXX-X-XXXXXX-XX-X

# Appendix E - Aboriginal Cultural Heritage Assessment Report (Stage 3 PACHCI) (ACHAR)



**MR677 Thredbo River (Cascade) Culvert Relining Works**

# Aboriginal Cultural Heritage Assessment Report (Stage 3 PACHI)

Prepared for Transport for NSW

22 May 2024

**Biosis offices**

**NEW SOUTH WALES**

**Albury**

Phone: (02) 6069 9200

Email: albury@biosis.com.au

**Gosford**

Phone: (02) 9101 8700
Email: gosford@biosis.com.au

**Newcastle**

Phone: (02) 4911 4040
Email: newcastle@biosis.com.au

**Sydney**

Phone: (02) 9101 8700
Email: sydney@biosis.com.au

**Western Sydney**

Phone: (02) 9101 8700
Email: sydney@biosis.com.au

**Wollongong**

Phone: (02) 4201 1090
Email: wollongong@biosis.com.au

**VICTORIA**

**Ballarat**

Phone: (03) 5304 4250
Email: ballarat@biosis.com.au

**Melbourne**

Phone: (03) 8686 4800
Email: melbourne@biosis.com.au

**Wangaratta**

Phone: (03) 5718 6900
Email: wangaratta@biosis.com.au

## Document information

| | |
|---|---|
| **Report to:** | Transport for NSW |
| **Prepared by:** | Dominique Bezzina<br>Charlotte Allen<br>Ashleigh Keevers-Eastman<br>Hannah Mills |
| **Biosis project no.:** | 38538 |
| **File name:** | 38538.Alpine.Way.Thredbo.PACHCI.Stage 3.ACHA.FIN01.20240521 |

## Document control

| Version | Internal reviewer | Date issue |
|---|---|---|
| Draft 01 | Samantha Keats | 11/01/2023 |
| Draft 02 | Samantha Keats | 07/02/2024 |
| Draft 03 | Samantha Keats | 19/02/2024 |
| Final 01 | Samantha Keats | 08/05/2024 |

## Acknowledgements

Biosis gratefully acknowledges the contributions of the following people and organisations in preparing this report:

- Transport for NSW: Daniel Bojkovic, Tabatha Cann, John Turville

Biosis staff involved in this project were:

- GIS Operator: Jennifer Townsend
- Assistance in the field: Nathan Windram

© Biosis Pty Ltd

This document is subject to copyright and may only be used for the purposes in respect of which it was commissioned and in accordance with the Terms of Engagement of the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Disclaimer:

Biosis Pty Ltd has completed this assessment in accordance with the relevant federal, state and local legislation and current industry best practice. The company accepts no liability for any damages or loss incurred as a result of reliance placed upon the report content or for any purpose other than that for which it was intended.

# Glossary

| | |
|---|---|
| AAER | Aboriginal Archaeological Excavation Report |
| ACHAR | Aboriginal Cultural Heritage Assessment Report |
| AHIMS | Aboriginal Heritage Information Management System |
| AFG | Aboriginal Focus Group |
| ASO | Aboriginal Site Officer |
| ASR | Archaeological Survey Report |
| Burra Charter | *The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance* |
| CBD | Central Business District |
| Consultation requirements | *Aboriginal Cultural Heritage Consultation Requirements for Proponents* |
| DECCW | Department of Environment, Climate Change and Water (now Heritage NSW) |
| DP | Deposited Plan |
| EP&A Act | *Environmental Planning and Assessment Act 1979* |
| ESD | Environmentally Sustainable Development |
| Heritage Act | *Heritage Act 1977* |
| Heritage NSW | Heritage NSW, Department of Climate Change, Energy, the Environment and Water |
| ICOMOS | International Council on Monuments and Sites |
| LALC | Local Aboriginal Land Council |
| LEP | Local Environmental Plan |
| LGA | Local Government Area |
| MWREF | Minor Works Review of Environmental Factors |
| NNTT | National Native Title Tribunal |
| NPW Act | *National Parks and Wildlife Act 1974* |
| NPWS | National Parks and Wildlife Service |
| NSW | New South Wales |
| NTSCORP | Native Title Services Corporation |
| PAD | Potential Archaeological Deposit |
| PACHCI | *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* |
| RAPs | Registered Aboriginal Parties |
| REP | Regional Environmental Plan |
| SEPP | State Environmental Planning Policy |
| SHR | State Heritage Register |
| Study area | Culvert of the Thredbo River under Alpine Way, Thredbo, New South Wales |
| the Code | *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* |
| TfNSW | Transport for New South Wales |

# Summary

Biosis Pty Ltd (Biosis) was commissioned by Transport for New South Wales (TfNSW) to undertake an Aboriginal Cultural Heritage Assessment Report (ACHAR) (Stage 3 of the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Transport for NSW 2011)) for the proposed remediation of four corrugated iron pipe culverts and inlet headwall at Alpine Way, Thredbo, New South Wales (NSW) (the study area).

This report details the investigation, consultation and assessment of Aboriginal cultural heritage undertaken for the project (Figure 1, Figure 2). The study area is located in within the Kosciusko National Park approximately 5 kilometres south-west of Thredbo and approximately 215 kilometres direction of the Canberra central business district (CBD).

The proposed development will be assessed as a development application under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This ACHAR provides evidence about the material traces and cultural significance of Aboriginal land use to support the conclusions and management recommendations to inform a Minor Works Review of Environmental Factors (MWREF).

Biosis undertook a Stage 2 PACHCI for TfNSW in 2022. Prior to the archaeological survey conducted in 2022 as part of a Stage 2 PACHCI for TfNSW, there were no Aboriginal cultural heritage sites registered with the Aboriginal Heritage Information Management System (AHIMS) register within the study area or in the vicinity. Within 5 kilometres of the study area, 22 Aboriginal sites have been registered. The nearest recorded site is AHIMS 61-6-0007/Dead Horse Gap, located 250 metres west of the study area.

An archaeological survey was conducted in accordance with the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a) (the Code) on 5 May 2022 by Samantha Keats (Biosis, Manager - Heritage (NSW)), Craig Robinson (TfNSW), Gnublum John Dixon (Djirringanj Elders Federation) and Jason Davison (Monero Ngarigo Elders Group). The overall effectiveness of the survey for examining the ground for Aboriginal sites was deemed low. This was attributed to vegetation cover restricting ground surface visibility combined with a low amount of exposure present. Five previously unrecorded Aboriginal cultural heritage sites were identified during the archaeological survey, which consisted of one artefact scatter (AHIMS 61-6-0135/Alpine Way Culvert AS 1), two isolated artefacts (AHIMS 61-6-0137/Alpine Way Culvert ISO 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2) and two areas of potential archaeological deposit (PAD) (Alpine Way Culvert PAD 1 and Alpine Way Culvert PAD 2). There is potential for development activities to impact Aboriginal sites and the identified areas of PAD (Alpine Way Culvert PAD 1 and Alpine Way Culvert PAD 2).

Following the results of the archaeological survey, test excavations were undertaken in accordance with the Code to characterise the extent, nature, and archaeological (scientific) value of potential Aboriginal cultural heritage within portions of Alpine Way Culvert PAD 1 and Alpine Way Culvert PAD 2 which would be impacted by the proposed development. A team of two Biosis archaeologists (Ashleigh Keevers-Eastman – Senior Heritage Consultant, and Nathan Windram – Graduate Heritage Consultant) and two Cultural Sites Officers (Confidential party 15 / 69and Confidential party 32) undertook test excavations on 23 May 2023. Test excavations did not identify any subsurface deposits in either Alpine Way Culvert PAD 1 nor Alpine Way Culvert PAD 2. The extent of Alpine Way Culvert PAD 1 was reassessed as a result and is not considered to be located within the study area. Alpine Way Culvert PAD 2 was determined not to be a site due to the findings of the test excavations. A fourth surface artefact scatter was identified upon revisiting the site during the testing program. AHIMS 61-6-0140/Alpine Way Culvert AS 2 consists of an artefact scatter of silcrete and quartz

artefacts on the edge of the Cascade Trails carpark on the eastern side of Thredbo River. The site was highly disturbed and not associated with intact archaeological deposits.

The assessment has concluded that sites identified within the vicinity of the study area consistent with predictive modelling for the local region, in that low density artefact sites dominated by quartz were identified within slope/crest landforms, albeit within areas of disturbance. These sites are considered to be representative of the seasonal occupation of the study area and adjacent areas to the Thredbo River (Navin Officer 2000, Dibden 2004, Dibden 2003a, Dibden 2003b, Biosis 2019). It is also likely that AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0140/Alpine Way Culvert AS 2 may be representative of a single site complex that has been disturbed by the construction of the Cascade Trails carpark. There is potential that further artefact sites may be identified within the vicinity of the Cascade Trails carpark and potentially beneath its surface, however, no further assessment will be required as part of this project as no upgrades to the Cascade Trails carpark are proposed.

## Consultation

The Aboriginal community was consulted by TfNSW regarding the heritage management of the project throughout its lifespan. Consultation has been undertaken as per the process outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a) (consultation requirements) and the PACHCI. The appropriate government bodies were notified, and advertisements placed in the following newspapers (22 February 2023):

- *Orbost Snowy River Mail*.
- *Eden Imlay Magnet*.
- *Bega District News*.
- *Koori Mail*.

These actions resulted in the following Aboriginal organisations being registered by TfNSW for consultation (Table 1):

**Table 1 List of registered Aboriginal parties and group contact**

| Organisation | | Contact |
|---|---|---|
| **Snowy Valleys LGA** | | |
| **4** | Adrian Brown | Adrian Brown ; Maree Moore |
| **8** | Alice Williams | Alice Williams |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | Shayne Dickson |
| **220** | Guntawang Aboriginal Resources Incorporated | Wendy Morgan |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | Jason Davison |
| **300** | Konanggo Aboriginal Cultural Heritage Services | Robert Young |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | - |
| **381** | Mundawari Heritage Consultants | Dean Delponte |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | Darleen Johnson ; Ryan Johnson |
| **418** | Ngunawal Heritage Aboriginal Corporation | Mrs Dorothy Carroll |

| Organisation | | Contact |
|---|---|---|
| **420** | Ngunnawal Elders Corporation | Mr Arnold Williams CEO |
| **445** | Oak Hill Enterprises | Sonia Shea |
| **502** | Snowy Mountains Indigenous Elders Group | Ramsay Freeman |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | Tyronne Bell |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | Dean Bell ; Merekai Bell |
| **Snowy Monaro LGA** | | |
| **4** | Adrian Brown | Adrian Brown ; Maree Moore |
| **8** | Alice Williams | Alice Williams |
| **30** | Badu (Murrin Clan/Peoples) | Karia Lea Bond |
| **46** | Bega Local Aboriginal Land Council | Peter Dixon |
| **51** | Bilinga (Murrin Clan/Peoples) | Simalene Carriage |
| **82** | Buru Ngunawal Aboriginal Corporation (BNAC) | Wally Bell |
| **98** | Clive Freeman (Archaeologist in a private company) | Clive Freeman |
| **113** | Corroboree Aboriginal Corporation | Marilyn Carroll-Johnson |
| **151** | Didge Ngunawal Clan | Lillie Carroll ; Paul Boyd |
| **161** | Eden Local Aboriginal Land Council | Mark Bateman |
| **162** | Chair of Eden LALC | BJ Cruze |
| **163** | Ellen Mundy | Ellen Mundy |
| **170** | Gadhu Dreaming | Gordon Campbell |
| **189** | Ginninderra Aboriginal Corporation | Steven Johnson; Krystle Carroll |
| **197** | Goobah Development PTY LTD (Murrin Clan/Peoples) | Basil Smith |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | Shayne Dickson |
| **220** | Guntawang Aboriginal Resources Incorporated | Wendy Morgan |
| **222** | Gunyuu (Murrin Clan/Peoples) | Kylie Ann Bell |
| **246** | Iris White | Iris White |
| **257** | Janine Thompson | Janine Thompson |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | Jason Davison |
| **265** | Jerringong (Murrin Clan/Peoples) | Joanne Anne Stewart |
| **284** | Karrial (Murrin Clan/Peoples) | Karrial Johnson |
| **298** | King Brown Tribal Group | Tina Brown |
| **300** | Konanggo Aboriginal Cultural Heritage Services | Robert Young |
| **338** | Maria Williams | Maria Williams |

| Organisation | | Contact |
|---|---|---|
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | - |
| **350** | Members of the Southern Snowy Mountains Aboriginal Community MoU Working group | - |
| **353** | Merrigarn Indigenous Corporation | Shaun Carroll |
| **381** | Mundawari Heritage Consultants | Dean Delponte |
| **384** | Munyunga (Murrin Clan/Peoples) | Kaya Dawn Bell |
| **386** | Muragadi Heritage Indigenous Corporation | Jesse Johnson |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | Darleen Johnson ; Ryan Johnson |
| **413** | Ngarigo and Djiringanj people | John Dixon |
| **417** | Ngunawal Consultancy | Peiro Delponte |
| **418** | Ngunawal Heritage Aboriginal Corporation | Mrs Dorothy Carroll |
| **420** | Ngunnawal Elders Corporation | Mr Arnold Williams CEO |
| **423** | Ngurambang | Robert Monaghan |
| **439** | Nundagurri Aboriginal Corporation | Newton Carriage |
| **445** | Oak Hill Enterprises | Sonia Shea |
| **461** | Pemulwuy (Murrin Clan/Peoples) | Pemulwuy Johnson |
| **470** | Ramsay Freeman/Snowy Mountains Indigenous Elders Group | - |
| **525** | Thauaira | Shane Carriage |
| **533** | Thoorga Nura | John Carriage (Chief Executive Officer) |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | Tyronne Bell |
| **540** | Timothy Stubbs | Timothy Stubbs |
| **564** | Wagonga Local Aboriginal Land Council | - |
| **567** | Walbunja (Murrin Clan/Peoples) | Hika Te Kowhai |
| **568** | Walgalu (Murrin Clan/Peoples) | Ronald Stewart |
| **598** | Wingikara (Murrin Clan/Peoples) | Hayley Bell |
| **615** | Wullung (Murrin Clan/Peoples) | Lee-Roy James Boota |
| **623** | Yerramurra (Murrin Clan/Peoples) and Taste of Tradition Native Aboriginal Corporation | Robert Parson |
| **627** | Yukkumbruk | Serena Williams |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | Dean Bell ; Merekai Bell |

TfNSW confirmed that the study area is not located within the South Coast Native Title Determination Application Claim area.

On 31 March 2023, TfNSW contacted the RAPs, inviting them to attend an Aboriginal Focus Group (AFG) on 19 April 2023 at Eden LALC in Broadwater. As part of this correspondence, TfNSW also provided each RAP with a summary of the Archaeological Survey Report (ASR), draft archaeological test excavation methodology and a Aboriginal Site Officer (ASO) application form. On 11 April 2023, the invitation for the AFG meeting was amended to be held in Merimbula on 19 April 2023. RAPs were given 28 days to review and prepare feedback on the proposed methodology and were requested to provide comments by 26 April 2023. Copies of the correspondence between TfNSW and the RAPs is provided in Appendix D.

An AFG meeting was held on 19 April 2023. Representatives from Confidential party 25 and Confidential party 49 attended the AFG. TfNSW presented information on the proposed works within the study area and Biosis presented the proposed archaeological excavation methodology. A range of comments were contributed by the RAPs during both discussions. These comments were recorded in minutes taken by TfNSW, which can be found in Appendix C. A copy of the AFG minutes were provided to RAPs on 10 May 2023.

All RAP groups were invited to submit an ASO application to participate in the test excavations. Applications were received from Confidential party 29, Confidential party 4 / 32, Confidential party 47, Confidential party 15 / 69 and Confidential party 9 / 48. TfNSW reviewed applications and selected representatives from Confidential party 4 / 32and Confidential party 15 / 69; both groups were notified on 12 May 2023.

Test excavations were conducted on 23 May 2023 with a team of two Biosis archaeologists and two ASOs. During the test excavations program within the study area, ASOs considered the entire landscape as significant although no specific examples were shared.

A project update was sent out to the RAPs on 18 December 2023 following a change to the study area.

The draft ACHAR and AAER was sent to RAPs on 29 February 2024, along with an invitation to attend an AFG on 15 March 2024 in Thredbo Village or via Microsoft Teams. TfNSW also asked the RAPs to confirm if they would like to have their information made confidential in the report. No responses were received regarding the draft ACHAR and AAER.

Jason Davison, Murra Bidgee Mullangari Aboriginal Corporation, Guntawang Aboriginal Resources Incorporated, Ngarigo and Djiringanj People confirmed they would like to attend the meeting, either remotely or in person. Yurwang Gundana Consultancy Cultural Heritage Services and Ngarigo and Djiringanj People confirmed on 13 March 2024 they would not be able to attend. Yurwang Gundana Consultancy Cultural Heritage Services requested a copy of the meeting minutes. Corroboree Aboriginal Corporation contacted TfNSW on 25 March 2024 to apologise for not being able to attend.

Representatives of Guntawang Aboriginal Resources Incorporated were present at the meeting on 13 March 2024, attending remotely through Microsoft Teams. Minutes of the meeting can be found in Appendix D. The minutes were provided to selected RAPs on 8 April 2024. Yurwang Gundana Consultancy Cultural Heritage Services responded to TfNSW on 15 April 2024, and TfNSW responded on 22 April 2024. Copies of correspondence with the RAPs by TfNSW can be found in Appendix D.

The outcome of the consultation process was that the RAPs considered the study area and wider landscape to have a high level of cultural significance, although that significance was not clearly defined, and specific examples were not provided (or provide dot point detail of significance). The results of the consultation process are included in this document Appendix A.

The recommendations that resulted from the consultation process are provided below.

## Results

Within the study area there are five previously unrecorded Aboriginal cultural heritage sites. Of these, three may be subject to harm. It is expected that the potential of harm to Aboriginal archaeological sites from the project ranges from none to direct (Table 2).

**Table 2 Summary of potential archaeological impacts**

| AHIMS site no. | Site name | Site type | Significance | Type of harm before mitigated | Consequence of unmitigated harm | Consequence of mitigated harm | Site specific recommendations |
|---|---|---|---|---|---|---|---|
| **61-6-0135** | Alpine Way Culvert AS 1 | Artefact scatter | Moderate | Direct harm | Total harm | Total loss of value | Apply for an AHIP to impact through proposed works. |
| **61-6-0140** | Alpine Way Culvert AS 2 | Artefact scatter | Moderate | Direct harm | Total harm | Total loss of value | Apply for an AHIP to impact through proposed works. |
| **61-6-0137** | Alpine Way Culvert ISO 1 | Isolated artefact | Moderate | No harm | No Harm | No harm | Apply for an AHIP to impact through proposed works. |
| **61-6-0136** | Alpine Way Culvert ISO 2 | Isolated artefact | Moderate | Direct harm | Total harm | Total loss of value | Apply for an AHIP to impact through proposed works. |
| - | Alpine Way Culvert PAD 1 | PAD | Unknown | No harm | No Harm | No harm | Test excavations confirmed no PAD within study area.<br>Test excavations to be carried out if design updates lead to impacts within PAD outside of study area. |
| - | Alpine Way Culvert PAD 2 | PAD | Nil - Not a site | N/A | N/A | N/A | Test excavations confirmed there was no PAD. No further assessment required. |

## Management recommendations

Prior to any development impacts occurring within the study area, the following is recommended:

### Recommendation 1: Continued consultation with the registered Aboriginal parties

It is recommended that TfNSW continue to inform these groups about the management of Aboriginal cultural heritage sites within the study area throughout the life of the project. This recommendation is in keeping with the consultation requirements.

Further consultation regarding a long-term care agreement for the artefacts proposed to be salvaged through community collection is required as only two responses were received as part of Stage 4 consultation.

### Recommendation 2: Application for an Aboriginal Heritage Impact Permit

Impacts to AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137//Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 cannot be avoided, therefore it is recommended that an AHIP covering the development footprint be obtained from Heritage NSW, Department of Climate Change, Energy, the Environment and Water (Heritage NSW) under Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act), prior to impacts occurring. An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places, or that cause land to be disturbed for the purposes of discovering an Aboriginal object.

**The AHIP should be for a term of five (5) years. It is recommended that the AHIP cover the entirety of the study area.** The AHIP will allow for impacts to AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 to occur through the proposed development or salvage through community collection (Recommendation 3).

### Recommendation 3: Community surface collection of AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2

It is recommended that once an AHIP has been approved, AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 should be salvaged via community collection of surface artefacts before the proposed works commence.

A community collection methodology will need to be prepared by a suitably qualified archaeologist in consultation with RAPs. This methodology will then support the AHIP application to Heritage NSW.

### Recommendation 4: No further archaeological work required once an AHIP is obtained from Heritage NSW and community collection is complete

No further archaeological work (other than community collection) is required within the study area should the AHIP be approved. Works may proceed in accordance with the AHIP once community collection has been undertaken.

### Recommendation 5: Further archaeological assessment is required within Alpine Way Culvert PAD 1 if impacts cannot be avoided.

Alpine Way Culvert PAD 1 is located outside of the current development footprint. Should future development be unable to avoid impacts within the PAD boundary, further archaeological assessment in the form of an ACHAR and archaeological test excavations will be required within Alpine Way Culvert PAD 1.

### Recommendation 6: Fencing of the study area during construction

Prior to any construction works taking place, it is recommended that the study area be fenced off and secured to ensure that Alpine Way Culvert PAD 1 is conserved and remain unharmed by the adjacent proposed works. Fencing must remain in place over the lifespan of the construction phase. Alpine Way Culvert PAD 1 should be managed in accordance with Recommendation 5.

### Recommendation 7: Stop work provision for any potential heritage sites identified during construction

All Aboriginal places and objects are protected under the NPW Act. This protection extends to Aboriginal objects and places that have not been identified but might be unearthed during construction.

If construction proceeds without an approved AHIP, work must cease if Aboriginal objects or places are identified. TfNSW and the project archaeologist must be notified to make an assessment of the find and advise on subsequent management.

Historical archaeological sites are protected under the relics provisions (Sections 139–146) of the *Heritage Act 1977* (Heritage Act). Should any historical archaeological sites be identified during any phase of the proposed development, all works must cease in the vicinity of the find and the project archaeologist and TfNSW notified. Should the archaeological nature of the find be confirmed, the Heritage NSW will require notification.

### Recommendation 8: Stop work provision for any potential discovery of human remains

If any suspected human remains are discovered during any activity works, all activity in the vicinity must cease immediately. The remains must be left in place and protected from harm or damage. The following contingency plan describes the immediate actions that must be taken in instances where human remains, or suspected human remains, are discovered. Any such discovery at the study area must follow these steps:

1. **Discovery:** If suspected human remains are discovered all activity in the vicinity must stop to ensure minimal damage is caused to the remains; and the remains must be left in place and protected from harm or damage.
2. **Notification:** Once suspected human skeletal remains have been found, the Coroner's Office and the NSW Police must be notified immediately. Following this, and if the human remains are likely to be Aboriginal in origin, the find will be reported to the Aboriginal parties and Heritage NSW. If the find is likely to be non-Aboriginal in origin and more than 100 years in age, the heritage division of NSW will be notified of the find under Section 146 of the Heritage Act.

### Recommendation 9: Heritage induction

Heritage inductions for all site workers and contractors should be undertaken in order to prevent any unintentional harm to unexpected Aboriginal objects or sites, or Aboriginal sites or objects located within proximity to the study area. The heritage induction should include the following items:

- Relevant legislation.

- Location of identified Aboriginal heritage sites, areas of archaeological potential, and areas of archaeological sensitivity.
- Basic identification skills for Aboriginal and non-Aboriginal artefacts and human remains.
- Procedure to follow in the event of an unexpected heritage item find during construction works.
- Procedure to follow in the event of the discovery of human remains during construction works.
- Penalties and non-compliance.

# Contents

Glossary ..... ii
Summary ..... iii
Results ..... viii
Management recommendations ..... i
1. Introduction ..... 1
1.1. Project background ..... 1
1.2. Study area ..... 1
1.3. Proposed development ..... 2
1.4. Planning approvals ..... 6
1.5. Restricted and confidential information ..... 6
2. Study area context ..... 9
2.1. Geology, topography and hydrology ..... 9
2.2. Soil landscapes ..... 10
2.3. Climate and rainfall ..... 11
2.4. Landscape resources ..... 11
2.5. European land use history ..... 12
3. Aboriginal community consultation ..... 15
3.1. Notification of project proposal and registration of interest ..... 15
3.2. Review of methodology for the proposed project ..... 19
3.3. Review of draft ACHA ..... 21
4. Archaeological results ..... 23
4.1. Archaeological survey report (Stage 2 PACHCI) ..... 23
4.2. Aboriginal archaeological excavations ..... 25
4.3. Aboriginal heritage located in the study area ..... 26
4.4. Interpretation of past Aboriginal land use ..... 28
5. Aboriginal cultural heritage context ..... 31
5.1. Aboriginal cultural heritage sensitivities ..... 32
6. Aboriginal cultural significance assessment ..... 34
6.1. Introduction to the assessment process ..... 34
6.2. Cultural (social significance) values ..... 35
6.3. Historic values ..... 36
6.4. Archaeological (scientific significance) values ..... 36
6.5. Aesthetic values ..... 36

6.6. Statement of significance ..... 36
7. Development limitations and mitigation measures ..... 41
7.1. Potential risks to Aboriginal cultural heritage ..... 41
7.2. Ecologically Sustainable Development ..... 42
7.3. Management and mitigation measures ..... 43
8. Recommendations ..... 47
References ..... 50
APPENDICES ..... 53
Appendix A. Consultation log ..... 54
Stage 1: Notification of project proposal and registration of interest ..... 54
Stage 2 and 3: Presentation of information about the proposed project and proposed assessment methodology ..... 58
Stage 4: Review of draft report ..... 72
Appendix B. Stage 1: Notification of project proposal and registration of interest ..... 82
Appendix C. Stage 2 and 3: Presentation of information about the proposed project and proposed assessment methodology ..... 83
Appendix D. Stage 4: Review of draft report ..... 84
**Appendix E.** Aboriginal Cultural Heritage Survey Report (PACHCI Stage 2) ..... 85
Appendix F. Aboriginal Archaeological Excavation Report (Stage 3 PACHCI) ..... 86

**Tables**

Table 1 List of registered Aboriginal parties and group contact ..... iv
Table 2 Summary of potential archaeological impacts ..... i
Table 3 List of registered Aboriginal parties ..... 16
Table 4 Survey coverage ..... 23
Table 5 Landform summary ..... 23
Table 6 Survey results ..... 23
Table 7 Significance assessment criteria for AHIMS 61-6-0135/Alpine Way Culvert AS 1 ..... 37
Table 8 Significance assessment criteria for AHIMS 61-6-0140/Alpine Way Culvert AS 2 ..... 38
Table 9 Significance assessment criteria for AHIMS 61-6-0137/Alpine Way Culvert ISO 1 ..... 38
Table 10 Significance assessment criteria for AHIMS 61-6-0136/Alpine Way Culvert ISO 2 ..... 39
Table 11 Significance assessment criteria for Alpine Way Culvert PAD 1 ..... 40
Table 12 Summary of potential archaeological impacts ..... 41

**Figures**

Figure 1 Location of the study area ..... 7
Figure 2 Study area detail ..... 8
Figure 3 Aboriginal sites located in the study area and vicinity ..... 30

# 1. Introduction

## 1.1. Project background

Biosis was commissioned by TfNSW to undertake an ACHAR as part of Stage 3 of the PACHCI for the proposed remediation of four corrugated iron pipe culverts and inlet headwall at Alpine Way, Thredbo, NSW (Figure 1, Figure 2). The proposed development will be assessed as a MWREF under Part 5 of the EP&A Act. This report details the investigation, consultation and assessment of Aboriginal cultural heritage undertaken for the study area and project. The PACHCI Stage 1 Archaeological Survey Report (ASR) in Appendix E and the PACHCI Stage 3 Aboriginal Archaeological Excavation Report (AAER) details the findings of the archaeological investigations conducted as part of the ACHAR.

This investigation has been carried out under Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act). It has been undertaken in accordance with the Code and the PACHCI. The Code and PACHCI have been developed to support the process of investigating and assessing Aboriginal cultural heritage by specifying the minimum standards for archaeological investigation undertaken in NSW under the NPW Act. The archaeological investigation must be undertaken in accordance with the requirements of the Code.

The report has been developed in line with the following guidelines and procedures:

- *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Transport for NSW 2011).
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010b) (consultation requirements).
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a) (the Code.
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011).

As required under Section 2.3 of the Code, the ASR and AAER provide evidence about the material traces of Aboriginal land use to support the conclusions and management recommendations in the ACHAR.

An archaeological (PACHCI Stage 2) survey was undertaken for the project on 5 May 2022. The PACHCI Stage 2 survey was carried out within the study area and immediate vicinity. Test excavations (PACHCI Stage 3) were then carried out on 23 May 2023 within the portions of the two areas of moderate archaeological potential contained in the study area.

## 1.2. Study area

The study area is located on Alpine Way and is approximately 5 kilometres south-west of Thredbo and approximately 215 kilometres south of the Canberra CBD (Figure 1). It encompasses 0.15 hectares of public land and the adjacent road reserves.

The study area (Figure 2) is within the:

- Ngarigo country.
- Snowy Monaro Regional Local Government Area (LGA).
- Eden Local Aboriginal Land Council (LALC).
- Parishes of Thredbo and Kosciuszko.

- County of Wallace.

The study area is bounded by Thredbo River Track to the north, Cascade Trail to the south and Alpine Way to the east and west. The study area is surrounded by the Kosciuszko National Park.

## 1.3. Proposed development

TfNSW are proposing to rehabilitate the Thredbo River Culverts, comprising four corrugated iron pipe culverts and inlet headwall to Alpine Way as part of the Thredbo River Culverts Relining Works. This is to improve the structural integrity of the culvert due to current misalignment and corrosion of the existing pipes. This is to ensure the safety of roads users and to increase the efficient operation of the culvert.

The four culverts to be installed have an internal diameter of 2400 millimetres which will be reduced by 300 millimetres at the completion of the works due to the required thickness of the liner. The length of the pipes are 17 metres. Works will be done primarily underneath and adjacent to the road with some activities needing access from the road and above for access to materials and equipment. The area of the works allows contractors to move plant in and outside of the vicinity of the culverts.

The following information has been provided by TfNSW as part of a methodology for the works (13 November 2023).

### 1.3.1. Key features

The primary focus of the works is to rehabilitate the culverts at the Thredbo River crossing underneath the Alpine Way. The works primarily include:

- Establish temporary compound and stockpile sites on existing parking area.
- Establish access to both sides of the inlet and outlet ends of the culverts.
- Install water diversion.
- Excavate and construct inlet apron.
- Build a new headwall and wingwall in front of the existing.
- Concrete line the corrugated steel culverts.
- Place rip rap rock scour protection at outlet.

### 1.3.2. Proposed methodology

General site set-up:

- Pre-clearance checks to delineate and protect known heritage items and sensitive areas.
- Site survey to establish limit of works and levels for excavation.
- Implementation of traffic guidance scheme in accordance with relevant road occupancy licence approval, including:
  - Single lane closure with traffic signals as a minimum for the duration of works from 06:00 to 19:00 weekdays and 6:00 to 13:00 on Saturdays.
  - Lane closure with traffic signals may be required 24 hours a day, seven days a week during specific activities that require equipment to be in position overnight.

- Full road closures may also be required for activities that require the establishment of cranes for primarily facilitating placement of rock scour protection at the outlet. Any full road closures will only be in place from 09:00 to 15:00 daily, with approval, consultation and notifications as required.

- Establish a compound and stockpile site within the confines of the existing car park in accordance with the site plan (Photo 1).

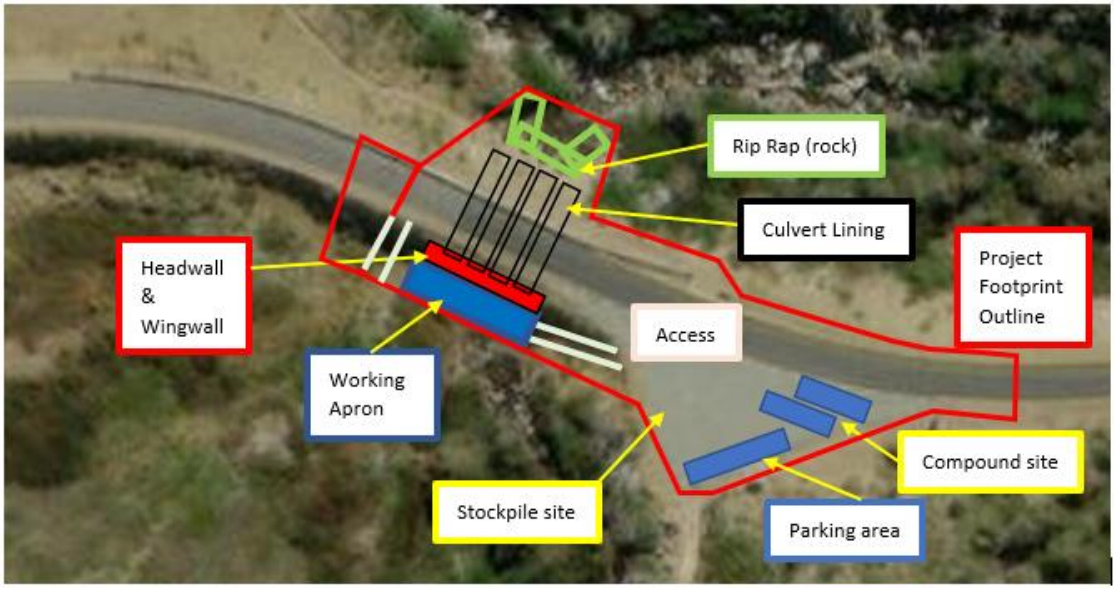



**Photo 1 Proposed site plan (Source: TfNSW, provided 13 November 2023)**

Inlet works:

- Establish access to the western embankment at the culvert inlet (cell 4) via the adjacent batter. Temporary steps will be installed to provide access for workers. A section of guardrail adjacent to the culvert will be removed to allow for a small excavator to track down the batter with the aid of metal ramps, grates and plastic excavator mats.
- Install water diversion, sediment control and filtration system to direct water into eastern most pipe (cell 1) in accordance with the approved erosion and sediment control plan. Using a combination of sandbags, concrete blocks, pumps, filtration unit and other various sediment controls as required.
- Install a sump and pump out the western inlet apron area (cell 4 to 2), to test and verify water diversion system is working as designed prior to commencing excavation.
- Excavate the accumulated sediment in the western inlet apron area (cell 4 to 2) using a small excavator, with the assistance of a large excavator positioned on the road above. The small excavator will place the excavated material into the bucket of the large excavator which then load into a truck for removal.
- Waste generated from the excavation will be transported to an appropriate offsite stockpile facility nearby (north of Thredbo Village) to be stored and processed prior to reuse. Note that large sized rock removed from the area may be stockpiled on site for reuse as scour protection at the outlet.
- Pour concrete blinding layer using a concrete boom as soon as possible after excavating to seal off the exposed soil in the area.

- Construct western half of the inlet apron (cells 4 and 3) by installing formwork, fixing steel reinforcement, pouring concrete, and curing. A Truck mounted Hiab Crane will be used to assist by lowering the required materials down to the inlet area. Also concrete will be placed with the use of a concrete boom pump. Note a suitable concrete washout bay will be provided in the site compound area well away from the watercourse.
- Establish access to the eastern embankment at the culvert inlet (cell 1) via the adjacent batter. Temporary steps will be installed to provide access for workers. A section of guardrail adjacent to the carpark / compound area will be removed to allow for a small excavator to track down the batter and traverse to the culvert with the aid of metal ramps, grates and plastic excavator mats.
- Adjust the water diversion system to redirect water into the western most pipe (cell 4) allowing for the eastern half of the inlet apron area to be dewatered.
- Install a sump and pump out the eastern inlet apron area (cell 1-3), to test and verify water diversion system is working as designed prior to commencing excavation.
- Excavate, pour concrete blinding, and construct the eastern half of the inlet apron similar to the western half as previously described.
- Establish an additional water diversion barrier using the newly constructed concrete apron as a base to seal off the eastern inlet apron area. Continue to direct water into the western most culvert (cell 4) (Photo 2). Note that the initial water diversion system will still be in position as a backup.

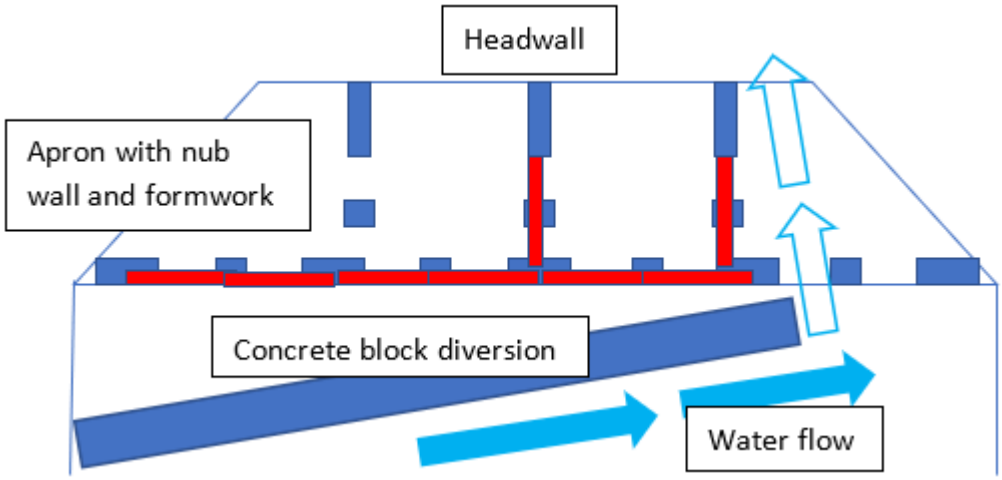



**Photo 2 Plan of proposed water diversion (Source: TfNSW, provided 13 November 2023)**

- Clean down and prepare existing headwall including draping plastic sheeting over the old headwall prior to construction of the new headwall in front of the existing.
- Construct new headwall and wingwall on the eastern side of the inlet (cells 1 and 2) in front of the existing headwall. The new headwall will require formwork installation, steel fixing, and concreting (Photo 3). Concrete pumps and trucks will stay on road level above.
- Line existing steel culvert in (cells 1 and 2) with the "Tunneline" system including:
  - Establish monitoring trucks and crane material down to working apron.
  - Prepare and clean the dry work area.
  - Install reinforcing steel.
  - Place mould made with plastic formwork.

- Fully seal the mould.
- Pump grout/concrete in the mould and wait for it to set.
- Once set, mould can be removed in a day.
- Install steel and move mould to next section of the culvert and until culvert is fully relined.

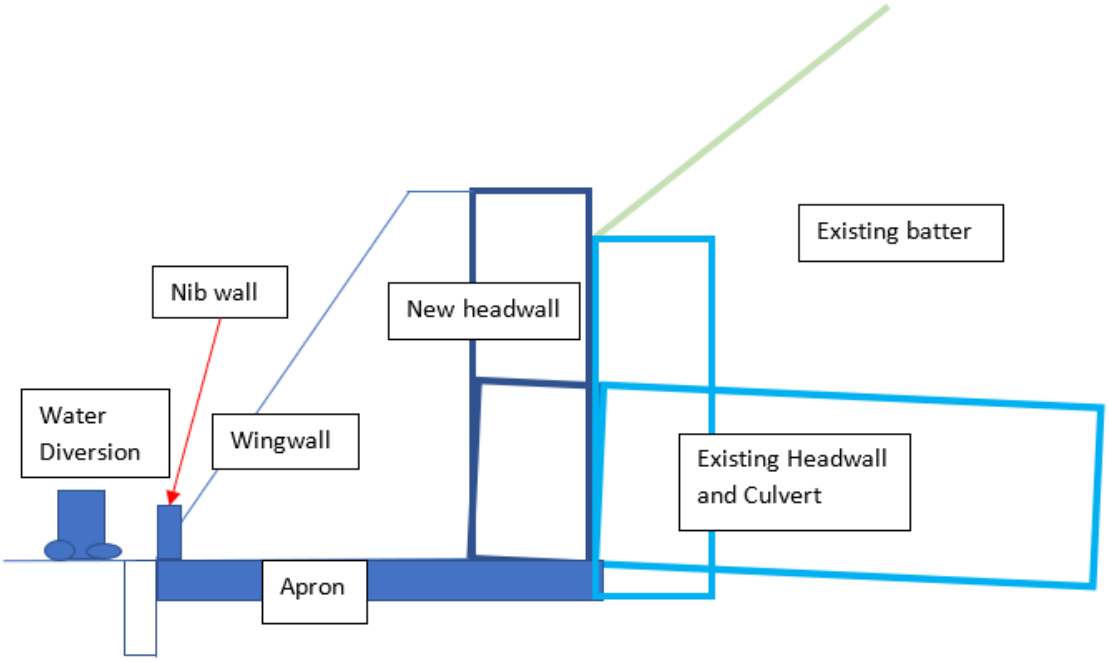



**Photo 3 Section of proposed works (Source: TfNSW, provided 13 November 2023)**

- Adjust the water diversion system again to redirect water to the eastern most pipe (cell 1) to allow for the construction of the western half of the inlet headwall and wingwall.
- Clean and prepare the existing headwall, construct new headwall and wingwall, line the remaining pipes (cell 3 and 4) similar to the eastern half above.

Outlet works:

- Establish access to the outlet end installing pedestrian steps from the top embankment to the river level.
- Place rip rap material on outlet end using excavator, cranes and outriggers to move rocks on road level and move rocks to their positions on the outlet.

General site demobilising:

- Remediate all work areas and access tracks.
- Remove machinery and disestablish compound and stockpile sites. Remove remaining materials from site and dispose at a licenced premises.
- Remove traffic control.

Proposed site facilities:

- A temporary compound area will be established on the existing hardstand carpark of the Cascade Trail. This will serve as the main site compound area and house the site facilities as well as storage of materials and equipment.

- A small stockpile area will be made available within the main site compound area. However additional stockpile and material storage will be required at the TfNSW stockpile site on the Alpine Way north of Thredbo Village.
- Crane, outriggers, concrete pump, excavator, and trucks will also travel on road level above the culverts facilitating large tasks for easier execution and installation of features of the works.
- Light vehicle parking for workers will be available in site compound area.
- Some limited public parking spaces will be allowed to the east of the compound area on the road shoulder. However additional parking is available at Dead Horse Gap parking area a short distance up the hill.
- Access for workers down the steep road batters to the inlet and outlet areas of the culvert will be via temporary steps and the small excavator will access the inlet area by using metal ramps and plastic protective mats.

The onsite works commencement date is yet to be confirmed. However, it is proposed that works commence in early October 2024. Works may be split with the first half up to relining until the end of December 2024 and the headwall works when workers return at the end of January 2025. The proposal would be conducted under standard construction hours with employees working from:

- 06:00 to 19:00 – Monday to Friday, and
- 06:00 to 13:00 – Saturday.

There will be a few instances where works will be during night hours. This is predominantly for monitoring and maintaining water diversions and for curing concrete. Night works hours would include:

- 19:00 to 05:00 – Sunday to Thursday.

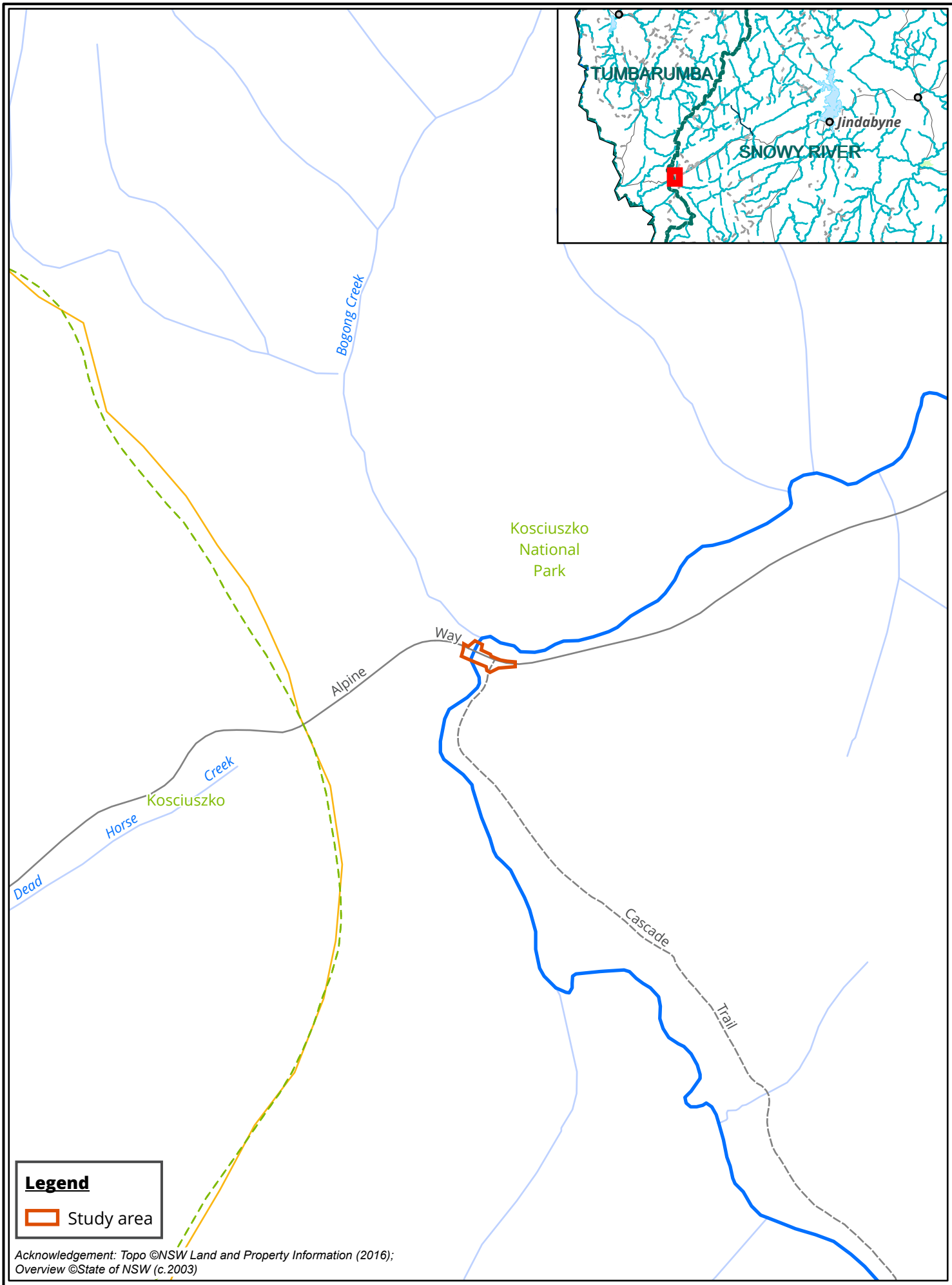
## 1.4. Planning approvals

The western section of the project will be assessed against Part 5 of the *Environmental Planning and Assessment Act 1979* NSW (EP&A Act). Relevant legislation and planning instruments that will inform this assessment include:

- EP&A Act.
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- NPW Act.
- NSW *National Parks and Wildlife Amendment Act 2010.*
- Transport Infrastructure State Environmental Planning Policy (SEPP) 2021.
- *Snowy River Local Environmental Plan 2013* (LEP).
- *Snowy River Development Control Plan 2013*.

## 1.5. Restricted and confidential information

Appendix 1 and Figure 6 in the ASR (PACHCI Stage 2) (Appendix E) and Appendix A in the AAER (Stage 3 PACHCI) (Appendix F) contains AHIMS information which is confidential and not to be made public. This is clearly marked on the title page for the attachment.




*Acknowledgement: Topo ©NSW Land and Property Information (2016); Overview ©State of NSW (c.2003)*

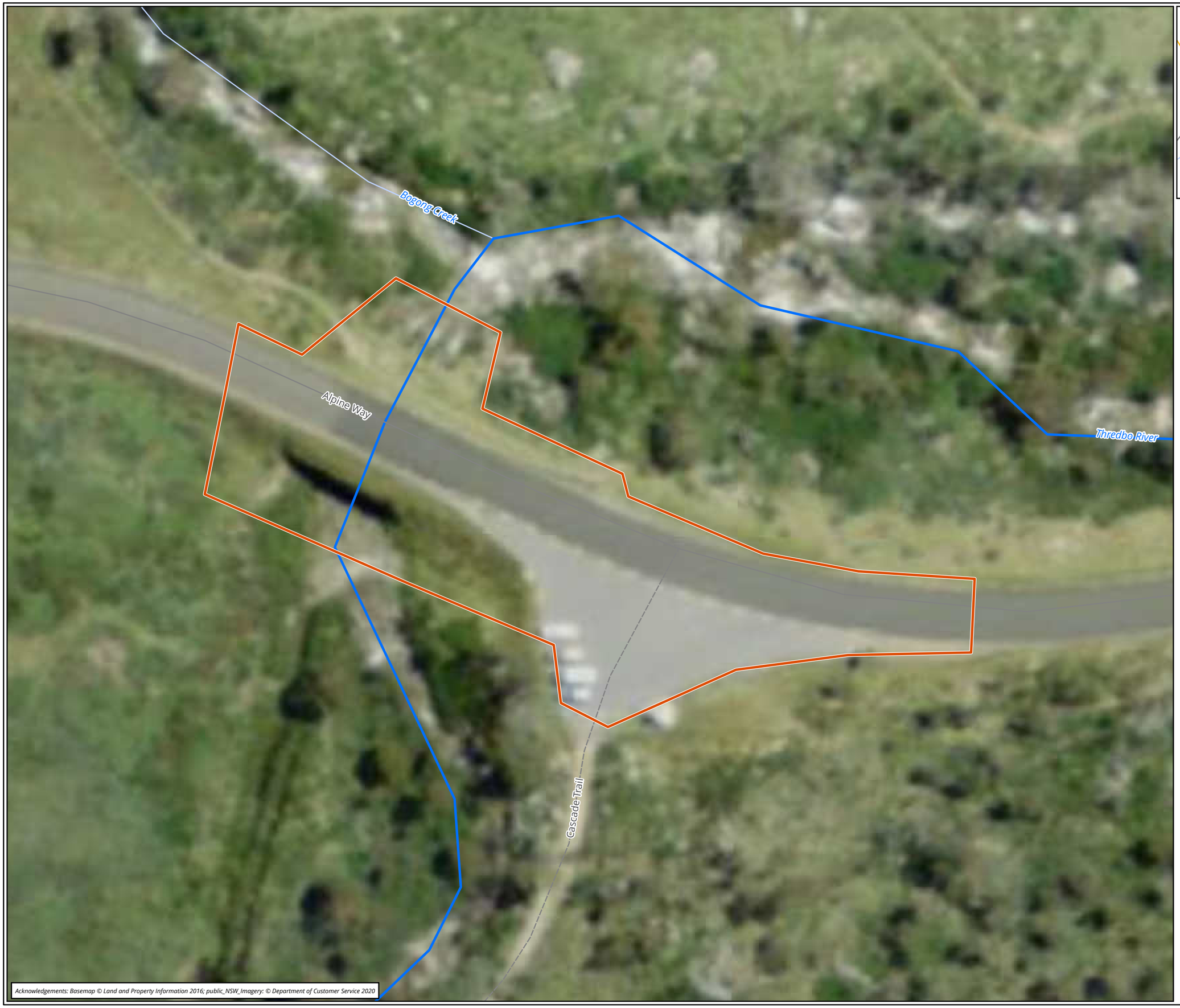
biosis

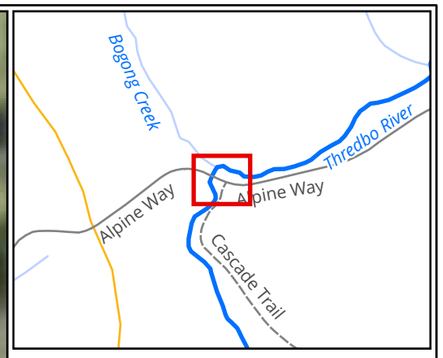
**Figure 1 Location of the study area**

Matter: 38538
Date: 12 January 2024,
Drawn by: JET, Checked by: CA, Last edited by: jtownsend
Location:P:\38500s\38538\Mapping\
38538_AlpineWay, Layout: 38538_AR_F1_Locality

0 100 200 300 400
Metres
Scale 1:10,000@ A4, GDA 1994 MGA Zone 55

N




**Legend**

Study area

**Figure 2 Study area detail**

0 10 20

Metres

Scale: 1:500@ A3

*Coordinate System:*
*GDA 1994 MGA Zone 55*

N

*Acknowledgements: Basemap © Land and Property Information 2016; public_NSW_Imagery: © Department of Customer Service 2020*

Matter: 38538, Date: 15 January 2024,
Drawn by: JET, Checked by: CA, Last edited by: jtownsend
Location: P:\38500s\38538\Mapping\
38538_AlpineWay, Layout: 38538_AR_F2_StudyArea

# 2. Study area context

This section discusses the study area in regard to its landscape, environmental and Aboriginal cultural heritage context. This section should be read in conjunction with the AAER attached in Appendix F. The background research has been undertaken in accordance with the Code.

## 2.1. Geology, topography and hydrology

The study area is located within the Australian Alps Bioregion which contains the highest section of the Great Dividing Range and Australia's highest mountain, Mount Kosciusko at 2,228 metres. This landscape is characterised by peaked ranges and broad forested valleys. Superimposed glacial features dating back to the Pleistocene can also be seen above 1,100 metres in altitude (Department of Planning, Industry and Environment 2016).

Geologically, the area is underlain by Late Silurian Biotite granodiorite and tonalite of the Mowamba Granodiorite unit that have formed faulted stepped ranges, in addition to more recent basalt formation (Department of Planning, Industry and Environment 2016, Navin Officer 2000). This is commonly present as gravels and cobbles in addition to outcrops on tors, crests and steeper slopes. Quartz veins also occur within the bedrock providing a raw material source for stone tool knapping (Dibden 2003b).

Stream order is recognised as a factor which assists the development of predictive modelling and has seen extensive use, most notably by Jo McDonald Cultural Heritage Management (JMCHM) (JMCHM 2000, JMCHM 2005a, JMCHM 2005b, JMCHM 2008). Predictive models which have been developed for the region have a tendency to favour high order streams as the locations of campsites as they would have been more likely to provide a stable source of water and by extension other resources which would have been used by Aboriginal groups.

The stream order system used for this assessment was originally developed by Strahler (1952). It functions by adding two streams of equal order at their confluence to form a higher order stream, as shown in Photo 4. As stream order increases, so does the likelihood that the stream would be a perennial source of water.

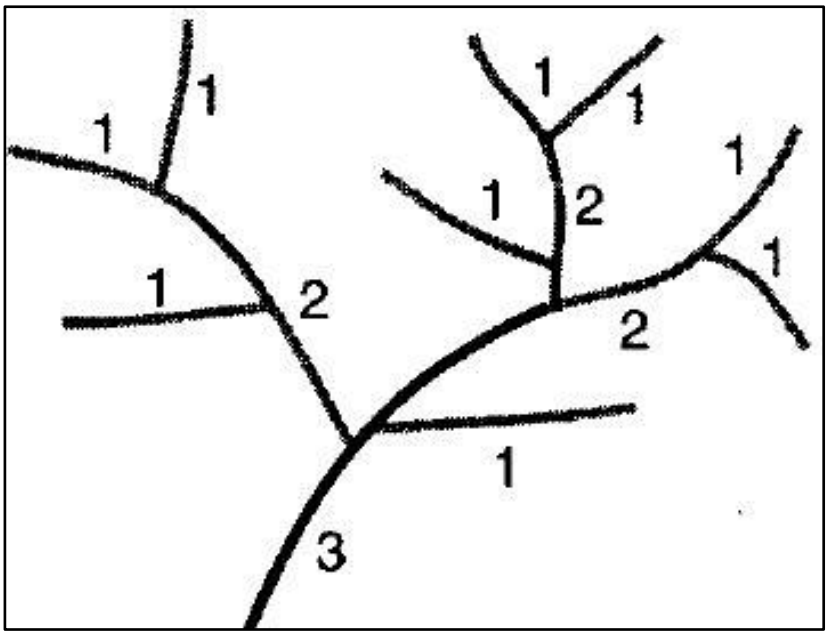



**Photo 4 Diagram showing Strahler stream order (Ritter, Kochel, & Miller 1995, pp. 151)**

There is one water course located within the study area. Thredbo River, a third order perennial creek, flows north-easterly through the centre of the study area. Water courses located in the vicinity of the study area include a tributary of the Thredbo River, Bogong Creek, which is a second order water course that flows easterly to the north. Located approximately 500 metres south-west of the study area is Dead Horse Creek, a first order non-perennial water course that flows to the south-west.

## 2.2. Soil landscapes

Soil landscapes have distinct morphological and topological characteristics that result in specific archaeological potential. They are defined by a combination of soils, topography, vegetation and weathering conditions. Soil landscapes are essentially terrain units that provide a useful way to summarise archaeological potential and exposure.

The study area contains two soil landscapes – the Main Range Sub-Alpine Mitchell soil landscape and the Chimneys Ridge Sub-alpine soil landscape. The Main Range Sub-Alpine Mitchell Soil Landscape is characterised by alpine humus and transitional alpine humus soils (Mitchell 2002). Steep slopes are also noted to have stonier profiles over deeply weathered bedrock. Soils within the alpine and subalpine areas date to the mid Holocene (7,000 to 5,000 years before present (BP)). This is due to the earlier landform processes during the early Holocene (Dibden 2003a).

The Chimneys Ridge Sub-alpine soil landscape is characterised by high plateaus and block faulted ranges on Silurian-Devonian gneissic granite and granites and areas of Devonian rhyolite below the tree line with general elevation from 1500 to 1800 metres (Mitchell 2002). Peaks and tor covered rounded hills stand above the plateaus, while valley swamps developed in the dendritic drainage network with a local relief 300 metres. Limited areas of Pleistocene block streams and slope deposits are present. Uniform textured alpine humus and transitional alpine humus soils and peat with abundant organic matter exist in this soil landscape, while steep slopes have stonier profiles over deeply weathered bedrock.

Archaeological sites within the sub-alpine landscape are known to increase in density with decreasing altitude. The most common site types include artefact scatters, PAD and isolated finds (Navin Officer 2000, Dibden 2003b, Dibden 2003a).

## 2.3. Climate and rainfall

Climate data was provided for the study area by the Thredbo Village weather station located approximately 5 kilometres north-east of the study area (Station number: 071041). Climate data has been produced by on the average temperature and rainfall between 1969-2020.

- The mean maximum temperature is highest in January when it reaches 21.6 degrees.
- The lowest mean maximum temperature is in January at 7.5 degrees.
- The mean minimum temperature is highest in July at 5.4 degrees and lowest in July at -3.5 degrees.
- The average rainfall is highest in September at 205.3 millimetres and lowest in February at 88.0 millimetres.

This climate data suggests the study area is associated with a cool oceanic climate likely to have been occupied on a seasonal basis by local Aboriginal populations. The area is likely to have been frequented more so in warmer seasons when resources were more widely available to obtain in the region.

## 2.4. Landscape resources

The wider region includes distinct ecological zones, with riparian vegetation extending along many of the watercourses. Each ecological zone hosts a different array of floral and faunal species, many of which would have been utilised according to seasonal availability. Aboriginal inhabitants of the region would have had access to a wide range of avian, terrestrial and aquatic fauna and repeated firing of the vegetation would have opened up the foliage allowing ease of access through and between different resource zones.

The study area is located within the Subalpine environment of the Australian Alps Bioregion (Department of Planning, Industry and Environment 2016). This environment ranges from 1,400 to 1850 metres in altitude. This environment would have provided a wide range of plant and animal resources used by Aboriginal inhabitants. An array of floral and faunal species would have been utilised according to seasonal availability.

Common plant species within the Main Range Sub-alpine landscape include open to dense sub-alpine woodlands of Snow Gum with extensive *Eucalyptus pauciflora*, with extensive open grasslands, fen, heath and bogs controlled by cold air drainage and soil moisture. Black Sallee *Eucalyptus stellulata* marginal to streams on the high plains. Typical shrubs and ground cover species include; Snow Grasses *Poa* spp., Wallaby Grasses *Austrodanthonia* and *Danthonia* spp., Silver Snow Daisy *Celmisia astelifolia*, Alpine Orites *Orites lancifolia*, Alpine Hovea *Hovea montana*, Mountain Shaggy-pea *Oxylobium alpestre*, Alpine Riceflower *Pimelea alpina,* Speedwell *Veronica serpyllifolia*, Scaly Everlasting *Ozothamnus hookeri*, Tasman Flax-lily *Dianella tasmanica*, Mountain Gentian *Gentianella diemensis,* variable Groundsel *Senecio lautus*, and native Dandelion *Microseris lanceolate* (Mitchell 2002).

Plant resources were used in a variety of ways. Fibres were twisted into string, which was used for many purposes, including the weaving of nets, baskets and fishing lines. String was also used for personal adornment. Bark was used in the provision of shelter; a large sheet of bark being propped against a stick to form a gunyah (Attenbrow 2002).

Common animal species within the area include the Eastern Grey Kangaroo *Macropus giganteus*, Red-necked Wallaby *Notamacropus rufogriseus*, Common Ringtail Possum *Pseudocheirus peregrinus*, Mountain Pygmy-possum *Burramys parvus*, Mountain Brushtail Possum *Trichosurus cunninghami*, Common Brushtail Possum *Trichosurus vulpecula*, Short-beaked Echidna *Tachyglossus aculeatus*, and Common Wombat *Vombatus ursinus* (Global Biodiversity Information Facility 2019).

As well as being important food sources, animal products were also used for tool making and fashioning a myriad of utilitarian and ceremonial items. For example, tail sinews are known to have been used to make fastening cord, while 'bone points', would have functioned as awls or piercers. Animals such as Brush-tailed Possums were highly prized for their fur, with possum skin cloaks worn fastened over one shoulder and under the other. Kangaroo teeth were incorporated into decorative items, such as head bands (Attenbrow 2002).

Bogong moths were also reportedly a rich seasonal food source for the Aboriginal people of the Snowy Mountains region from the period of October to March. During this time, the moths aestivate in the cool climates of the Snowy Mountains. The Aboriginal people of the region scrape the moths off surfaces (often rocks) and collect them in a coolamon dish or a net made from Kurrajong fibre, and then cooked on a large hotplate (heated stone) (Flood 1996, pp. 12).

## 2.5. European land use history

Early European exploration of the area was conducted by Hume and Hovell in 1824 who were the first European explorers to sight the Alps (French 1965). At this time, the high country was commonly used for grazing and inhabited by squatters reaching outside the colony's limits of location. Later in the 1840s, the Polish explorer Count Paul Edmund Strzelecki explored the area and named Mt Kosciuszko after the polish politician Tadeusz Kosciuszko. Settlers then began moving stock into the area during the summer months and retreating during the winter (Durham 1959). However, an early winter led to the loss of cattle and men during the 1860s. Many of these stockmen's huts are historically listed items within the National Park (Australian Government 2021).

A series of aerial photographs dating from 1965-1992 demonstrate little change over time within the study area, with the Alpine Way road, carpark and tracks having been well established by the mid-20th century (Photo 5, Photo 6, Photo 7).



**Photo 5** **1965 aerial photograph, with the study area outlined in red (Source: NSW Spatial Services)**



**Photo 6** 1988 aerial photograph, with the study area outlined in red (Source: NSW Spatial Services)



**Photo 7** 1992 aerial photograph, with the study area outlined in red (Source: NSW Spatial Services)

# 3. Aboriginal community consultation

Consultation with the Aboriginal community has been undertaken by Transport for NSW in compliance with the consultation requirements as detailed below. A consultation log of all communications with RAPs is provided in Appendix A. The following section outlines the steps carried out in accordance with the PACHCI Stage 3 formal consultation requirements.

## 3.1. Notification of project proposal and registration of interest

### 3.1.1. PACHCI Stage 3 Action 1 – Seek the names of Aboriginal people with cultural knowledge by letter or notify native title holders

TfNSW contacted Heritage NSW, Department of Climate Change, Energy, the Environment and Water (Heritage NSW) on 31 October 2022 requesting information on potential interested parties for the PACHCI Stage 3.

A list of known Aboriginal stakeholders for the Snowy Monaro region was provided by Heritage NSW on 8 November 2023 (a copy of this response is provided in Appendix B).

### 3.1.2. PACHCI Stage 3 Action 2 – Notify Aboriginal people with cultural knowledge by letter

TfNSW accepted the list of Aboriginal stakeholders provided by Heritage NSW as the list of registered Aboriginal parties (RAPs) for the project. Correspondence notifying the Aboriginal stakeholders of the project and inviting them to register their interest was not undertaken by TfNSW.

TfNSW contacted the following agencies on 21 February 2023 inviting local Aboriginal people to register for community consultation. TfNSW sent follow up communication on 21 February 2023 to replace the first, requesting responses to register by 10 March 2023.

- South East Local Land Services (LLS).
- Eden LALC.
- NSW Aboriginal Land Council (ALC).
- Bega LALC.
- Aboriginal Cultural Heritage Advisory Committee, Kosciuszko National Park.
- NTSCORP Limited.
- Snowy Monaro Regional Council.

TfNSW confirmed that the study area is not located within the South Coast Native Title Determination Application Claim area. South East LLS confirmed on 1 March 2023 they do not hold details of parties who may want to be consulted on development projects. Snowy Monaro Regional Council recommended

contacting Bega and/or Eden LALC.[1] Confidential party 19 confirmed they would like to register for the project on 27 February 2023. Confidential party 25 confirmed they would like to register for the project on 21 February 2023. No response was received from the Aboriginal Cultural Heritage Advisory Committee, Kosciuszko National Park, nor the NSW ALC.

### 3.1.3. Action 3 – Notify Aboriginal people with cultural knowledge by advertisement

In accordance with the consultation guidelines, public notifications were placed in the following newspapers on 22 February 2023:

- *Orbost Snowy River Mail*.
- *Eden Imlay Magnet*.
- *Bega District News*.
- *Koori Mail*.

The advertisement invited Aboriginal people who hold cultural knowledge to the study area to register their interest in a process of community consultation to provide assistance in determining the significance of Aboriginal object(s) and/or places in the vicinity of the study area. This registration period ended after 14 days on 22 March 2023. Copies of the public notice are provided in Appendix B.

### 3.1.4. Action 5 – Prepare register of Aboriginal parties

TfNSW accepted the list of Aboriginal stakeholders provided by Heritage NSW as the list of registered Aboriginal parties (RAPs) for the project. The list of RAPs for the project is presented in Table 3.

On 29 March 2023, Confidential party 34 contacted TfNSW wishing to accept registration for any Cultural Heritage Assessments or Surveys proposed by TfNSW. It was also suggested that members from the South Coast National Tribunal Services should not be involved due to the project being upon the Traditional Lands of the Monero-Ngarigo people, and not part of or subject to the South Coast Peoples' National Tribunal Claim.

**Table 3 List of registered Aboriginal parties**

| Organisation | | Contact |
|---|---|---|
| **Snowy Valleys LGA** | | |
| **4** | Adrian Brown | Adrian Brown ; Maree Moore |
| **8** | Alice Williams | Alice Williams |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | Shayne Dickson |
| **220** | Guntawang Aboriginal Resources Incorporated | Wendy Morgan |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | Jason Davison |
| **300** | Konanggo Aboriginal Cultural Heritage Services | Robert Young |

[1] Email correspondence to and from Snowy Monaro Regional Council was deleted. As such, it is not possible to confirm the exact dates of liaison between TfNSW and Snowy Monaro Regional Council.

| Organisation | | Contact |
|---|---|---|
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | - |
| **381** | Mundawari Heritage Consultants | Dean Delponte |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | Darleen Johnson ; Ryan Johnson |
| **418** | Ngunawal Heritage Aboriginal Corporation | Mrs Dorothy Carroll |
| **420** | 420 | Ngunnawal Elders Corporation |
| **445** | 445 | Oak Hill Enterprises |
| **502** | 502 | Snowy Mountains Indigenous Elders Group |
| **535** | 535 | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation |
| **631** | 631 | Yurwang Gundana Consultancy Cultural Heritage Services. |
| **Snowy Monaro LGA** | | |
| **4** | Adrian Brown | Adrian Brown ; Maree Moore |
| **8** | Alice Williams | Alice Williams |
| **30** | Badu (Murrin Clan/Peoples) | Karia Lea Bond |
| **46** | Bega Local Aboriginal Land Council | Peter Dixon |
| **51** | Bilinga (Murrin Clan/Peoples) | Simalene Carriage |
| **82** | Buru Ngunawal Aboriginal Corporation (BNAC) | Wally Bell |
| **98** | Clive Freeman (Archaeologist in a private company) | Clive Freeman |
| **113** | Corroboree Aboriginal Corporation | Marilyn Carroll-Johnson |
| **151** | Didge Ngunawal Clan | Lillie Carroll ; Paul Boyd |
| **161** | Eden Local Aboriginal Land Council | Mark Bateman |
| **162** | Chair of Eden LALC | BJ Cruze |
| **163** | Ellen Mundy | Ellen Mundy |
| **170** | Gadhu Dreaming | Gordon Campbell |
| **189** | Ginninderra Aboriginal Corporation | Steven Johnson; Krystle Carroll |
| **197** | Goobah Development PTY LTD (Murrin Clan/Peoples) | Basil Smith |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | Shayne Dickson |
| **220** | Guntawang Aboriginal Resources Incorporated | Wendy Morgan |
| **222** | Gunyuu (Murrin Clan/Peoples) | Kylie Ann Bell |
| **246** | Iris White | Iris White |

| Organisation | | Contact |
|---|---|---|
| **257** | Janine Thompson | Janine Thompson |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | Jason Davison |
| **265** | Jerringong (Murrin Clan/Peoples) | Joanne Anne Stewart |
| **284** | Karrial (Murrin Clan/Peoples) | Karrial Johnson |
| **298** | King Brown Tribal Group | Tina Brown |
| **300** | Konanggo Aboriginal Cultural Heritage Services | Robert Young |
| **338** | Maria Williams | Maria Williams |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | - |
| **350** | Members of the Southern Snowy Mountains Aboriginal Community MoU Working group | - |
| **353** | Merrigarn Indigenous Corporation | Shaun Carroll |
| **381** | Mundawari Heritage Consultants | Dean Delponte |
| **384** | Munyunga (Murrin Clan/Peoples) | Kaya Dawn Bell |
| **386** | Muragadi Heritage Indigenous Corporation | Jesse Johnson |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | Darleen Johnson ; Ryan Johnson |
| **413** | Ngarigo and Djiringanj people | John Dixon |
| **417** | Ngunawal Consultancy | Peiro Delponte |
| **418** | Ngunawal Heritage Aboriginal Corporation | Mrs Dorothy Carroll |
| **420** | Ngunnawal Elders Corporation | Mr Arnold Williams CEO |
| **423** | Ngurambang | Robert Monaghan |
| **439** | Nundagurri Aboriginal Corporation | Newton Carriage |
| **445** | Oak Hill Enterprises | Sonia Shea |
| **461** | Pemulwuy (Murrin Clan/Peoples) | Pemulwuy Johnson |
| **470** | Ramsay Freeman/Snowy Mountains Indigenous Elders Group | - |
| **525** | Thauaira | Shane Carriage |
| **533** | Thoorga Nura | John Carriage (Chief Executive Officer) |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | Tyronne Bell |
| **540** | Timothy Stubbs | Timothy Stubbs |
| **564** | Wagonga Local Aboriginal Land Council | - |
| **567** | Walbunja (Murrin Clan/Peoples) | Hika Te Kowhai |
| **568** | Walgalu (Murrin Clan/Peoples) | Ronald Stewart |

| Organisation | | Contact |
|---|---|---|
| **598** | Wingikara (Murrin Clan/Peoples) | Hayley Bell |
| **615** | Wullung (Murrin Clan/Peoples) | Lee-Roy James Boota |
| **623** | Yerramurra (Murrin Clan/Peoples) and Taste of Tradition Native Aboriginal Corporation | Robert Parson |
| **627** | Yukkumbruk | Serena Williams |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | Dean Bell ; Merekai Bell |

#### 3.1.5. Action 6 – Send the names of registered parties to OEH [Heritage NSW] and local Aboriginal land council(s)

The list of RAPs presented in Table 3 was provided to Heritage NSW on 1 May 2023. The list of RAPs was not provided to the Eden or Bega LALCs.

## 3.2. Review of methodology for the proposed project

#### 3.2.1. Action 7 – Send invitation to attend an Aboriginal focus group meeting and draft methodology for review

On 31 March 2023, TfNSW contacted the RAPs, inviting them to attend an AFG on 19 April 2023 to be held at Eden LALC, Jigamy Farm in Broadwater NSW. As part of this correspondence, TfNSW also provided each RAP with copies of the following documents:

- A summary of the ASR.
- Draft archaeological test excavation methodology.
- ASO application form.

On 11 April 2023, the invitation for the AFG meeting was amended to be held in Merimbula at the Merimbula Education Centre on 19 April 2023.

RAPs were given 28 days to review and prepare feedback on the proposed methodology and were requested to provide comments by 26 April 2023. Copies of the correspondence between TfNSW and the RAPs is provided in Appendix D.

#### 3.2.2. Action 8 – Hold an Aboriginal focus group meeting

An AFG meeting was held on 19 April 2023. Representatives from two RAPs attended the AFG:

- Eden LALC.
- Ngarigo and Djiringanj Peoples.

During this AFG meeting, TfNSW presented information on the proposed works within the study area after which a representative from Biosis presented the proposed archaeological excavation methodology. A range of comments were contributed by the RAPs during both discussions. These comments were recorded in minutes taken by TfNSW, which can be found in Appendix C.

### 3.2.3. Action 9 – Provide meeting minutes to Aboriginal parties

On 10 May 2023, TfNSW provided the RAPS with a copy of the AFG minutes.

### 3.2.4. Action 10 – Finalise methodology

The archaeological test excavation methodology was finalised following the close of the review period on 26 April 2023.

### 3.2.5. Action 13 – Notify Heritage NSW that the Code of practice for archaeological investigation Aboriginal objects in NSW 2010 will be followed OR submit an AHIP application to Heritage NSW

Heritage NSW were notified on 8 May 2023 of the proposed commencement date of archaeological test excavations. A copy of the notification is provided in Appendix C.

### 3.2.6. Action 14 – Engage Aboriginal site officers

All RAP groups were invited to submit an ASO application as part of Action 7. Applications were received from the following RAPs:

- Ginninderra Aboriginal Corporation (application submitted 3 May 2023).
- Guntawang Aboriginal Resources Incorporated (application submitted 21 April 2023).
- Muragadi Heritage Indigenous Corporation (application submitted 21 April 2023).
- Yurwang Gundana Consultancy Cultural Heritage Services (application submitted 10 May 2023).
- Murra Bidgee Mullangari Aboriginal Corporation (application submitted 21 April 2023)

TfNSW reviewed applications and selected two competent site officers to assist in the test excavations. The following RAPs were successful and were notified on 12 May 2023:

- Guntawang Aboriginal Resources Incorporated.
- Yurwang Gundana Consultancy Cultural Heritage Services.

### 3.2.7. Action 15 – Test excavations

Test excavations were conducted on 23 May 2023 with a team of two Biosis archaeologists and two ASOs.

During the test excavations program within the study area, ASOs considered the entire landscape as significant although no specific examples were shared.

### 3.2.8. Project update, December 2024

A project update was provided to RAPs on 18 December 2023 following a change to the study area boundary.

## 3.3. Review of draft ACHA

### 3.3.1. Appendix D Action 3 – Aboriginal party review of draft cultural heritage assessment report

The draft ACHAR and AAER were provided to RAPs on 29 February 2024 for their review and comment. The RAPs were also invited to attend an AFG on 13 March 2024, to be held at the Alpine Hotel in Thredbo Village, with options for online attendance if RAP representatives could not attend in person. No comments were received from RAPs regarding the draft reports.

As part of this correspondence, TfNSW asked the RAPs to confirm if they would like to have their information made confidential in the report. No responses were received.

Copies of correspondence with the RAPs by TfNSW can be found in Appendix D.

### 3.3.2. Appendix D Action 4 – Hold an AFG meeting

The RAPs were invited to attend an AFG on 13 March 2024 to discuss the findings of the draft reports, to be held at the Alpine Hotel in Thredbo Village, with options for online attendance if RAP representatives could not attend in person. Jason Davison, Murra Bidgee Mullangari Aboriginal Corporation, Guntawang Aboriginal Resources Incorporated, Ngarigo and Djiringanj People confirmed they would like to attend the meeting, either remotely or in person. Yurwang Gundana Consultancy Cultural Heritage Services and Ngarigo and Djiringanj People confirmed on 13 March 2024 they would not be able to attend. Yurwang Gundana Consultancy Cultural Heritage Services requested a copy of the meeting minutes. Corroboree Aboriginal Corporation contacted TfNSW on 25 March 2024 to apologise for not being able to attend. Copies of correspondence with the RAPs by TfNSW can be found in Appendix D.

Representatives of Guntawang Aboriginal Resources Incorporated were present at the meeting on 13 March 2024, attending remotely through Microsoft Teams. Minutes of the meeting can be found in Appendix D. The minutes were provided to selected RAPs on 8 April 2024. Yurwang Gundana Consultancy Cultural Heritage Services responded to TfNSW on 15 April 2024:

> *Thanks for sending me this, sorry again I couldn't attend the meeting, Yurwang Gundana agrees that salvage should happen before any works can commence, as for the disturbance, I know it says it is disturbed but doesn't say what by, cause there has been cases where an area has been disturbed really bad due to farming, road works, earth works to then when digging pits to a certain depth to find lots of artifacts & what looks to be campsites, I know it not common but there is always a possibility for this to occur.*
>
> *As it is going to works done by transport in always since large machine, trucks, workers, do disturb & destroy (unknowingly of course) Yurwang Gunana ask that if time and budget allows to as many salvage pits as possible, even in spots where it is not considered low-mid to High Potential, so we don't leave any bit of our heritage behind.*
>
> *Yurwang Gundana members also ask that no matter the significance of the artifacts, that they be returned to country & placed somewhere safe as we considered everything from the smallest to the biggest, no matter the significance be placed in a safe place, as it still our history we do wish to be apart of the fieldwork and put our hand up for it giving our experience, but even if we are not chosen, we hope that Transport keeps in mind everything we have said*
>
> *Thanks so much, for listening and for sending this information to me*

TfNSW provided the following response on 22 April 2024:

> *Thanks for the email. I'm referring to the first three paragraphs asking for clarifications on artefact preservation during and after work. Disturbance may occur due to excavators and worker traffic travelling through to site. The western bank*

*will need to be excavated along with the river bed at the inlet end. This will be done to build the working apron. Any artefacts found will need to be salvaged by team members and preserved to be returned at a later date.*

*Salvage pits may be suitable in this case, however from the advice given by consultants undertaking the PACHCI process for TfNSW, they have analysed the excavation results of only one PAD to the west (PAD 2). During the excavation, samples were taken from that PAD and concluded with the artefact possessing low historical significance (page 37 of the Aboriginal Cultural Heritage Assessment Report). TfNSW will ensure to follow the recommendations in preserving the artefacts according to the advice given by the consultants and Heritage NSW in accordance to the report and legislation respectively.*

*As stated above TfNSW will return artefacts to their resting places after works.*

Copies of correspondence with the RAPs by TfNSW can be found in Appendix D.

# 4. Archaeological results

## 4.1. Archaeological survey report (Stage 2 PACHCI)

An archaeological survey of the study area was undertaken on 5 May 2022 by Samantha Keats (Biosis, Heritage Team Leader), Craig Robinson (TfNSW), Gnublum John Dixon (Djirringanj Elders Federation) and Jason Davison (Monero Ngarigo Elders Group).

### 4.1.1. Archaeological survey methodology

The survey methods were intended to assess and understand the landforms and to determine whether any archaeological material from Aboriginal occupation or land use exists within the study area. The archaeological survey was conducted on foot with a field team of four members across a lower slope and terrace landform unit associated with the Thredbo River (Table 4). The archaeological survey consisted of a meandering transect walked across the entire study area. Recording during the survey followed the archaeological survey requirements of the Code and industry best practice methodology. During the survey, three Aboriginal sites and two PADs were identified in the study area.

**Table 4 Survey coverage**

| Survey unit | Landform | Survey unit area (m²) | Visibility (%) | Exposure (%) | Effective coverage area (m²) | Effective coverage (%) |
|---|---|---|---|---|---|---|
| **1 (within study area)** | Lower slope/terrace | 1486.04 | 5 | 5 | 3.72 | 0.25 |
| **2 (outside of study area)** | Lower slope/terrace | 1884.39 | 5 | 5 | 4.71 | 0.25 |

**Table 5 Landform summary**

| Landform | Landform area (m²) | Area effectively surveyed (m²) | Landform effectively surveyed (%) | No. of Aboriginal sites | No. of artefacts or features |
|---|---|---|---|---|---|
| **Lower slope/terrace (within the study area)** | 2822.31 | 7.72 | 0.13 | 5 | 6 |

### 4.1.2. Archaeological survey results

Within the study area, one artefact scatter, two isolated artefacts and two areas of potential archaeological deposit (PAD) were identified. A brief description of each Aboriginal site and PAD is presented in Table 6

**Table 6 Survey results**

| AHIMS number | Site name | Survey unit | Site type | Description |
|---|---|---|---|---|
| **61-6-0135** | Alpine Way Culvert AS 1 | 1 | Artefact scatter | AHIMS 61-6-0135/Alpine Way Culvert AS 1 is located along the edge of a bitumen carpark associated with Cascade Trail and Thredbo River Track. The site consists of an artefact scatter of two |

| AHIMS number | Site name | Survey unit | Site type | Description |
|---|---|---|---|---|
| | | | | single platform cores, one complete flake and one proximal flake fragment, all of which were quartz and located within an area of 1m by 2m. The site has been subjected to significant disturbance created by the construction of the carpark and the artefacts are not likely in situ. There were no areas of PAD identified due to the highly disturbed nature of the area associated with the carpark. |
| **61-6-0137** | Alpine Way Culvert ISO 1 | 1 | Isolated artefact | AHIMS 61-6-0137/Alpine Way Culvert ISO 1 is located approximately 20m north-east of AHIMS 61-6-0135/Alpine Way Culvert AS 1 within a large pothole in the middle of the bitumen carpark. The site consists of a single platform quartz core measuring 35.2mm long by 28.3mm wide by 23.1mm thick. The site has been significantly disturbed by the construction of the carpark and the artefact is not likely in situ |
| **61-6-0136** | Alpine Way Culvert ISO 2 | 1 | Isolated artefact | AHIMS 61-6-0136/Alpine Way Culvert ISO 2 is located approximately 60m north-west of AHIMS 61-6-0135/Alpine Way Culvert AS 1 on the western side of the Alpine Way culverts in an exposure adjacent to a large boulder associated with Thredbo River. The site consists of a medial quartz flake fragment measuring 14.1mm long by 8.6mm wide by 5.1mm thick. The site has minimal disturbances and is associated with Alpine Way Culvert PAD 2. |
| **N/A** | Alpine Way Culvert PAD 1 | 1 | PAD | Alpine Way Culvert PAD 1 is located 35m north-west of AHIMS 61-6-0135/Alpine Way Culvert AS 1 on a small, elevated terrace adjacent to Thredbo River and measures approximately 15m by 10m. The construction of the culvert and approaches has likely significantly disturbed part of the PAD; however, the portion of the PAD adjacent to Thredbo River displayed natural soils at the surface and appears relatively undisturbed. Alpine Way Culvert PAD 1 was identified as having moderate archaeological potential during the survey. This assessment was based on the location of the PAD on a terrace landform and its association with Thredbo River. |
| **N//A** | Alpine Way Culvert PAD 2 | 1 | PAD | Alpine Way Culvert PAD 2 is located 30m north-west of Alpine Way Culvert PAD 1 on a small, elevated terrace adjacent to Thredbo River. The PAD measures approximately 20m by 15m and appears relatively undisturbed. Alpine Way Culvert PAD 2 was identified as having moderate archaeological potential during the survey. This assessment was based on the location of the PAD on a terrace landform and its association with Thredbo River and AHIMS 61-6-0136/Alpine Way Culvert ISO 2. |

The survey results supported the predictive statements developed for the study area. The two areas of PAD were recorded on alluvial flats above the Thredbo River, as were AHIMS 61-6-0135/Alpine Way Culvert AS 1, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0136/Alpine Way Culvert ISO 2, albeit in a disturbed context.

### 4.1.3. Archaeological survey report recommendations

The ASR made the following recommendations:

- **Recommendation 1 - Undertake an Aboriginal Cultural Heritage Assessment:** As three Aboriginal sites and two PADs were identified as part of the archaeological site survey, it is recommended that an ACHAR be prepared. The ACHAR must be prepared in accordance with *the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011), the Code, and the PACHCI). The ACHAR must include consultation with Aboriginal community in accordance with the consultation requirements.
- **Recommendation 2 - Test excavations within areas of PAD:** Areas identified as having PAD should be avoided wherever possible. If impacts to these areas cannot be avoided, subsurface investigations (test excavations) would be required to determine the extent, nature and archaeological (scientific) value of cultural heritage within the study area. The archaeological testing must be completed in accordance with requirement 16 of the Code. Following test excavations, an Archaeological Report (AR) would be prepared in accordance with the Code.

## 4.2. Aboriginal archaeological excavations

Following the recommendation from the ASR, archaeological test excavations were conducted on 23 May 2023. Full details of the test excavations are provided within the AAER (Appendix F).

The purpose of the test excavations was to characterise the extent, nature, and archaeological (scientific) value of potential Aboriginal cultural heritage within identified areas of PAD which would be impacted by the proposed development (Alpine Way Culvert PAD 1 and Alpine Way Culvert PAD 2).

### 4.2.1. Test excavation participants

Test excavations were undertaken on 23 May 2023 with a team of two Biosis archaeologists and two Cultural Sites Officers. Excavations were attended by Ashleigh Keevers-Eastman (Biosis, Senior Heritage Consultant), Nathan Windram (Biosis, Graduate Heritage Consultant), Merekai Bell (Yurwang Gundana) and Brad Mayburn (Guntawong).

### 4.2.2. Test excavation methodology

Test excavations were conducted in accordance with requirement 16a of the Code. An Archaeological Test Excavation Methodology (ATEM) was developed in consultation with RAPs and in line with the following guidelines and procedures:

- PACHCI guidelines (Transport for NSW 2011).
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010b) (consultation requirements).
- The Code.
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011).

It should be noted that due to the size of the two PAD areas (an approximate 450 metres squared in total), limited testing was able to be undertaken in order to remain compliant with the Code, which states that all test excavation units must be no greater than 0.5% of the PAD or area being investigated. Under the Code, a maximum of approximately 2.25 metres squared could be excavated during testing.

The first test pit within each PAD area was excavated in 5cm spits with subsequent test pits being excavated in 10 centimetre spits. All test pits were 50 by 50 centimetres. For each test pit excavated, documentation was taken including global positioning system coordinates, Munsell soil colour and texture, nature of disturbances, stratigraphy, amount and location of cultural material within the deposit, archaeological features (if present), photographic records and spit records. All excavated soil was sieved in 5 millimetre sieves utilising dry sieving. All cultural material was collected, bagged and clearly labelled and is being temporarily stored in the Biosis' Wollongong office for analysis (at 30 Wentworth Street Port Kembla NSW 2505).

### 4.2.3. Test excavation results

A total of three test pits were excavated within two areas of PAD (Alpine Way Culvert PAD 1 and Alpine Way Culvert PAD 2). It should be noted that due to the size of the two PAD areas (an approximate 450 metres squared in total), limited testing was able to be undertaken in order to remain compliant with the Code, which states that all test excavation units must be no greater than 0.5% of the PAD or area being investigated. Under the Code, a maximum of approximately 2.25 metres squared could be excavated during testing.

Observations made within the field resulted in the archaeologists extending the area of PAD associated with Alpine Way Culvert PAD 1; this was undertaken in consultation with attending RAPs. The portion of Alpine Way Culvert PAD 1 which originally extended into the study area was situated upon thick vegetation and rocky surfaces that would have been unsuitable for testing. Two test pits were therefore placed in consultation with RAPs adjacent to the PAD area upon flat surfaces in the same landform unit. Alpine Way Culvert PAD 1 was then expanded to include this portion of the study area.

No subsurface artefact deposits were identified within the portions of Alpine Way Culvert PAD 1 and Alpine Way Culvert PAD 2 during the testing program. However, during test excavations a previously unrecorded surface artefact scatter was recorded within the study area (AHIMS 61-6-0140/Alpine Way Culvert AS 2). AHIMS 61-6-0140/Alpine Way Culvert AS 2 was recorded within a ground surface exposure at the edge of the Cascade Trails car park at the top of the slope/terrace landform. For full details, please see Section 3.3 within the AAER (provided within Appendix F).

## 4.3. Aboriginal heritage located in the study area

The archaeological assessment of the study area identified the following Aboriginal sites in the study:

- AHIMS 61-6-0140/Alpine Way Culvert AS 2
- AHIMS 61-6-0137/Alpine Way Culvert ISO 1
- AHIMS 61-6-0136/Alpine Way Culvert ISO 2
- AHIMS 61-6-0135/Alpine Way Culvert AS 1

The archaeological assessment identified the following Aboriginal sites in the vicinity of the study area:

- Alpine Way Culvert PAD 1

Alpine Way Culvert PAD 2, recorded as part of the ASR, was confirmed not to be a site, as no PAD was identified as part of the test excavations. Therefore, Alpine Way Culvert PAD 2 is not included in the description of sites below.

The AAER attached in Appendix F provides details for Aboriginal sites identified during the archaeological assessment and shown on Figure 3. A brief description of each site is provided below.

### AHIMS 61-6-0135/Alpine Way Culvert AS 1

AHIMS 61-6-0135/Alpine Way Culvert AS 1 consists of an artefact scatter located adjacent to Alpine Way outside of the study area. The artefact scatter is comprised of four quartz artefacts, including a single platform core, a complete flake, a proximal flake fragment, and a flake that had been repurposed as a single platform core. AHIMS 61-6-0135/Alpine Way Culvert AS 1 is located within the extent of the study area, within 3 metres south of Alpine way and 66 metres east of the culverts at Thredbo River.

The site extent covers an approximate area of 1 by 2 metres and is located in an area of exposure adjacent to the Cascade Trails carpark. The site has been subjected to significant disturbance created by the construction of the carpark and the artefacts are not likely in situ. The condition of the site is poor.

### AHIMS 61-6-0140/Alpine Way Culvert AS 2

AHIMS 61-6-0140/Alpine Way Culvert AS 2 consists of an artefact scatter located adjacent to Alpine Way within the study area. The scatter is comprised of four artefacts, including a complete silcrete flake, two complete quartz flakes, and a quartz proximal flake fragment. AHIMS 61-6-0140/Alpine Way Culvert AS 2 is located within the extent of the study area, within 12.8 metres south of Alpine way and 33 metres east of the culverts at Thredbo River.

The site extent covers an approximate area of 1 by 2 metres and is located in an area of exposure adjacent to the Cascade Trails carpark at the top of the disturbed slope/terrace landform overlooking Thredbo River. The site has been subjected to significant disturbance created by the construction of the carpark and the artefacts are not likely *in situ*. The condition of the site is poor.

### AHIMS 61-6-0137/Alpine Way Culvert ISO 1

AHIMS 61-6-0137/Alpine Way Culvert ISO 1 consists of an isolated artefact located adjacent to Alpine Way within the study area. The artefact is a single platform quartz core. AHIMS 61-6-0137/Alpine Way Culvert ISO 1 is located approximately 20 metres east of Alpine Way Culvert AS 1 within a large pothole in the middle of the bitumen carpark.

The site extent covers an approximate area of 1 by 2 metres and is located in a large pothole in the middle of the Cascade Trails carpark. The site has been significantly disturbed by the construction of the carpark and the artefact is not likely in situ. The condition of the site is poor.

### AHIMS 61-6-0136/Alpine Way Culvert ISO 2

AHIMS 61-6-0136/Alpine Way Culvert ISO 2 consists of an isolated artefact located adjacent to Alpine Way within the study area. The artefact is a medial quartz flake fragment. AHIMS 61-6-0136/Alpine Way Culvert ISO 2 is located 60 metres north-west of AHIMS 61-6-0137/Alpine Way Culvert ISO 1 on the western side of the Alpine Way culverts in an exposure adjacent to a large boulder associated with Thredbo River

The site extent covers an approximate area of 1 by 2 metres. The condition of the site is fair. The site is not associated with PAD and is considered representative of an isolated occurrence associated with resource gathering within this landform or may have been washed down into the landform from Alpine Way following the construction of the road.

### Alpine Way Culvert PAD 1

Alpine Way Culvert PAD 1 is located 30 metres north-west of Alpine Way Culvert PAD 2 on a small, elevated terrace adjacent to Thredbo River. The PAD measures approximately 20 metres by 15 metres and appears relatively undisturbed.

Alpine Way Culvert PAD 1 was identified as having moderate archaeological potential during the survey. Test excavations within the portion of Alpine Way Culvert PAD 1 within the study area did not identify any cultural deposits. Alpine Way Culvert PAD 1 has been revised to exclude the portion of the PAD previously identified within the study area. Further testing would be required to confirm the presence, nature and extent of any cultural deposits within the remainder of Alpine Way Culvert PAD 1.

## 4.4. Interpretation of past Aboriginal land use

The study area is located within a lower slope and terrace landform unit within the Australian Alps Bioregion adjacent to Thredbo River. Thredbo River is a third order perennial fresh water source that would have provided Aboriginal people with a variety of resources. Bogong Creek, a second order creek line was also located within the vicinity of the study area, forming a confluence with Thredbo River. The location of the study area at the confluence of the Thredbo River and Bogong Creek, and along a known cultural pathway (Bundian Way), indicates that suitable landforms adjacent to Thredbo River may contain evidence of Aboriginal occupation.

Artefact sites are considered to be the most common site type within the local region. Previous archaeological investigations have determined that isolated artefacts and scatters are often representative of the seasonal occupation of the alpine region rather than long term occupation sites characterised by high density knapping floors (Navin Officer 2000, Dibden 2004, Dibden 2003a, Dibden 2003b, Biosis 2019). Quartz veins are also known to occur within the local providing a raw material source for stone tool knapping (Dibden 2003b). Therefore, it is highly likely that artefact sites within the local region are likely to be made of quartz.

An archaeological survey of the study area was undertaken by Biosis on 5 May 2022. The survey resulted in the identification of one artefact scatter (AHIMS 61-6-0135/Alpine Way Culvert AS 1) and two isolated artefacts (AHIMS 61-6-0137/Alpine Way Culvert ISO 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2), and two areas of PAD (Alpine Way Culvert PAD 1 and Alpine Way Culvert PAD 2) within and adjacent to Thredbo River and the study area.

The sites identified during the survey were considered likely to be representative of temporary living sites used while traversing the landscape between more permanent living sites such as AHIMS 61-6-0007/Dead Horse Gap, located 250 metres west of the study area. Areas of PAD were identified upon favourable landforms (creek terraces and lower slopes) where low levels of disturbance had been recorded and were considered to have moderate potential.

A program of test excavations was therefore undertaken on 23 May 2023, to determine whether the areas of PAD identified by the survey contained archaeological deposits which were representative of seasonal occupation of the study area. A walkover of the study area during the testing program resulted in the identification of AHIMS 61-6-0140/Alpine Way Culvert AS 2, an artefact scatter of silcrete and quartz artefacts on the edge of the Cascade Trails carpark within approximately 10 metres west of Alpine Way Culvert PAD 1. The site was highly disturbed and not associated with intact archaeological deposits.

The test excavations did not identify evidence of cultural deposits in Alpine Way Culvert PAD 1 or Alpine Way Culvert PAD 2. Alpine Way Culvert PAD 1 was reassessed during test excavations to include a portion of the landform directly north-east of its original extent as test pits were unable to be placed within the original

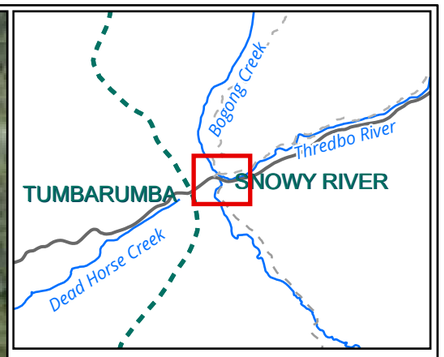
extent due to high levels of ground vegetation and the underlying presence of bedrock which made it unsuitable for excavation. No artefacts were identified within the extent of Alpine Way Culvert PAD 1 within the study area, and the extent of the site was updated as part of this assessment. Further investigation may be required to determine whether the slope landform to the south may have potential to contain cultural material should future development have the potential to impact upon the untested extent of Alpine Way Culvert PAD 1. If archaeological deposits are identified by further investigations, it is anticipated that these deposits may be representative of background scatter associated with the disturbed slope/terrace landform overlooking Thredbo River where AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0140/Alpine Way Culvert AS 2 have been identified. The entirety of Alpine Way Culvert PAD 2, both within and outside of the study area, was reassessed a having low potential due to the poorly drained nature of the landform in which Alpine Way Culvert PAD 2 was located. Vegetation within the creek flat landform suggests that this portion of the study area may become regularly inundated and for this reason could not be considered a suitable site for temporary occupation. AHIMS 61-6-0136/Alpine Way Culvert ISO 2 is located within 3 metres of Alpine Way Culvert PAD 2, however, it may be representative of an isolated occurrence associated with resource gathering within this landform or may have been washed down into the landform from Alpine Way following the construction of the road.

The study area and the sites identified by this assessment are located in close proximity to the Bundian Way, which is listed on the State Heritage Register (SHR) (SHR Item no 01906). The Bundian Way is of State significance as a rare surviving ancient pathway used by Aboriginal people over thousands of years linking the high country at Kosciuszko and the coast at Eden. The Bundian Way is associated with seasonal gatherings of Aboriginal tribes on the Snowy River for Bogong moth collection and on the Eden Coast during whale migration. Historical documentation and archaeology found on the route reinforces traditional knowledge held by contemporary Aboriginal society and provides a strong validation of the social significance of this pathway today. The Bundian Way continues to be an important place of education and cultural activity in the Aboriginal community. The Bundian Way travels through wilderness areas of untouched beauty with spectacular views over the coastal plain which contributes to the aesthetic significance of the route (State Heritage Inventory 2013).

Information shared by RAPs during the Aboriginal Focus Group (AFG) meeting on 19 April 2023 indicates that low density sites may represent singular or small groups associated with but living or travelling apart from larger main groups. These may be elders requiring privacy or isolation for cultural reasons, or those who had been shunned by the larger group, for example. It could be interpreted that the larger and high-density artefact site and archaeological deposit at AHIMS 61-6-0007/Dead Horse Gap, 250 metres west of the study area, is representative of a living site regularly and repeatedly occupied by a main group in a favourable location near to but above flood levels. The sites identified within and in the immediate vicinity of the study area, whether they are disturbed or *in situ*, could be considered to be associated with these singular or small groups, or may be places of temporary opportunistic occupation when conditions were suitable, i.e. when water levels were low and the terrace areas remained above the water mark.

The results of the assessment of the study area are considered to be consistent with predictive modelling for the local region, in that low density artefact sites dominated by quartz were identified within slope/crest landforms, albeit in a disturbed context, and are considered to be representative of the seasonal occupation of the study area and adjacent areas (Navin Officer 2000, Dibden 2004, Dibden 2003a, Dibden 2003b, Biosis 2019). It is also considered likely that AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0140/Alpine Way Culvert AS 2 may be representative of a single site complex that has been disturbed by the construction of the Cascade Trails carpark. There is potential that further artefact sites may be identified within the vicinity of the Cascade Trails carpark and potentially beneath its surface, however, no further assessment will be required as no upgrades to the Cascade Trails carpark are proposed.




**Legend**

- Study area
- Survey tracks
- Surface artefacts
- AHIMS
- PAD

**Figure 3 Aboriginal sites within the study area and vicinity**

0 10 20 30 40 50

Metres

Scale: 1:2,000@ A3

*Coordinate System: GDA 1994 MGA Zone 55*

N

*Acknowledgements: Basemap © Land and Property Information 2016; public_NSW_Imagery: © Department of Customer Service 2020*

Matter: 38538, Date: 15 January 2024,
Drawn by: JET, Checked by: CA, Last edited by: jtownsend
Location: P:\38500s\38538\Mapping\
38538_AlpineWay, Layout: 38538_ACHA_F3_Sites

# 5. Aboriginal cultural heritage context

According to (Allen & O'Connell 2003), Aboriginal people have inhabited the Australian continent for the last 50,000 years. New evidence out of the Northern Territory has pushed this date back to around 60,000 years with the Malakanunja II rock shelter dated at 61,000 +9000/-13,000 BP (Clarkson et al. 2015). In NSW, according to Bowler *et al* (2003), Aboriginal people have occupied the land for over 42,000 years. However, preliminary evidence presented by Biosis (2016) from a subsurface testing program in south-western NSW suggests Aboriginal people may have occupied the semi-arid zone of the region for 50,000 years.

Without being part of the Aboriginal culture and the productions of this culture, it is not possible for non-Aboriginal people to fully understand the meaning of site, objects and places to Aboriginal people – only to move closer towards understanding this meaning with the help of the Aboriginal community. Similarly, definitions of Aboriginal culture and cultural heritage without this involvement constitute outsider interpretations.

With this preface Aboriginal cultural heritage broadly refers to things that relate to Aboriginal culture and hold cultural meaning and significance to Aboriginal people (DECCW 2010b, pp. 3). There is an understanding in Aboriginal culture that everything is interconnected. In essence Aboriginal cultural heritage can be viewed as potentially encompassing any part of the physical and/or cultural landscape, that is, 'Country' (DECCW 2010b, pp. iii).

Aboriginal people's interpretation of cultural value is based on their "traditions, observance, lore, customs, beliefs and history" (DECCW 2010b, pp. 3). The things associated with Aboriginal cultural heritage are continually and actively being defined by Aboriginal people (DECCW 2010b, pp. 3). These things can be associated with traditional, historical or contemporary Aboriginal culture (DECCW 2010b, pp. 3).

### Tangible Aboriginal cultural heritage

Three categories of tangible Aboriginal cultural heritage may be defined:

- Things that have been observably modified by Aboriginal people.
- Things that may have been modified by Aboriginal people, but no discernible traces of that activity remain.
- Things never physically modified by Aboriginal people (but associated with Dreamtime Ancestors who shaped those things).

### Intangible Aboriginal cultural heritage

Examples of intangible Aboriginal cultural heritage would include memories of stories and 'ways of doing', which would include language and ceremonies (DECCW 2010b, pp. 3).

### Statutory

Currently Aboriginal cultural heritage, as statutorily defined by the NPW Act, consists of objects and places which are protected under Part 6 of the Act.

Aboriginal objects are defined as:

> *any deposit, object or material evidence…relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains*

Aboriginal places are defined as a place that is or was of special Aboriginal cultural significance. Places are declared under section 84 of the NPW Act.

**Values**

Aboriginal cultural heritage is valued by Aboriginal people as it is used to define their identity as both individuals and as part of a group (DECCW 2010b, pp. iii). More specifically it is used:

- To provide a:
  - *'Connection and sense of belonging to Country'* (DECCW 2010b, pp. iii).
  - Link between the present and the past (DECCW 2010b, pp. iii).
- As a learning tool to teach Aboriginal culture to younger Aboriginal generations and the general public (DECCW 2010b, pp. 3).
- As further evidence of Aboriginal occupation prior to European settlement for people who do not understand the magnitude to which Aboriginal people occupied the continent (DECCW 2010b, pp. 3).

## 5.1. Aboriginal cultural heritage sensitivities

### 5.1.1. Ethnohistory

It is generally accepted that Aboriginal people have inhabited Australia for the last 50,000 years (Allen & O'Connell 2003, Hamm et al. 2016). The Birrigai rockshelter is the earliest Aboriginal site identified in the Snowy Mountains region dating to 21,000 BP (Flood 1996).

Despite a proliferation of known Aboriginal sites, there is considerable ongoing debate about the nature, territory and range of pre-contact Indigenous language groups in the region. These debates have arisen largely due to the lack of ethnographic and linguistic information recorded at the time of European contact. By the time colonial diarists, missionaries and proto-anthropologists began making detailed records of indigenous people in the late 19th century; pre-European Aboriginal groups had been broken up and reconfigured by European settlement activity.

The Jindabyne region was identified by Tindale (1974) as belonging to the Ngarigo language speaking tribe, part of a territory stretching 200 kilometres north to south and up to 120 kilometres wide. This included the tablelands between the western coastal ranges and the Kosciuszko Plateau and incorporated the peaks of the Snowy and Kosciuszko Ranges. According to Flood (1996, p. 5), Ngarigo was spoken between Canberra, Delegate, Omeo, Tumbarumba, and Bombala. Flood (1996, p. 5) also states that it is likely the Aboriginal groups in the region would have spoken the language of their neighbors. Flood asserts that the Aboriginal groups in the area seem to have been part of a larger 'Federation' group consisting of the groups from the Queanbeyan, Monaro, Omeo, and Mount Buffalo regions. These 'Federation' groups shared adjoining lands, interests, cultural practices, and spoke dialects of a common language (Flood 1996, pp. 7).

The main food sources for the Aboriginal people of the Jindabyne region were possums, kangaroos, wallabies, birds, fish, and vegetables such as the yam daisy. Fire was used extensively throughout the Snowy Mountains region and served a twofold purpose. The fire would drive out large game assisting in hunting, while the new

green growth that would appear after a fire would attract wildlife, again resulting in easier hunting (Flood 1996, pp. 9).

Bogong moths were also reportedly a rich food source for the Aboriginal people of the Snowy Mountains region. From the period of October to March, the moths aestivate in the cool climates of the Snowy Mountains. The Aboriginal people of the region would scrape the moths off surfaces (often rocks) and collect them in a coolamon dish or a net made from Kurrajong fibre. The moths were then cooked on a large hotplate (heated stone) (Flood 1996, pp. 12).

The rich food resources of the Snowy Mountains allowed for upwards of 500 Aboriginal people from many different groups to gather in the region to trade and participate in ceremonies. An account of such a gathering was recorded in the Queanbeyan Observer (23 March 1913, cited by Flood 1996, pp. 12). As is noted above, the study area is in close proximity to the Bundian Way (SHR Item no 01906). As a rare surviving ancient pathway used by Aboriginal people over thousands of years linking the high country at Kosciuszko and the coast at Eden, the Bundian Way is of State heritage significance. The Bundian Way is associated with seasonal gatherings of Aboriginal tribes on the Snowy River for Bogong moth collection and on the Eden Coast during whale migration. Documentary and archaeological evidence reinforces traditional knowledge held by contemporary Aboriginal society and provides a strong validation of the social significance of this pathway today. The Bundian Way continues to be an important place of education and cultural activity in the Aboriginal community (State Heritage Inventory 2013).

As noted above the population of Aboriginal groups prior to European occupation is notoriously difficult to estimate. Numerous historic accounts from the mid-1800s however estimate that the Canberra tribe and the County Murray tribe (Queanbeyan) each consisted of around 500 Aboriginal people (Flood 1996, pp. 17). This suggest the Alpine region of NSW and the Australian Capital Territory was heavily populated by Aboriginal people prior to European occupation.

The first known European to enter Ngarigo territory was Captain Currie R.N. in 1823, and the area subsequently experienced rapid settlement by graziers and squatters, with a dray road passing through the Jindabyne area by 1840 (Hancock 1972). This had a rapid impact on the local Aboriginal population. According to Chapman the Aboriginal population in the region had declined dramatically by the 1880s (Chapman 1977, pp. 22).

# 6. Aboriginal cultural significance assessment

The two main values addressed when assessing the significance of Aboriginal sites are cultural values to the Aboriginal community and archaeological (scientific) values. This report will assess the cultural values of Aboriginal sites in the study area. Details of the scientific significance assessment of Aboriginal sites in the study area are provided in Appendix F.

## 6.1. Introduction to the assessment process

Heritage assessment criteria in NSW fall broadly within the significance values outlined in the Australia International Council on Monuments and Sites (ICOMOS) *Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (Australia ICOMOS 2013) (the Burra Charter). This approach to heritage has been adopted by cultural heritage managers and government agencies as the set of guidelines for best practice heritage management in Australia. These values are provided as background and include:

- **Historical significance** (evolution and association) refers to historic values and encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section. A place may have historic value because it has influenced, or has been influenced by, a historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment.
- **Aesthetic significance** (Scenic/architectural qualities, creative accomplishment) refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with social values and may include consideration of form, scale, colour, texture, and material of the fabric or landscape, and the smell and sounds associated with the place and its use.
- **Social significance** (contemporary community esteem) refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day community. Places of social significance have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities can experience a sense of loss should a place of social significance be damaged or destroyed. These aspects of heritage significance can only be determined through consultative processes with local communities.
- **Scientific significance** (Archaeological, industrial, educational, research potential and scientific significance values) refers to the importance of a landscape, area, place or object because of its archaeological and/or other technical aspects. Assessment of scientific value is often based on the likely research potential of the area, place or object and will consider the importance of the data involved, its rarity, quality or representativeness, and the degree to which it may contribute further substantial information.

The cultural and archaeological significance of Aboriginal and historic sites and places is assessed on the basis of the significance values outlined above. As well as the Burra Charter significance values guidelines, various government agencies have developed formal criteria and guidelines that have application when assessing the significance of heritage places within NSW. Of primary interest are guidelines prepared by the Australian

Government, Heritage NSW and the Heritage Branch, and the NSW Department of Planning and Environment. The relevant sections of these guidelines are presented below.

These guidelines state that an area may contain evidence and associations which demonstrate one or any combination of the Burra Charter significance values outlined above in reference to Aboriginal heritage. Reference to each of the values should be made when evaluating archaeological and cultural significance for Aboriginal sites and places.

In addition to the previously outlined heritage values, the Heritage NSW Guidelines to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011) also specify the importance of considering cultural landscapes when determining and assessing Aboriginal heritage values. The principle behind a cultural landscape is that 'the significance of individual features is derived from their inter-relatedness within the cultural landscape'. This means that sites or places cannot be 'assessed in isolation' but must be considered as parts of the wider cultural landscape. Hence the site or place will possibly have values derived from its association with other sites and places. By investigating the associations between sites, places, and (for example) natural resources in the cultural landscape the stories behind the features can be told. The context of the cultural landscape can unlock 'better understanding of the cultural meaning and importance' of sites and places.

Although other values may be considered – such as educational or tourism values – the two principal values that are likely to be addressed in consideration of Aboriginal sites and places are the cultural/social significance to Aboriginal people and their archaeological or scientific significance to archaeologists and the Aboriginal community. The determinations of archaeological and cultural significance for sites and places should then be expressed as statements of significance that preface a concise discussion of the contributing factors to Aboriginal cultural heritage significance.

## 6.2. Cultural (social significance) values

Cultural or social significance refers to the spiritual, traditional, historical and/or contemporary associations and values attached to a place or objects by Aboriginal people. Aboriginal cultural heritage is broadly valued by Aboriginal people as it is used to define their identity as both individuals and as part of a group (DECCW 2010b, pp. iii). More specifically it provides:

- A 'connection and sense of belonging to Country' (DECCW 2010b, pp. iii).
- A link between the present and the past (DECCW 2010b, pp. 3).
- A learning tool to teach Aboriginal culture to younger Aboriginal generations and the general public (DECCW 2010b, pp. 3).
- Further evidence of Aboriginal occupation prior to European settlement for people who do not understand the magnitude to which Aboriginal people occupied the continent (DECCW 2010b, pp. 3).

It is acknowledged that Aboriginal people are the primary determiners of the cultural significance of Aboriginal cultural heritage. During consultation the following information was provided by RAPs in regard to the cultural values of the study area.

- Confidential party 34stated in correspondence associated with the Stage 2 PACHCI on 29 March 2022 that the study area is within the traditional lands of the Monero-Ngarigo people.
- At the AFG meeting on 19 April 2023, a number of statements were made Confidential party 49 and Confidential party 25:
  - The land is being actively used by the community for cultural activities.

- The artefacts used by past people are an ancestral and cultural connection for the current community.
- The sovereign rights of the Monero-Ngarigo people to the land have not been relinquished or ceded.

Additional information may be included in this section following review of this report by the RAPs.

## 6.3. Historic values

Historic significance refers to associations a place or object may have with a historically important person, event, phase or activity to the Aboriginal and other communities. The study area is in close proximity to the Bundian Way (SHR Item no 01906), a rare surviving ancient pathway used by Aboriginal people over thousands of years linking the high country at Kosciuszko and the coast at Eden. The Bundian Way is associated with seasonal gatherings of Aboriginal tribes on the Snowy River for Bogong moth collection and on the Eden Coast during whale migration. Historical documentation and archaeology found on the route reinforces traditional knowledge held by contemporary Aboriginal society and provides a strong validation of the social significance of this pathway today. It is historically significant for its role in early colonisation whereby non-Aboriginal people were aided by Aboriginal guides in colonial exploration and the search for pastures.

## 6.4. Archaeological (scientific significance) values

An archaeological scientific assessment was undertaken for the study area and is presented in detail as part of the attached AAER (Appendix F).

## 6.5. Aesthetic values

The study area has been partially cleared of vegetation, with disturbances associated with the construction of Alpine Way and Cascade Trail. The landscape of the study area is closely linked with Aboriginal cultural values and provides a context for Aboriginal sites that gives a strong sense of place. More widely, the Bundian Way travels through wilderness areas of untouched beauty with spectacular views over the coastal plain which contributes to the aesthetic significance of the route. The study area has been assessed to hold moderate aesthetic value due to historical modifications.

## 6.6. Statement of significance

The significance of sites was assessed in accordance with the following criteria:

- Requirements of the Code.
- The Burra Charter.
- *Guide to Investigating and Reporting on Aboriginal Heritage* (OEH 2011).

The combined use of these guidelines is widely considered to represent the best practice for assessments of Aboriginal cultural heritage. The identification and assessment of cultural heritage values includes the four values of the Burra Charter: social, historical, scientific and aesthetic values. The resultant statements of significance have been constructed for the sites within and in the vicinity of the study area based on the significance ranking criteria.

### 6.6.1. Statement of significance for AHIMS 61-6-0135/Alpine Way Culvert AS 1

AHIMS 61-6-0135/Alpine Way Culvert AS 1 consists of an artefact scatter located adjacent to Alpine Way upon a disturbed crest/slope. The site has been subjected to significant disturbance created by the construction of the Cascade Trails carpark and the artefacts are not likely to be *in situ*. The condition of the site is poor. The archaeological assessment completed by Biosis determined that AHIMS 61-6-0135/Alpine Way Culvert AS 1 is a common site type and possess low potential for further information to be obtained which could contribute to our understanding of Aboriginal land use within the local region. AHIMS 61-6-0135/Alpine Way Culvert AS 1 therefore possesses low scientific significance. While AHIMS 61-6-0135/Alpine Way Culvert AS 1 is located in close proximity to the Bundian Way, it is not known to be associated with a specific person or event. It is therefore considered to have low historical significance. AHIMS 61-6-0135/Alpine Way Culvert AS 1 is located in an area adjacent to the Thredbo River which has been subject to tree clearing and historical modifications, such as Alpine Way and the Cascade Trails carpark, resulting in an assessment of moderate aesthetic significance. Initial comments from the RAPs indicate that AHIMS 61-6-0135/Alpine Way Culvert AS 1 has high cultural value; this will be fully determined once the RAPs have had an opportunity to review and comment on the draft ACHAR.

**Table 7 Significance assessment criteria for AHIMS 61-6-0135/Alpine Way Culvert AS 1**

| Site name | Criteria | Ranking |
|---|---|---|
| **AHIMS 61-6-0135/Alpine Way Culvert AS 1** | Cultural – initial discussions with the local Aboriginal communities reflect that the site is high in value. | High |
| | Historical – the site in close proximity to the Bundian Way but is not known to be associated with a specific person or event. | Low |
| | Scientific – the site possesses some archaeological values. | Low |
| | Aesthetic – the site is located adjacent to Alpine Way. The site has been subjected to significant disturbance created by the construction of the Cascade Trails carpark. | Moderate |

### 6.6.2. Statement of significance for AHIMS 61-6-0140/Alpine Way Culvert AS 2

AHIMS 61-6-0140/Alpine Way Culvert AS 2 consists of an artefact scatter located adjacent to Alpine Way upon a disturbed crest/slope. The site has been subjected to significant disturbance created by the construction of the Cascade Trails carpark and the artefacts are not likely to be *in situ*. The condition of the site is poor. The archaeological assessment completed by Biosis determined that AHIMS 61-6-0140/Alpine Way Culvert AS 2 is a common site type and possess low potential for further information to be obtained which could contribute to our understanding of Aboriginal land use within the local region. AHIMS 61-6-0140/Alpine Way Culvert AS 2 therefore possesses low scientific significance. While AHIMS 61-6-0140/Alpine Way Culvert AS 2 is located in close proximity to the Bundian Way, it is not known to be associated with a specific person or event. It is therefore considered to have low historical significance. AHIMS 61-6-0140/Alpine Way Culvert AS 2 is located in an area adjacent to the Thredbo River which has been subject to tree clearing and historical modifications, such as Alpine Way and the Cascade Trails carpark, resulting in an assessment of moderate aesthetic significance. Comments from the RAPs indicate that AHIMS 61-6-0140/Alpine Way Culvert AS 2 has high cultural value.

**Table 8 Significance assessment criteria for AHIMS 61-6-0140/Alpine Way Culvert AS 2**

| Site name | Criteria | Ranking |
|---|---|---|
| **AHIMS 61-6-0140/Alpine Way Culvert AS 2** | Cultural – initial discussions with the local Aboriginal communities reflect that the site is high in value. | High |
| | Historical – the site in close proximity to the Bundian Way but is not known to be associated with a specific person or event. | Low |
| | Scientific – the site possesses some archaeological values. | Low |
| | Aesthetic – the site is located adjacent to Alpine Way. The site has been subjected to significant disturbance created by the construction of the Cascade Trails carpark. | Moderate |

### 6.6.3. Statement of significance for AHIMS 61-6-0137/Alpine Way Culvert ISO 1

AHIMS 61-6-0137/Alpine Way Culvert ISO 1 consists of an isolated artefact located adjacent to Alpine Way upon a disturbed crest/slope. The site has been subjected to significant disturbance created by the construction of the Cascade Trails carpark and the artefact site is not likely to be *in situ*. The condition of the site is poor. The archaeological assessment completed by Biosis determined that AHIMS 61-6-0137/Alpine Way Culvert ISO 1 is a common site type and possess low potential for further information to be obtained which could contribute to our understanding of Aboriginal land use within the local region. AHIMS 61-6-0137/Alpine Way Culvert ISO 1 therefore possesses low scientific significance. While AHIMS 61-6-0137/Alpine Way Culvert ISO 1 is located in close proximity to the Bundian Way, it is not known to be associated with a specific person or event. It is therefore considered to have low historical significance. AHIMS 61-6-0137/Alpine Way Culvert ISO 1 is located in an area adjacent to the Thredbo River which has been subject to tree clearing and historical modifications, such as Alpine Way and the Cascade Trails carpark, resulting in an assessment of moderate aesthetic significance. Comments from the RAPs indicate that AHIMS 61-6-0137/Alpine Way Culvert ISO 1 has high cultural value.

**Table 9 Significance assessment criteria for AHIMS 61-6-0137/Alpine Way Culvert ISO 1**

| Site name | Criteria | Ranking |
|---|---|---|
| **AHIMS 61-6-0137/Alpine Way Culvert ISO 1** | Cultural – initial discussions with the local Aboriginal communities reflect that the site is high in value. | High |
| | Historical – the site in close proximity to the Bundian Way but is not known to be associated with a specific person or event. | Low |
| | Scientific – the site possesses some archaeological values. | Low |
| | Aesthetic – the site is located adjacent to Alpine Way. The site has been subjected to significant disturbance created by the construction of the Cascade Trails carpark. | Moderate |

### 6.6.4. Statement of significance for AHIMS 61-6-0136/Alpine Way Culvert ISO 2

AHIMS 61-6-0136/Alpine Way Culvert ISO 2 consists of an isolated artefact located on the western side of the Alpine Way culverts in an exposure, adjacent to a large boulder associated with Thredbo River. The site is not considered likely to be *in situ*. The condition of the site is fair. The archaeological assessment completed by Biosis determined that AHIMS 61-6-0136/Alpine Way Culvert ISO 2 is a common site type and possess low potential for further information to be obtained which could contribute to our understanding of Aboriginal land use within the local region. The site is considered to be representative of an isolated occurrence

associated with resource gathering activity within the local area or may have been washed down into the landform from Alpine Way following the construction of the road. AHIMS 61-6-0136/Alpine Way Culvert ISO 2 therefore possesses low scientific significance. While AHIMS 61-6-0136/Alpine Way Culvert ISO 2 is located in close proximity to the Bundian Way, it is not known to be associated with a specific person or event. It is therefore considered to have low historical significance. AHIMS 61-6-0136/Alpine Way Culvert ISO 2 is located in an area adjacent to the Thredbo River which has been subject to tree clearing and historical modifications, such as Alpine Way and the Cascade Trails carpark, resulting in an assessment of moderate aesthetic significance. Comments from the RAPs indicate that AHIMS 61-6-0136/Alpine Way Culvert ISO 2 has high cultural value.

**Table 10 Significance assessment criteria for AHIMS 61-6-0136/Alpine Way Culvert ISO 2**

| Site name | Criteria | Ranking |
|---|---|---|
| **AHIMS 61-6-0136/Alpine Way Culvert ISO 2** | Cultural – initial discussions with the local Aboriginal communities reflect that the site and surrounding landscape is high in value. | High |
| | Historical – the site in close proximity to the Bundian Way but is not known to be associated with a specific person or event. | Low |
| | Scientific – the site possesses some archaeological values. | Low |
| | Aesthetic – the site is located adjacent to Alpine Way. The site has been subjected to significant disturbance created by the construction of the Cascade Trails carpark. | Moderate |

### 6.6.5. Statement of significance for Alpine Way Culvert PAD 1

The scientific significance of the area of Alpine Way Culvert PAD 1 is unable to be determined prior to further archaeological investigation in the form of test excavations in the remaining area of PAD outside of the study area. The proposed development will not impact this area of archaeological potential. Therefore, further investigation is not required unless the development footprint changes. While Alpine Way Culvert PAD 1 is located in close proximity to the Bundian Way, it is not known to be associated with a specific person or event. It is therefore considered to have low historical significance. Alpine Way Culvert PAD 1 is located in an area adjacent to the Thredbo River which has been subject to tree clearing and historical modifications, such as Alpine Way and the Cascade Trails carpark, resulting in an assessment of moderate aesthetic significance. Comments from the RAPs indicate that Alpine Way Culvert PAD 1 has high cultural value.

**Table 11 Significance assessment criteria for Alpine Way Culvert PAD 1**

| Site name | Criteria | Ranking |
|---|---|---|
| **Alpine Way Culvert PAD 1** | Cultural – initial discussions with the local Aboriginal communities reflect that the site and surrounding landscape is high in value. | High |
| | Historical – the site in close proximity to the Bundian Way but Alpine Way Culvert PAD 1 is not known to be associated with a specific person or event. | Low |
| | Scientific – further test excavations in remaining area of PAD outside of study area is required to determine the scientific (archaeological) significance of the site. Test excavations within the study area confirmed there are no archaeological deposits within the study area; no further test excavations are required within the study area. | To be determined |
| | Aesthetic – the site is located adjacent to Alpine Way. The site has been subjected to significant disturbance created by the construction of the Cascade Trails carpark. | Moderate |

# 7. Development limitations and mitigation measures

## 7.1. Potential risks to Aboriginal cultural heritage

Within the study area, there are four recorded Aboriginal sites (Figure 3); all of these sites may be subject to harm (AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2). Impacts to these Aboriginal sites are direct in nature (Table 12). These sites may be impacted by the proposed works, which broadly comprise:

- Removal and installation of piping and culverts beneath Alpine Way.
- Heavy vehicle and equipment movement within study area with potential compaction of surface and subsurface soils.
- Stockpiling of construction material.

A summary of the potential impacts of the proposed works on known Aboriginal sites within the study area is provided in Table 12.

**Table 12 Summary of potential archaeological impacts**

| AHIMS site no. | Site name | Significance | Type of harm | Degree of harm | Consequence of harm |
|---|---|---|---|---|---|
| **AHIMS 61-6-0135** | Alpine Way Culvert AS 1 | Moderate | Direct harm | Total harm | Total loss of value |
| **AHIMS 61-6-0140** | Alpine Way Culvert AS 2 | Moderate | Direct harm | Total harm | Total loss of value |
| **AHIMS 61-6-0137** | Alpine Way Culvert ISO 1 | Moderate | Direct harm | Total harm | Total loss of value |
| **AHIMS 61-6-0136** | Alpine Way Culvert ISO 2 | Moderate | Direct harm | Total harm | Total loss of value |
| **-** | Alpine Way Culvert PAD 1 | Unknown | No harm | No harm | No harm |
| **-** | Alpine Way Culvert PAD 2 | Nil – not a site | N/A | N/A | N/A |

Strategies to avoid or minimise harm to Aboriginal heritage in the study area are discussed below.

### 7.1.1. Avoiding harm to Aboriginal heritage

Left unmitigated, the activities outlined above have the potential to completely remove or disturb the archaeological contents associated with AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2. Impacts to AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 are unable to be avoided as part of the works.

### Avoidance of Alpine Way PAD 1

Avoidance of impacts to Alpine Way Culvert PAD 1 are able to be achieved, as this site extent fall outside of the current development footprint (Figure 3). It is recommended that sturdy fencing be established around the study area to ensure the protection of Alpine Way Culvert PAD 1 during the lifespan of the construction phase.

## 7.2. Ecologically Sustainable Development

One of the primary aims of the NPW Act is the 'conservation of objects places and features … of cultural value within the landscape, including … places, objects and features of significance to Aboriginal people …' ((s.2A(1)(b)(i)). The *Operational Policy: Protecting Aboriginal Cultural Heritage (Version 2)* (State of NSW and Office of Environment and Heritage NSW 2011) provides guidance to proponents in term of Ecologically Sustainable Development (ESD).

ESD has been defined in Part 3, 6. (2) Objective of the Authority of the *Protection of the Environment Administration* Act 1991 (NSW). This outlines that the ESD requires the integration of economic and environmental considerations (including cultural heritage) in the decision-making process. Regarding Aboriginal cultural heritage, ESD can be achieved by applying the principle of intergenerational equity and the precautionary principle.

***Intergenerational equity***

*The principle of intergenerational equity states that the present generation should make every effort to ensure the health, diversity and productivity of the environment – which includes cultural heritage – for the benefit of future generations.*

*In terms of Aboriginal cultural heritage, intergenerational equity can be considered in terms of the 'cumulative impacts' of any proposal to Aboriginal objects and places. For example, if few Aboriginal objects and places remain in a region (because of harm authorised under previous AHIPs), fewer opportunities remain for future generations of Aboriginal people to enjoy the cultural benefits of those Aboriginal objects and places.*

*Information about the significance of Aboriginal cultural heritage values associated with the Aboriginal objects and places proposed to be harmed will be relevant to the consideration of intergenerational equity and an understanding of the cumulative impacts of a proposal.*

*Where there is uncertainty, the precautionary principle should also be followed (see below).*

***The precautionary principle***

*The precautionary principle states that the lack of full scientific certainty about the threat of harm should not be used as a reason for not taking measures to prevent harm from occurring.*

*In applying the precautionary principle, decisions should be guided by:*

- *a careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment (which includes cultural heritage)*
- *an assessment of the risk-weighted consequences of various options.*

*The precautionary principle is relevant to Heritage NSW consideration of potential harm to Aboriginal cultural heritage where:*

- *the proposal involves a risk of serious or irreversible harm to Aboriginal objects or places or to the value of those objects or places, and*
- *there is a lot of uncertainty about the significance of Aboriginal cultural heritage values of the Aboriginal objects or places proposed to be harmed.*

*Where this is the case, a precautionary approach should be taken and all cost-effective measures implemented to prevent or reduce harm to the Aboriginal objects/place* (State of NSW and Office of Environment and Heritage NSW 2011, pp. 26).

The results of this assessment identified four surface artefact sites and one area of moderate archaeological potential. Therefore, this assessment has been able to further our knowledge of Aboriginal archaeology in the area, by identifying and recording tangible cultural heritage within and in the immediate vicinity of the study area.

## 7.3. Management and mitigation measures

Ideally, heritage management involves conservation of sites through the preservation and conservation of fabric and context within a framework of 'doing as much as necessary, as little as possible' (Marquis-Kyle & Walker 1994, pp. 13). In cases where conservation is not practical, several options for management are available. For sites, management often involves the salvage of features or artefacts, retrieval of information through excavation or collection (especially where impact cannot be avoided) and interpretation.

Avoidance of impacts to archaeological and cultural heritage sites through the design of the development is the primary mitigation and management strategy and should be implemented where practicable. As discussed, the proposed works will impact AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2. Impacts to AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 were unable to be avoided through redesign due to landscape limitations, however, impacts have been isolated to areas of existing disturbance where possible (Alpine Way and the Cascade Trails Carpark). This assessment has determined that AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 possess low archaeological significance. Therefore, an AHIP will be required to allow for direct impacts to these sites through the proposed works however no further archaeological investigation of these sites is required. The AHIP will also need to allow for community collection of AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 so that direct impacts to this site can be mitigated. The following management measures have been developed with consideration to Ecologically Sustainable Development (ESD) in order mitigate impacts to Aboriginal cultural values identified within the study area.

Mitigation of unintentional harm of the extent of Alpine Way PAD 1 is proposed through the fencing off of the boundary of the proposed works area. Mitigation strategies for the study area are presented below.

### 7.3.1. Apply for an AHIP to impact AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2

Impacts to AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 cannot be avoided, therefore it is recommended that an AHIP covering the development footprint be obtained from Heritage NSW under Part 6 of the NPW Act, prior to impacts occurring. An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places, or that cause land to be disturbed for the purposes of discovering an Aboriginal object. **The AHIP should be for a term of five (5) years.** The AHIP will allow for impacts to AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 to occur through the proposed development or community collection.

#### Advice preparing AHIPs

An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places or cause land to be disturbed for the purposes of discovering an Aboriginal object. Heritage NSW issues AHIPs under Part 6 of the NPW Act.

AHIPs should be prepared by a qualified archaeologist and lodged with Heritage NSW. Once the application is lodged processing time can take between 8-12 weeks. It should be noted that there will be an application fee levied by the Heritage NSW for the processing of AHIPs, which is dependent on the estimated total cost of the development project.

### 7.3.2. No further archaeological assessment is recommended within areas of low potential or within AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2

No further archaeological work is recommended for areas of low archaeological potential or within AHIMS Pending61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 which fall within the current development footprint. Archaeological test excavations have determined that AHIMS Pending/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 the study area possesses low archaeological potential, with no Aboriginal archaeological deposits identified. and have limited potential to expand our understanding of the archaeology of the local area or the surrounding region through further investigation. No further investigation is therefore warranted within the development footprint.

### 7.3.3. Community surface collection of AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2

AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 should be salvaged through community surface collection. This ensures that the most information possible is obtained from the sites prior to their destruction. Following collection of surface artefacts, an analysis of the complete artefact assemblage identified will be undertaken to provide further information about the potential uses of the site by Aboriginal people. This not only increases current understanding of the site but increases our knowledge

of Aboriginal occupation in the wider Snowy Monaro region and ensures that any scientific and cultural information that we obtain can be accessed and used by future generations.

A community collection methodology will need to be prepared by a suitably qualified archaeologist in consultation with RAPs. This methodology will then support the AHIP application to Heritage NSW.

### 7.3.4. Long-term care agreement

The establishment of a long-term care agreement in consultation with RAPs should be developed in order to ensure the artefacts collected during community collection is adequately cared for in accordance with RAP recommendations. Several management options are possible depending on the wishes of RAPs. The artefacts recovered from the test excavations can be given back to the Aboriginal community through a long-term care agreement where they can then be used to teach subsequent generations about Aboriginal culture. Alternatively, the artefact can be reburied on Country in a location to be determined in consultation with RAPs and the proponent. This approach considers the principles of ESD and intergenerational equity and more importantly ensures that recovered artefact is managed according to the wishes of RAPs.

### 7.3.5. Further archaeological assessment within Alpine Way PAD 1 should future impacts be proposed

As discussed above, the proponent has determined that impacts to the remaining extent of Alpine Way PAD 1 are able to be avoided by the proposed development. However, should future impacts to Alpine Way PAD 1 be unable to be avoided, then further archaeological investigation of this area will be required. This will include archaeological test excavations under the Code, and an ACHAR to be prepared in consultation with RAPs in accordance with consultation requirements.

### 7.3.6. Fencing of study area boundary

Prior to any construction works taking place, it is recommended that the study area be fenced off and secured to ensure that Alpine Way PAD 1 is conserved, and remain unharmed by the adjacent proposed works. Fencing must remain in place over the over the lifespan of construction phase.

### 7.3.7. Heritage induction

Heritage inductions for all site workers and contractors should be undertaken in order to prevent any unintentional harm to unexpected Aboriginal objects or sites, or Aboriginal sites or objects located within proximity to the study area. The heritage induction should include the following items:

- Relevant legislation.
- Location of identified Aboriginal heritage sites, areas of archaeological potential, and areas of archaeological sensitivity.
- Basic identification skills for Aboriginal and non-Aboriginal artefacts and human remains.
- Procedure to follow in the event of an unexpected heritage item find during construction works.
- Procedure to follow in the event of discovery of human remains during construction works.
- Penalties and non-compliance.

### 7.3.8. Continued Aboriginal community consultation

As per the consultation requirements it is recommended that a copy of this report is provided to RAPs. It is also recommended that the proponent should continue to inform RAPs about the management of Aboriginal cultural heritage sites within the study area throughout the life of the project.

# 8. Recommendations

The recommendations below respond specifically to the wishes of the RAPs. Recommendations regarding the archaeological value of the site, and the subsequent management of Aboriginal cultural heritage is provided in the archaeological report (Appendix F).

Prior to any impacts occurring within the study area, the following is recommended.

### Recommendation 1: Continued consultation with the registered Aboriginal parties

It is recommended that TfNSW continue to inform these groups about the management of Aboriginal cultural heritage sites within the study area throughout the life of the project. This recommendation is in keeping with the consultation requirements.

Further consultation regarding a long-term care agreement for the artefacts proposed to be salvaged through community collection is required as only two responses were received as part of Stage 4 consultation.

### Recommendation 2: Application for an Aboriginal Heritage Impact Permit

Impacts to AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 cannot be avoided, therefore it is recommended that an AHIP covering the development footprint be obtained from Heritage NSW, Department of Planning and Environment (Heritage NSW) under Part 6 of the NPW Act, prior to impacts occurring. An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places, or that cause land to be disturbed for the purposes of discovering an Aboriginal object.

**The AHIP should be for a term of five (5) years. It is recommended that the AHIP cover the entirety of the study area.** The AHIP will allow for impacts to AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 to occur through the proposed development or salvage through community collection (Recommendation 3).

### Recommendation 3: Community surface collection of AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2

It is recommended that once an AHIP has been approved, AHIMS 61-6-0140/Alpine Way Culvert AS 2, AHIMS 61-6-0137/Alpine Way Culvert ISO 1, AHIMS 61-6-0135/Alpine Way Culvert AS 1 and AHIMS 61-6-0136/Alpine Way Culvert ISO 2 should be salvaged via community collection of surface artefacts before the proposed works commence.

A community collection methodology will need to be prepared by a suitably qualified archaeologist in consultation with RAPs. This methodology will then support the AHIP application to Heritage NSW.

### Recommendation 4: No further archaeological work required once an AHIP is obtained from Heritage NSW and community collection is complete

No further archaeological work (other than community collection) is required within the study area should the AHIP be approved. Works may proceed in accordance with the AHIP once community collection has been undertaken.

### Recommendation 5: Further archaeological assessment is required within Alpine Way Culvert PAD 1 if impacts cannot be avoided.

Alpine Way Culvert PAD 1 is located outside of the current development footprint. Should future development be unable to avoid impacts within the PAD boundary, further archaeological assessment in the form of an ACHAR and archaeological test excavations will be required within Alpine Way Culvert PAD 1.

### Recommendation 6: Fencing of the study area during construction

Prior to any construction works taking place, it is recommended that the study area be fenced off and secured to ensure that Alpine Way Culvert PAD 1 is conserved and remain unharmed by the adjacent proposed works. Fencing must remain in place over the lifespan of the construction phase. Alpine Way Culvert PAD 1 should be managed in accordance with Recommendation 5.

### Recommendation 7: Stop work provision for any potential heritage sites identified during construction

All Aboriginal places and objects are protected under the NPW Act. This protection extends to Aboriginal objects and places that have not been identified but might be unearthed during construction.

If construction proceeds without an approved AHIP, work must cease if Aboriginal objects or places are identified. TfNSW and the project archaeologist must be notified to make an assessment of the find and advise on subsequent management.

Historical archaeological sites are protected under the relics provisions (Sections 139–146) of the Heritage Act. Should any historical archaeological sites be identified during any phase of the proposed development, all works must cease in the vicinity of the find and the project archaeologist and TfNSW notified. Should the archaeological nature of the find be confirmed, the Heritage NSW will require notification.

### Recommendation 8: Stop work provision for any potential discovery of human remains

If any suspected human remains are discovered during any activity works, all activity in the vicinity must cease immediately. The remains must be left in place and protected from harm or damage. The following contingency plan describes the immediate actions that must be taken in instances where human remains, or suspected human remains, are discovered. Any such discovery at the study area must follow these steps:

1. **Discovery:** If suspected human remains are discovered all activity in the vicinity must stop to ensure minimal damage is caused to the remains; and the remains must be left in place and protected from harm or damage.
2. **Notification:** Once suspected human skeletal remains have been found, the Coroner's Office and the NSW Police must be notified immediately. Following this, and if the human remains are likely to be Aboriginal in origin, the find will be reported to the Aboriginal parties and Heritage NSW. If the find is likely to be non-Aboriginal in origin and more than 100 years in age, the heritage division of NSW will be notified of the find under Section 146 of the Heritage Act.

### Recommendation 9: Heritage induction

Heritage inductions for all site workers and contractors should be undertaken in order to prevent any unintentional harm to unexpected Aboriginal objects or sites, or Aboriginal sites or objects located within proximity to the study area. The heritage induction should include the following items:

- Relevant legislation.

- Location of identified Aboriginal heritage sites, areas of archaeological potential, and areas of archaeological sensitivity.
- Basic identification skills for Aboriginal and non-Aboriginal artefacts and human remains.
- Procedure to follow in the event of an unexpected heritage item find during construction works.
- Procedure to follow in the event of the discovery of human remains during construction works.
- Penalties and non-compliance.

# References

Allen J & O'Connell J 2003. 'The long and the short of it: archaeological approaches to determining when humans first colonised Australia and New Guinea', *Australian Archaeology*, 57: 5–19.

Attenbrow V 2002. *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, University of New South Wales Press Ltd, Sydney.

Australia ICOMOS 2013. *The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance*, Australia ICOMOS, Burwood, VIC.

Australian Government 2021. *Australian Alps National Parks and Reserves, The Alpine Way, Thredbo Village, NSW, Australia*, *Australian Heritage Database*, accessed 3 October 2021, http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;search=place_name%3DKosciuszko%3Bkeyword_PD%3Don%3Bkeyword_SS%3Don%3Bkeyword_PH%3Don%3Blatitude_1dir%3DS%3Blongitude_1dir%3DE%3Blongitude_2dir%3DE%3Blatitude_2dir%3DS%3Bin_region%3Dpart;place_id=105891.

Biosis 2016. *Darcoola West Water Efficiency Scheme Aboriginal Cultural Heritage Assessment Report*, Report prepared for NSW Department of Primary Industries Water. A Atkinson, S Smith, J Cole. Biosis Pty Ltd. Sydney, NSW. Project no. 19860.

Biosis 2019. *Stage 2 Kunama Ridge East Jindabyne: Salvage Excavation Report*, Report prepared for Friash Consulting on behalf of Kunama Developments Pty Ltd. Author: Gooley. T, Biosis Pty Ltd, Newcastle, NSW. Project no. 27225.

Bowler JM, Johnston H, Olley JM, Prescott JR, Roberts RG, Shawcross W, & Spooner NA 2003. 'New ages for human occupation and climatic change at Lake Mungo, Australia', *Nature*, 421, 6925: 837–840.

Chapman V 1977., *The Jindabyne Valley in Southern Uplands Prehistory: An Archaeological Investigation*,MAQ Thesis, Australian National University, Canberra ACT.

Clarkson C, Smith M, Marwick B, Fullager R, Wallis LA, Faulkner P, Manne T, Hayes E, Roberts RG, Jacobs Z, Carah X, Lowe KM, Matthews J, & Florin SA 2015. 'The archaeology, chronology and stratigraphy of Madjedbebe (Malakunanja II): A site in northern Australia with early occupation', *Journal of Human Evolution*, 83: 46–64.

DECCW 2010a. *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*, Department of Environment and Climate Change, Sydney NSW.

DECCW 2010b. *Aboriginal Cultural Heritage Consultation Requirements for Proponents*, New South Wales Government Department of Environment and Climate Change., Sydney, NSW.

Department of Planning, Industry and Environment 2016. *Australian Alps Bioregion*, accessed 15 February 2021, https://www.environment.nsw.gov.au/bioregions/AustralianAlpsBioregion.htm.

Dibden J 2003a. *Underground Cable Installation - Country Energy Blue Cow to Guthega Kosciusko National Park Aboriginal Archaeological Assessment*, Report to Nick Graham-Higgs.

Dibden J 2003b. *Proposed works at Perisher Valley, Smiggin Holes and Guthega: Sewerage Ponds Rehabilitation, Helipad Site, NPWS Office Block, Removal of Eremo Lodge Reservoir, Sewer Rising Main and Two Water Pipelines Aboriginal Archaeological Assessment*, Report to Nick Graham-Higgs.

Dibden J 2004. *Proposed Road Upgrade Works at Perisher Valley, Smiggin Holes and Guthega Aboriginal Archaeological Assessment*, Reprt to Nick Graham-Higgs.

Durham LJ 1959. 'Indicators of Land Deterioration in Snowy Mountains Catchments', *Journal of the Soil Conservation Service of NSW*, 15, 3: 1–26.

Flood J 1996. *Moth Hunters of the Australian Capital Territory, Aboriginal Traditional Life in the Canberra Region*, Gecko Books, Marleston, South Australia.

French JD 1965. *Discovery and Early History of Tumut Valley*, *Tumut History*, accessed 16 June 2020, http://www.tumuthistory.com/files/French_one_column.pdf.

Global Biodiversity Information Facility 2019. *Atlas of Living Australia - Species*, *Atlas of Living Australia*, http://biocache.ala.org.au/explore/your-area#-35.852755439790656|141.88285447714838|11|ALL_SPECIES.

Hamm G, Mitchell P, Arnold L, Prideaux G, Questiaux D, Spooner N, Levechenko V, Foley E, Worthy T, Stephenson B, Coulthard V, Coulthard C, Wilton S, & Johnston D 2016. 'Cultural innovation and megafauna interaction in the early settlement of arid Australia', *Nature*, 539: 280–297.

Hancock WK 1972. *Discovering Monaro: a study of man's impact on his environment*, Cambridge University Press, Cambridge.

JMCHM 2000. *Archaeological Survey for Aboriginal Sites: Proposed Light Industrial Subdivision, 'Austral Site', Mamre Road, Erskine Park, NSW*, Report prepared for Gunninah Environmental Consultants for Austral Brick Company. Jo McDonald Cultural Heritage Management Pty Ltd.

JMCHM 2005a. *Archaeological Salvage Excavation of Site CG1 (NPWS #45-5-2648), at the corner of Charles and George Streets, Parramatta, NSW*, Report prepared for Meriton Apartments Pty Ltd. Jo McDonald Cultural Heritage Management Pty Ltd.

JMCHM 2005b. *Archaeological Salvage Excavation of Site RTA-GI, 109-113 George Street, Parramatta, NSW*, Unpublished Report prepared for Landcom. Jo McDonald Cultural Heritage Management Pty Ltd.

JMCHM 2008. *Austral Land Mamre Road , Erskine Park Archaeological Salvage Excavations*, Report prepared for Macquarie Goodman. Jo McDonald Cultural Heritage Management Pty Ltd.

Marquis-Kyle P & Walker M 1994. *The illustrated Burra Charter : making good decisions about the care of important places*, Repr. with corrections., Australia ICOMOS with the assistance of the Australian Heritage Commission, Sydney, NSW.

Mitchell P 2002. *NSW (Mitchell) Landscapes*, Department of Environment and Climate Change NSW, Hurstville NSW.

Navin Officer 2000. *Perisher Range Resorts Area Aboriginal Cultural Heritage Study*, Report to Connell Wagner (NSW) Pty Ltd for the NSW NPWS.

OEH 2011. Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW, Office of Environment and Heritage, Department of Premier and Cabinet, Sydney NSW.

Ritter DF, Kochel RC, & Miller JR 1995. *Process Geomorphology*, Wm. C. Brown.

State Heritage Inventory 2013. *Bundian Way*, *State Heritage Inventory*, accessed 19 September 2023, https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=5060185.

State of NSW and Office of Environment and Heritage NSW 2011. *Operational Policy: Protecting Aboriginal Cultural Heritage.*,.

Strahler A 1952. 'Hypsometric (area-altitude) analysis of erosional topology', *Geological Society of America Bulletin*, 63, 11: 1117–1142.

Tindale NB 1974. *Aboriginal Tribes of Australia: The Terrain, Environmental Controls, Distribution, Limits and Proper names*, Australian National University, Canberra.

Transport for NSW 2011. *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*,.

# APPENDICES

# Appendix A. Consultation log

Please note, consultation was undertaken by TfNSW. Biosis has compiled the details of consultation undertaken as per the information provided to Biosis by TfNSW. For queries regarding consultation please liaise with TfNSW.

## Stage 1: Notification of project proposal and registration of interest

Correspondence associated with Actions 1-3 is presented in Appendix B.

### Action 1 – Identification of relevant Aboriginal stakeholders

| Organisation contacted | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|
| **Heritage NSW** | 31/10/2022, Email<br>01/05/2023, Email | 08/11/2023, Email<br>01/05/2023, Email | List of parties provided for Snowy Valley and Snowy Monaro LGAs.<br>Acknowledged receipt of details of updated RAP list, list of interested parties regarding the works, test excavation methodology and advertisement sent out to media outlets in the area |
| **Native Title Services CORP Limited** | 21/02/2023, Email | N/A | No response received. |
| **South East Local Land Services** | 21/02/2023, Email | 01/03/2023, Email | LLS note that they do not coordinate any Aboriginal reference group. LLS cannot provide a list of any RAPS. It is not the responsibility of LLS to contact or manage contact lists for Aboriginal communities or persons that may inform or provide comment on planning issues. |
| **Eden LALC** | 21/02/2023, Email | 21/02/2023, Email | Confirmed that Eden LALC would like to register for the project. |
| **NSW Aboriginal Land Council (Southern)** | 21/02/2023, Email | N/A | No response received. |
| **Snowy Monaro Regional Council** | 20/02/2023-21/02/2023, Email – correspondence lost. | Unknown – correspondence deleted. | They are not in a position to nominate an Aboriginal Person, recommended contacting Bega / Eden LALC. Correspondence to and from Snowy Monaro Regional Council was deleted by TfNSW and copies are not able to be provided. |
| **Aboriginal Cultural Heritage Advisory Committee, Kosciuszko National Park** | 21/02/2023, Email | N/A | No response received. |
| **Bega LALC** | 21/02/2023, Email | 27/02/2023, Email | Confirmed would like to register for the project. Workers can be provided to assist with site surveys for Aboriginal artefacts. Also informed that Bega LALC has provided |

| Organisation contacted | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|
| | | | assistance for similar works in the Snowy mountains. |

### Action 2 – Registration of Aboriginal parties and Action 5 – Register of Aboriginal parties

TfNSW accepted the list of contacts provided by Heritage NSW on 8 November 2022 as the RAPs for the project. The list of RAPs is presented in the following table.

| Organisation | | Contact |
|---|---|---|
| **Snowy Valleys LGA** | | |
| **4** | Adrian Brown | Adrian Brown ; Maree Moore |
| **8** | Alice Williams | Alice Williams |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | Shayne Dickson |
| **220** | Guntawang Aboriginal Resources Incorporated | Wendy Morgan |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | Jason Davison |
| **300** | Konanggo Aboriginal Cultural Heritage Services | Robert Young |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | - |
| **381** | Mundawari Heritage Consultants | Dean Delponte |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | Darleen Johnson ; Ryan Johnson |
| **418** | Ngunawal Heritage Aboriginal Corporation | Mrs Dorothy Carroll |
| **420** | Ngunnawal Elders Corporation | Mr Arnold Williams CEO |
| **445** | Oak Hill Enterprises | Sonia Shea |
| **502** | Snowy Mountains Indigenous Elders Group | Ramsay Freeman |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | Tyronne Bell |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | Dean Bell ; Merekai Bell |
| **Snowy Monaro LGA** | | |
| **4** | Adrian Brown | Adrian Brown ; Maree Moore |
| **8** | Alice Williams | Alice Williams |
| **30** | Badu (Murrin Clan/Peoples) | Karia Lea Bond |
| **46** | Bega Local Aboriginal Land Council | Peter Dixon |
| **51** | Bilinga (Murrin Clan/Peoples) | Simalene Carriage |
| **82** | Buru Ngunawal Aboriginal Corporation (BNAC) | Wally Bell |
| **98** | Clive Freeman (Archaeologist in a private company) | Clive Freeman |

| Organisation | | Contact |
|---|---|---|
| **113** | Corroboree Aboriginal Corporation | Marilyn Carroll-Johnson |
| **151** | Didge Ngunawal Clan | Lillie Carroll ; Paul Boyd |
| **161** | Eden Local Aboriginal Land Council | Mark Bateman |
| **162** | Chair of Eden LALC | BJ Cruze |
| **163** | Ellen Mundy | Ellen Mundy |
| **170** | Gadhu Dreaming | Gordon Campbell |
| **189** | Ginninderra Aboriginal Corporation | Steven Johnson; Krystle Carroll |
| **197** | Goobah Development PTY LTD (Murrin Clan/Peoples) | Basil Smith |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | Shayne Dickson |
| **220** | Guntawang Aboriginal Resources Incorporated | Wendy Morgan |
| **222** | Gunyuu (Murrin Clan/Peoples) | Kylie Ann Bell |
| **246** | Iris White | Iris White |
| **257** | Janine Thompson | Janine Thompson |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | Jason Davison |
| **265** | Jerringong (Murrin Clan/Peoples) | Joanne Anne Stewart |
| **284** | Karrial (Murrin Clan/Peoples) | Karrial Johnson |
| **298** | King Brown Tribal Group | Tina Brown |
| **300** | Konanggo Aboriginal Cultural Heritage Services | Robert Young |
| **338** | Maria Williams | Maria Williams |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | - |
| **350** | Members of the Southern Snowy Mountains Aboriginal Community MoU Working group | - |
| **353** | Merrigarn Indigenous Corporation | Shaun Carroll |
| **381** | Mundawari Heritage Consultants | Dean Delponte |
| **384** | Munyunga (Murrin Clan/Peoples) | Kaya Dawn Bell |
| **386** | Muragadi Heritage Indigenous Corporation | Jesse Johnson |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | Darleen Johnson ; Ryan Johnson |
| **413** | Ngarigo and Djiringanj people | John Dixon |
| **417** | Ngunawal Consultancy | Peiro Delponte |
| **418** | Ngunawal Heritage Aboriginal Corporation | Mrs Dorothy Carroll |
| **420** | Ngunnawal Elders Corporation | Mr Arnold Williams CEO |
| **423** | Ngurambang | Robert Monaghan |

| Organisation | | Contact |
|---|---|---|
| **439** | Nundagurri Aboriginal Corporation | Newton Carriage |
| **445** | Oak Hill Enterprises | Sonia Shea |
| **461** | Pemulwuy (Murrin Clan/Peoples) | Pemulwuy Johnson |
| **470** | Ramsay Freeman/Snowy Mountains Indigenous Elders Group | - |
| **525** | Thauaira | Shane Carriage |
| **533** | Thoorga Nura | John Carriage (Chief Executive Officer) |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | Tyronne Bell |
| **540** | Timothy Stubbs | Timothy Stubbs |
| **564** | Wagonga Local Aboriginal Land Council | - |
| **567** | Walbunja (Murrin Clan/Peoples) | Hika Te Kowhai |
| **568** | Walgalu (Murrin Clan/Peoples) | Ronald Stewart |
| **598** | Wingikara (Murrin Clan/Peoples) | Hayley Bell |
| **615** | Wullung (Murrin Clan/Peoples) | Lee-Roy James Boota |
| **623** | Yerramurra (Murrin Clan/Peoples) and Taste of Tradition Native Aboriginal Corporation | Robert Parson |
| **627** | Yukkumbruk | Serena Williams |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | Dean Bell ; Merekai Bell |

The following groups were specifically contacted and invited local Aboriginal people to register for consultation.

| Organisation contacted | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|
| **Eden LALC** | 21/02/2023, Email | 21/02/2023, Email | Requested that Confidential party 25 be registered for the project as the study area is within their boundary area. |
| **NSW Aboriginal Land Council (Southern)** | 21/02/2023, Email | N/A | No response received. |
| **Aboriginal Cultural Heritage Advisory Committee, Kosciuszko National Park** | 21/02/2023, Email | N/A | No response received. |
| **Bega LALC** | 21/02/2023, Email | 27/02/2023, Email | Confirmed would like to register for the project. Workers can be provided to assist with site surveys for Aboriginal artefacts. Also informed that Confidential party 19has |

| Organisation contacted | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|
| | | | provided assistance for similar works in the Snowy mountains. |
| **Native Title Services CORP Limited** | 21/02/2023, Email | N/A | No response received. |

The following groups/individuals confirmed they would like to register for the project.

| Organisation contacted | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|
| **Iris White** | N/A | 29/03/2023, Phone | Wished to register for the project. Suggested that members from South Coast NTS should not be involved due to the project being the Traditional Lands of the Monero-Ngarigo people and not part of or subject to the South Coast Peoples NT Claim. Confirmed available for AFG. |

**Action 3 – Public notice**

The public notice was published in the following publications:

- *Orbost Snowy River Mail* (22/02/2023, 01/03/2023)
- *Eden Imlay Magnet* (23/02/2023, 02/03/2023)
- *Bega District News* (24/02/2023)
- *Koori Mail* (08/03/2023)
- *National Indigenous Times* (20/02/2023)

Respondents were asked to respond by 22 March 2023. A copy of the advertisements are provided in Appendix B.

## Stage 2 and 3: Presentation of information about the proposed project and proposed assessment methodology

Correspondence associated with Actions 7, 9, 14 and 15 are presented in Appendix C.

Initial talks took place with custodians of the land and other interested parties with the intention to hold an AFG and establish the means of communication and rapport with stakeholders. The talks highlighted the following:

- AFG meeting and its necessities.
- OEH NSW involvement.
- LALC and its related items.
- Native Title Claims.
- TfNSW responsibilities.

- Stakeholder responsibilities.
- Request for their information being published – all accepted.

These conversations were held with the following groups:

| Organisation contacted | Date and type of contact |
|---|---|
| **Bega LALC** | 27/03/2023, Phone |
| **Didge Ngunawal Clan** | 27/03/2023, Phone |
| **Eden LALC** | 27/03/2023, Phone |
| **Ngarigo and Djiringanj Peoples** | 27/03/2023, Phone |

Correspondence took place regarding a venue for the AFG.

| Organisation contacted | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|
| **Eden LALC** | 24/02/2023, Email<br>27/03/2023, Email | 28/03/2023, Email | Confirmed meeting room at Jigamy Farm is available for proposed AFG on 12/04/2023. |
| **Iris White** | N/A<br>12/04/2023, Email | 31/03/2023, Email | Concerns around proposed venue at Eden LALC's Jigamy Farm. |

### Action 7 – Draft methodology review

RAPs were contacted on 31 March 2023 inviting them to the AFG and were provided with copies of the following documents:

- The proposed test excavation methodology.
- ASR (Stage 2 PACHI).
- Site officer application form.

RAPs were contacted again on 11/04/2023 advising of the change of venue for the AFG meeting. Selected RAPs were contacted by phone on 14/04/2023 to verify attendance at the AFG.

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **Snowy Valleys LGA** | | | | |
| **4** | Adrian Brown | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **8** | Alice Williams | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **220** | Guntawang Aboriginal Resources Incorporated | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | 31/03/2023, Email<br>11/04/2023, Email<br>14/04/2023, Phone | N/A | N/A |
| **300** | Konanggo Aboriginal Cultural Heritage Services | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | 31/03/2023, Mail | N/A | N/A |
| **381** | Mundawari Heritage Consultants | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **418** | Ngunawal Heritage Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **420** | Ngunnawal Elders Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **445** | Oak Hill Enterprises | 31/03/2023, Email | N/A | N/A |
| **502** | Snowy Mountains Indigenous Elders Group | 31/03/2023, Mail | N/A | N/A |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **Snowy Monaro LGA** | | | | |
| **4** | Adrian Brown | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **8** | Alice Williams | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **30** | Badu (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **46** | Bega Local Aboriginal Land Council | 31/03/2023, Email<br>11/04/2023, Email<br>14/04/2023, Phone | 14/04/2023, Phone | Advised over phone call Peter Dixon unsure if he will be coming. |
| **51** | Bilinga (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **82** | Buru Ngunawal Aboriginal Corporation (BNAC) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **98** | Clive Freeman (Archaeologist in a private company) | 31/03/2023, Email<br>11/04/2023, Email<br>18/04/2023, Phone<br>28/04/2023, Email | 18/04/2023, Phone | Discussion on the project over the phone. Discussed his history. Archaeologist that works in archaeological digs. Suggested that the AFG meeting be done through Microsoft Teams. Meeting details were sent by email to RAP on 28/04/2023. |
| **113** | Corroboree Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **151** | Didge Ngunawal Clan | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **161** | Eden Local Aboriginal Land Council | 31/03/2023, Email<br>11/04/2023, Email<br>14/04/2023, Phone | 14/04/2023, Phone | Mark Bateman advised over phone call that he will not be attending. |
| **162** | Chair of Eden LALC | 31/03/2023, Email<br>11/04/2023, Email<br>14/04/2023, Phone | 14/04/2023, Phone | BJ Cruse advised over phone call that he would attend |
| **163** | Ellen Mundy | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **170** | Gadhu Dreaming | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **189** | Ginninderra Aboriginal Corporation | 11/04/2023, Email | N/A | N/A |
| **197** | Goobah Development PTY LTD (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **220** | Guntawang Aboriginal Resources Incorporated | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **222** | Gunyuu (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **246** | Iris White | 31/03/2023, Email<br>14/04/2023, Phone | 14/04/2023, Phone | Advised over phone call that she will not be attending. |
| **257** | Janine Thompson | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | 31/03/2023, Email<br>11/04/2023, Email<br>14/04/2023, Text message | N/A | N/A |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **265** | Jerringong (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **284** | Karrial (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **298** | King Brown Tribal Group | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **300** | Konanggo Aboriginal Cultural Heritage Services | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **338** | Maria Williams | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | 31/03/2023, Mail | N/A | N/A |
| **350** | Members of the Southern Snowy Mountains Aboriginal Community MoU Working group | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **353** | Merrigarn Indigenous Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **381** | Mundawari Heritage Consultants | 30/03/2023, Email<br>31/03/2023, Email<br>11/04/2023, Email | 14/04/2023, Email<br>28/04/2023, Email and Phone | Confirmed unable to attend the AFG, but happy to discuss the project by phone.<br>Discussion regarding the topics and featured studied in the previous AFG. TfNSW talked about some general features and answered general questions about the physical works.<br>Mundawari Heritage Consultants provided some details on their experience and thoughts. Email sent inviting Mundawari Heritage Consultants to the alternative AFG over Microsoft Teams. |
| **384** | Munyunga (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **386** | Muragadi Heritage Indigenous Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **413** | Ngarigo and Djiringanj people | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **417** | Ngunawal Consultancy | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **418** | Ngunawal Heritage Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **420** | Ngunnawal Elders Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **423** | Ngurambang | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **439** | Nundagurri Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **445** | Oak Hill Enterprises | 31/03/2023, Email | N/A | N/A |
| **461** | Pemulwuy (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **470** | Ramsay Freeman/Snowy Mountains Indigenous Elders Group | 31/03/2023, Mail | N/A | N/A |
| **525** | Thauaira | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **533** | Thoorga Nura | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **540** | Timothy Stubbs | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **564** | Wagonga Local Aboriginal Land Council | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **567** | Walbunja (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **568** | Walgalu (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **598** | Wingikara (Murrin Clan/Peoples) | 11/04/2023, Email | N/A | N/A |
| **615** | Wullung (Murrin Clan/Peoples) | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |
| **623** | Yerramurra (Murrin Clan/Peoples) and Taste of Tradition Native Aboriginal Corporation | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **627** | Yukkumbruk | 31/03/2023, Email | N/A | N/A |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | 31/03/2023, Email<br>11/04/2023, Email | N/A | N/A |

### Action 8 – Aboriginal Focus Group meeting

The AFG was held at the BVSC Learning Center, Merimbula from 10:00-12:00 on 19/04/2023. The attendees are listed below, and a copy of the minutes are presented in Appendix C.

| Organisation | Representative |
|---|---|
| **Eden LALC** | BJ Cruse |
| **Ngarigo and Djiringanj Peoples** | John Dixon |
| **TfNSW** | Daniel Bojkovic |
| **TfNSW** | Tabatha Cann |
| **TfNSW** | Craig Robinson |
| **TfNSW** | John Turville |
| **TfNSW** | John Brooks |
| **TfNSW** | Tallara Andy |
| **Biosis** | Charlotte Allen |
| **Biosis** | Sunday de Joux |

A second AFG was held via Microsoft Teams on 5 May 2023 at the request of Confidential party 22.

### Action 9 – Provide AFG meeting minutes to RAPs

The RAPs were provided with a copy of the AFG minutes on 10/05/2023.

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **Snowy Valleys LGA** | | | | |
| **4** | Adrian Brown | 10/05/2023, Email | N/A | N/A |
| **8** | Alice Williams | 10/05/2023, Email | N/A | N/A |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | 10/05/2023, Email | N/A | N/A |
| **220** | Guntawang Aboriginal Resources Incorporated | 10/05/2023, Email | N/A | N/A |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | 10/05/2023, Email | N/A | N/A |
| **300** | Konanggo Aboriginal Cultural Heritage Services | 10/05/2023, Email | N/A | N/A |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | Not sent by TfNSW | N/A | N/A |
| **381** | Mundawari Heritage Consultants | 10/05/2023, Email | N/A | N/A |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | 10/05/2023, Email | N/A | N/A |
| **418** | Ngunawal Heritage Aboriginal Corporation | Not sent by TfNSW | N/A | N/A |
| **420** | Ngunnawal Elders Corporation | 10/05/2023, Email | N/A | N/A |
| **445** | Oak Hill Enterprises | 10/05/2023, Email | N/A | N/A |
| **502** | Snowy Mountains Indigenous Elders Group | Not sent by TfNSW | N/A | N/A |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | 10/05/2023, Email | N/A | N/A |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | 10/05/2023, Email | N/A | N/A |
| **Snowy Monaro LGA** | | | | |
| **4** | Adrian Brown | 10/05/2023, Email | N/A | N/A |
| **8** | Alice Williams | 10/05/2023, Email | N/A | N/A |
| **30** | Badu (Murrin Clan/Peoples) | Not sent by TfNSW | N/A | N/A |
| **46** | Bega Local Aboriginal Land Council | 10/05/2023, Email | N/A | N/A |
| **51** | Bilinga (Murrin Clan/Peoples) | Not sent by TfNSW | N/A | N/A |
| **82** | Buru Ngunawal Aboriginal Corporation (BNAC) | 10/05/2023, Email | N/A | N/A |
| **98** | Clive Freeman (Archaeologist in a private company) | 10/05/2023, Email | N/A | N/A |
| **113** | Corroboree Aboriginal Corporation | 10/05/2023, Email | N/A | N/A |
| **151** | Didge Ngunawal Clan | 10/05/2023, Email | N/A | N/A |
| **161** | Eden Local Aboriginal Land Council | 10/05/2023, Email | N/A | N/A |
| **162** | Chair of Eden LALC | 10/05/2023, Email | N/A | N/A |
| **163** | Ellen Mundy | 10/05/2023, Email | N/A | N/A |
| **170** | Gadhu Dreaming | 10/05/2023, Email | N/A | N/A |
| **189** | Ginninderra Aboriginal Corporation | Not sent by TfNSW | N/A | N/A |
| **197** | Goobah Development PTY LTD | 10/05/2023, Email | N/A | N/A |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| | (Murrin Clan/Peoples) | | | |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | 10/05/2023, Email | N/A | N/A |
| **220** | Guntawang Aboriginal Resources Incorporated | 10/05/2023, Email | N/A | N/A |
| **222** | Gunyuu (Murrin Clan/Peoples) | Not sent by TfNSW | N/A | N/A |
| **246** | Iris White | 10/05/2023, Email | N/A | N/A |
| **257** | Janine Thompson | 10/05/2023, Email | N/A | N/A |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | 10/05/2023, Email | N/A | N/A |
| **265** | Jerringong (Murrin Clan/Peoples) | Not sent by TfNSW | N/A | N/A |
| **284** | Karrial (Murrin Clan/Peoples) | Not sent by TfNSW | N/A | N/A |
| **298** | King Brown Tribal Group | 10/05/2023, Email | N/A | N/A |
| **300** | Konanggo Aboriginal Cultural Heritage Services | 10/05/2023, Email | N/A | N/A |
| **338** | Maria Williams | 10/05/2023, Email | N/A | N/A |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | Not sent by TfNSW | N/A | N/A |
| **350** | Members of the Southern Snowy Mountains Aboriginal Community MoU Working group | 10/05/2023, Email | N/A | N/A |
| **353** | Merrigarn Indigenous Corporation | 10/05/2023, Email | N/A | N/A |
| **381** | Mundawari Heritage Consultants | 10/05/2023, Email | N/A | N/A |
| **384** | Munyunga (Murrin Clan/Peoples) | Not sent by TfNSW | N/A | N/A |
| **386** | Muragadi Heritage Indigenous Corporation | 10/05/2023, Email | N/A | N/A |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | 10/05/2023, Email | N/A | N/A |
| **413** | Ngarigo and Djiringanj people | 10/05/2023, Email | N/A | N/A |
| **417** | Ngunawal Consultancy | 10/05/2023, Email | N/A | N/A |
| **418** | Ngunawal Heritage Aboriginal Corporation | Not sent by TfNSW | N/A | N/A |
| **420** | Ngunnawal Elders Corporation | 10/05/2023, Email | N/A | N/A |
| **423** | Ngurambang | 10/05/2023, Email | N/A | N/A |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **439** | Nundagurri Aboriginal Corporation | 10/05/2023, Email | N/A | N/A |
| **445** | Oak Hill Enterprises | 10/05/2023, Email | N/A | N/A |
| **461** | Pemulwuy (Murrin Clan/Peoples) | 10/05/2023, Email | N/A | N/A |
| **470** | Ramsay Freeman/Snowy Mountains Indigenous Elders Group | Not sent by TfNSW | N/A | N/A |
| **525** | Thauaira | Not sent by TfNSW | N/A | N/A |
| **533** | Thoorga Nura | 10/05/2023, Email | N/A | N/A |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | 10/05/2023, Email | N/A | N/A |
| **540** | Timothy Stubbs | 10/05/2023, Email | N/A | N/A |
| **564** | Wagonga Local Aboriginal Land Council | 10/05/2023, Email | N/A | N/A |
| **567** | Walbunja (Murrin Clan/Peoples) | 10/05/2023, Email | N/A | N/A |
| **568** | Walgalu (Murrin Clan/Peoples) | Not sent by TfNSW | N/A | N/A |
| **598** | Wingikara (Murrin Clan/Peoples) | Not sent by TfNSW | N/A | N/A |
| **615** | Wullung (Murrin Clan/Peoples) | Not sent by TfNSW | N/A | N/A |
| **623** | Yerramurra (Murrin Clan/Peoples) and Taste of Tradition Native Aboriginal Corporation | Not sent by TfNSW | N/A | N/A |
| **627** | Yukkumbruk | Not sent by TfNSW | N/A | N/A |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | 10/05/2023, Email | N/A | N/A |

The minutes from the AFG were also sent to two organisations which were not in the RAP list:

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| - | Bell | 10/05/2023, Email | N/A | N/A |
| - | Woka Corp | 10/05/2023, Email | N/A | N/A |

### Action 14 – Engage Aboriginal site officers

All RAPs were provided with Site Officer application forms as part of the AFG invitation to apply for participation in fieldwork. Correspondence regarding Site Officer applications is presented in the table below.

| Organisation contacted | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|
| **Guntawang Aboriginal Resources Incorporated** | 12/05/2023, Email | 21/04/2023, Email | Submitted application for Site Officer.<br>TfNSW confirmed successful application for Site Officer |
| **Yurwang Gundana Consultancy Cultural Heritage Services.** | 17/04/2023, Email<br>12/05/2023, Email | 17/04/2023, Email<br>10/05/2023, Email | Provided correct mobile number to TfNSW for phone call.<br>RAP followed up to clarify and confirmed application received.<br>TfNSW confirmed successful application for Site Officer |
| **Ngarigo and Djiringanj people** | 19/04/2023, Email | - | TfNSW resent application form. |
| **Murra Bidgee Mullangari Aboriginal Corporation** | 12/05/2023, Email | 21/04/2023, Email | Submitted application for Site Officer.<br>TfNSW confirmed unsuccessful application for Site Officer |
| **Ginninderra Aboriginal Corporation** | 04/05/2023, Email | 03/05/2023, Email | Requested confirmation that applications are still open, with application attached.<br>TfNSW confirmed that applications had closed but offered to keep details on file for future applications and be notified of future work. |
| **Muragadi Heritage Indigenous Corporation** | 05/05/2023, Email | 21/04/2023, Email | Submitted application for Site Officer.<br>TfNSW confirmed that applications were currently under review and would update with result soon. |

### Action 15 – Test excavations

Test excavations took place on 23/05/2023. The following organisations attended the test excavations.

| Organisation | Representative |
|---|---|
| **Guntawang Aboriginal Resources Incorporated** | - |
| **Yurwang Gundana Consultancy Cultural Heritage Services.** | - |

### Project update, December 2023

A project update was provided to RAPs on 18/12/25023 following a change to the study area boundary.

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **Snowy Valleys LGA** | | | | |
| **4** | Adrian Brown | 18/12/2023, Email | N/A | N/A |
| **8** | Alice Williams | 18/12/2023, Email | N/A | N/A |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **220** | Guntawang Aboriginal Resources Incorporated | 18/12/2023, Email | 02/01/2024, Email | Confirmed they would like to be included in the process of the project. |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | 18/12/2023, Email | N/A | N/A |
| **300** | Konanggo Aboriginal Cultural Heritage Services | 18/12/2023, Email | N/A | N/A |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | 18/12/2023, Mail | N/A | N/A |
| **381** | Mundawari Heritage Consultants | 18/12/2023, Email | N/A | N/A |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **418** | Ngunawal Heritage Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **420** | Ngunnawal Elders Corporation | 18/12/2023, Email | N/A | N/A |
| **445** | Oak Hill Enterprises | 18/12/2023, Email | N/A | N/A |
| **502** | Snowy Mountains Indigenous Elders Group | 18/12/2023, Mail | N/A | N/A |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | 18/12/2023, Email | N/A | N/A |
| **Snowy Monaro LGA** | | | | |
| **4** | Adrian Brown | 18/12/2023, Email | N/A | N/A |
| **8** | Alice Williams | 18/12/2023, Email | N/A | N/A |
| **30** | Badu (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **46** | Bega Local Aboriginal Land Council | 18/12/2023, Email | N/A | N/A |
| **51** | Bilinga (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **82** | Buru Ngunawal Aboriginal | 18/12/2023, Email | N/A | N/A |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| | Corporation (BNAC) | | | |
| **98** | Clive Freeman (Archaeologist in a private company) | 18/12/2023, Email | N/A | N/A |
| **113** | Corroboree Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **151** | Didge Ngunawal Clan | 18/12/2023, Email | N/A | N/A |
| **161** | Eden Local Aboriginal Land Council | 18/12/2023, Email | N/A | N/A |
| **162** | Chair of Eden LALC | 18/12/2023, Email | N/A | N/A |
| **163** | Ellen Mundy | 18/12/2023, Email | N/A | N/Aa |
| **170** | Gadhu Dreaming | 18/12/2023, Email | N/A | N/A |
| **189** | Ginninderra Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **197** | Goobah Development PTY LTD (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **220** | Guntawang Aboriginal Resources Incorporated | 18/12/2023, Email | 02/01/2024, Email | Confirmed they would like to be notified in the future regarding the project. |
| **222** | Gunyuu (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **246** | Iris White | Not sent by TfNSW | N/A | N/A |
| **257** | Janine Thompson | 18/12/2023, Email | N/A | N/A |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | 18/12/2023, Email | N/A | N/A |
| **265** | Jerringong (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **284** | Karrial (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **298** | King Brown Tribal Group | 18/12/2023, Email | N/A | N/A |
| **300** | Konanggo Aboriginal Cultural Heritage Services | 18/12/2023, Email | N/A | N/A |
| **338** | Maria Williams | 18/12/2023, Email | N/A | N/A |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | 18/12/2023, Mail | N/A | N/A |
| **350** | Members of the Southern Snowy Mountains Aboriginal Community MoU Working group | 18/12/2023, Email | N/A | N/A |
| **353** | Merrigarn Indigenous Corporation | 18/12/2023, Email | N/A | N/A |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **381** | Mundawari Heritage Consultants | 18/12/2023, Email | N/A | N/A |
| **384** | Munyunga (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **386** | Muragadi Heritage Indigenous Corporation | 18/12/2023, Email | N/A | N/A |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **413** | Ngarigo and Djiringanj people | 18/12/2023, Email | N/A | N/A |
| **417** | Ngunawal Consultancy | 18/12/2023, Email | N/A | N/A |
| **418** | Ngunawal Heritage Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **420** | Ngunnawal Elders Corporation | 18/12/2023, Email | N/A | N/A |
| **423** | Ngurambang | 18/12/2023, Email | N/A | N/A |
| **439** | Nundagurri Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **445** | Oak Hill Enterprises | 18/12/2023, Email | N/A | N/A |
| **461** | Pemulwuy (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **470** | Ramsay Freeman/Snowy Mountains Indigenous Elders Group | 18/12/2023, Mail | N/A | N/A |
| **525** | Thauaira | 18/12/2023, Email | N/A | N/A |
| **533** | Thoorga Nura | 18/12/2023, Email | N/A | N/A |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **540** | Timothy Stubbs | 18/12/2023, Email | N/A | N/A |
| **564** | Wagonga Local Aboriginal Land Council | 18/12/2023, Email | N/A | N/A |
| **567** | Walbunja (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **568** | Walgalu (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **598** | Wingikara (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **615** | Wullung (Murrin Clan/Peoples) | 18/12/2023, Email | N/A | N/A |
| **623** | Yerramurra (Murrin Clan/Peoples) and Taste of Tradition Native Aboriginal Corporation | 18/12/2023, Email | N/A | N/A |
| **627** | Yukkumbruk | 18/12/2023, Email | N/A | N/A |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | 18/12/2023, Email | N/A | N/A |

## Stage 4: Review of draft report

Correspondence associated with Actions 3-4 is presented in Appendix D.

### Appendix D Action 3 – Aboriginal party review of draft ACHA and Appendix D Action 4 – Hold an AFG meeting

RAPs were provided with a copy of the draft ACHAR and AAER on 29 February 2024 and were requested to provide any comments or feedback by 31 March 2024. As part of this correspondence, RAPs were invited to attend an AFG meeting on 29 February 2024, with the meeting to be held on 15 March 2024. Details of the Microsoft Teams online meeting were sent to those who had confirmed online attendance on 13 March 2024. The minutes from the AFG were provided to selected RAPs on 8 April 2024.

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **Snowy Valleys LGA** | | | | |
| **4** | Adrian Brown | 29/02/2024 Email | NA | NA |
| **8** | Alice Williams | 29/02/2024 Email | NA | NA |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | 29/02/2024 Email | NA | NA |
| **220** | Guntawang Aboriginal Resources Incorporated | 29/02/2024 Email<br>08/03/2024 Email<br>13/03/2024 Email<br>04/08/2024 Email | 02/03/2024 Email | Will attend on Microsoft Teams.<br>Mentioned during the meeting that the entire area is classified as disturbed. Artefacts have likely not come from the place itself. They are also unlikely to have arrived from Dead Horse Gap site as well. This could have been brought in by people from different areas nearby or on large journeys. The crews should aim to preserve and rebury on site after work. Avoid disturbance as much as possible. Supportive to having the ceremony with other Registered Aboriginal Parties (RAPs) if they suggest or comment on the event. Encourages that discussions and suggestions with RAPs as to the best way to protect artefacts and ways to return them to their original |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| | | | | locations. Mentions that places that are used to hold such ceremonies need to be approved. Highlighted that the significance of the artefacts show that they don't need to be in keeping places. |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | 29/02/2024 Email<br>08/04/2024 Email | 01/03/2024 Email | Accepted invite. |
| **300** | Konanggo Aboriginal Cultural Heritage Services | 29/02/2024 Email | NA | NA |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | 29/02/2024 Email | NA | NA |
| **381** | Mundawari Heritage Consultants | 29/02/2024 Email | NA | NA |
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | 29/02/2024 Email<br>08/04/2024 Email | 01/03/2024 Email | Accepted invite. |
| **418** | Ngunawal Heritage Aboriginal Corporation | 29/02/2024 Email | NA | NA |
| **420** | Ngunnawal Elders Corporation | 29/02/2024 Email | NA | NA |
| **445** | Oak Hill Enterprises | 29/02/2024 Email | NA | NA |
| **502** | Snowy Mountains Indigenous Elders Group | 29/02/2024 Email | NA | NA |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | 29/02/2024 Email | 01/03/2024 Email | Requested removal from RAP list for project/ outside Ngunnawal area |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | 29/02/2024 Email<br>08/03/2024 Email<br>13/03/2024 Email<br>22/04/2024 Email | 08/03/2024 Email<br>13/03/2024 Email<br>15/03/2024 Email | Apologies, unable to attend meeting.<br>Apologies, unable to attend meeting.<br>Provided the following response to the AFG minutes:<br>*Thanks for sending me this, sorry again I couldn't attend the meeting, Yurwang Gundana agrees that salvage should happen before any works can commence, as for the disturbance, I know it says it is disturbed but doesn't say* |

| Organisation | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|
| | | | *what by, cause there has been cases where an area has been disturbed really bad due to farming, road works, earth works to then when digging pits to a certain depth to find lots of artifacts & what looks to be campsites, I know it not common but there is always a possibility for this to occur.*<br>*As it is going to works done by transport in always since large machine, trucks, workers, do disturb & destroy (unknowingly of course)*<br>*Yurwang Gunana ask that if time and budget allows to as many salvage pits as possible, even in spots where it is not considered low-mid to High Potential, so we don't leave any bit of our heritage behind.*<br>*Yurwang Gundana members also ask that no matter the significance of the artifacts, that they be returned to country & placed somewhere safe as we considered everything from the smallest to the biggest, no matter the significance be placed in a safe place, as it still our history we do wish to be apart of the fieldwork and put our hand up for it giving our experience, but even if we are not chosen, we hope that Transport keeps in mind everything we have said*<br>*Thanks so much, for listening and for sending this information to me*<br>TfNSW responded as follows:<br>*Thanks for the email. I'm referring to the first three paragraphs asking for clarifications on artefact* |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| | | | | *preservation during and after work. Disturbance may occur due to excavators and worker traffic travelling through to site. The western bank will need to be excavated along with the river bed at the inlet end. This will be done to build the working apron. Any artefacts found will need to be salvaged by team members and preserved to be returned at a later date.*<br>*Salvage pits may be suitable in this case, however from the advice given by consultants undertaking the PACHCI process for TfNSW, they have analysed the excavation results of only one PAD to the west (PAD 2). During the excavation, samples were taken from that PAD and concluded with the artefact possessing low historical significance (page 37 of the Aboriginal Cultural Heritage Assessment Report). TfNSW will ensure to follow the recommendations in preserving the artefacts according to the advice given by the consultants and Heritage NSW in accordance to the report and legislation respectively.*<br>*As stated above TfNSW will return artefacts to their resting places after works.* |
| **Snowy Monaro LGA** | | | | |
| **4** | Adrian Brown | 29/02/2024 Email | NA | NA |
| **8** | Alice Williams | 29/02/2024 Email | NA | NA |
| **30** | Badu (Murrin Clan/Peoples) | 29/02/2024 Email | NA | NA |
| **46** | Bega Local Aboriginal Land Council | 29/02/2024 Email | NA | NA |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **51** | Bilinga (Murrin Clan/Peoples) | 29/02/2024 Email | NA | NA |
| **82** | Buru Ngunawal Aboriginal Corporation (BNAC) | 29/02/2024 Email | NA | NA |
| **98** | Clive Freeman (Archaeologist in a private company) | 29/02/2024 Email | NA | NA |
| **113** | Corroboree Aboriginal Corporation | 29/02/2024 Email<br>08/04/2024 Email | 25/03/2024 Email | Apologies, unable to attend meeting. |
| **151** | Didge Ngunawal Clan | 29/02/2024 Email | NA | NA |
| **161** | Eden Local Aboriginal Land Council | 29/02/2024 Email | NA | NA |
| **162** | Chair of Eden LALC | 29/02/2024 Email | NA | NA |
| **163** | Ellen Mundy | 29/02/2024 Email | NA | NA |
| **170** | Gadhu Dreaming | 29/02/2024 Email | NA | NA |
| **189** | Ginninderra Aboriginal Corporation | 29/02/2024 Email | NA | NA |
| **197** | Goobah Development PTY LTD (Murrin Clan/Peoples) | 29/02/2024 Email | NA | NA |
| **219** | Gunjeewong Cultural Heritage Aboriginal Corporation | 29/02/2024 Email | NA | NA |
| **220** | Guntawang Aboriginal Resources Incorporated | 29/02/2024 Email<br>08/03/2024 Email<br>13/03/2024 Email<br>04/08/2024 Email | 02/03/2024 Email | Will attend on Microsoft Teams.<br>Mentioned during the meeting that the entire area is classified as disturbed. Artefacts have likely not come from the place itself. They are also unlikely to have arrived from Dead Horse Gap site as well. This could have been brought in by people from different areas nearby or on large journeys. The crews should aim to preserve and rebury on site after work. Avoid disturbance as much as possible. Supportive to having the ceremony with other Registered Aboriginal Parties (RAPs) if they suggest or comment on the event. Encourages that discussions and suggestions with RAPs |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| | | | | as to the best way to protect artefacts and ways to return them to their original locations. Mentions that places that are used to hold such ceremonies need to be approved. Highlighted that the significance of the artefacts show that they don't need to be in keeping places. |
| **222** | Gunyuu (Murrin Clan/Peoples) | 29/02/2024 Email | NA | NA |
| **246** | Iris White | 29/02/2024 Email | NA | NA |
| **257** | Janine Thompson | 29/02/2024 Email | NA | NA |
| **259** | Jason Davison (representative of Ngarigo and Djiringanj people) | 29/02/2024 Email<br>11/03/2024 Phone<br>08/04/2024 Email | 01/03/2024 Email<br>11/03/2024 Phone | Accepted invite.<br>Record of phone conversation: unhappy with no invite to excavation works, not being paid for travel to meeting and having to pay for National Park entry |
| **265** | Jerringong (Murrin Clan/Peoples) | 29/02/2024 Email | NA | NA |
| **284** | Karrial (Murrin Clan/Peoples) | 29/02/2024 Email | NA | NA |
| **298** | King Brown Tribal Group | 29/02/2024 Email | NA | NA |
| **300** | Konanggo Aboriginal Cultural Heritage Services | 29/02/2024 Email | NA | NA |
| **338** | Maria Williams | 29/02/2024 Email | NA | NA |
| **345** | Matilda House (on behalf of Williams, Freeman and Simpson-Wedge families) | 29/02/2024 Email | NA | NA |
| **350** | Members of the Southern Snowy Mountains Aboriginal Community MoU Working group | 29/02/2024 Email | NA | NA |
| **353** | Merrigarn Indigenous Corporation | 29/02/2024 Email | NA | NA |
| **381** | Mundawari Heritage Consultants | 29/02/2024 Email | NA | NA |
| **384** | Munyunga (Murrin Clan/Peoples) | 29/02/2024 Email | NA | NA |
| **386** | Muragadi Heritage Indigenous Corporation | 29/02/2024 Email | NA | NA |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| **390** | Murra Bidgee Mullangari Aboriginal Corporation | 29/02/2024 Email<br>08/04/2024 Email | 01/03/2024 Email | Accepted invite. |
| **413** | Ngarigo and Djiringanj people | 29/02/2024 Email<br>13/03/2024 Email<br>08/04/2024 Email | 08/03/2024 Phone<br>13/03/2024 Email | Apologies<br>Record of phone conversation: didn't receive excavation findings, can attend meeting |
| **417** | Ngunawal Consultancy | 29/02/2024 Email | NA | NA |
| **418** | Ngunawal Heritage Aboriginal Corporation | 29/02/2024 Email | NA | NA |
| **420** | Ngunnawal Elders Corporation | 29/02/2024 Email | NA | NA |
| **423** | Ngurambang | 29/02/2024 Email | NA | NA |
| **439** | Nundagurri Aboriginal Corporation | 29/02/2024 Email | NA | NA |
| **445** | Oak Hill Enterprises | 29/02/2024 Email | NA | NA |
| **461** | Pemulwuy (Murrin Clan/Peoples) | 29/02/2024 Email | NA | NA |
| **470** | Ramsay Freeman/Snowy Mountains Indigenous Elders Group | 29/02/2024 Email | NA | NA |
| **525** | Thauaira | 29/02/2024 Email | NA | NA |
| **533** | Thoorga Nura | 29/02/2024 Email | NA | NA |
| **535** | Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation | 29/02/2024 Email | 01/03/2024 Email | Requested removal from RAP list for project/ outside Ngunnawal area |
| **540** | Timothy Stubbs | 29/02/2024 Email | NA | NA |
| **564** | Wagonga Local Aboriginal Land Council | 29/02/2024 Email | NA | NA |
| **567** | Walbunja (Murrin Clan/Peoples) | Not contacted by TFNSW | NA | NA |
| **568** | Walgalu (Murrin Clan/Peoples) | Not contacted by TFNSW | NA | NA |
| **598** | Wingikara (Murrin Clan/Peoples) | Not contacted by TFNSW | NA | NA |
| **615** | Wullung (Murrin Clan/Peoples) | Not contacted by TFNSW | NA | NA |
| **623** | Yerramurra (Murrin Clan/Peoples) and Taste of Tradition Native Aboriginal Corporation | Not contacted by TFNSW | NA | NA |
| **627** | Yukkumbruk | Not contacted by | NA | NA |

| Organisation | | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|---|
| | | TFNSW | | |
| **631** | Yurwang Gundana Consultancy Cultural Heritage Services. | 29/02/2024 Email<br>08/03/2024 Email<br>13/03/2024 Email<br>22/04/2024 Email | 08/03/2024 Email<br>13/03/2024 Email<br>15/03/2024 Email | Apologies, unable to attend meeting.<br>Apologies, unable to attend meeting.<br>Provided the following response to the AFG minutes:<br>*Thanks for sending me this, sorry again I couldn't attend the meeting, Yurwang Gundana agrees that salvage should happen before any works can commence, as for the disturbance, I know it says it is disturbed but doesn't say what by, cause there has been cases where an area has been disturbed really bad due to farming, road works, earth works to then when digging pits to a certain depth to find lots of artifacts & what looks to be campsites, I know it not common but there is always a possibility for this to occur.*<br>*As it is going to works done by transport in always since large machine, trucks, workers, do disturb & destroy (unknowingly of course)*<br>*Yurwang Gunana ask that if time and budget allows to as many salvage pits as possible, even in spots where it is not considered low-mid to High Potential, so we don't leave any bit of our heritage behind.*<br>*Yurwang Gundana members also ask that no matter the significance of the artifacts, that they be returned to country & placed somewhere safe as we considered everything from the smallest to the biggest, no matter the* |

| Organisation | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|
| | | | *significance be placed in a safe place, as it still our history we do wish to be apart of the fieldwork and put our hand up for it giving our experience, but even if we are not chosen, we hope that Transport keeps in mind everything we have said Thanks so much, for listening and for sending this information to me*<br>TfNSW responded as follows:<br>*Thanks for the email. I'm referring to the first three paragraphs asking for clarifications on artefact preservation during and after work. Disturbance may occur due to excavators and worker traffic travelling through to site. The western bank will need to be excavated along with the river bed at the inlet end. This will be done to build the working apron. Any artefacts found will need to be salvaged by team members and preserved to be returned at a later date.*<br>*Salvage pits may be suitable in this case, however from the advice given by consultants undertaking the PACHCI process for TfNSW, they have analysed the excavation results of only one PAD to the west (PAD 2). During the excavation, samples were taken from that PAD and concluded with the artefact possessing low historical significance (page 37 of the Aboriginal Cultural Heritage Assessment Report). TfNSW will ensure to follow the recommendations in* |

| Organisation | Date and type of contact | Date and type of response | Response details |
|---|---|---|---|
| | | | *preserving the artefacts according to the advice given by the consultants and Heritage NSW in accordance to the report and legislation respectively.*<br>*As stated above TfNSW will return artefacts to their resting places after works.* |

# Appendix B. Stage 1: Notification of project proposal and registration of interest

# Appendix C. Stage 2 and 3: Presentation of information about the proposed project and proposed assessment methodology

# Appendix D. Stage 4: Review of draft report

# Appendix E. Aboriginal Cultural Heritage Survey Report (PACHCI Stage 2)

# Appendix F. Aboriginal Archaeological Excavation Report (Stage 3 PACHCI)

## Contact

Charlotte Allen

Senior Heritage Consultant

callen@biosis.com.au

+61 437 641 267

# Appendix F - Biodiversity Assessment Report (BAR)

# Culvert lining work at Thredbo River on Alpine Way (MR677)

## Biodiversity Assessment Report

Transport for NSW | December 2020



NSW GOVERNMENT

BLANK PAGE

# Culvert lining work at Thredbo River on Alpine Way (MR677)

## Biodiversity Assessment Report

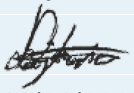
Transport for NSW | December 2020

Prepared by EnviroKey Pty. Ltd

Copyright: The concepts and information contained in this document are the property of Transport for NSW. Use or copying of this document in whole or in part without the written permission of Transport for NSW constitutes an infringement of copyright.

# Document controls

## Approval and authorisation

| | |
|---|---|
| Title | Biodiversity assessment report |
| Accepted on behalf of Transport for NSW by: | Daniel Bojkovic<br>Project Engineer |
| Signed: |  |
| Dated: | 11/01/2021 |

# Executive summary

EnviroKey were engaged by Transport for New South Wales (TfNSW) to carry out a Biodiversity Assessment (BA) for a proposal to remediate culverts at the Thredbo River on Alpine Way (MR677). The proposal is required to improve the structural integrity of the culverts to ensure the safety of road users along MR677 as well as increase the efficient operation of the culverts.

The proposal is located within an area of native vegetation and is surrounded by one of state's largest national park, Kosciuszko National Park. Thredbo River flows through the study area from south to north. Two plant community types were recorded within the study area. These being PCT 641 Alpine grassland/herbfield and open heathlands in Kosciuszko National Park, Australian Alps Bioregion and PCT 644 Alpine Snow Gum - Snow Gum shrubby woodland at intermediate altitudes in northern Kosciuszko NP, South Eastern Highlands Bioregion and Australian Alps Bioregion. A threatened ecological community is also present. This being 'The aquatic ecological community of the Snowy River catchment in NSW', as listed by the *Fisheries Management Act 1994*.

The aquatic habitat within the study area is of varying condition, largely due to the previous construction of the culverts for the Alpine Way formation. The stream is highly disturbed and modified in the immediate vicinity of the existing culverts, however, both upstream and downstream, the in-stream and riparian habitats are in good condition. The stream width is variable in the study area; between 3-7 metres. Riffle depth where present is between 10-30 centimetres and the amount of shading on the stream is between 0-5 percent. Substrates are dominated by gravel and rock. No aquatic macrophytes were recorded. Regardless of in-stream and riparian characteristics, the Thredbo River forms part of the Aquatic Ecological Community in the catchment of the Snowy River in NSW (FM Act).

A single threatened species was detected during the field survey. This being a Scarlet Robin, listed as vulnerable under the NSW *Biodiversity Conservation Act 2016*.

The proposed work would result in both temporary and permanent impact to both terrestrial and aquatic habitat. The proposed work would result in the blockage of up to three culverts to enable the lining of the culverts to occur. During this process, at least one other culvert would remain open and given the temporary increase in the cross section of water, fish passage would be maintained. Once the proposed work is completed in the blocked culverts, the process would be switched to reopen the previously blocked culverts, and therefore diverting the flow of water into the newly opened culverts. This process of work would ensure that the flow, and any impacts to fish passage are minimised.

To enable the proposed work to occur, a temporary clean gravel pad would be placed within the stream (southern side). This would provide a pad for the excavator that would be required during the proposed work period. This would also be placed in position to ensure fish passage is maintained around it.

Permanent removal of a small area of riparian vegetation would occur. Remaining impacts to vegetation would be temporary, ie machinery and materials storage, moving across open, grassy areas. Some small shrubs would also be removed. Downstream of the culverts, it is proposed to put rock rip-rap on the curtains of the culvert. This would provide additional bank stability and reducing erosion which would ensure fish and aquatic invertebrates passage through this section of the Thredbo River.

This assessment has concluded that the proposal is '*unlikely*' to have a significant effect on any listed threatened flora and fauna species, communities, and their habitats in accordance with the BC Act and FM Act. Additional assessment has also determined that the proposal is '*unlikely*' to have a significant effect on any EPBC Act listed threatened and migratory biota and their habitats or other matters of national environmental significance. Therefore, a species impact statement is not required.

A series of mitigation measures are proposed that have been developed with specific regard to the proposal using the TfNSW *Biodiversity Guidelines: Protecting and Managing Biodiversity on TfNSW projects* and site-specific safeguards to minimise potential impact to biodiversity.

# Contents


**1. Introduction ..... 1**
1.1 Proposal background ..... 1
1.2 The proposal ..... 1
1.3 Legislative context ..... 4
**2. Methods ..... 5**
2.1 Personnel ..... 5
2.2 Background research ..... 6
2.3 Habitat assessment ..... 7
2.4 Field survey ..... 7
**3. Existing environment ..... 13**
3.1 Plant community types ..... 13
3.2 Threatened ecological communities ..... 19
3.3 Threatened species ..... 23
3.4 Areas of outstanding biodiversity value ..... 27
3.5 Wildlife connectivity corridors ..... 27
3.6 Matters of National Environmental Significance ..... 27
**4. Avoidance and minimisation ..... 28**
**5. Impact assessment ..... 29**
5.1 Construction impacts ..... 29
5.2 Indirect/operational impacts ..... 31
5.3 Cumulative impacts ..... 32
5.4 Assessments of significance ..... 32
**6. Mitigation ..... 36**
**7. Conclusion ..... 40**
**8. References ..... 41**

# Tables

Table 2.1 Qualifications and experience of personnel ..... 5
Table 2.2 Database searches ..... 6
Table 2-3: Targeted species survey details ..... 12
Table 3-1: Plant community types ..... 13
Table 3-2: Habitat assessment and surveys results ..... 23
Table 5-1: Impacts on vegetation ..... 29
Table 5-2: Impacts on terrestrial and aquatic threatened and migratory species habitat ..... 30
Table 5-3: Summary of the findings of the BC Act, FM Act and EPBC Act significance assessments ..... 33
Table 6-1: Mitigation measures ..... 37

# Figures

Figure 1-1: Proposal context ..... 2
Figure 1-2: The location of the Proposal ..... 3
Figure 2-1: Threatened and migratory bird records in the locality ..... 9
Figure 2-2: Threatened flora records in the locality ..... 10
Figure 2-3: Other existing threatened species records in the locality ..... 11
Figure 3-1: Plant community types of the study area ..... 18
Figure 3-2: Threatened ecological communities of the study area ..... 20
Figure 3-3: Locations of the threatened species recorded during the field survey ..... 26

# Annexures



| | |
|---|---|
| Annexure A | Consultation with DPI Fisheries |
| Annexure B | Species recorded |
| Annexure C | Habitat assessment table |
| Annexure D | Significance assessments |
| Annexure E | Protected Matters Search Tool results |
| Annexure F | Priority Weed Declarations |

# Glossary of terms

| Definitions | |
|---|---|
| Biodiversity offsets | Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of proposal (OEH 2017). |
| Construction footprint | The area to be directly impacted by the proposal during construction activities. Analogous with subject land (see 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)(BAM 2017) |
| Habitat | An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component. |
| Indirect impact | Indirect impacts include but not limited to:<br>(a) indirect impacts on adjacent vegetation and habitat during construction<br>(b) indirect impacts on adjacent vegetation and habitat during operation<br>(c) impacts on adjacent vegetation and habitat arising from a change in land-use patterns (BAM 2017) |
| Local population | The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately (OEH 2017). |
| MNES | A matter of national environmental significance (MNES) protected by a provision of Part 3 of the EPBC Act |
| Mitchell landscape | Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (OEH 2014). |
| Mitigation | Action to reduce the severity of an impact (OEH 2014). |
| Mitigation measure | Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality or injury. |
| Native vegetation | (a) trees (including any sapling or shrub or any scrub),<br>(b) understorey *plants*,<br>(c) groundcover (being any type of herbaceous vegetation),<br>(d) *plants* occurring in a wetland.<br>A *plant* is native to New South Wales if it was established in New South Wales before European settlement (BC Act). |

| Definitions | |
|---|---|
| OEH BAM Credit Calculator (BCC) | An online application of the Biodiversity Assessment Method (BAM). The calculator uses the rules and calculations outlined in the BAM, and allows the user to apply the BAM at a site and observe the results of the assessment. |
| 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. |
| Population | A group of organisms, all of the same species, occupying a particular area (BAM 2017). |
| Proposal area/site/ footprint | The area of land that is directly impacted on by the proposal that is being assessed under the EP&A Act, including access roads, and areas used to store construction materials (OEH 2014). It includes the construction and operational areas for the proposal. |
| Study area | The area directly affected by the proposal and any additional areas likely to be affected by the proposal, either directly or indirectly (OEH 2014). |
| Target species | A species has been identified within the study area or is considered to have a moderate to high likelihood of occurrence and may be impacted by the proposal. |

| Abbreviations | |
|---|---|
| BAM | Biodiversity Assessment Method (OEH 2018) |
| BC Act | Biodiversity Conservation Act 2017 |
| BOS | Biodiversity Offset Scheme under the BC Act |
| CEEC | Critically Endangered Ecological Community |
| CEMP | Construction Environmental Management Plan |
| DoEE | Department of Environment and Energy |
| DP&E | Department of Planning and Environment |
| DPI | Department of Primary Industries |
| EEC | Endangered ecological community |
| EPBC Act | Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth). |
| FM Act | Fisheries Management Act 1994 (NSW) |
| GDE | Groundwater dependent ecosystems |
| IBRA | Interim Biogeographically Regionalisation of Australia |
| MNES | Matters of National Environmental Significance |
| OEH | Office of Environment and Heritage |
| PCT | Plant Community Type |
| REF | Review of Environmental Factors |

| Abbreviations | |
|---|---|
| SEPP | State Environmental Planning Policy |
| TECs | Threatened Ecological Communities |
| TBDC | Threatened Biodiversity Data Collection |
| VEC | Vulnerable Ecological Community |
| VIS | Vegetation information system |

# 1. Introduction

## 1.1 Proposal background

Transport for New South Wales (TfNSW) propose to remediate culverts at the Thredbo River on Alpine Way (MR677). The proposal is required to improve the structural integrity of the culverts to ensure the safety of road users along MR677 as well as increase the efficient operation of the culverts.

EnviroKey were engaged by TfNSW to carry out a Biodiversity Assessment (BA) that would form part of a Minor Works Review of Environmental Factors (Minor Works REF) to be assessed under Division 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). For this proposal, TfNSW would be the proponent and determining authority. Accordingly, the proposed work and associated environmental impact would be assessed in the context of clause 228 of the NSW *Environmental Planning and Assessment Regulation 2000*, the NSW *Biodiversity Conservation Act 2016* (BC Act) and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In accordance with the requirements of Section 111 of the EP&A Act, a Minor Works REF allows TfNSW to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of a proposed activity. The BA would be an appendix to the Minor Works REF that TfNSW are currently preparing.

## 1.2 The proposal

The proposal is to remediate culverts at the Thredbo River on Alpine Way (MR677). The proposal is required to improve the structural integrity of the culverts to ensure the safety of road users along MR677 as well as increase the efficient operation of the culverts.

The study area is located within the Australian Alps Bioregion (NPWS, 2003, Thackway and Creswell, 1995), in the Snowy Monaro Regional Council LGA and at the border of the Main Range Sub-alpine and Chimneys Ridge Sub-alpine Mitchell landscape (Mitchell, 2002). The regional location of the proposal is provided in Figure 1-1.

The extent of the study area has been developed to allow flexibility in preparing the final methodology for the proposed work by considering a larger area than required

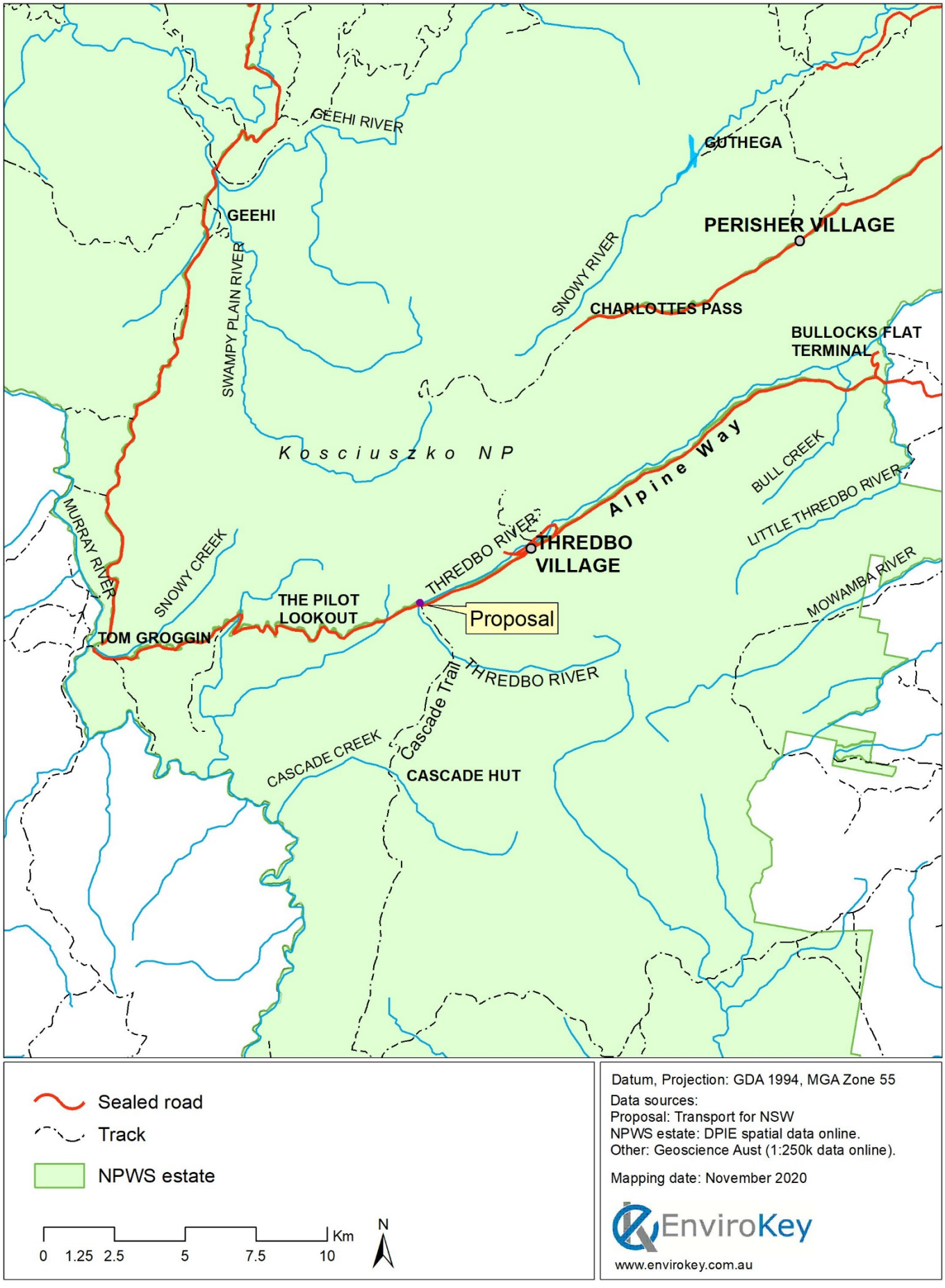



Figure 1-1: Proposal context

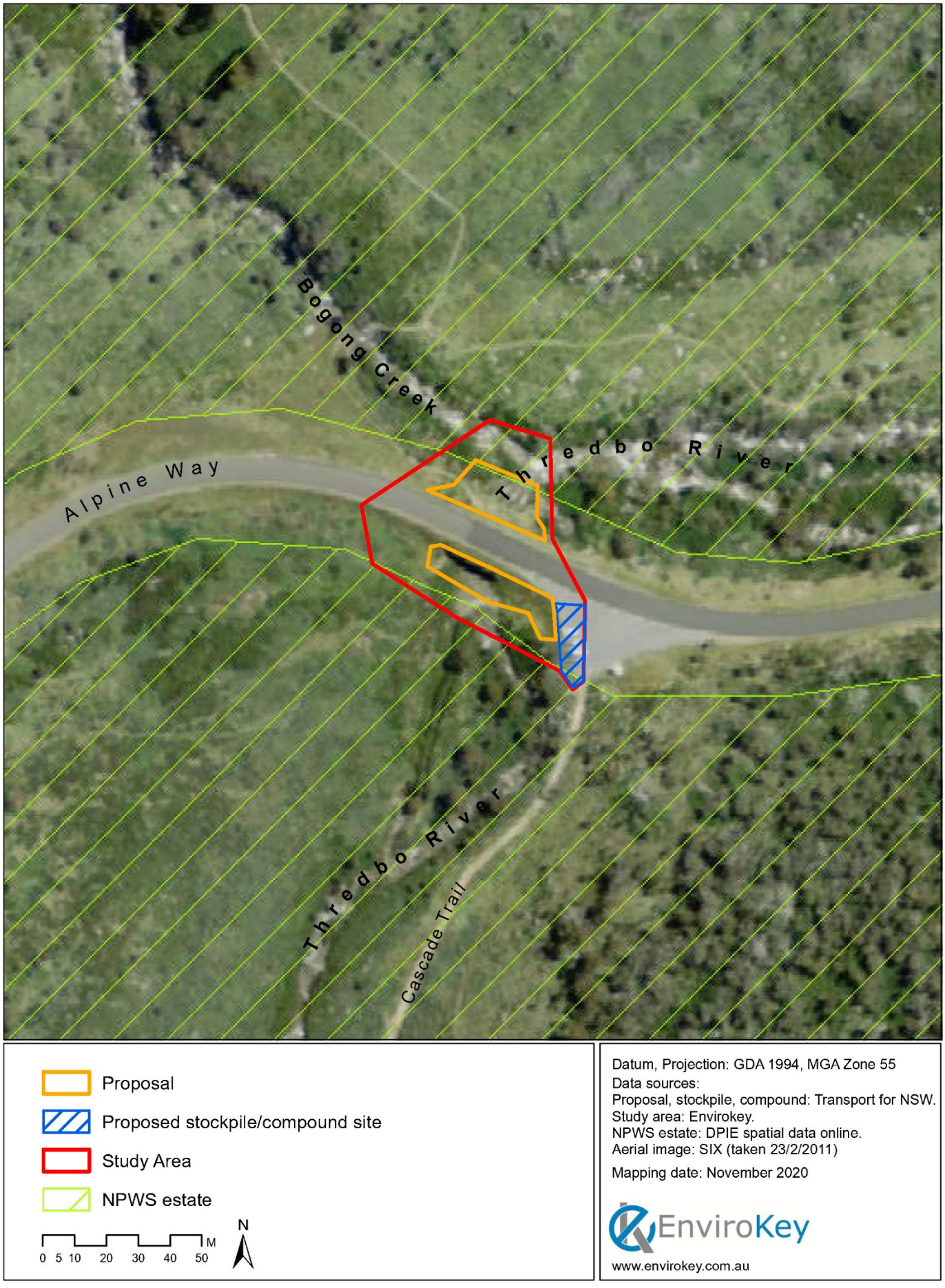



Figure 1-2: The location of the Proposal

## 1.3 Legislative context

A Review of Environmental Factors (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 proposal, and assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

Sections 7.2 A of the BC Act and Part 7A of the FM Act require that the significance of the impact on threatened species, and endangered ecological communities is assessed using a five-part test. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Director-General's requirements or a Biodiversity Proposal 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 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 proposals assessed via an REF:

- must address and consider potential impacts on nationally listed threatened species, populations, ecological communities and migratory species, including application of the "avoid, minimise, mitigate and offset" hierarchy
- do not require referral to the Federal Department of the Environment for these matters, even if the activity is likely to have a significant impact.

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

## 1.4 Consultation

NSW DPI Fisheries have been contacted by TfNSW as part of the consultation process. DPI Fisheries have stated that the Minor Works REF must include an assessment of the impacts to fish passage from the alteration of structures, as well as the potential impact of the proposed work on the Snowy River Aquatic EEC.

This BA includes an assessment under the *Fisheries Management Act 1994* (FM Act), and provides a series of recommendations regarding the design of the proposal in terms of fish passage as well as riparian and aquatic rehabilitation at the completion of the proposed work.

Correspondence from NSW DPI Fisheries is provided in Appendix A.

# 2. Methods

## 2.1 Personnel

The personnel involved in this assessment and an overview of their qualifications is included in Table 2.1.

Table 2.1 Qualifications and experience of personnel

| Name and Qualifications | Experience |
|---|---|
| **Steve Sass**<br>B.App.Sci (Env.Sci) (Hons), GradCert.CaptVertMngt (CSU)<br>Director / Principal Ecologist<br><br>Certified Environmental Practitioner, EIANZ<br>OEH Biodiversity Accredited Assessor (BAAS17047)<br>Member, Ecological Consultants Association of NSW | Steve is a highly experienced Ecologist having undertaken hundreds of terrestrial and aquatic ecological surveys and assessments across Australia since 1992. He has an in-depth working knowledge of environmental and biodiversity legislation across all states and territories which allows him to provide detailed and accurate assessments and formulate practical solutions to clients and specific projects on a case-by-case basis.<br>Steve is current Councillor of the Ecological Consultants Association of NSW. Steve was recently given "Expert" status for a number of threatened species listed under the NSW *Biodiversity Conservation Act 2016* and is on a panel reporting directly to the Minister for a review of matters relating to wildlife under the BC Act.<br>Previous and current research holds Steve in high regard within both the scientific and ecological consultants' community. To date, Steve has published, submitted or has in preparation, thirty-six manuscripts within peer-reviewed scientific journals, many of which are relate to threatened species survey, monitoring or management.<br>Steve has extensive experience in Southern NSW. Over the past 15 years, he has completed or provided specialist biodiversity advice for more than 1,300 environmental assessments for projects such as residential and industrial developments, highway upgrades and telecommunications, water, sewerage, energy, mining and electricity network infrastructure projects.<br>Steve is the Principal Ecologist of EnviroKey. For the BA, he managed the project, led the field surveys and prepared this report. |
| **Linda Sass**<br>Ass.Deg. Gn.St (Science), B.A, Dip. Ed (Sec)<br><br>Director / Senior Ecologist<br>Member, Ecological Consultants Association of NSW (ECA) | Linda is an experienced ecologist having conducted flora and fauna surveys across NSW over the past 12 years.<br>Linda has extensive experience with the flora and fauna of southern and western NSW. In recent years, she has completed biodiversity surveys for a number of projects along MR279, MR284, and MR677.<br>For this project, Linda carried out a number of botanical identifications from field samples and conducted an internal review of the BA. |

| Name and Qualifications | Experience |
|---|---|
| **Mark Harris**<br>B.App.Sci (Natural Resource Management)<br>GIS Analyst | Mark is a highly experienced GIS Analyst having been employed by a number of government agencies over the last 15 years. Mark prepared the maps within this BA and the GIS data for provision to the client. |

## 2.2 Background research

Background research is required to collect and review information on the presence or likelihood of occurrence of:

- Threatened and protected terrestrial and aquatic flora and fauna species and their habitat
- Threatened ecological communities
- Important habitat for migratory species
- Critical habitats.

The database searches carried out for this BA are included in Table 2.2.

Table 2.2 Database searches

| Database | Search For | Search Area | Timing |
|---|---|---|---|
| BioNET Atlas | Threatened species, migratory species, JAMBA, CAMBA, ROKAMBA | 10 kilometre radius | 20/11/2020 |
| OEH Threatened species profile search | Threatened flora, fauna and ecological communities | Study area | 20/11/2020 |
| EPBC Act Protected Matters Search | Threatened flora and fauna, endangered populations, ecological communities and migratory species | 10 kilometre radius | 25/11/2020 |
| OEH vegetation information system (VIS) | Vegetation communities and descriptions | Study area | 23/11/2020 |
| OEH Vegetation Types Database | Vegetation communities | Study area | 23/11/2020 |
| Department of Environment's directory of important wetlands | Important wetlands | 10 kilometre radius | 23/11/2020 |
| Priority weeds database | Declared priority weeds | Snowy Monaro Regional Council | 25/11/2020 |

Additionally, a literature review for any relevant local information was conducted on 25 November 2020 using the following key words: Alpine Way, biodiversity, weed, vegetation, management plan, Thredbo River, aquatic. The search also extended to previous environmental assessments in proximity to the proposal. The literature review identified the following:

- REF, Lower Thredbo Valley Track, Kosciuszko National Park (EnviroKey, 2015)
- REF, Thredbo River Bank Stabilisation Project (EnviroKey, 2014)
- Snowy River Aquatic Ecological Community final determination (DPI, 2011).

These documents were considered in this BA where appropriate.

## 2.3 Habitat assessment

The desktop analysis and literature review found that threatened biota are regularly recorded in the locality. Figure 2-1-3 indicates the previous records of threatened biota that have been recorded within the locality (10 kilometre radius).

A habitat assessment for the threatened species with potential to occur within the vicinity of the proposal is provided in Annexure C. This revealed that a total of 19 threatened or migratory biota were known to, or had a moderate to high potential to occur in the vicinity of the proposal.

## 2.4 Field survey

### 2.4.1 Vegetation surveys

Threatened species searches and general vegetation surveys were carried out between 18 – 19 November 2020.

The aims of the flora surveys were to:

- Determine all vegetation communities present within the study area, their condition and extent, with reference to the OEH plant community type (PCT) classification
- Identify potential Threatened Ecological Communities (TECs) within the study area and determine their condition and extent
- Identify whether threatened flora species are present within the study area, and whether it is likely that any have the potential to occur within the habitats present
- Identify areas of high weed infestation.

Species and vegetation communities identified from the background searches as potentially occurring in the study area were targeted during the surveys

Flora survey methods were based on the *Threatened Species Survey and Assessment: Guidelines for developments and activities* (DEC, 2004) using the random meander method. All habitat variations were covered across each study area.

No threatened flora species were recorded within the study area. Given previous disturbance along the existing road corridor from previous road construction, it is deemed unlikely that any of the more cryptic threatened flora species known from the region would be found in further surveys during other seasons. Particular effort was made towards searching for the threatened flora which had been recorded in the locality previously.

Native vegetation communities/types were classified in accordance with the NSW Vegetation Information System (OEH, 2020b). Threatened ecological communities (if present) were classified in accordance with relevant State and Federal threatened ecological community descriptions (OEH, 2020c, SPRAT, 2017).

Exotic species were checked for priority weed status on the Department of Primary Industries websites (DPI, 2020).

### 2.4.2 Targeted flora surveys

The study area was surveyed using a random meander method (informal transects) (Cropper, 1993). This was carried out by walking through the proposed impact areas covering all of the site. All observed vascular plant species were identified to species level or otherwise as accurately as possible. The random meander method provides comprehensiveness in terms of the number of species recorded and variation within vegetation types. It is used to maximise the coverage of threatened species habitat and the encounter rate of different species (SoQ, 2014). During the random meander dominant tree species, physical structure of the vegetation, and species composition were also recorded and used to identify vegetation types. A comprehensive species list is provided in Annexure B.

### 2.4.3 Targeted fauna surveys

Targeted fauna surveys were carried out between 18 – 19 November 2020.

#### Diurnal Bird Surveys

A diurnal bird survey were conducted using the widely accepted 'standardised method' (Watson, 2003). Any species of bird observed or identified from call recognition, were recorded during the field survey period as the observer walked through the proposed impact area over a 20 minute survey period. Calls of birds were used for species identification, as were direct observation. Given the small size of the study area, all of the study area was traversed.

#### Habitat Assessment

A general habitat assessment was conducted across the study area to develop an understanding of the proximate resources available to flora and fauna. A particular emphasis was given to those resources that are most likely to influence the likelihood of occurrence for threatened and migratory species.

An assessment of habitat values for each waterway would also be completed in accordance with the NSW DPI (Fisheries) document, Policy and Guidelines for fish habitat conservation and management. The aquatic habitat assessment both up and downstream of each culvert included:

- Stream width
- Reach and riffle substrate descriptions
- Riffle depth
- Amount of shading
- Percentage cover of macrophytes

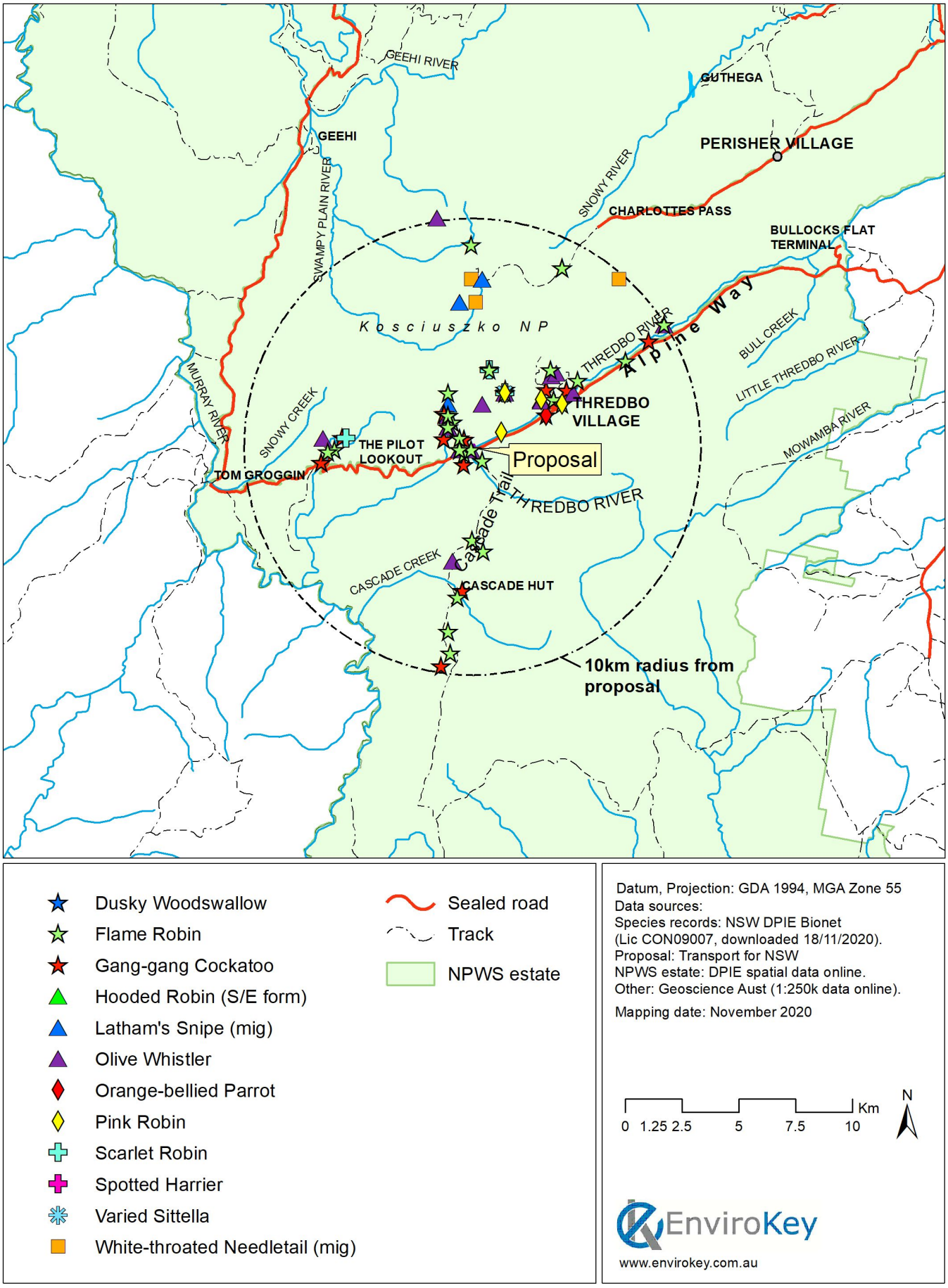



Figure 2-1: Threatened and migratory bird records in the locality

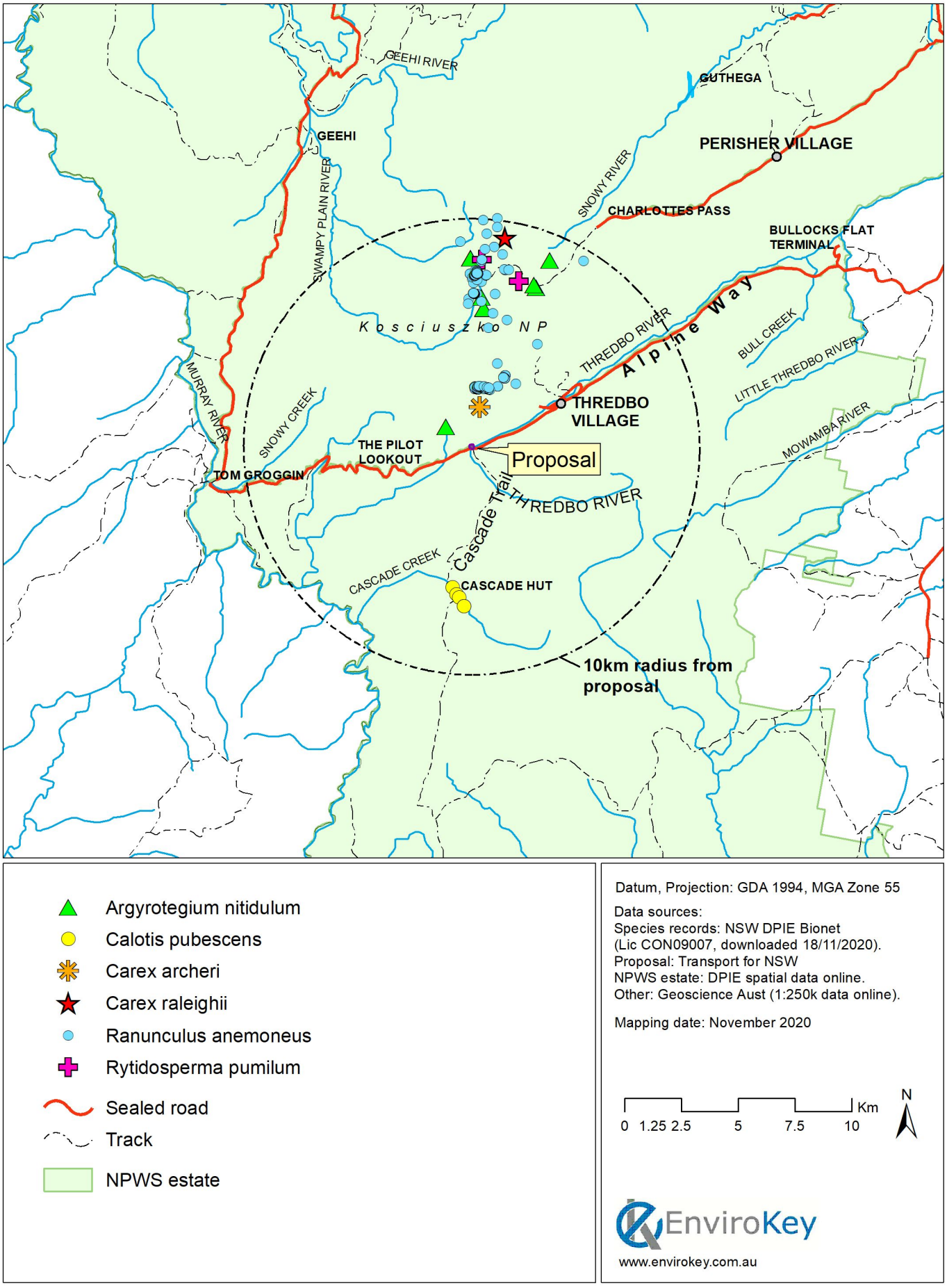



Figure 2-2: Threatened flora records in the locality

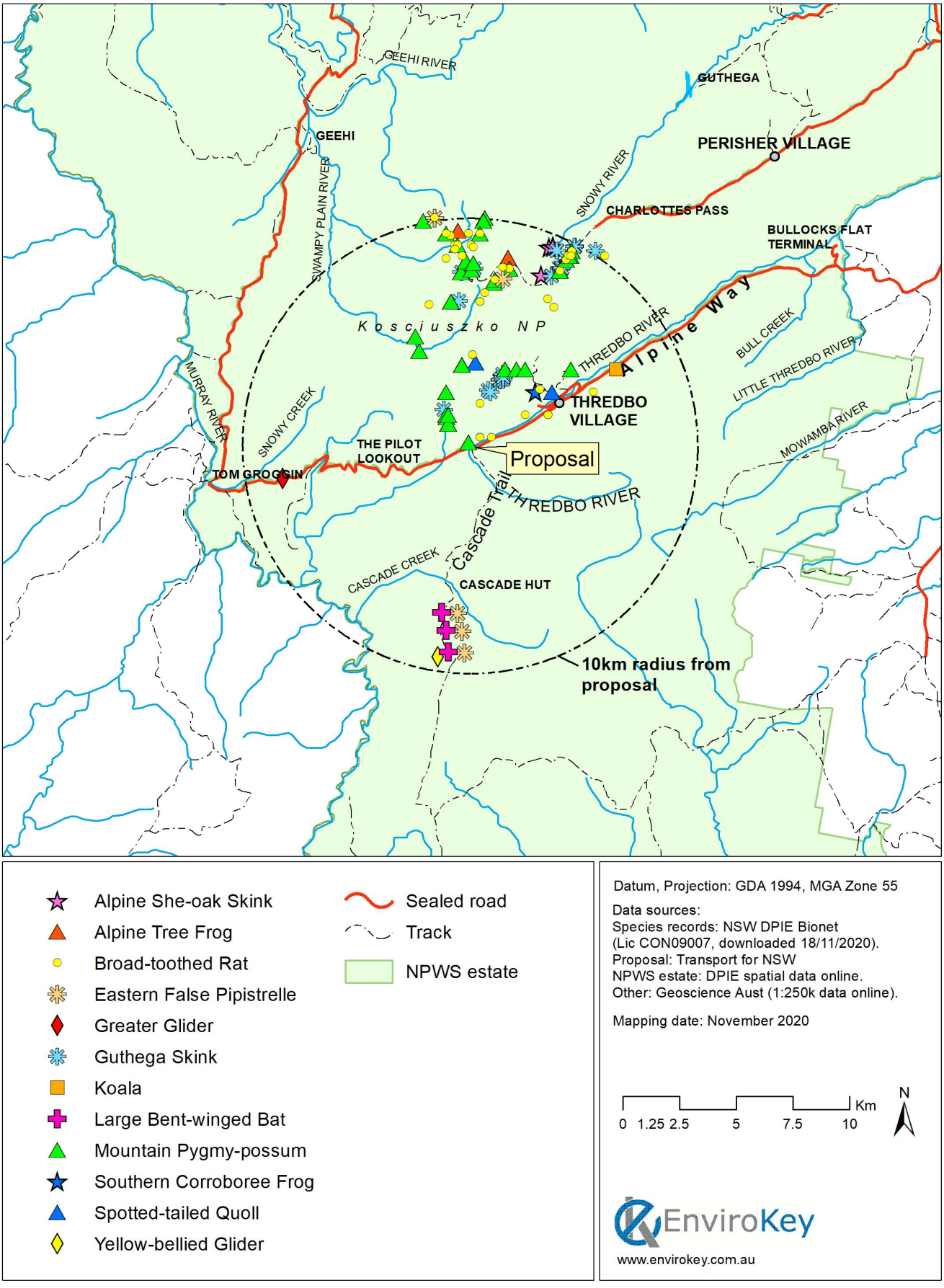



Figure 2-3: Other existing threatened species records in the locality

### 2.4.4 Summary of survey effort and limitations

Table 2-3: Targeted species survey details

| Species | Minimum survey requirements[1] | Survey completed |
|---|---|---|
| All flora species | 1 plot per <2 hectares of a vegetation zone | Random meander survey of the study area due to small size |
| All bird species | No specific minimum | 1 x 20 minute bird survey across the study area |
| All species via Habitat assessment, scat and sign search | No specific minimum | The study area was traversed to search for signs, scats and fauna habitat including hollow-bearing trees |

A common limitation of many biodiversity studies is the short period of time in which they are conducted. When combined with a lack of seasonal sampling this can lead to either low detection rates or false absences being reported. This is also particularly relevant to highly mobile species that may not have been in the study area at the time of the survey or in the very dry conditions during and prior to the field surveys. Given this, further analysis was conducted to evaluate which threatened and migratory biota were likely to occur within the vicinity of the proposal based on the presence of habitat. This is detailed within Annexure C.

The floristic survey carried out recorded as many species as possible and provides a comprehensive but not definitive species list. More species would probably be recorded during a longer survey over various seasons. Nevertheless, the techniques used in this investigation are considered adequate to gather the data necessary to assess the impacts of the proposal on the flora species and vegetation communities found in the study area.

# 3. Existing environment

## 3.1 Plant community types

The proposal is located within an area of native vegetation directly adjacent to one of the state's largest national park, Kosciuszko National Park.

A review of the vegetation community mapping found across the region failed to reveal a State Vegetation Type map that includes the study area (OEH, 2018). Comparing our field survey collected data with the BioNET Vegetation Information System (VIS) (OEH, 2020b), our field surveys revealed the presence of two plant community types (PCT) as listed in Table 3.1, and mapped in Figure 3-3. The highly disturbed areas that form the existing road formation and adjacent verge are not discussed further given they are dominated by hard packed road base and or pavement.

Table 3-1: Plant community types

| Plant community type (PCT) | Vegetation zone | Patch size (ha) | Threatened ecological community? | Area (ha) in study area |
|---|---|---|---|---|
| Alpine grassland/herbfield and open heathlands in Kosciuszko National Park, Australian Alps Bioregion (641) (Mod-Good) | 1 | >100 | No | 0.10 |
| Alpine Snow Gum – Snow Gum shrubby woodland at intermediate altitudes in northern Kosciuszko NP, South Eastern Highlands Bioregion and Australian Alps Bioregion (644) (Mod-good) | 2 | >100 | No | 0.12 |
| | | | | **0.22** |

# Alpine grassland/herbfield and open heathland in Kosciuszko National Park, Australian Alps Bioregion

***Vegetation formation: Alpine Complex***

***Vegetation class: Alpine Herbfield***

***PCT: 641***

***Conservation status: n/a***

***Estimate of percent cleared: 5%***

***Condition: Moderate-good***

***Extent in the study area: 0.10 hectares***

***Extent in the proposal footprint: 0.044 hectares***

| Growth form | Typical species |
|---|---|
| Trees | *nil* |
| Shrubs | *Epacris gunnii, Pimelea alpina, Acrothamnus montanus* |
| Grass and grass like | *Poa constiniana, Poa labillardieri, Phalaris aquatica* |
| Forb | *Ozothamnus alpinus, Veronica derwentiana, Olearia brevipedunculata, Rumex acetosella* |

**Description:** PCT 641 is widespread across the main range and surrounds including adjacent areas of the study area where it occurs on well-drained slopes and mainly above the treeline between 1600-200 metres in elevation.

The extent of all vegetation communities is shown in Figure 3-1.



*Photograph 1: Alpine grassland/herbfield and open heathland*

# Alpine Snow Gum - Snow Gum shrubby woodland at intermediate altitudes in northern Kosciuszko NP, South Eastern Highlands Bioregion and Australian Alps Bioregion

***Vegetation formation: Grassy Woodlands***

***Vegetation class: Subalpine Woodlands***

***PCT: 644***

***Conservation status: n/a***

***Estimate of percent cleared: 5%***

***Condition: Moderate-good***

***Extent in the study area: 0.12 hectares***

***Extent in the proposal footprint: 0.032 hectares***

| Growth form | Typical species |
|---|---|
| Trees | *Eucalyptus niphophila, Eucalyptus pauciflora* |
| Shrubs | *Bossieaa foliosa, Hovea montana, Leptospermum brevipes, Kunzea muelleri, Grevillea lanigera, Hakea microcapra* |
| Grass and grass like | *Poa constiniana, Poa labillardieri, Trisetum spicatum* |
| Forb | *Veronica derwentiana, Blechnum penna-marina subsp. alpina* |

**Description:** PCT 644 is widespread across the main range and surrounds including adjacent areas of the study area where it occurs along the Thredbo River at between 1500m and 1700m, as well as on free-draining slopes, ridges and spurs.

The extent of all vegetation communities is shown in Figure 3-1.



*Photograph 2: Alpine snow gum – Snow gum shrubby woodland downstream of Alpine Way*

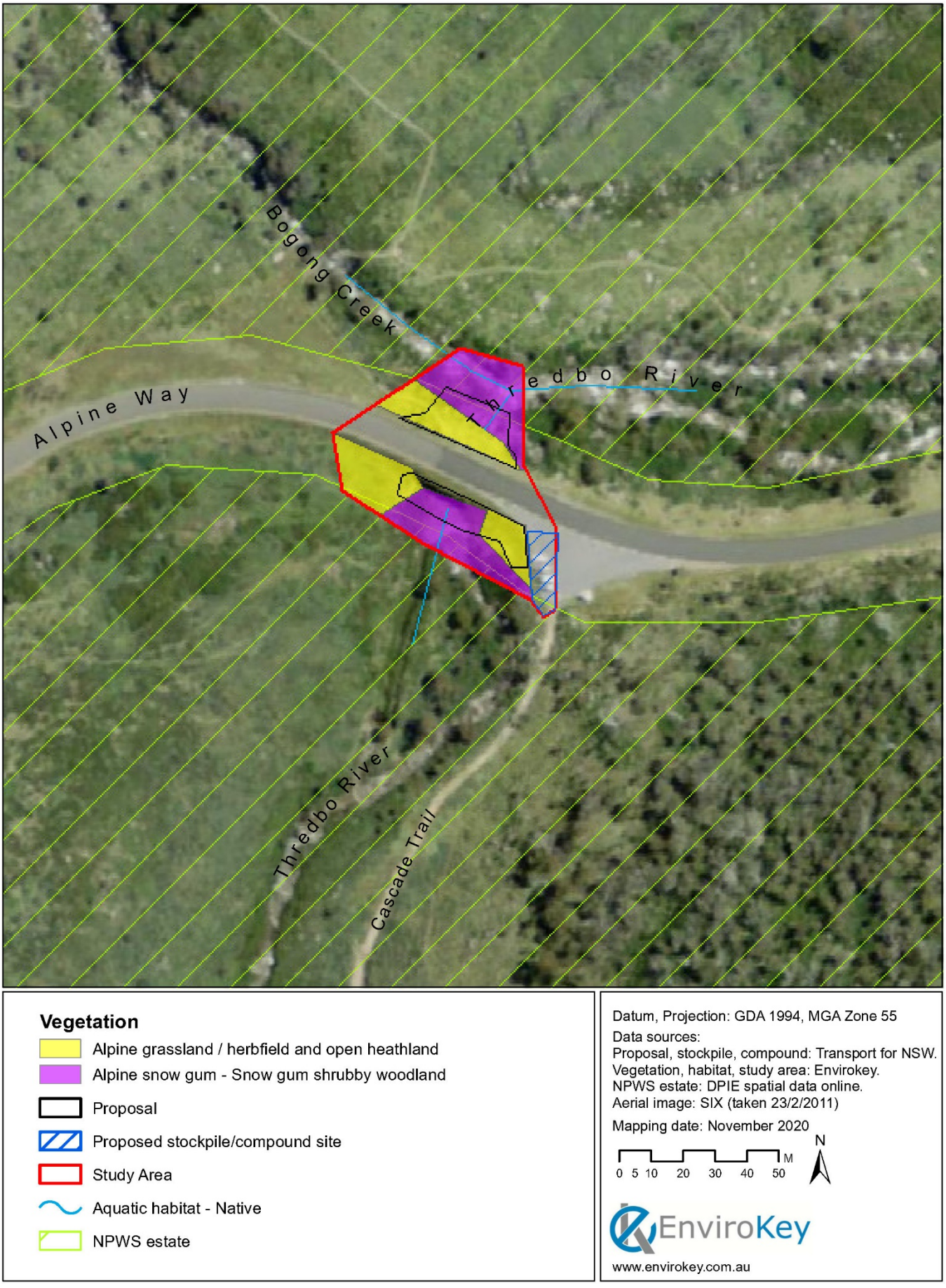



Figure 3-1: Plant community types of the study area

## 3.2 Threatened ecological communities

One threatened ecological community (TEC) was recorded during the field survey. This being:

- Aquatic Ecological Community in the catchment of the Snowy River in NSW (FM Act)

The aquatic ecological community of the Snowy River catchment in NSW has been listed as an endangered ecological community under the FM Act. The listing includes all native fish and aquatic invertebrates within all rivers, creeks and streams of the Snowy River catchment. This includes the Snowy, Eucumbene, Thredbo, Gungarlin, Mowamba, Bombala, McLaughlin, Delegate, Pinch and Jacobs Rivers and their tributaries which includes the Little Thredbo River (DPI, 2011).



*Photograph 3: Thredbo River is part of the Aquatic Ecological Community in the catchment of the Snowy River in NSW (FM Act). This is on the southern side of Alpine Way.*

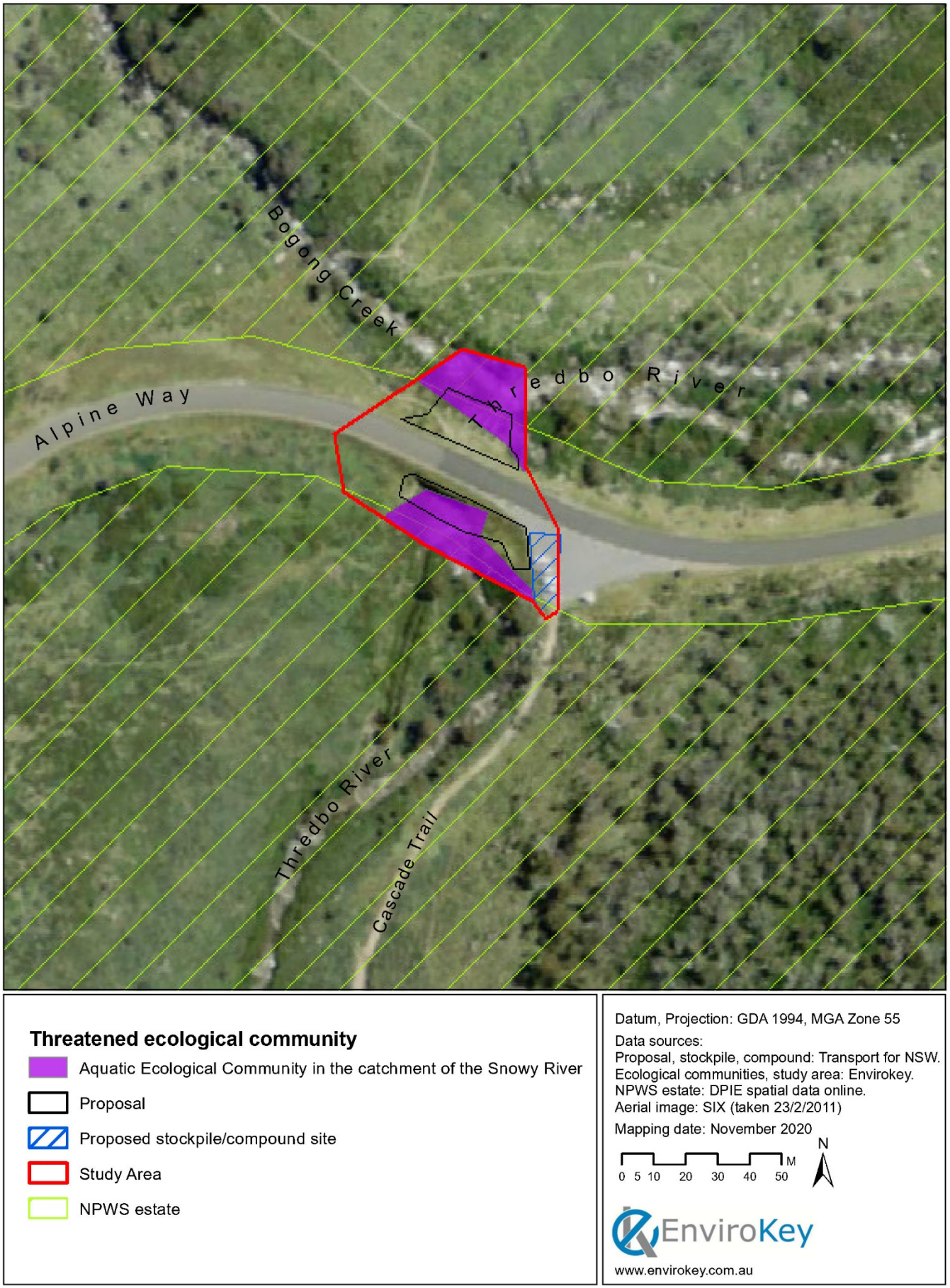



Figure 3-2: Threatened ecological communities of the study area

## 3.3 Aquatic habitat

The aquatic habitat within the study area is of varying condition, largely due to the previous construction of the culverts for the Alpine Way formation.

The stream is highly disturbed and modified in the immediate vicinity of the existing culverts, however, both upstream and downstream, the in-stream and riparian habitats are in good condition. The stream width is variable in the study area; between 3- 7 metres. Riffle depth where present is between 10-30 centimetres and the amount of shading on the stream is between 0-5 percent.

Substrates are dominated by gravel and rock. No aquatic macrophytes were recorded.

Regardless of in-stream and riparian characteristics, the Thredbo River forms part of the Aquatic Ecological Community in the catchment of the Snowy River in NSW (FM Act).



*Photograph 4: Thredbo River upstream of the proposed work*



*Photograph 5: Thredbo River downstream of the proposed work*

## 3.4 Threatened and migratory species

During the field surveys, one threatened species was recorded; this being the Scarlet Robin listed as vulnerable under the BC Act.

Table 3-2 summarises the results of the habitat assessment completed in Annexure C.

Table 3-2: Habitat assessment and surveys results

| Scientific name | Common Name | BC Act/FM Act status | EPBC Act status | Potential occurrence (Moderate, High, Recorded) |
|---|---|---|---|---|
| *Stagonopleura guttata* | Diamond Firetail | V | - | Moderate |
| *Artamus cyanopterus cyanopterus* | Dusky Woodswallow | V | - | Moderate |
| *Petroica phoenicea* | Flame Robin | V | - | High |
| *Callocephalon fimbriatrum* | Gang-gang Cockatoo | V | - | Moderate |
| *Melanodryas cucullata cucullate* | Hooded Robin | V | - | Moderate |
| *Merops ornatus* | Rainbow Bee-eater | - | M | Moderate |
| *Petroica boodang* | Scarlet Robin | V | - | Moderate |
| *Chthonicola sagittate* | Speckled Warbler | V | - | Moderate |
| *Daphoenositta chrysoptera* | Varied Sittella | V | - | Moderate |
| *Hieraaetus morphnoides* | Little Eagle | V | - | Moderate |
| | Aquatic ecological community in the catchment of the Snowy River in NSW | EEC | - | Recorded |
| *Mastacomys fuscus* | Broad-toothed Rat | V | V | Moderate |
| *Burramys parvus* | Mountain Pygmy-possum | E | E | Moderate |
| *Dasyurus maculatus* | Spotted-tailed Quoll | V | E | Moderate |
| *Leucochrysum albicans var.tricolor* | Hoary Sunray | | E | Moderate |

### Diamond Firetail

Diamond Firetail is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South-western Slopes and the North-west Plains and Riverina (OEH, 2020c, Morcombe, 2004). Although they are not commonly found in coastal districts, there are records from near Sydney, the Hunter Valley and the Bega Valley (OEH, 2020c). They are considered relatively sedentary; however, many populations are known to disperse, especially during drought periods. They are known to build bottle-shaped nests in trees and bushes and preferentially choose mistletoe as a nest site (Cooney and Watson, 2005). It has declined in numbers in many areas and has disappeared from parts of its former range with Reid (1999) identifying it as a 'decliner' in a review of bird species' status in the NSW sheep-wheatbelt (Reid, 1999). No Diamond Firetail were recorded during the field survey.

### Dusky Woodswallow
The Dusky Woodswallow is often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests (Higgins et al., 2006). They are also seen in areas of non-native vegetation. No Dusky Woodswallow were recorded, however, they are likely to occur in the study area.

### Flame Robin
Flame Robin breeds in upland, moist eucalypt forests and woodlands spending winter in more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains (OEH, 2020c). Given this, there is some probability that they could use the proposal area and any area of open farmland with scattered trees in the locality. No Flame Robin were recorded within the study area.

### Gang-gang Cockatoo
The Gang-gang Cockatoo is distributed from southern Victoria through south and central-eastern New South Wales (Morcombe, 2004). In New South Wales they have been recorded from the south-east coast to the Hunter region, and inland to the Central Tablelands and South-west slopes (OEH, 2020c). In summer, this species is generally found in tall mountain forests, showing a preference for more mature wet sclerophyll forests. This species is reliant on the presence of nest sites – medium sized hollows high in trees, suitable foraging habitat and it is known to favour old growth attributes for nesting and roosting. No Gang-gang Cockatoo were recorded during the field survey but they are known from the locality.

### Hooded Robin
The Hooded Robin is found across many parts of Australia in woodlands, acacia scrub and mallee (OEH, 2020c, Sass, 2009, Reid, 1999, Watson et al., 2001). First recognised as a declining woodland bird (Reid, 1999), the Hooded Robin is now listed as Vulnerable under the TSC Act. It is generally considered that the Hooded Robin requires a structurally diverse habitat including microhabitat such as native grasses, shrubs and fallen timber across a breeding territory of around 10 hectares (OEH, 2020c). However, it is believed that the species generally exhibits demanding requirements for both habitat complexity and area (>100ha) (Watson et al., 2001) confirming that the study area provides both of these attributes.

### Rainbow Bee-eater
Most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels. Rainbow Bee-eater were not recorded during the field survey but are known from the locality.

### Scarlet Robin
In NSW, the Scarlet Robin occurs in open forests and woodlands from the coast to the inland slopes and in winter, dispersing birds are known to appear in the east of the inland plains (OEH 2012b). The Scarlet Robin is considered sensitive to habitat fragmentation and the reductions of structural complexity of habitat and native ground covers. (Barrett *et al.* 2007; Watson *et al.* 2001). One Scarlet Robin female was recorded during the field survey.

### Speckled Warbler
The Speckled Warbler lives in a wide range of *Eucalyptus* dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.

### Varied Sittella
The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands, with a nearly continuous distribution in NSW from the coast to the far west (Morcombe, 2004, OEH, 2020c, OEH, 2020a). It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. The Varied Sittella feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing

dead trees, and from small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. Field survey did not reveal the presence of this species.

### Little Eagle

The Little Eagle is found across mainland Australia except in densely forested areas. They nest in tall, living trees, where a large stick nest is built in winter. The species lays two or three eggs during spring, and young fledge in early summer. The field survey did not detected this species. In addition, no past or current nesting site has been identified in the field survey.

### Aquatic ecological community in the catchment of the Snowy River in NSW

The listing includes all native fish and aquatic invertebrates within all creeks, rivers and streams of the Snowy River catchment including Thredbo River (DPI, 2011).

### Broad-toothed Rat

The Broad-toothed Rat lives in a complex of runways through the dense vegetation of its wet grass, sedge or heath environment, and under the snow in Winter. Home ranges generally overlap and they shelter in nests of grass in the understory or under logs.

### Mountain Pygmy-possum

Mountain Pygmy-possum lives on the ground in rocky areas where boulders have accumulated below mountain peaks, frequently associated with alpine heathland shrubs.

### Spotted-tailed Quoll

The Spotted-tailed Quoll is a marsupial that is forest dependant, ranging in weight from 2-3kg (Dickman, 1994, Holland and Bennett, 2007, May and Norton, 1996, Claridge et al., 2005, Ruibal et al., 2010). The medium sized adept climber is rich rust to dark brown in colour with irregular white spots on the back and tail (OEH, 2020c). The carnivore preys on a variety of animals including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects.

The Spotted-tailed Quoll can be found along the east coast of NSW where it has been recorded in a variety of habitat types including coastal heath (OEH, 2020c) open forest and uses hollow-bearing trees, fallen logs and rock outcrops as den sites (OEH, 2020c, Menkhorst and Knight, 2010).

The Spotted-tailed Quoll has been also recorded in rainforest, wet and dry sclerophyll forest, woodland, scrubs (OEH, 2020c, Menkhorst and Knight, 2010). The species is largely nocturnal and solitary, foraging through areas characterised by dense vegetation and substantial layers of ground litter.  Females are known to occupy home ranges up to 750 hectares while males as large as 3,500 hectares (OEH, 2020c).

### Hoary Sunray

Hoary Sunray occurs in a wide variety of grassland, woodland and forest habitat, generally on heavy soils. It is also known to occur in modified habitats including roadsides. The species is highly dependant on the presence of bare ground for germination. While none were recorded during the field survey, it could occur post-construction as a result of ground disturbance.

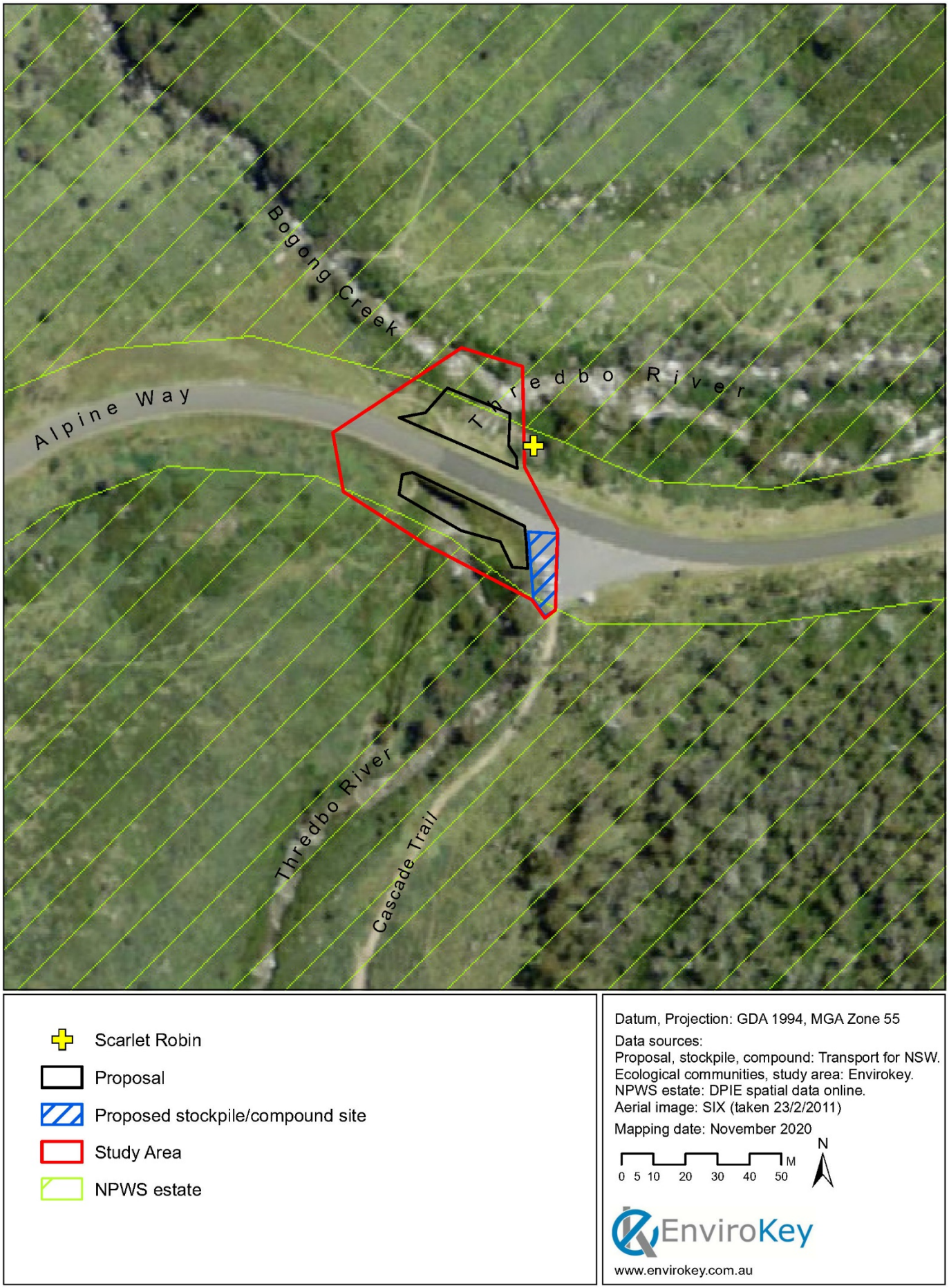



Figure 3-3: Locations of the threatened species recorded during the field survey

## 3.5 Areas of outstanding biodiversity value

No areas of outstanding biodiversity value as listed on the *Register of Declared Areas of Outstanding Biodiversity Value* are present in the study area or in the Snowy Monaro Regional LGA.

## 3.6 Wildlife connectivity corridors

The importance of corridors cannot be overstated within any landscape (Lindenmayer and Nix, 1993, MacDonald, 2003, Johnson et al., 2007). Features such as these are considered important to maintain long-term genetic diversity amongst woodland and forest flora and fauna.

The proposal lies within a relatively natural landscape within an area known as the Thredbo Valley. While ski resorts and other related infrastructure are widespread, the majority of the landscape comprises native vegetation. Given this, the study area is likely to form part of a larger, wildlife corridor.

## 3.7 Matters of National Environmental Significance

No Matters of National Environmental Significance (MNES) were recorded during the field survey.

The EPBC Act Protected Matters Search identified the following MNES with potential to occur within the study area:

- World heritage properties – None
- National heritage places – 3
- Wetlands of international importance – 8
- Listed Threatened Ecological Communities – 3
- Listed Threatened Species – 40
- Migratory species – 12

There are no wetlands of international importance within the direct vicinity of the proposal. The proposal is located within 10 kilometres of Blue Lake, a RAMSAR wetland on the Main Range. This is well clear of the proposal.

Further assessment of matters of MNES relating to threatened ecological communities, threatened species and migratory species is considered further in Annexure C.

# 4. Avoidance and minimisation

Avoidance and minimisation of impacts to biodiversity have been incorporated at the strategic design stage of planning. This has resulted in avoiding areas of high biodiversity value (where possible), and minimise the areas of impact in these areas (where not possible to avoid).

# 5. Impact assessment

Road construction, operation and associated maintenance can have a range of potential impacts to biodiversity. The potential impacts as a result of this proposal are summarised below and in the following sections. These include:

- Removal of native vegetation
- Impacts to terrestrial and aquatic threatened species habitats
- Injury and mortality
- Invasion and spread of weeds
- Noise, light and vibration
- Invasion and spread of pathogens and disease

## 5.1 Construction impacts

### 5.1.1 Removal of native vegetation

Clearing of native vegetation is a key threatening process listed under the BC Act and the EPBC Act.

The proposal would result in the removal of native vegetation. The area of impact has been calculated using GIS. The potential extent of clearing expected as a result of the proposal is listed by PCT in Table 5-1.

Table 5-1: Impacts on vegetation

| Plant community type (PCT) | Status | | Proposal area[1] (hectares/m$^2$) |
|---|---|---|---|
| | BC Act | EPBC Act | |
| Alpine grassland/herbfield and open heathlands in Kosciuszko National Park, Australian Alps Bioregion (641) (Mod-Good) | - | - | 0.05 |
| Alpine Snow Gum – Snow Gum shrubby woodland at intermediate altitudes in northern Kosciuszko NP, South Eastern Highlands Bioregion and Australian Alps Bioregion (644) (Mod-good) | - | - | 0.04 |
| | | | |
| **Total** | | | **0.09** |

[1]Area to be cleared based on ground-truthed vegetation mapping within the study area.

### 5.1.2 Impacts to terrestrial and aquatic threatened species habitat

The proposed work would result in both temporary and permanent impact to both terrestrial and aquatic habitat.

The proposed work would result in the blockage of up to three culverts to enable the lining of the culverts to occur. During this process, at least one other culvert would remain open and given the temporary increase in the cross section of water, fish passage would be maintained. Once the proposed work is completed in the blocked culverts, the process would be switched to reopen the previously blocked culverts, and

therefore diverting the flow of water into the newly opened culverts. This process of work would ensure that the flow, and any impacts to fish passage are minimised.

To enable the proposed work to occur, a temporary clean gravel pad would be placed within the stream upstream of the road formation. This would provide a pad for the excavator that would be required during the proposed work period. This would also be placed in position to ensure fish passage is maintained around it.

Remaining impacts to vegetation would be temporary, ie machinery and materials storage, moving across open, grassy areas. Some overhanging trees adjacent to the existing car park are likely to require pruning only.

Downstream of the culverts, it is proposed to put rock rip-rap on the curtains of the culvert. This would also improve bank stability and therefore, reducing the potential impact of erosion and subsequent sediment deposition into the Thredbo River. Post-construction, no barriers to fish passage would occur as a result of the proposed work.

Potential impacts to the threatened fauna species recorded or with a moderate to high potential to occur in the study area and their habitats are listed in Table 5-2.

Table 5-2: Impacts on terrestrial and aquatic threatened and migratory species habitat

| Species | Potential occurrence (Moderate, High, Recorded) | Impacted by proposal? | Impact (ha/ individuals) |
|---|---|---|---|
| Diamond Firetail | Moderate | Yes | 0.09 (temporary) |
| Dusky Woodswallow | Moderate | Yes | 0.09 (temporary) |
| Flame Robin | Moderate | Yes | 0.09 (temporary) |
| Gang-gang Cockatoo | Moderate | Yes | 0.04 (temporary) |
| Hooded Robin | Moderate | Yes | 0.04 (temporary) |
| Rainbow Bee-eater | Moderate | Yes | 0.09 (temporary) |
| Scarlet Robin | Moderate | Yes | 0.04 (temporary) |
| Speckled Warbler | Moderate | Yes | 0.04 (temporary) |
| Varied Sittella | Moderate | Yes | 0.04 (temporary) |
| Little Eagle | Moderate | Yes | 0.09 (temporary) |
| Aquatic ecological community in the catchment of the Snowy River in NSW | Recorded | Yes | 0.04 (temporary) |
| Broad-toothed Rat | Moderate | Yes | 0.05 (temporary) |
| Mountain Pygmy-possum | Moderate | Yes | 0.05 (temporary) |
| Spotted-tailed Quoll | Moderate | Yes | 0.09 (temporary) |
| Hoary Sunray | Moderate | Yes | 0.09 (temporary) |

### 5.1.3 Injury and mortality

Fauna injury or mortality can occur during construction either during the site establishment phase or during the proposed work.

During construction it is anticipated that some diurnal and mobile fauna species such as birds and larger reptiles may be able to move from the path of construction equipment during any clearing operations, other fauna species such as those that are less mobile and nocturnal, are less likely to move away from clearing activity.

During operation, impacts are not expected to increase given that the proposed work is not likely to result in any blockage to fish passage or an increase in vehicles using the Alpine Way.

The establishment of the gravel pad for in-stream work may result in direct impacts to aquatic fauna without adequate supervision.

## 5.2 Indirect/operational impacts

### 5.2.1 Wildlife connectivity, habitat fragmentation and fish passage

The proposal is likely to have no negative affect on the potential wildlife corridors or markedly increase habitat fragmentation particularly in the context of the proposed work and that potentially significant wildlife corridors remain within the road corridor and across the locality.

The proposal would not increase habitat fragmentation above pre-existing levels given the current detailed design.

The proposed work would result in the blockage of up to three culverts to enable the lining of the culverts to occur. During this process, at least one other culvert would remain open and given the temporary increase in the cross section of water, fish passage would be maintained. Once the proposed work is completed in the blocked culverts, the process would be switched to reopen the previously blocked culverts, and therefore diverting the flow of water into the newly opened culverts. This process of work would ensure that the flow, and any impacts to fish passage are minimised.

### 5.2.2 Invasion and spread of weeds

Across the study area, weed species are relatively rare apart from the existing highly disturbed road reserve that contains a number of weeds including the Priority Weed St John's Wort (*Hypericum perforatum*).

St John's Wort occurs across the study area and was not mapped due to being present only in the existing clear zone and around the car park boundary.

The proposed work has some potential to disperse priority and environmental weed plant material into retained areas of native vegetation from incoming construction equipment and incoming fill materials such as the rock for the temporary pad and rip-rap, the most likely cause would be once construction vehicles and machinery first enter the proposal area from elsewhere and when fill is unloaded at the site. For the remaining weeds, the general impact is negligible and of no significance to the long-term viability of the retained vegetation within the study area or the locality given their current presence.

### 5.2.3 Noise, light and vibration

Noise, vibration and light impact already pre-exists on the Alpine Way from vehicular movements and so, potential impacts are restricted to construction impact. Within Thredbo River, pulse disturbance over the construction period is likely which may lead to avoidance behavior. This is most likely to have an impact on fish migration through disruption of movement at key stages of their life cycle.

Construction noise and vibration are likely to result from the proposal but would be limited to the construction period and during daylight hours. While it is important to remember that no multi-species study has found all species to be sensitive to noise and vibration, it is generally agreed that for species that vocalise frequently such as birds and amphibians, there is some potential for negative effects over the long-term. In the context of the proposal, the work is expected to be conducted over a relatively short time frame. Potential impact, if any, is therefore considered to be relatively minor and temporary with extensive areas of the existing road reserve and other habitats in the locality remaining unaffected by temporary increases in noise and vibration.

No light impacts are expected due to construction occurring during daylight hours.

### 5.2.4 Invasion and spread of pathogens and disease

Pathogens result in disease in flora and fauna and can be found living in organisms such as fungus, bacteria and virus. Two pathogens are known from the region and these are listed as KTP. These being:

- Dieback caused by *Phytophthora* (BC Act and EPBC Act)
- Infection of frogs by amphibian chytrid fungus causing the disease *chytridiomycosis* (BC Act and EPBC Act).

Without appropriate mitigation measures, both pathogens could be inadvertently be transported into the proposal area by construction machinery and vehicles.

## 5.3 Cumulative impacts

There are no other projects being considered within the vicinity of the proposal. However, the proposed work is considered relatively minor in nature in the context of the existing landscape and the configuration of the proposal, and therefore, cumulative impacts are unlikely from the proposal.

## 5.4 Assessments of significance

Section 7.3 of the BC Act details five factors which are to be considered when determining if a proposed development or activity '*is likely to have a significant effect on the threatened species, ecological communities, or their habitats'*. These five factors must be taken into account by consent or determining authorities when considering a development proposal or development application. This enables a decision to be made as to whether there is likely to be a significant effect on the species.

The Test of Significance (Annexure C) has determined that the proposed activity is *'unlikely'* to have a *'significant effect'* on species that are known from the study area, or that have been assessed as having a moderate to high potential of occurring in the study area. They include the following biota and their habitats:

- Woodland Birds (Diamond Firetail, Dusky Woodswallow, Flame Robin, Gang-gang Cockatoo, Hooded Robin, Scarlet Robin, Speckled Warbler, Varied Sittella, Little Eagle)
- Mammals (Spotted-tailed Quoll, Broad-toothed Rat, Mountain Pygmy-possum)

In the FM Act, there are seven factors which are to be considered when determining if a proposed development or activity '*is likely to have a significant effect on the threatened species, or ecological communities, or their habitats'.* These seven factors must be taken into account by consent or determining authorities when considering a development proposal or development application. This enables a decision to be made as to whether there is likely to be a significant effect on the species.

The habitat assessment table in Annexure C found that one threatened biota listed under the FM Act that was known to, or has the potential to occur within the study area based on the evaluation completed. Given this, further assessment by application of the 7-part test is completed on the following biota:

- Aquatic ecological community in the catchment of the Snowy River in NSW

With consideration of the assessment completed within Annexure C, the proposed activity is *unlikely* to have a significant effect on threatened or migratory species, populations, communities or their habitats as listed by the EPBC Act.

The proposal itself, with the adoption of mitigation measures outlined within Chapter 6 and further consideration of potential impact, is considered low risk. Based on this, referral to the Commonwealth Minster is not warranted.

A summary of the results of the BC Act Assessment of Significance and EPBC Act Significance Assessments is provided in Table 5-3.

Table 5-3: Summary of the findings of the BC Act, FM Act and EPBC Act significance assessments.

| **BC Act & FM Act significance assessments** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Threatened species, or communities | Significance assessment question[1] | | | | | | Likely significant impact? |
| | A | b | c | d | e | | |
| Diamond Firetail | N | X | N | N | N | | No |
| Dusky Woodswallow | N | X | N | N | N | | No |
| Flame Robin | N | X | N | N | N | | No |
| Gang-gang Cockatoo | N | X | N | N | N | | No |
| Hooded Robin | N | X | N | N | N | | No |
| Scarlet Robin | N | X | N | N | N | | No |
| Speckled Warbler | N | X | N | N | N | | No |
| Varied Sittella | N | X | N | N | N | | No |
| Little Eagle | N | X | N | N | N | | No |
| Broad-toothed Rat | N | X | N | N | N | | No |
| Mountain Pygmy-possum | N | X | N | N | N | | No |
| Spotted-tailed Quoll | N | X | N | N | N | | No |
| Aquatic ecological community in the catchment of the Snowy River in NSW | X | X | N | N | N | N | No |

| EPBC Act Assessments | | |
|---|---|---|
| Threatened species, or communities | Important population[2] | Likely significant impact? |
| Rainbow Bee-eater | No | No |
| Broad-toothed Rat | No | No |
| Mountain Pygmy-possum | No | No |
| Spotted-tailed Quoll | No | No |
| Hoary Sunray | No | No |

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable, ?= unknown impact.

1. Under Section 7.2 of the BC Act, a proposed proposal or activity is likely to significantly affect threatened species or ecological communities, or their habitats if:

   a) in the case of a threatened species, whether the proposed proposal 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,

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

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

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

   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 proposal or activity, and

      ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed proposal or activity, and

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

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

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

2. A 'population of a species' as determined by the EPBC Act is an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:
   a) a geographically distinct regional population, or collection of local populations, or
   b) a population, or collection of local populations, that occurs within a particular bioregion.

   Important Population as determined by the EPBC Act is one that for a vulnerable species:

   a) is likely to be key source populations either for breeding or dispersal
   b) is likely to be necessary for maintaining genetic diversity

c) is at or near the limit of the species range.

# 6. Mitigation

Measures to minimise impacts on threatened species have been recommended as part of this assessment and are summarised in Table 6-1.

Safeguards and management measures proposed have been developed by referring to the best practice management measures found in the TfNSW *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (2011).

Table 6-1: Mitigation measures

| Impact | Mitigation measures | Timing and duration | Likely efficacy of mitigation | Residual impacts anticipated |
|---|---|---|---|---|
| Removal of native vegetation | The limit of works (including compounds and parking areas) must be clearly and physically demarcated with flagging/fencing or similar. | Prior to construction | Effective | None |
| | Only vegetation assessed within this REF is to be removed. Should any additional clearing be necessary, further onsite assessment is required | During construction | Effective | None |
| | Fauna will be managed in accordance with *Guide 9: Fauna handling* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) | During construction | Proven | None |
| | Parking options should be limited to existing hard stand areas, within the existing car park or any of the areas marked as proposed impact area. | During construction | Effective | None |
| | No overstory species of eucalypt (gum tree) would be removed. Minor trimming of overhanging branches where required is permitted. | During construction | Effective | None |
| | Vegetation removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011). | During construction | Effective | None |
| | 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, not assessed in the biodiversity assessment, are identified in the proposal site. | During construction | Proven | None |

| Impact | Mitigation measures | Timing and duration | Likely efficacy of mitigation | Residual impacts anticipated |
|---|---|---|---|---|
| Waterways and water quality | Aquatic habitat will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) and Section 3.3.2 *Standard precautions and mitigation measures* of the *Policy and guidelines for fish habitat conservation and management Update 2013* (DPI (Fisheries NSW) 2013). | During construction | Proven | None |
| | Should any fish kills be observed during the work, TfNSW Environmental Manager must be notified immediately for urgent action. | During construction | Proven | None |
| | Work should be carried out during low flow periods where possible. | During construction | Proven | None |
| | Rock for the temporary work platform and rip-rap must be clean and free of dirt or plant material including seeds | During construction | Proven | None |
| | There must be no release of dirty water into any waterways. | During construction | Proven | None |
| | Visual monitoring of local water quality (irrigation channel if water present) (ie, turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or defiant silt curtains or erosion and sediment controls. | During construction | Proven | None |
| | All fuels, chemicals and liquids are to be stored in an impervious bunded area a minimum of 50 metres from:<br>• Rivers, creeks or any concentrated water flow<br>• Flooded or poorly drained areas<br>• Slopes above 10% | During construction | Proven | None |
| | Refuelling of plant and equipment is to occur in impervious bunded areas located a minimum of 50 metres from drainage lines or waterways | During construction | Proven | None |

| Impact | Mitigation measures | Timing and duration | Likely efficacy of mitigation | Residual impacts anticipated |
|---|---|---|---|---|
| | An emergency spill kit must be kept on site at all times and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances at the work site. | During construction | Proven | None |
| | If an incident occurs, the TfNSW *Environmental Incident Classification and Management Procedure* must be followed and the TfNSW Contract Manager notified as soon as practicable | During construction | Proven | None |
| | All workers will be advised of the location of the spill kit and trained in its use | During construction | Proven | None |
| | Vehicles and plant must be properly maintained and regularly inspected for fluid leaks | During construction | Proven | None |
| | No vehicle wash-down would occur on-site | During construction | Proven | None |
| | Disturbed areas must be progressively stabilised with a method appropriate for the location and slope of the site as per the TfNSW Guideline for Batter Surface Stabilisation using vegetation. Riparian zones should be rehabilitated based on recommendations of DPI Policy and guidelines for fish habitat conservation and management (2013). Endemic native riparian vegetation or similar should be considered in the design to stabilise the waterway and minimise the reestablishment of weeds. | During and after construction | Proven | None |

# 7. Conclusion

This assessment has concluded that the proposal is '*unlikely*' to have a significant effect on any listed threatened flora and fauna species, communities, and their habitats.

The study area is located within an area of native vegetation directly adjacent to one of the state's largest national park, Kosciuszko National Park. Two plant community types occur there, and the Endangered Aquatic community of the Snowy River in NSW is also present.

Assessments of significance under the BC Act, FM Act and EPBC Act were conducted for threatened species that are known to, or have a moderate to high likelihood of occurring within the study area, and therefore, be impacted by the proposal. These concluded that the proposal is unlikely to have a significant impact on any threatened biota. Therefore, a species impact statement or a referral to the Commonwealth is not required.

A number of mitigation measures have been recommended to minimise and mitigate impacts from the proposal. Overall, the measures aim to mitigate impacts to threatened species, threatened fauna species and aquatic habitat and habitat features, and other potential impacts identified by this BA.

# 8. References


CLARIDGE, A., PAULL, D., DAWSON, J., MIFSUD, G., MURRAY, A., POORE, R. & SAXON, M. 2005. Home range of the spotted-tailed quoll (Dasyurus maculatus), a marsupial carnivore, in a rainshadow woodland. *Wildlife Research,* 32**,** 7-14.

COONEY, S. J. N. & WATSON, D. M. 2005. Diamond Firetails (Stagonopleura guttata) preferentially nest in mistletoe. *Emu,* 105**,** 317-322.

CROPPER, H. 1993. Management of Endangered Plants. *CSIRO Publishing, Melbourne*.

DEC 2004. Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft). *NSW Department of Environment & Conservation, Hurstville, NSW.*

DEWHA 2009. EPBC Act Policy Statement 1.1 Significant Impact Guidelines, Matters of National Environmental Significance. *Department of the Environment, Water, Heritage and the Arts.*

DICKMAN, C. 1994. Mammals of New South Wales: past, present and future. *Australian Zoologist,* 29**,** 158-165.

DPI 2011. Final Determination - Aquatic Ecological Community in the Catchment of the Snowy River in NSW. ***http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/426308/Snowy-River-EEC-Final-Determination.pdf***.

DPI. 2020. *NSW Priority Weed Declarations* [Online]. Available: ***http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed*** [Accessed].

ENVIROKEY 2014. Review of Environmental Factors: Thredbo River Bank Stabilisation. A report prepared by J. Wellington and S. Sass, for Local Land Services South East. Report No. REF.0571. Final Report. Version 1.0. 23/06/2014.

ENVIROKEY 2015. Review of Environmental Factors: Proposed Lower Thredbo Valley Track, Bullocks Flat to Thredbo River Picnic Area. A report prepared by EnviroKey for NSW Office of Environment & Heritage. Report No. 15.REF-043. Final Report. Version 3.2. 25 August 2015.

HIGGINS, P. J., PETER, J. & COWLING, S. 2006. *Handbook of Australian, New Zealand and Antarctic Birds (vol 7).* Melbourne, Oxford University Press.

HOLLAND, G. J. & BENNETT, A. F. 2007. Occurrence of small mammals in a fragmented landscape: the role of vegetation heterogeneity. *Wildlife Research,* 34**,** 387-397.

JOHNSON, M., REICH, P. & MAC NALLY, R. 2007. Bird assemblages of a fragmented agricultural landscape and the relative importance of vegetation structure and landscape pattern. *Wildlife Research,* 34**,** 185-193.

LINDENMAYER, B. D. & NIX, H. A. 1993. Ecological principles for the design of wildlife corridors. *Conservation Biology,* 7**,** 627-630.

MACDONALD, M. A. 2003. The Role of corridors in biodiversity conservation in production forest landscapes: a literature review. *Tasforests,* 14**,** 41-52.

MAY, S. A. & NORTON, T. W. 1996. Influence of fragmentation and disturbance on the potential impact of feral predators on native fauna in Australian Forest Ecosystems. *Wildlife Research,* 23**,** 387-400.

MENKHORST, P. & KNIGHT, F. 2010. A field guide to the mammals of Australia. *Oxford University Press*.

MITCHELL, P. B. 2002. Descriptions for NSW Mitchell Landscapes. *A report prepared for the NSW National Parks and Wildlife Service, Hurstville, NSW.*

MORCOMBE, M. 2004. *Field guide to Australian Birds,* Archerfield, Queensland, Steve Parish Publishing.

NPWS 2003. The Bioregions of New South Wales: their biodiversity, conservation and history. *NSW National Parks and Wildlife Service, Hurstville*.

OEH 2018. NSW State Vegetation Type Map. ***http://data.environment.nsw.gov.au/dataset/***.

OEH. 2020a. *BioNET: The website for the Atlas of NSW Wildlife: A whole-of-government system for flora and fauna sightings information* [Online]. Available: ***www.bionet.nsw.gov.au*** [Accessed].

OEH 2020b. NSW Vegetation Information System: Classification. ***http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx***.

OEH 2020c. Threatened species, populations and ecological communities of NSW. *NSW Office of Environment & Heritage. ,* ***www.threatenedspecies.environment.nsw.gov.au***.

REID, J. R. W. 1999. Threatened and declining birds in the New South Wales sheep-wheat belt: Diagnosis, Characteristics and Management. *A consultancy report prepared for the NSW National Parks and Wildlife Service.*

RUIBAL, M., PEAKALL, R., CLARIDGE, A., MURRAY, A. & FIRESTONE, K. 2010. Advancement to hair-sampling surveys of a medium-sized mammal: DNA-based individual identification and population estimation of a rare Australian marsupial, the spotted-tailed quoll (Dasyurus maculatus). *Wildlife Research,* 37**,** 27-38.

SASS, S. 2009. An overview of bird assemblages within arid shrubland and woodland habitats of western New South Wales. *Consulting Ecology,* 23**,** 58-65.

SPRAT 2017. Species Profile and Threats Database - EPBC Act listed biota. ***http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl***.

THACKWAY, R. & CRESWELL, I. D. 1995. An interim biogeographic regionalisation for Australia: a framework for establishing the national system of reserves. Version 4.0. *Australian Nature Conservation Agency, Canberra.*

WATSON, D. M. 2003. The 'standardized search' : An improved way to conduct bird surveys. *Austral Ecology,* 28**,** 515:525.

WATSON, J., FREUDENBERGER, D. & PAUL, D. 2001. An assessment of the focal-species approach for conserving birds in variegated landscapes in south-eastern Australia. *Conservation Biology,* 15**,** 1364-1373.

# Annexure A

## Consultation with NSW DPI Fisheries

Department of Primary Industries

Our Ref: C20/478

7 August 2020

Daniel Bojkovic
Project Engineer
Transport for NSW
90 Crown Street
WOLLONGONG NSW 2520

Dear Daniel,

**Consultation for proposed MR677 Thredbo River Culverts Relining Works- Alpine Way**

Thank you for your letter of 29 July 2020 seeking comment on the proposed culvert relining, headwall reconstruction and scour protection within 2 waterway crossings on Alpine Way, in Thredbo River and Little Thredbo River from DPI Fisheries, a division of NSW Department of Primary Industries.

DPI Fisheries is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats upon which they depend. To achieve this, DPI Fisheries ensures that developments comply with the requirements of the *Fisheries Management Act 1994* (namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act, respectively), and the associated *Policy and Guidelines for Fish Habitat Conservation and Management (2013)*. In addition, DPI Fisheries is responsible for ensuring the sustainable management of commercial, recreational and Aboriginal cultural fishing, aquaculture and marine protected areas within NSW.

The aquatic health of the Thredbo River and its tributaries is of particular importance to DPI Fisheries. The rivers, creeks and streams of the Snowy River Catchment are considered to be part of the Aquatic Endangered Ecological Community of the Snowy River. This includes the Thredbo River and Little Thredbo River and their tributaries. Threats to the Snowy River Aquatic EEC include the degradation of riparian vegetation, the loss of in-stream aquatic vegetation and instream structures preventing migration of aquatic species.

The Review of Environmental Factors will need to include an assessment of the impacts to fish passage from the alteration to structures and will also require a test of significance or '7 part test' on the potential impact of the works on the Snowy River Aquatic EEC.

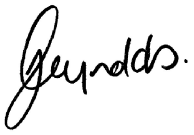
In accordance with section 219 of the FM Act, the works on the culverts must be designed to facilitate fish passage through the structures. Designs will need to ensure that the new invert level will not result in a 'waterfall' effect resulting in a barrier to fish passage. Efforts should also be made to improve the ability of fish to migrate through the culvert cells. Further information on fish passage within waterway crossings can be found in Section 4 of the Departments Policy and Guidelines and in the publication *Why do Fish Need to Cross the Road.*

Details for the final rehabilitation of the waterway following works should also be included in the REF  Works should be designed to restore endemic riparian and aquatic habitats.

Once the REF is completed and has been received by DPI Fisheries we will be able to provided final comment in accordance with the provisions of s199 of the FM Act..

Please do not hesitate to contact me should you wish to discuss anything further.

Yours sincerely



Jillian Reynolds
Fisheries Manager
Coastal Systems – South

# Annexure B

## Species recorded

### *Recorded flora*

| Scientific Name | Common Name | Exotic |
|---|---|---|
| *Achillea millefolium* | Yarrow | * |
| *Baeckea utilis* | Mountain Baeckea | |
| *Blechnum penna-marina subsp. alpina* | Alpine Water Fern | |
| *Bossiaea foliosa* | Leafy Bossiaea | |
| *Echium plantagineum* | Pattersons Curse | * |
| *Eparcis gunnii* | | |
| *Eucalyptus niphophila* | Alpine Snow Gum | |
| *Eucalyptus pauciflora* | White Sally | |
| *Grevillea lanigera* | Woolly Grevillea | |
| *Hakea microcarpa* | Small-fruit Hakea | |
| *Holcus lanatus* | Yorkshire Fog | * |
| *Hovea montana* | Alpine Hovea | |
| *Hypericum perforatum* | St John's Wort | * |
| *Hypochaeris radicata* | Cat's-ears | * |
| *Juncus sp.* | Rush | |
| *Kunzea muelleri* | Yellow Kunzea | |
| *Leptospermum brevipes* | Slender Tea-tree | |
| *Acrothamnus montanus* | Snow Beard-heath | |
| *Olearia brevipedunculata* | Dusty Daisy-bush | |
| *Ozothamnus alpinus* | Alpine Everlasting | |
| *Phalaris aquatica* | Canary Grass | * |
| *Pimelea alpina* | | |
| *Plantago sp.* | | |
| *Poa labillardierei* | Tussock | |
| *Poa constiniana* | Bog Snowgrass | |
| *Polystichum proliferum* | Mother Shield Fern | |
| *Rubus parvifolius* | Native Raspberry | |
| *Rumex acetosella* | Sheep sorrel | * |

| Scientific Name | Common Name | Exotic |
|---|---|---|
| *Taraxacum officinale* | Dandelion | * |
| *Trifloium repens* | White Clover | * |
| *Verbascum thapsus* | Great Mullein | * |
| *Veronica derwentiana subsp. maideniana* | Speedwell | |

### *Recorded fauna*

| Taxa/Fauna group | Scientific Name | Common name | Status | |
|---|---|---|---|---|
| | | | BC Act | EPBC Act |
| Aves | *Rhipidura leucophrys* | Willie Wagtail | - | - |
| Aves | *Sericornis frontalis* | White-browed Scrubwren | - | - |
| Aves | *Colluricincla harmonica* | Grey-shrike Thrush | - | - |
| Aves | *Cracticus tibicen* | Australian Magpie | - | - |
| Aves | *Hirundo neoxena* | Welcome Swallow | - | - |
| Aves | *Microeaca fascinans* | Jacky Winter | - | - |
| Aves | *Petroica boodang* | Scarlet Robin | - | - |
| Aves | *Platycercus elegans* | Crimson Rosella | - | - |
| Aves | *Corvus coronoides* | Australian Raven | - | - |
| Aves | *Sturnus vulgaris* | Common Starling | - | - |
| Mammalia | *Vombatus ursinus* | Common Wombat | - | - |

# Annexure C

## Habitat assessment table

### *Likelihood of occurrence criteria*

| Likelihood | Criteria |
|---|---|
| Recorded | The species was observed in the study area during the current survey |
| High | It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration. |
| Moderate | Potential habitat is present in the study area. Species 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 (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded. |
| Low | It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded. |
| None | Suitable habitat is absent from the study area.<br>Based on a field assessment of the habitat constraints or microhabitats on the study area , the habitat is identified as being substantially degraded such that the species is unlikely to utilise the study area (or specific vegetation zones), or an expert report that is prepared that states the species is unlikely to be present on the study area or specific vegetation zones. |

### *Habitat assessment table*

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Alpine Tree Frog *Litoria verreauxii alpina* | E | V | Found in a wide variety of habitats including woodland, heath, grassland and herb fields. | Low |
| Booroolong Frog *Litoria booroolongensis* | E | E | Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. | Low |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Spotted Tree Frog *Litoria spenceri* | CE | E | Found in a range of montane vegetation types at both high altitude and moderate to low altitude and is restricted to cascade stream sections with rocky banks. | None as known only from western side of Kosciuszko National Park |
| Southern Corroboree Frog *Pseudophryne corroboree* | CE | CE | Summer breeding habitat is pools and seepages in sphagnum bogs, wet tussock grasslands and wet heath. | Low |
| Yellow-spotted Tree Frog *Litoria castanea* | CE | E | Found in large permanent pools or slow flowing chain of ponds streams with abundant emergent vegetation. | None |
| Eastern Bentwing-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. | None |
| Eastern False Pipistrelle *Falsistrellus tasmaniensis* | V | | Prefers moist habitats, with trees taller than 20m. | 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. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. | None |
| Australasian Bittern *Botaurus poiciloptilus* | E | E | A heron-like bird which inhabits wetlands. | None |
| Black-faced Monarch *Monarcha melanopsis* | | M | They are found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating. | Low |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Brown Treecreeper (eastern subspecies) *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. | None |
| Cattle Egret *Ardea ibis* | | M | The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor. It will also forage at garbage dumps, and is often seen with cattle and other stock. | Low |
| Common Sandpiper *Actitis hypoleucos* | | M | A small sandpiper that is widely distributed in small numbers along the coast of Australia and in many inland regions. | None |
| Curlew Sandpiper *Calidris ferruginea* | E | CE M | Widespread occurrence along the coast and inland. | None |
| Diamond Firetail *Stagonopleura guttata* | V | | Found in grassy woodlands including Box-Gum Woodlands and Snow Gum Woodland | Moderate |
| Dusky Woodswallow *Artamus cyanopterus cyanopterus* | V | | Found mostly in dry, open eucalypt forests and woodlands | Moderate |
| Eastern Curlew *Numenius madagascarensis* | | CE M | Australia's largest shorebird. Flies to Russia and China annually to breed, returning to Australia to feed. | None |
| Flame Robin *Petroica phoenicea* | V | | This species breeds in upland tall moist eucalypt forests and woodlands though also inhabits clearings or open understorey areas. | High |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Fork-tailed Swift *Apus pacificus* | | M | Almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. | Low |
| Gang-gang Cockatoo *Callocephalon fimbriatum* | V | | In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. | Moderate |
| Great Egret *Ardea alba* | | M | Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area. | Low |
| Hooded Robin *Melanodryas cucullata cucullata* | V | | Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. | Moderate |
| Latham's Snipe *Gallinago hardwickii* | | M | Habitat in Australia includes permanent and ephemeral wetlands. | Low |
| Olive Whistler *Pachycephala olivacea* | V | | Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes to dense coastal thickets. | None |
| Painted Honeyeater *Grantiella picta* | V | V | This species specialises in feeding on the fruit of mistletoe. It inhabits *Acacia pendula*, *Acacia harpophylla* and box gum, ironbark woodlands. | None |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Painted Snipe *Rostratula benghalensis (sensu lato)* | | E M | In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. | None |
| Pectoral Sandpiper *Calidris melanotos* | | M | A small to medium sandpiper. In Australia it can be found in both shallow fresh and salt water. The sandpiper flies to Russia and Northern America to breed. | None |
| Pink Robin *Petroica rodinogaster* | V | | Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies. | Low |
| Powerful Owl *Ninox strenua* | V | | Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. | Low |
| Rainbow Bee-eater *Merops ornatus* | | M | It is most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels. | Moderate |
| Regent Honeyeater *Anthochaera Phrygia* | CE | E | Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. | None |
| Rufous Fantail *Rhipidura rufifrons* | | M | A rainforest and wet sclerophyll inhabitant. | None |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Satin Flycatcher *Myiagra cyanoleuca* | | M | The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. | Low |
| Scarlet Robin *Petroica boodang* | V | | Inhabits dry eucalypt forests and woodlands with open understorey. | Recorded |
| Sharp-tailed Sandpiper *Calidris acuminate* | | M | Occurs in Australia during the non-breeding part of the year. Found on both the coast and inland areas. Flies north to Siberia to breed. | None |
| Speckled Warbler *Chthonicola sagittata* | V | | Found in woodland and grassland habitats with a native understorey. | Moderate |
| Spotted Harrier *Circus assimilis* | V | | Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. | Low |
| Varied Sittella *Daphoenositta chrysoptera* | V | | This species is sedentary and known to inhabit most forest/woodland habitats. | Moderate |
| Little Eagle *Hieraaetus morphnoides* | V | | Little Eagle is distributed across all of the Australian mainland except for densely vegetated areas, particularly on the Dividing Range escarpment. In NSW the Little Eagle is considered a single population. They inhabit open eucalypt woodland, woodland and open woodland, including Sheoak, *Acacia* woodland and riparian woodland in arid and semi-arid regions. | Moderate |
| White-bellied Sea-eagle *Haliaeetus leucogaster* | V | M | The species is normally seen perched high in a tree, or soaring over waterways and adjacent land, particularly along coastlines, lakes and rivers. | None |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| White-throated Needletail *Hirundapus caudacutus* | | M | For a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity. | Low |
| Yellow Wagtail *Motacilla flava* | | M | Occurs in a variety of habitats, favouring damp or wet vegetation. Forages on the edges of rivers, dams and wetlands. | Low |
| Aquatic ecological community in the catchment of the Snowy River in NSW | EEC (FM Act) | | The listing includes all native fish and aquatic invertebrates within all creeks, rivers and streams of the Snowy River catchment including Thredbo River and Little Thredbo River. | Recorded |
| Alpine Redspot Dragonfly *Austropetalia tonyana* | V (FM Act) | | Restricted to high altitude areas that extremely specific habitat requirements in that they only occur amongst rocks and logs within waterfall splash zones | None |
| River Blackfish in the Snowy River catchment *Gadopsis marmoratus* | E Pop (FM Act) | | Occurs in the Snowy River catchment where it was quite abundant in the mid and upper reaches. It is now known only from about 50km of the Delegate River and some of its tributaries | None |
| Flathead Galaxias *Galaxias rostratus* | E (FM Act) | CE | Known from the southern half of the Marry-Darling Basin within the Murrumbidgee, Murray and Macquarie River catchments. Inhabits a variety of habitats including rivers, lakes and swamps. | None. Study area is within Snowy River catchment |
| Stocky Galaxis *Galaxias tantangara* | CE (FM Act) | | Known from only one locality, Tantangara Creek in Kosciuszko National Park | None |
| Macquarie Perch *Macquaria australasica* | E (FM Act) | E | Found in the upstream reaches of the Murray-Darling Basin. Found in rivers and lakes. | None |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Murray Cod *Maccullochella peelii* | | V | Prefers deep, slow flowing turbid water in rivers and streams with boulders or undercut banks. | None |
| Trout Cod *Maccullochella macquariensis* | E (FM Act) | E | Found in the southern Murray-Darling river system, this fish inhabits fast flowing freshwater rivers and large streams | None |
| Broad-toothed Rat *Mastacomys fuscus* | V | V | Lives in a complex of runways through the dense vegetation of its wet grass, sedge or heath environment, and under the snow in winter. | Moderate |
| Greater Glider *Petauroides volans* | | V | Patchy distribution along the eastern coast of Australia. Prefers tall eucalyptus forests. | Low |
| Koala *Phascolarctos cinereus* | V | V | Inhabit eucalypt woodlands and forests. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. | Low |
| Mountain Pygmy-possum *Burramys parvus* | E | E | Distribution is limited to alpine and subalpine regions where there is a continuous period of snow cover for up to six months. High quality habitat for this species is characterised by deep, extensive boulderfields, high elevations, abundant Bogong Moths, and a nearby seed source. | Moderate |
| Smoky Mouse *Pseudomys fumeus* | CE | E | Occurs in a variety of vegetation communities, ranging from coastal heath to dry ridgeline forest, sub-alpine heath and, occasionally, wetter gullies. Known only from Bondo and Ingbyra State Forest, Mt Poole, Nullica State Forest and the adjoining South East Forests National Park. | None |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Spotted-tailed Quoll *Dasyurus maculatus* | V | E | 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. | Moderate |
| Alpine She-oak Skink *Cyclodomorphus praealtus* | E | E | In NSW, the species has only been observed in dry tussock grassland within the Kosciuszko region. | Low |
| Guthega Skink *Liopholis guthega* | | E | Prefers rocky or have sub-surface boulders hidden beneath soil or thick vegetation. The species utilizes burrows often opening from under boulders or shrubs. | Low |
| Pink-tailed Worm-lizard *Aprasia parapulchella* | V | V | Found on sloping, open woodland areas with a predominately native grassy ground layer usually dominated by Kangaroo Grass. | None |
| 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.<br>Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland. | None |
| Anemone Buttercup *Ranunculus anemoneus* | V | V | Generally occurs in environments with late melting snow; on south to east facing, steep grassy slopes, or rocky crevices, or short alpine herbfields on the main range and other high altitude locations. | Low |
| Austral Toadflax *Thesium australis* | V | V | Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*). | None |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Bago Leek-orchid *Prasophyllum bagoense* | CE | CE | Prefers sub-alpine treeless plain at an elevation of approximately 1200 m above sea level. Occurs in wet grassland dominated by Tussock Grass (*Poa labillardierei*), Fine-leaved Snow Grass (*Poa clivicola*) and Snow Grass (*Poa sieberiana*) | None |
| Blue-tongued Greenhood *Pterostylis oreophila* | CE | CE | Grows along sub-alpine watercourses under more open thickets of Mountain Tea-tree in muddy ground very close to water. Less commonly grows in peaty soils and sphagnum mounds | None |
| Clover Glycine *Glycine latrobeana* | | V | Found across south-eastern Australia in native grasslands, dry sclerophyll forests, woodlands and low open woodlands with a grassy ground layer | Low |
| Feldmark Grass *Rytidosperma pumilum* | V | V | Found in Australia and New Zealand. In Australia, distribution is restricted to Main Range, Kosciuszko National Park. | None |
| Hoary Sunray *Leucochrysum albicans var.tricolor* | | E | Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils. Can also occur on roadsides. | Moderate |
| Kiandra Leek Orchid *Prasophyllum retroflexum* | V | V | All known populations occurs in sub-alpine grasslands and woodlands in the Long Plain, Kiandra and Tantangara area. | None |
| Leafy Anchor Plant *Discaria nitida* | V | | Found on stream banks and on rocky areas near waterfalls | None, area extensively searched and none present |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Mauve Burr-daisy *Calotis glandulosa* | V | V | Found in montane and subalpine grasslands in the Australian Alps. Found in subalpine grassland (dominated by Poa spp.), and montane or natural temperate grassland dominated by Kangaroo Grass (*Themeda australis*) | None |
| Max Muellers Burr-daisy *Calotis pubescens* | E | | Grows in subalpine treeless plains in herb-rich grassland | None |
| Monaro Golden Daisy *Rutidosis leiolepis* | V | V | Found in natural temperate grassland on the Monaro and sub-alpine grasslands in Kosciuszko NP. | None |
| Perisher Wallaby-grass *Rytidosperma vickeyae* | E | - | Perisher Wallaby-grass is restricted to Kosciuszko NP. It has been recorded in the Perisher Valley and nearby creeks that drain into the Snowy River. | None |
| Pale Golden Moths *Diurus ochroma* | E | V | Occurs in eucalyptus woodland and sub-alpine grassland | None |
| Raleigh Sedge *Carex raleighii* | E | - | Grows in sphagnum bogs and high mountain wetlands | None |
| Shining Cudweed *Argyrotegium nitidulum* | V | V | Found in alpine and sub-alpine regions of New South Wales, Victoria, Tasmania and New Zealand in herbfields or open heathland | None |
| Silky Swainson-pea *Swainsona sericea* | V | - | Found in box-gum woodland and natural temperate grassland. | None |
| Swamp Everlasting *Xerochrysum palustre* | - | V | Grows in swamps and bogs which are often dominated by heath | Low |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Square Raspwort *Haloragis exalata subsp. exalata* | V | V | Appears to require protected and shaded damp situations in riparian habitats. Flowering specimens in NSW are recorded from November to January. | Low |
| Tarengo Leek Orchid *Prasophyllum petilum* | E | E | Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Also grows in grassy woodland in association with River Tussock (*Poa labillardieri*), Black Gum (*Eucalyptus aggregata*) and tea-trees (*Leptospermum spp.*) at Captains Flat and within the grassy groundlayer dominated by Kanagroo Grass under Box-Gum Woodland at Ilford (and Hall, ACT). | None |
| Alpine Sphagnum Bogs and Associated Fens (Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions) | E | E | The Alpine Sphagnum Bogs and Associated Fens ecological community is usually defined by the presence or absence of Sphagnum spp. on a peat substratum. Sphagnum is not always a major floristic component, and there are some sites in the community where Sphagnum has become depleted or been lost as a result of disturbance. | None |
| Monaro Tableland Cool Temperate Grassy Woodland in South Eastern Highlands Bioregion | CE | - | This is a woodland or derived natural grassland that replaces the southern distribution of the EEC Snow Gum Grassy Woodland. It occurs south of Captains Flat and along the Thredbo River valley until Thredbo village | None |

| Common Name (Scientific Name) | BC Act | EPBC Act | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory | - | CE | The community is dominated by moderately tall (25-50 cm) to tall (50 cm-1 m), dense to open tussock grasses with up to 70% of species being forbs. The community may be treeless or contain up to 10% cover of trees, shrubs or sedges. In the Southern Tablelands natural temperate grasslands are located at altitudes between 560 and 1200 metres in valleys influenced by cold air drainage and in broad plains. | None |
| Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions. | E | | Tablelands Basalt Forest is dominated by an open eucalypt canopy of variable composition. Eucalyptus viminalis, E. radiata, E. dalrympleana and E.pauciflora. May occur in the community in pure stands or in varying combinations. Tableland Basalt Forest is currently found in the Eastern Highlands and Southern and Central Tablelands covering the LGA of Bathurst Regional Council, Goulburn Mulwaree, Oberon, Palerand, Shoalhaven, Upper Lachlan and Wingecarribee. | None |
| White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland | E | CE | Box – Gum Grassy Woodlands and Derived Grasslands are characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum trees. In the Nandewar Bioregion, Grey Box (*Eucalyptus macrocarpa* or *E. moluccana*) may also be dominant or co-dominant. | None |

# Annexure D

## Significance assessments (BC Act and FM Act)

## NSW Biodiversity Conservation Act 2016

In Section 7.3 of the BC Act are five factors which are to be considered when determining if a proposed development or activity '*is likely to have a significant effect on the threatened species, or ecological communities, or their habitats'.* These five factors must be taken into account by consent or determining authorities when considering a development proposal or development application. This enables a decision to be made as to whether there is likely to be a significant effect on the species.

The habitat assessment table in Annexure C found that 14 threatened biota or threatened ecological communities listed under the BC Act that were known to, or have the potential to occur within the study area based on the evaluation completed. Given this, further assessment by application of the 5-part test is completed on the following biota:

- Woodland Birds (Diamond Firetail, Dusky Woodswallow, Flame Robin, Gang-gang Cockatoo, Hooded Robin, Scarlet Robin, Speckled Warbler, Varied Sittella, Little Eagle)
- Mammals (Spotted-tailed Quoll, Broad-toothed Rat)

**(a) in the case of a threatened species, whether the action proposed 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,**

**Woodland Birds (**Dusky Woodswallow, Brown Treecreeper, Diamond Firetail, Flame Robin, Gang-gang Cockatoo, Hooded Robin, Scarlet Robin, Speckled Warbler, Varied Sittella, Little Eagle**)**

### Dusky Woodswallow

The Dusky Woodswallow is often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests (Higgins et al., 2006). They are also seen in areas of non-native vegetation. No Dusky Woodswallow were recorded.

The NSW Scientific Committee lists the following threats for Dusky Woodswallow:

- Past and ongoing reductions in habitat quality
- Competitive exclusion by Noisy Miners (*Manorina melanocephala*)
- Nest predation by Currawongs, Magpies and Grey Butcherbirds
- Inappropriate fire regimes, excessive grazing and removal of coarse woody debris from the ground layer.

Of these, the proposed activity contributes to these threats through the clearing of native vegetation.

The clearing of up to about 0.09 hectares of potential habitat is necessary to carry out the proposal. The direct impact is considered negligible in the context of the woodlands within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected, as well as the impact being considered temporary only. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Dusky Woodswallow such that a viable local population (should one occur there) is likely to be placed at risk of extinction.

### Diamond Firetail

Diamond Firetail is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South-western Slopes and the North-west Plains and Riverina (OEH, 2020c, Morcombe, 2004). Although they are not commonly found in coastal districts, there are records from near Sydney, the Hunter Valley and the Bega Valley (OEH, 2020c). They are considered

relatively sedentary; however, many populations are known to disperse, especially during drought periods. They are known to build bottle-shaped nests in trees and bushes and preferentially choose mistletoe as a nest site (Cooney and Watson, 2005). It has declined in numbers in many areas and has disappeared from parts of its former range with Reid (1999) identifying it as a 'decliner' in a review of bird species' status in the NSW sheep-wheatbelt (Reid, 1999). No Diamond Firetail were recorded during the field survey.

OEH (2020b) identify the following threats to Diamond Firetail:

- Clearing and fragmentation of woodland, open forest, grassland and mallee habitat for agriculture and residential development, and firewood collection.
- Poor regeneration of open forest and woodland habitats.
- Invasion of weeds, resulting in the loss of important food plants.
- Modification and destruction of ground- and shrub layers within habitat through: removal of native plants, litter and fallen timber; introduction of exotic pasture grasses; heavy grazing and compaction by stock; and frequent fire.
- Predation of eggs and nestlings by increased populations of native predators such as the Pied Currawong *Strepera graculina*.
- Risk of local extinction due to small, isolated populations.

The clearing of about 0.09 hectares of potential woodland habitat is necessary to carry out the proposal. The direct impact is considered negligible in the context of the woodlands within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected as well as the impact being considered temporary only. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Diamond Firetail such that a viable local population is likely to be placed at risk of extinction.

### Flame Robin

Flame Robin breeds in upland, moist eucalypt forests and woodlands spending winter in more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains (OEH, 2020c). They often occurs in recently burnt areas, however habitat becomes unsuitable as vegetation closes up following regeneration (OEH, 2020c). Flame Robin were not recorded during the field survey.

OEH (2020b) identify the following threats to Flame Robin:

- Clearing and degradation of breeding habitat.
- Degradation of wintering habitat.
- Degradation and simplification of habitat by overgrazing and removal of standing dead timber, logs and coarse woody debris.
- Nest predation by native and exotic predators, including artificially large populations of Pied Currawong (*Strepera graculina*) in some areas.
- Habitat for this species may become unsuitable if dense regeneration occurs after bushfires or other disturbances.

The clearing of about 0.09 hectares of potential habitat is necessary to carry out the proposal. The direct impact is considered negligible in the context of the woodlands within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected as well as the impact being considered temporary only. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposed activity could have an adverse effect on the life cycle of Flame Robin or their habitats, such that a viable local population is likely to be placed at risk of extinction.

### Gang-gang Cockatoo

The Gang-gang Cockatoo is distributed from southern Victoria through south and central-eastern New South Wales (Morcombe, 2004). In New South Wales they have been recorded from the south-east coast to the Hunter region, and inland to the Central Tablelands and South-west slopes (OEH, 2020c). In summer, this species is generally found in tall mountain forests, showing a preference for more mature wet sclerophyll forests. This species is reliant on the presence of nest sites – medium sized hollows high in trees, suitable foraging habitat and it is known to favour old growth attributes for nesting and roosting. No Gang-gang Cockatoo were recorded during the field survey but they are known from the locality.

OEH (2020b) identify the following threats to Gang-gang Cockatoo:

- Clearing of vegetation and degradation of habitat may reduce the abundance of optimal foraging and roosting habitat.
- Individual pairs show high fidelity to selected nesting trees (choosing nesting hollows of particular shape, position and structure), with clearing and frequent fire posing a threat to continued successful breeding.
- Climate change may alter the extent and nature of its preferred habitat (cool termperate vegetation).
- Susceptible to Psittacine cirovirus disease (PCD) which is spread through contaminated nest chambers. PCD is known to have increased near Bowral in the southern highlands of New South Wales over the past decade and constitutes a further threat to the species.

The clearing of about 0.04 hectares of potential woodland habitat is necessary to carry out the proposal. This would be considered potential foraging habitat only due to the absence of suitable hollows for breeding. The direct impact is considered negligible in the context of the woodlands within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected as well as the impact being considered temporary only. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Gang-gang Cockatoo such that a viable local population (should one occur there) is likely to be placed at risk of extinction.

### Hooded Robin

The Hooded Robin is found across many parts of Australia in woodlands, acacia scrub and mallee (OEH, 2020c, Sass, 2009, Reid, 1999, Watson et al., 2001). First recognised as a declining woodland bird (Reid, 1999), the Hooded Robin is now listed as Vulnerable under the TSC Act. It is generally considered that the Hooded Robin requires a structurally diverse habitat including microhabitat such as native grasses, shrubs and fallen timber across a breeding territory of around 10 hectares (OEH, 2020c). However, it is believed that the species generally exhibits demanding requirements for both habitat complexity and area (>100ha) (Watson et al., 2001) which suggests that some portions of the study area may provide marginal habitat.

OEH (2020d) identify the following threats to this species:

- Clearing of woodlands, resulting in loss and fragmentation of habitat.
- Modification and destruction of ground habitat through heavy grazing and compaction by stock, removal of litter and fallen timber, introduction of exotic pasture grasses and frequent fire.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.
- Reduction in resources due to drought.
- Disturbance and changes to vegetation structure due to forestry activities (e.g. fire and harvesting).

The clearing of about 0.04 hectares of potential habitat is necessary to carry out the proposal. The direct impact is considered negligible in the context of the woodlands within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected as well as the impact being considered temporary only. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Hooded Robin such that a viable local population (should one occur there) is likely to be placed at risk of extinction.

### Scarlet Robin

In NSW, the Scarlet Robin occurs in open forests and woodlands from the coast to the inland slopes and in winter, dispersing birds are known to appear in the east of the inland plains (OEH 2012b).The Scarlet Robin is considered sensitive to habitat fragmentation and the reductions of structural complexity of habitat and native ground covers. (Barrett *et al.* 2007; Watson *et al.* 2001). One female Scarlet Robin was recorded on the northern side of Alpine Way during the field survey.

OEH (2020c) identify the following threats to Scarlet Robin:

- Historical habitat clearing and degradation.
- Habitat modification due to overgrazing.
- Reduction of size of remnant patches.
- Reduction in the structural complexity of habitat, including reductions in canopy cover, shrub cover, ground cover, logs, fallen branches and leaf litter.
- Reduction of the native ground cover in favour of exotic grasses.
- Loss of nest sites, food sources and foraging sites, such as standing dead timber, logs and coarse woody debris from depletion by grazing, firewood collection and ‘tidying up’ of rough pasture.
- Predation by over-abundant populations of Pied Currawong (*Strepera graculina*) which are supported by planted exotic berry-producing shrubs; this pressure, is addition to that from other native and exotic predators, may be a potentially severe threat to the breeding success of Scarlet Robin populations.
- Predation by feral cats (*Felis catus*).
- Robbing of nests and predation of fledglings by rats.
- Isolation of patches of habitat, particularly where these patches are smaller than 30 ha, and in landscapes where clearing has been heavy or where remnants are surrounded by cropping or stock grazing.
- Habitat for the Scarlet Robin may become unsuitable if dense regeneration occurs after bushfires or other disturbances.

The clearing of about 0.04 hectares of potential habitat is necessary to carry out the proposal. The direct impact is considered negligible in the context of the woodlands within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected as well as the impact being considered temporary only. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Scarlet Robin such that a viable local population (should one occur there) is likely to be placed at risk of extinction.

### Speckled Warbler

The Speckled Warbler lives in a wide range of *Eucalyptus* dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock

grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.

OEH (2020d) identify the following threats to this species:

- Due to the fragmented nature of the populations and their small size the species is susceptible to catastrophic events and localised extinction.
- Clearance of remnant grassy woodland habitat for paddock management reasons and for firewood.
- Poor regeneration of grassy woodland habitats.
- Modification and destruction of ground habitat through removal of litter and fallen timber, introduction of exotic pasture grasses, heavy grazing and compaction by stock and frequent fire.
- Habitat is lost and further fragmented as land is being cleared for residential and agricultural developments. In particular, nest predation increases significantly, to nest failure rates of over 80%, in isolated fragments.
- Nest failure due to predation by native and non-native birds, cats, dogs and foxes particularly in fragmented and degraded habitats.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.
- Climate change impacts including reduction in resources due to drought.

The clearing of about 0.04 hectares of potential woodland habitat is necessary to carry out the proposal. The direct impact is considered negligible in the context of the woodlands within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected as well as the impact being considered temporary only. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Speckled Warbler such that a viable local population (should one occur there) is likely to be placed at risk of extinction.

### Varied Sittella

The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands, with a nearly continuous distribution in NSW from the coast to the far west (Morcombe, 2004, OEH, 2020c, OEH, 2020a). It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. The Varied Sittella feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. Field survey did not reveal the presence of this species.

OEH (2020c) identify the following threats to Varied Sittella:

- Apparent decline has been attributed to declining habitat. The sedentary nature of the Varied Sittella makes cleared land a potential barrier to movement.
- The Varied Sittella is also adversely affected by the dominance of Noisy Miners in woodland patches.
- Threats include habitat degradation through small-scale clearing for fencelines and road verges, rural tree decline, loss of paddock trees and connectivity, 'tidying up' on farms, and firewood collection.

The clearing of about 0.04 hectares of potential habitat is necessary to carry out the proposal. The direct impact is considered negligible in the context of the woodlands within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected as well as the impact being considered temporary only. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Varied Sittella such that a viable local population is likely to be placed at risk of extinction.

### Little Eagle

The Little Eagle is found across mainland Australia except in densely forested areas. They nest in tall, living trees, where a large stick nest is built in winter. The species lays two or three eggs during spring, and young fledge in early summer. The field survey did not detected this species. In addition, no past or current nesting site was identified within the study area.

OEH (2020b) identify the following threats to Little Eagle:

- Secondary poisoning from rabbit baiting.
- Rural-residential subdivision and associated land uses (e.g. horse and goat grazing).
- Urban expansion.
- Clearing and degradation of foraging and breeding habitat.

The clearing of about 0.09 hectares of potential habitat is necessary to carry out the proposal. The direct impact is considered negligible in the context of the woodlands within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected as well as the impact being considered temporary only. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Little Eagle such that a viable local population is likely to be placed at risk of extinction.

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

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

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

These biota are not listed as an endangered ecological community or critically endangered ecological community.

**(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 action proposed, and**

**(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

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

i. The proposed work would result in the removal of up to 0.09 hectares of potential habitat; all of which would be temporary in nature.
ii. The proposal would not isolate or fragment other areas of habitats further than the impact that pre-exists given the ability of these species to move (fly), the relatively small nature of proposed work and the extent and quality of heathland, herbfield and woodlands present, adjacent to the study area as well as the wider locality, which would remain unaffected by the proposed work
iii. For these biota, the potential and known habitat to be removed is considered to be of little importance to the long-term viability of these biota in the locality.

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

No declared areas of outstanding biodiversity value are known from the Snowy Monaro LGA.

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

While the proposed activity – culvert lining work – is not recognised as a key threatening process (KTP) under the BC Act, the *Clearing of native vegetation*, is potential relevance.

The 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biodiversity. Clearing of any area of native vegetation, may impact on biological diversity such as habitat fragmentation limiting gene flow between small isolated populations, which may result in a reduction in the potential for biodiversity to adapt to environmental change.

Temporary impacts of up to about 0.09 hectares of native vegetation is necessary to carry out the proposal. The direct impact is considered negligible in the context of the native vegetation within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected.

### Conclusion

This Test of Significance has determined that the proposed activity is *'unlikely'* to have a *'significant effect'* on Dusky Woodswallow, Diamond Firetail, Flame Robin, Gang-gang Cockatoo, Hooded Robin, Scarlet Robin, Speckled Warbler, Varied Sittella, Little Eagle or their habitat.

---

**(a) in the case of a threatened species, whether the action proposed 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,**

### Mammals

#### Spotted-tailed Quoll

The Spotted-tailed Quoll is a marsupial that is forest dependant, ranging in weight from 2-3kg. The medium sized adept climber is rich rust to dark brown in colour with irregular white spots on the back and tail. It can be found along the east coast of NSW where it has been recorded in a variety of habitat types including coastal heath (OEH, 2020c) open forest and uses HBT, fallen logs and rock outcrops as den sites (OEH, 2020c, Menkhorst and Knight, 2010). The species is largely nocturnal and solitary, foraging through areas characterised by dense vegetation and substantial layers of ground litter. Females are known to occupy home ranges up to 750 hectares while males as large as 3,500 hectares (OEH, 2020c)

Habitat loss and fragmentation is the primary cause for the decline in Spotted-tailed Quolls within Australia. Habitat components such as structural complexity, adequate prey densities and den sites through clearing for agriculture are also factors for the species decreased populations.

The clearing of about 0.041 hectares of potential woodland habitat is necessary to carry out the proposal. This would be considered potential foraging habitat only due to the absence of suitable denning sites. Given their very large home ranges, this loss of potential foraging habitat is considered negligible, particularly in the context of the woodlands within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Spotted-tailed Quoll such that a viable local population is likely to be placed at risk of extinction.

### Broad-toothed Rat

The Broad-toothed Rat lives in a complex of runways through the dense vegetation of its wet grass, sedge or heath environment, and under the snow in Winter. Home ranges generally overlap and they shelter in nests of grass in the understory or under logs.

OEH (2020c) identify the following threats to this species:

- Predation by feral cats, especially around ski resorts
- Habitat loss, fragmentation and degradation from roads, ski runs and buildings
- Catastrophic fire events
- Grazing by rabbits and hares
- Invasion of weeds
- Climate change causing loss of snow cover
- Direct degradation of habitat by deer and pigs
- Damage of habitat by recreational users

The clearing of about 0.05 hectares of potential habitat is necessary to carry out the proposal. The impacts are temporary in nature, and are largely confined to the edges of potential habitat next to the Alpine Way and existing car park to facilitate machinery movement. These areas are already compromised by edge effects and previous clearing for the building of these infrastructure. Nonetheless, the direct impact is considered negligible in the context of the native vegetation within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected as well as the impact being considered temporary in nature. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Broad-toothed Rat such that a viable local population is likely to be placed at risk of extinction.

### Mountain Pygmy-possum

Mountain Pygmy-possum lives on the ground in rocky areas where boulders have accumulated below mountain peaks, frequently associated with alpine heathland shrubs.

OEH (2020c) identify the following threats to the species:

- Predation by feral cats, especially around ski resorts
- Habitat loss, fragmentation and degradation from roads, ski runs and buildings
- Fire damage to shrub cover
- Reduction in Bogong moth food supply
- Invasion of weeds
- Climate change causing loss of snow cover and reduced rainfall
- Predation by foxes
- Degradation of habitat by feral rabbit and deer
- Genetic loss and small population size

There is a single record of Mountain Pygmy-possum near the location. A review of the BioNET records confirm that the record is about 150 metres north of the proposal. This record is dated 1971 and comes from a study at Macquarie University, Sydney. This is well south of the known population at South Ramshead where the species is known and regularly recorded, and the closest other records to the proposal. At the proposal, no subalpine boulder field (the known habitat for this species) occurs, with only

scattered rocks present. Some of these rocks were placed during the construction of the Alpine Way and culverts for the Thredbo River as they are clearly lining the banks. Given these factors, there is some doubt that suitable habitat remains, should the record be spatially correct.

Nonetheless, the clearing of about 0.05 hectares of potential habitat is necessary to carry out the proposal. No subalpine or alpine boulder field would be cleared by the proposal. The impacts are considered temporary in nature, and are largely confined to the edges of native vegetation next to the Alpine Way and existing car park to facilitate machinery movement. These areas are already compromised by edge effects and previous clearing for the building of these infrastructure. Given this, the direct impact is considered negligible in the context of the native vegetation within the study area, and within the wider locality (including Kosciuszko National Park) as well as surrounding boulder fields which would remain unaffected. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

With consideration of these factors, it is *unlikely* that the proposal could have an adverse effect on the life cycle of Mountain Pygmy-possum such that a viable local population is likely to be placed at risk of extinction.

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

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

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

These biota are not listed as an endangered ecological community or critically endangered ecological community.

**(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 action proposed, and**

**(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

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

i. The proposed work would result in the removal of up to 0.05 hectares of potential habitat, all of which is considered temporary impacts.
ii. The proposal would not isolate or fragment other areas of habitats further than the impact that pre-exists given the ability of these species to move, the relatively small nature of proposed work and the extent and quality of native vegetation present, adjacent to the study area as well as the wider locality, which would remain unaffected by the proposed work
iii. For these biota, the potential and known habitat to be removed is considered to be of little importance to the long-term viability of these biota in the locality.

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

No declared areas of outstanding biodiversity value are known from the Snowy Monaro LGA.

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

While the proposed activity – culvert lining work – is not recognised as a key threatening process (KTP) under the BC Act, the *Clearing of native vegetation*, is potential relevance.

The 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biodiversity. Clearing of any area of native vegetation, may impact on biological diversity such as habitat fragmentation limiting gene flow between small isolated populations, which may result in a reduction in the potential for biodiversity to adapt to environmental change.

Temporary impacts of up to about 0.09 hectares of native vegetation is necessary to carry out the proposal. The direct impact is considered negligible in the context of the native vegetation within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected.

**Conclusion**

This Test of Significance has determined that the proposed activity is *'unlikely'* to have a *'significant effect'* on Spotted-tailed Quoll, Broad-toothed Rat, Mountain Pygmy-possum or their habitat.

---

NSW Fisheries Management Act 1994

In the FM Act, there are seven factors which are to be considered when determining if a proposed development or activity '*is likely to have a significant effect on the threatened species, or ecological communities, or their habitats'*. These seven factors must be taken into account by consent or determining authorities when considering a development proposal or development application. This enables a decision to be made as to whether there is likely to be a significant effect on the species.

The habitat assessment table in Annexure C found that one threatened biota listed under the FM Act that were known to, or have the potential to occur within the study area based on the evaluation completed. Given this, further assessment by application of the 7-part test is completed on the following biota:

- Aquatic ecological community in the catchment of the Snowy River in NSW

**(a) in the case of a threatened species, whether the action proposed 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,**

Aquatic ecological community in the catchment of the Snowy River in NSW is not a threatened species.

**(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,**

Aquatic ecological community in the catchment of the Snowy River in NSW is not listed as an endangered population.

**(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

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

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

The TEC, *aquatic ecological community in the catchment of the Snowy River in NSW* includes all native fish and aquatic invertebrates within all rivers, creeks and streams. The listing includes Snowy River, Eucumbene

River, Thredbo (or Crackenback River), Gungarlin River, Mowamba River, Bombala River, McLaughlin River, Delegate River, Pinch River, Jacobs River and their tributaries and the River bed channel inundated by Jindabyne, Eucumbene, Island Bend and Guthega Dams. This community varies within these water bodies however they are all interconnected. The threats this community are also varied however they include the introduction of dams and weirs reducing natural flow and in turn affecting water quality, thermal pollution, introduced fish species, degradation of riparian vegetation and increased rates or erosion and sedimentation. The last two threats are the most relevant threat to this community in relation to the proposed activity. A series of mitigation measures have been recommended in this BA to minimise these threats on this community. Conversely, the proposal would result in a long-term benefit by addressing the current degradation of the existing culverts.

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

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

**(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

**(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,**

i. The proposal would result in a minor direct impact to the aquatic environment of Thredbo River. The proposed work would help minimise further degradation of the existing infrastructure by minimising water entry points around the culverts. Temporary impacts are proposed within the stream. A temporary clean gravel pad would be placed within the stream. This would provide a pad for the excavator that would be required during the proposed work period. This would also be placed in position to ensure fish passage is maintained around it.

ii. No. The ability of fish to move through the study area would continue to occur should the proposal proceed. The proposed design and construction methodology would not permanently affect fish passage.

iii. The aquatic habitats of the study area are considered to be in relatively good condition and contribute to the health and condition of this widespread EEC. The proposed work aims to reduce the likelihood of continue erosion around the existing culverts which would also result in decreased sediment into the Thredbo River.

**(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),**

No critical habitat has been declared for this EEC under the FM Act.

**(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,**

While there is no recovery plan for threat abatement plan for this EEC, the proposed work would be considered consistent with one should it exist as it aims to improve the structural integrity of existing road infrastructure that would lead to long-term benefits including improvements to fish passage and minimising erosion and sediment flowing into Thredbo River from the erosion currently occurring around the culverts.

**(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.**

While the proposal – culvert rehabilitation – is not recognised as a key threatening process (KTP) under the FM Act, the *Degradation of native riparian vegetation along NSW watercourses, and increased sedimentation and erosion during construction* are of relevance to the proposal.

The proposed methodology allows for continued opportunity for fish passage along the Little Thredbo River during the proposed work period by having at least one of the culverts open at all time, while the proposed work is carried out within the remaining culverts. However, the proposal would result in a minor direct impact to the aquatic environment of Thredbo River by minimising water entry points around the culverts with concrete. Temporary impacts are also proposed within the stream. A temporary clean gravel pad would be placed within the stream. This would provide a pad for the excavator that would be required during the proposed work period. This would also be placed in position to ensure fish passage is maintained around it.

Mitigation measures provided in section 6 provide a framework to minimise the potential impacts of these KTP during construction. With consideration of the proposal design and proposed work methodology, the proposal is unlikely to result in the operation of, or increase the impact of, a key threatening process.

### Conclusion

This Assessment of Significance has determined that the proposal is *'unlikely'* to have a *'significant effect'* on the Aquatic Ecological Community in the catchment of the Snowy River in NSW and their habitats. Therefore, the proposal will not require a Species Impact Statement.

# Matters of National Environmental Significance

## Migratory Species

Protected under several international agreements to which Australia is a signatory, Migratory species are considered Matters of National Environmental Significance under the EPBC Act.

One migratory species was found to have a moderate to high potential, or were known to occur within the vicinity of the proposal; Rainbow Bee-eater (Habitat Assessment, Appendix C).

Under the EPBC Act, an action is likely to have a significant impact on a migratory species if it substantially modifies, destroys or isolates an area of 'important habitat' for the species (DEWHA, 2009). The study area is not considered to comprise 'important habitat' as it does not contain:

- Habitat used by a migratory species occasionally or periodically within a region that supports an ecological significant proportion of the population of the species.
- Habitat that is of critical importance to the species at particular life-cycle stages.
- Habitat used by a migratory species that is at the limit of the species' range.
- Habitat within an area where the species is declining.

Given this, the proposal would not impact on Rainbow Bee-eater or any migratory species and are not considered further.

## Threatened Species

The study area and immediate surrounds contains potential habitat for four biota listed as threatened under the EPBC Act; Spotted-tailed Quoll, Broad-toothed Rat, Mountain Pygmy-possum (also assessed under the BC Act and FM Act in Annexure D) and Hoary Sunray. The following section provides significance assessment for this biota.

### Vulnerable Species (Broad-toothed Rat)

*Will the action lead to a long-term decrease in the size of an important population of a species?*

No. There is no evidence that an 'important population' as defined by the EPBC Act occurs within the study area. The clearing of about 0.05 hectares of potential habitat is necessary to carry out the proposal. The impacts are temporary in nature, and are largely confined to the edges of potential habitat next to the Alpine Way and existing car park to facilitate machinery movement. These areas are already compromised by edge effects and previous clearing for the building of these infrastructure. Nonetheless, the direct impact is considered negligible in the context of the native vegetation within the study area, and within the wider locality (including Kosciuszko National Park) which would remain unaffected as well as the impact being considered temporary in nature. Recommendations detailed within section 6 provide a framework for minimising potential direct and indirect impacts to this species.

Given this, it is unlikely that the proposed action would lead to a long-term decrease in an area of occupancy of an important population of this species (should one even occur there).

*Will the action reduce the area of occupancy of an important population?*

No. While there is no evidence to suggest that an 'important' population even occurs within the study area, the proposed action would result in the direct impact to or removal of 0.05 hectares of potential habitat. There are large areas of existing native vegetation in the wider locality which would remain unaffected by the proposal and would continue to provide habitat for this species in the locality. Given this, it is unlikely that the proposed action would lead to a long-term decrease in an area of occupancy of an important population of this species (should one occur there).

*Will the action fragment an existing population into two or more populations?*

No population (should one occur there) would be fragmented into two or more populations by the current design of the proposed action.

*Will the action adversely affect habitat critical to the survival of a species?*

No. The habitat present is not considered critical for the survival of these species.

*Will the action disrupt the breeding cycle of an important population?*

No. There are large areas of existing native vegetation in the wider locality which would remain unaffected by the proposal and would continue to provide habitat for this species in the locality.

*Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?*

No. The potential habitat proposed for removal is a very small area. There are large areas of existing native vegetation in the wider locality which would remain unaffected by the proposal and would continue to provide habitat for this species in the locality.

*Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?*

No. Mitigation measures within section 6 provide a framework to minimise the risk of weed species becoming established as a result of this proposal.

*Will the action introduce disease that may cause the species to decline?*

No. Recommendations within section 6 provide a framework for managing potential risks to biodiversity.

*Will the action interfere with the recovery of the species?*

No. Mitigation measures outlined within section 6 suggest that it is unlikely that the proposed action would have an impact on the recovery of this species given the relatively minor level of impact proposed and that a range of mitigation measures designed specifically to minimise potential impacts would be implemented.

### Endangered Species (Mountain Pygmy-possum, Spotted-tailed Quoll, Hoary Sunray)

*Will the action lead to a long-term decrease in the size of a population of a species?*

No. There is a single record of Mountain Pygmy-possum near the location. A review of the BioNET records confirm that the record is about 150 metres north of the proposal. This record is dated 1971 and comes from a study at Macquarie University, Sydney. This is well south of the known population at South Ramshead where the species is known and regularly recorded, and the closest other records to the proposal. At the proposal, no subalpine boulder field (the known habitat for this species) occurs, with only scattered rocks present. Some of these rocks were placed during the construction of the Alpine Way and culverts for the Thredbo River as they are clearly lining the banks. Given these factors, there is some doubt that suitable habitat remains, should the record be spatially correct.

Nonetheless, the clearing of about 0.05 hectares of potential habitat is necessary to carry out the proposal. No subalpine or alpine boulder field would be cleared by the proposal. The impacts are considered temporary in nature, and are largely confined to the edges of native vegetation next to the Alpine Way and existing car park to facilitate machinery movement. These areas are already compromised by edge effects and previous clearing for the building of these infrastructure. Given this, the direct impact is considered negligible in the context of the native vegetation within the study area, and within the wider locality (including Kosciuszko National Park) as well as surrounding boulder fields which would remain unaffected.

For Hoary Sunray, this species is known to occur even in disturbed roadsides such as Alpine Way, but none were recorded during the field survey.

Given this, it is unlikely that the proposed action would lead to a long-term decrease in the size of a population of either species (should they even occur there).

*Will the action reduce the area of occupancy of the species?*

No. There is no evidence to suggest that a population relies upon the resources of the study area in its entirety given the existing environment and the absence of Hoary Sunray during the field survey. Given these factors, the action is unlikely to reduce any area of occupancy to the detriment of these species.

*Will the action fragment an existing population into two or more populations?*

No population would be fragmented into two or more populations given the context of vegetation along the Alpine Way, the design of the proposal and the nature of these species.

*Will the action adversely affect habitat critical to the survival of a species?*

No. The habitat located adjacent to the Alpine Way is not considered critical to these species for their survival.

*Will the action disrupt the breeding cycle of a population?*

No. There are large areas of existing native vegetation and boulder fields in the wider locality which would remain unaffected by the proposal and would continue to provide habitat for this species in the locality.

*Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?*

No. The availability of habitat in the locality indicates that the proposal is unlikely to impact potential habitat to the extent these species are likely to decline.

*Will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?*

No. Mitigation measures within section 6 provide a framework to minimise the risk of weed species invading adjoining habitats.

*Will the action introduce disease that may cause the species to decline?*

No. Recommendations within section 6 provide a framework for managing potential risks to biodiversity.

*Will the action interfere with the recovery of the species?*

No. Mitigation measures outlined within section 6 suggest that it is unlikely that the proposed action would have an impact on the recovery of this species given the relatively minor level of impact proposed and that a range of mitigation measures designed specifically to minimise potential impacts would be implemented.

## Conclusion

With consideration of the assessments completed within Annexure D, the proposal is *unlikely* to have a significant effect on threatened or migratory biota as listed by the EPBC Act. Based on this, referral to the Commonwealth Minister is not warranted.

# Annexure E

## Protected Matters Search Tool results

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

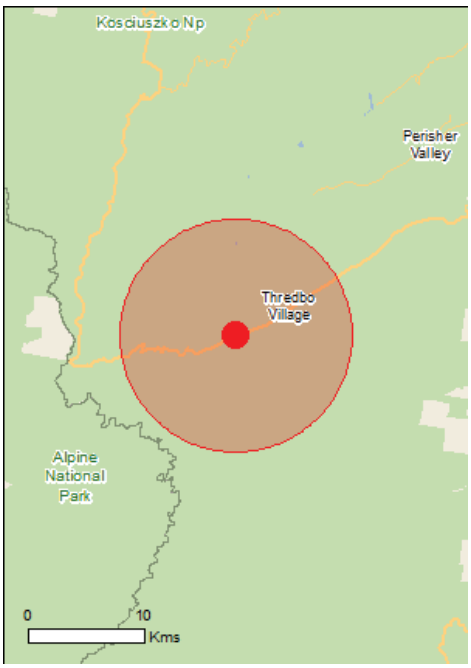
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 25/11/20 10:33:15

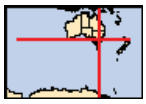
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements




This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates
Buffer: 10.0Km



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | 3 |
| Wetlands of International Importance: | 8 |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | None |
| Listed Threatened Ecological Communities: | 3 |
| Listed Threatened Species: | 40 |
| Listed Migratory Species: | 12 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

| | |
|---|---|
| Commonwealth Land: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 18 |
| Whales and Other Cetaceans: | None |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

| | |
|---|---|
| State and Territory Reserves: | 3 |
| Regional Forest Agreements: | 2 |
| Invasive Species: | 26 |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Marine) | None |

# Details

## Matters of National Environmental Significance

| National Heritage Properties | | [ Resource Information ] |
|---|---|---|
| Name | State | Status |
| Natural | | |
| Australian Alps National Parks and Reserves | NSW | Listed place |
| Australian Alps National Parks and Reserves | VIC | Listed place |
| Historic | | |
| Snowy Mountains Scheme | NSW | Listed place |

| Wetlands of International Importance (Ramsar) | [ Resource Information ] |
|---|---|
| Name | Proximity |
| Banrock station wetland complex | 700 - 800km upstream |
| Barmah forest | 200 - 300km upstream |
| Blue lake | Within 10km of Ramsar |
| Gunbower forest | 300 - 400km upstream |
| Hattah-kulkyne lakes | 500 - 600km upstream |
| Nsw central murray state forests | 200 - 300km upstream |
| Riverland | 700 - 800km upstream |
| The coorong, and lakes alexandrina and albert wetland | 700 - 800km upstream |

### Listed Threatened Ecological Communities [ Resource Information ]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

| Name | Status | Type of Presence |
|---|---|---|
| Alpine Sphagnum Bogs and Associated Fens | Endangered | Community known to occur within area |
| Natural Temperate Grassland of the South Eastern Highlands | Critically Endangered | Community may occur within area |
| White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland | Critically Endangered | Community likely to occur within area |

### Listed Threatened Species [ Resource Information ]

| Name | Status | Type of Presence |
|---|---|---|
| Birds | | |
| Anthochaera phrygia<br>Regent Honeyeater [82338] | Critically Endangered | Foraging, feeding or related behaviour may occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Falco hypoleucos<br>Grey Falcon [929] | Vulnerable | Species or species habitat may occur within area |
| Grantiella picta<br>Painted Honeyeater [470] | Vulnerable | Species or species habitat may occur within area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat known to occur within area |
| Lathamus discolor<br>Swift Parrot [744] | Critically Endangered | Species or species |

| Name | Status | Type of Presence |
|---|---|---|
| | | habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Rostratula australis<br>Australian Painted Snipe [77037] | Endangered | Species or species habitat may occur within area |
| **Fish** | | |
| Galaxias rostratus<br>Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745] | Critically Endangered | Species or species habitat likely to occur within area |
| Maccullochella macquariensis<br>Trout Cod [26171] | Endangered | Species or species habitat may occur within area |
| Maccullochella peelii<br>Murray Cod [66633] | Vulnerable | Species or species habitat may occur within area |
| Macquaria australasica<br>Macquarie Perch [66632] | Endangered | Species or species habitat may occur within area |
| Prototroctes maraena<br>Australian Grayling [26179] | Vulnerable | Species or species habitat likely to occur within area |
| **Frogs** | | |
| Litoria raniformis<br>Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828] | Vulnerable | Species or species habitat may occur within area |
| Litoria spenceri<br>Spotted Tree Frog [25959] | Endangered | Species or species habitat may occur within area |
| Litoria verreauxii alpina<br>Alpine Tree Frog, Verreaux's Alpine Tree Frog [66669] | Vulnerable | Species or species habitat known to occur within area |
| **Mammals** | | |
| Burramys parvus<br>Mountain Pygmy-possum [267] | Endangered | Species or species habitat known to occur within area |
| Dasyurus maculatus maculatus (SE mainland population)<br>Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184] | Endangered | Species or species habitat known to occur within area |
| Mastacomys fuscus mordicus<br>Broad-toothed Rat (mainland), Tooarrana [87617] | Vulnerable | Species or species habitat known to occur within area |
| Petauroides volans<br>Greater Glider [254] | Vulnerable | Species or species habitat likely to occur within area |
| Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)<br>Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104] | Vulnerable | Species or species habitat may occur within area |
| Pseudomys fumeus<br>Smoky Mouse, Konoom [88] | Endangered | Species or species habitat known to occur within area |
| Pteropus poliocephalus<br>Grey-headed Flying-fox [186] | Vulnerable | Foraging, feeding or related behaviour may occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| **Plants** | | |
| Argyrotegium nitidulum<br>Shining Cudweed [82043] | Vulnerable | Species or species habitat known to occur within area |
| Calotis glandulosa<br>Mauve Burr-daisy [7842] | Vulnerable | Species or species habitat may occur within area |
| Colobanthus curtisiae<br>Curtis' Colobanth [23961] | Vulnerable | Species or species habitat likely to occur within area |
| Glycine latrobeana<br>Clover Glycine, Purple Clover [13910] | Vulnerable | Species or species habitat likely to occur within area |
| Haloragis exalata subsp. exalata<br>Wingless Raspwort, Square Raspwort [24636] | Vulnerable | Species or species habitat may occur within area |
| Leucochrysum albicans subsp. tricolor<br>Hoary Sunray, Grassland Paper-daisy [89104] | Endangered | Species or species habitat may occur within area |
| Prasophyllum bagoense<br>Bago Leek-orchid [84276] | Critically Endangered | Species or species habitat may occur within area |
| Prasophyllum morganii<br>Mignonette Leek-orchid, Cobungra Leek-orchid, Dense Leek-orchid [13804] | Vulnerable | Species or species habitat may occur within area |
| Prasophyllum petilum<br>Tarengo Leek Orchid [55144] | Endangered | Species or species habitat may occur within area |
| Pterostylis oreophila<br>Blue-tongued Orchid, Kiandra Greenhood [22903] | Critically Endangered | Species or species habitat likely to occur within area |
| Ranunculus anemoneus<br>Anemone Buttercup [14889] | Vulnerable | Species or species habitat likely to occur within area |
| Rytidosperma pumilum<br>Feldmark Grass [66716] | Vulnerable | Species or species habitat likely to occur within area |
| Thesium australe<br>Austral Toadflax, Toadflax [15202] | Vulnerable | Species or species habitat likely to occur within area |
| Xerochrysum palustre<br>Swamp Everlasting, Swamp Paper Daisy [76215] | Vulnerable | Species or species habitat likely to occur within area |
| **Reptiles** | | |
| Aprasia parapulchella<br>Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665] | Vulnerable | Species or species habitat may occur within area |
| Cyclodomorphus praealtus<br>Alpine She-oak Skink [64721] | Endangered | Species or species habitat known to occur within area |
| Liopholis guthega<br>Guthega Skink [83079] | Endangered | Species or species habitat known to occur within area |

**Listed Migratory Species** [ Resource Information ]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

| Name | Threatened | Type of Presence |
|---|---|---|
| **Migratory Marine Birds** | | |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| **Migratory Terrestrial Species** | | |
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat known to occur within area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Species or species habitat likely to occur within area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Species or species habitat known to occur within area |
| Rhipidura rufifrons<br>Rufous Fantail [592] | | Species or species habitat known to occur within area |
| **Migratory Wetlands Species** | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Gallinago hardwickii<br>Latham's Snipe, Japanese Snipe [863] | | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |

## Other Matters Protected by the EPBC Act

**Listed Marine Species** [ Resource Information ]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

| Name | Threatened | Type of Presence |
|---|---|---|
| **Birds** | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Ardea alba<br>Great Egret, White Egret [59541] | | Species or species |

| Name | Threatened | Type of Presence |
|---|---|---|
| | | habitat likely to occur within area |
| Ardea ibis<br>Cattle Egret [59542] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Gallinago hardwickii<br>Latham's Snipe, Japanese Snipe [863] | | Species or species habitat may occur within area |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat likely to occur within area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat known to occur within area |
| Lathamus discolor<br>Swift Parrot [744] | Critically Endangered | Species or species habitat may occur within area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Species or species habitat likely to occur within area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Species or species habitat known to occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Rhipidura rufifrons<br>Rufous Fantail [592] | | Species or species habitat known to occur within area |
| Rostratula benghalensis (sensu lato)<br>Painted Snipe [889] | Endangered* | Species or species habitat may occur within area |

## Extra Information

### State and Territory Reserves [ Resource Information ]

| Name | State |
|---|---|
| Alpine | VIC |
| Indi | VIC |
| Kosciuszko | NSW |

### Regional Forest Agreements [ Resource Information ]

Note that all areas with completed RFAs have been included.

| Name | State |
|---|---|
| Gippsland RFA | Victoria |
| Southern RFA | New South Wales |

### Invasive Species [ Resource Information ]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

| Name | Status | Type of Presence |
|---|---|---|
| **Birds** | | |
| Alauda arvensis<br>Skylark [656] | | Species or species habitat likely to occur within area |
| Carduelis carduelis<br>European Goldfinch [403] | | Species or species habitat likely to occur within area |
| Columba livia<br>Rock Pigeon, Rock Dove, Domestic Pigeon [803] | | Species or species habitat likely to occur within area |
| Passer domesticus<br>House Sparrow [405] | | Species or species habitat likely to occur within area |
| Streptopelia chinensis<br>Spotted Turtle-Dove [780] | | Species or species habitat likely to occur within area |
| Sturnus vulgaris<br>Common Starling [389] | | Species or species habitat likely to occur within area |
| Turdus merula<br>Common Blackbird, Eurasian Blackbird [596] | | Species or species habitat likely to occur within area |
| **Mammals** | | |
| Canis lupus familiaris<br>Domestic Dog [82654] | | Species or species habitat likely to occur within area |
| Capra hircus<br>Goat [2] | | Species or species habitat likely to occur within area |
| Equus caballus<br>Horse [5] | | Species or species habitat likely to occur within area |
| Felis catus<br>Cat, House Cat, Domestic Cat [19] | | Species or species habitat likely to occur within area |
| Feral deer<br>Feral deer species in Australia [85733] | | Species or species habitat likely to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Lepus capensis<br>Brown Hare [127] | | Species or species habitat likely to occur within area |
| Mus musculus<br>House Mouse [120] | | Species or species habitat likely to occur within area |
| Oryctolagus cuniculus<br>Rabbit, European Rabbit [128] | | Species or species habitat likely to occur within area |
| Rattus rattus<br>Black Rat, Ship Rat [84] | | Species or species habitat likely to occur within area |
| Sus scrofa<br>Pig [6] | | Species or species habitat likely to occur within area |
| Vulpes vulpes<br>Red Fox, Fox [18] | | Species or species habitat likely to occur within area |
| **Plants** | | |
| Asparagus asparagoides<br>Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473] | | Species or species habitat likely to occur within area |
| Chrysanthemoides monilifera subsp. monilifera<br>Boneseed [16905] | | Species or species habitat likely to occur within area |
| Cytisus scoparius<br>Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934] | | Species or species habitat likely to occur within area |
| Nassella trichotoma<br>Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884] | | Species or species habitat likely to occur within area |
| Pinus radiata<br>Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] | | Species or species habitat may occur within area |
| Rubus fruticosus aggregate<br>Blackberry, European Blackberry [68406] | | Species or species habitat likely to occur within area |
| Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii<br>Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497] | | Species or species habitat likely to occur within area |
| Ulex europaeus<br>Gorse, Furze [7693] | | Species or species habitat likely to occur within area |

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

# Coordinates

-36.52276 148.2641

# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

© Commonwealth of Australia
Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

# Annexure F

## Priority Weed Declarations

# Priority weeds for the South East

**Note**: this region includes the local council areas of Bega Valley, Eurobodalla, Goulburn Mulwaree, Hilltops (eastern), Kiama, Queanbeyan-Palerang Regional, Shellharbour, Shoalhaven, Snowy Monaro Regional, Upper Lachlan, Wingecarribee, Wollongong and Yass Valley.

Select another region

| Weed | Duty |
| --- | --- |
| All plants | **General Biosecurity Duty**<br>*All plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.* |
| African boxthorn<br>*Lycium ferocissimum* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| African lovegrass<br>*Eragrostis curvula* | **Regional Recommended Measure**<br>*Land managers reduce impacts from the plant on priority assets.* |
| Alligator weed<br>*Alternanthera philoxeroides* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Alligator weed<br>*Alternanthera philoxeroides* | **Biosecurity Zone**<br>The Alligator Weed Biosecurity Zone is established for all land within the state except land in the following regions: Greater Sydney; Hunter (but only in the local government areas of City of Lake Macquarie, City of Maitland, City of Newcastle or Port Stephens).<br>*Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone* |

| | |
|---|---|
| Anchored water hyacinth<br>*Eichhornia azurea* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Athel pine<br>*Tamarix aphylla* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Bellyache bush<br>*Jatropha gossypiifolia* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Bitou bush<br>*Chrysanthemoides monilifera* subsp. *rotundata* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Bitou bush<br>*Chrysanthemoides monilifera* subsp. *rotundata* | **Biosecurity Zone**<br>The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south.<br>*Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone* |
| Black knapweed<br>*Centaurea x moncktonii* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Black willow<br>*Salix nigra* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |

| | |
|---|---|
| Blackberry<br>*Rubus fruticosus* species aggregate | **Prohibition on dealings**<br>*Must not be imported into the State or sold*<br>**All species in the Rubus fruiticosus species aggregate have this requirement, except for the varietals Black Satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smooth Stem, and Thornfree** |
| Blue hound's tongue<br>*Cynoglossum creticum* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Boneseed<br>*Chrysanthemoides monilifera* subsp. *monilifera* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Boneseed<br>*Chrysanthemoides monilifera* subsp. *monilifera* | **Control Order**<br>Bonseed Control Zone: Whole of NSW<br>*Boneseed Control Zone (Whole of NSW): Owners and occupiers of land on which there is boneseed must notify the local control authority of new infestations; immediately destroy the plants; ensure subsequent generations are destroyed; and ensure the land is kept free of the plant. A person who deals with a carrier of boneseed must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant.* |
| Boxing glove cactus<br>*Cylindropuntia fulgida* var. *mamillata* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Bridal creeper<br>*Asparagus asparagoides* | **Prohibition on dealings**<br>*Must not be imported into the State or sold*<br>***this requirement also applies to the Western Cape form of bridal creeper** |

| | |
|---|---|
| Bridal veil creeper<br>*Asparagus declinatus* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Broomrapes<br>*Orobanche* species | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*<br>**All species of Orobanche are Prohibited Matter in NSW, except Clover broomrape, Orobanche minor and Australian broomrape, Orobanche cernua var. australiana.** |
| Cabomba<br>*Cabomba caroliniana* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Cabomba<br>*Cabomba caroliniana* | **Regional Recommended Measure**<br>Exclusion zone: whole of region except the core infestation area of Wollongong, Shellharbour and Kiama councils.<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Cane cactus<br>*Austrocylindropuntia cylindrica* | **Prohibition on dealings**<br>*Must not be imported into the State or sold*<br>**All species in the Austrocylindropuntia genus have this requirement** |
| Cane needle grass<br>*Nassella hyalina* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |

| | |
|---|---|
| Cape broom<br>*Genista monspessulana* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Cape broom<br>*Genista monspessulana* | **Regional Recommended Measure**<br>Core infestation: whole region except for the exclusion zone of Bega and Wingecarribee councils<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Cat's claw creeper<br>*Dolichandra unguis-cati* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Cat's claw creeper<br>*Dolichandra unguis-cati* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Chilean needle grass<br>*Nassella neesiana* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Chilean needle grass<br>*Nassella neesiana* | **Regional Recommended Measure**<br>Exclusion zone: whole of region except core infestation area of Wollongong, Kiama, Shellharbour, Wingecarribee, Gouburn/Murwaree, and Queanbeyan/Palerang<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant.* |

| | |
|---|---|
| Chinese violet<br>*Asystasia gangetica* subsp. *micrantha* | **Control Order**<br>*Owners and occupiers of land on which there is Chinese violet must notify the local control authority for the area if the Chinese violet is part of a new infestation on the land, destroy all Chinese violet on the land ensuring that subsequent generations of Chinese violet are destroyed; and keep the land free of Chinese violet. A person who deals with a carrier of Chinese violet must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant on the land, or on or in a carrier.* |
| Climbing asparagus<br>*Asparagus africanus* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Climbing asparagus<br>*Asparagus africanus* | **Regional Recommended Measure**<br>Exclusion zone: whole of region except core infestation areas. Core infestation area: Wollongong, Kiama, Shellharbour, Bega and Shoalhaven local government areas.<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core infestation area: Land managers should mitigate spread from their land.* |
| Climbing asparagus fern<br>*Asparagus plumosus* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Common pear<br>*Opuntia stricta* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Common pear<br>*Opuntia stricta* | **Regional Recommended Measure**<br>Core infestation area: whole region except the exclusion zone of Wollongong, Kiama, and Shellharbour, and Eurobadalla<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core infestation: Land managers should mitigate spread from their land.*<br>***This Regional Recommended Measure applies to all species of Opuntia except for Opuntia ficus-indica (Indian fig)** |

| | |
|---|---|
| Coolatai grass<br>*Hyparrhenia hirta* | **Regional Recommended Measure**<br>Exclusion zone: whole region except the core infestation area of Bigga, Crooked Corner and Narrawa in the Upper Lachlan local government area, and Wollongong local government area<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Eurasian water milfoil<br>*Myriophyllum spicatum* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Eve's needle cactus<br>*Austrocylindropuntia subulata* | **Prohibition on dealings**<br>*Must not be imported into the State or sold*<br>**All species in the Austrocylindropuntia genus have this requirement** |
| Fireweed<br>*Senecio madagascariensis* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Fireweed<br>*Senecio madagascariensis* | **Regional Recommended Measure**<br>Exclusion zone: whole of region except the core infestation area of Wollongong, Kiama, Shellharbour, Eurobodalla, Shoalhaven, Bega Valley and Wingecaribee councils<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Flax-leaf broom<br>*Genista linifolia* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |

| | |
|---|---|
| Flax-leaf broom<br>*Genista linifolia* | **Regional Recommended Measure**<br>Exclusion zone: whole region except for the core infestation areas of Wollongong, Shellharbour, Kiama, Shoalhaven and Eurobodalla councils<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Foxtail fern<br>*Asparagus densiflorus* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Frogbit<br>*Limnobium laevigatum* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*<br>**All species of Limnobium are Prohibited Matter** |
| Gamba grass<br>*Andropogon gayanus* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Giant devil's fig<br>*Solanum chrysotrichum* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |

| | |
|---|---|
| Giant Parramatta grass<br>*Sporobolus fertilis* | **Regional Recommended Measure**<br>Exclusion zone: whole of region except core infestation area of Wollongong, Kiama, Shellharbour, Eurobodalla, and Shoalhaven councils<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Giant rat's tail grass<br>*Sporobolus pyramidalis* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Gorse<br>*Ulex europaeus* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Gorse<br>*Ulex europaeus* | **Regional Recommended Measure**<br>Exclusion zone: whole of region except the core infestation area of Upper Lachlan, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla, Yass Valley and Bega Valley councils<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Grey sallow<br>*Salix cinerea* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Ground asparagus<br>*Asparagus aethiopicus* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |

| | |
|---|---|
| Groundsel bush<br>*Baccharis halimifolia* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Hawkweeds<br>*Pilosella* species | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*<br>**All species in the genera *Pilosella* and *Hieracium* are Prohibited Matter except for *Hieracium murorum*.** |
| Holly leaved senecio<br>*Senecio glastifolius* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Horsetails<br>*Equisetum* species | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Hudson pear<br>*Cylindropuntia pallida* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Hydrocotyl<br>*Hydrocotyle ranunculoides* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |

| | |
|---|---|
| Hygrophila<br>*Hygrophila costata* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Hymenachne<br>*Hymenachne amplexicaulis* and hybrids | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Karroo thorn<br>*Vachellia karroo* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Kidney-leaf mud plantain<br>*Heteranthera reniformis* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Kochia<br>*Bassia scoparia* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*<br>**Excluding the subspecies *trichophylla*** |
| Koster's curse<br>*Clidemia hirta* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |

| | |
|---|---|
| Lagarosiphon<br>*Lagarosiphon major* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Lantana<br>*Lantana camara* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Lantana<br>*Lantana camara* | **Regional Recommended Measure**<br>Exclusion zone: whole region excluding the core infestation area of Eurobodalla, Kiama, Shellharbour, Wollongong and the Shoalhaven local government area north of the Lantana Containment Line at 35'11"42 S<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Long-leaf willow primrose<br>*Ludwigia longifolia* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Ludwigia<br>*Ludwigia peruviana* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Madeira vine<br>*Anredera cordifolia* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Mesquite<br>*Prosopis* species | **Prohibition on dealings**<br>*Must not be imported into the State or sold*<br>**All species in the genus *Prosopis* have this requirement** |

| | |
|---|---|
| Mexican feather grass<br>*Nassella tenuissima* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Miconia<br>*Miconia* species | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*<br>**All species of *Miconia* are Prohibited Matter in NSW** |
| Mikania vine<br>*Mikania micrantha* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*<br>***all species in the genus *Mikania* are Prohibited Matter in NSW** |
| Mimosa<br>*Mimosa pigra* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Ming asparagus fern<br>*Asparagus macowanii* var. *zuluensis* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |

| | |
|---|---|
| Mysore thorn<br>*Caesalpinia decapetala* | **Regional Recommended Measure**<br>Exclusion zone: whole region except the core infestation area of Wollongong<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Pampas grass<br>*Cortaderia* species | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*<br>**This Regional Recommended Measure applies to *Cortaderia jubata* (pink pampas grass)** |
| Parkinsonia<br>*Parkinsonia aculeata* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Parkinsonia<br>*Parkinsonia aculeata* | **Control Order**<br>Parkinsonia Control Zone: Whole of NSW<br>*Parkinsonia Control Zone (Whole of NSW): Owners and occupiers of land on which there is parkinsonia must notify the local control authority of new infestations; immediately destroy the plants; ensure subsequent generations are destroyed; and ensure the land is kept free of the plant. A person who deals with a carrier of parkinsonia must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant.* |
| Parthenium weed<br>*Parthenium hysterophorus* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |

| | |
|---|---|
| Parthenium weed<br>*Parthenium hysterophorus* | **Prohibition on dealings**<br>*The following equipment must not be imported into NSW from Queensland: grain harvesters (including the comb or front), comb trailers (including the comb or front), bins used for holding grain during harvest operations, augers or similar for moving grain, vehicles used to transport grain harvesters, support vehicles driven in paddocks during harvest operations, mineral exploration drilling rigs and vehicles used to transport those rigs, unless set out as an exception in Division 5, Part 2 of the Biosecurity Order (Permitted Activities) 2017* |
| Pond apple<br>*Annona glabra* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Prickly acacia<br>*Vachellia nilotica* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Prickly pears - Austrocylindropuntias<br>*Austrocylindropuntia* species | **Prohibition on dealings**<br>*Must not be imported into the State or sold*<br>**All species in the Austrocylindropuntia genus have this requirement** |
| Prickly pears - Cylindropuntias<br>*Cylindropuntia* species | **Prohibition on dealings**<br>*Must not be imported into the State or sold*<br>**All species in the Cylindropuntia genus have this requirement** |
| Prickly pears - Opuntias<br>*Opuntia* species | **Prohibition on dealings**<br>*Must not be imported into the State or sold*<br>**Except for Opuntia ficus-indica (Indian fig)** |

| | |
|---|---|
| Prickly pears - Opuntias<br>*Opuntia* species | **Regional Recommended Measure**<br>Core infestation area: whole region except the exclusion zone of Wollongong, Kiama, and Shellharbour, and Eurobadalla<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core infestation: Land managers should mitigate spread from their land.*<br>**This Regional Recommended Measure applies to all species of Opuntia except for Opuntia ficus-indica (Indian fig)** |
| Rope pear<br>*Cylindropuntia imbricata* | **Prohibition on dealings**<br>*Must not be imported into the State or sold*<br>**All species in the Cylindropuntia genus have this requirement** |
| Rubber vine<br>*Cryptostegia grandiflora* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Sagittaria<br>*Sagittaria platyphylla* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Sagittaria<br>*Sagittaria platyphylla* | **Regional Recommended Measure**<br>*Plant should not be allowed to be spread to priority sites of high environmental, economic or social value.* |
| Salvinia<br>*Salvinia molesta* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Salvinia<br>*Salvinia molesta* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |

| | |
|---|---|
| Scotch broom<br>*Cytisus scoparius* subsp. *scoparius* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Scotch broom<br>*Cytisus scoparius* subsp. *scoparius* | **Regional Recommended Measure**<br>Core infestation area: whole region except exclusion zone of : Bega council<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Sea spurge<br>*Euphorbia paralias* | **Regional Recommended Measure**<br>Exclusion zone: whole region except for the core infestation area of Eurobodalla and Bega Valley councils<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.* |
| Senegal tea plant<br>*Gymnocoronis spilanthoides* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Serrated tussock<br>*Nassella trichotoma* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Serrated tussock<br>*Nassella trichotoma* | **Regional Recommended Measure**<br>Core infestation: whole region except the exclusion zone of Shoalhaven, Eurobodalla, Kiama, Wollongong, Bega Valley and Shellharbour councils<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: Land managers should mitigate spread from their land. Core area: Land managers reduce impacts from the plant on priority assets.* |

| | |
|---|---|
| Siam weed<br>*Chromolaena odorata* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Sicklethorn<br>*Asparagus falcatus* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Silverleaf nightshade<br>*Solanum elaeagnifolium* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Smooth tree pear<br>*Opuntia monacantha* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Smooth tree pear<br>*Opuntia monacantha* | **Regional Recommended Measure**<br>Core infestation area: whole region except the exclusion zone of Wollongong, Kiama, and Shellharbour, and Eurobadalla<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core infestation: Land managers should mitigate spread from their land.*<br>***This Regional Recommended Measure applies to all species of Opuntia except for Opuntia ficus-indica (Indian fig)** |
| Snakefeather<br>*Asparagus scandens* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Spanish broom<br>*Spartium junceum* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |

| | |
|---|---|
| Spanish heath<br>*Erica lusitanica* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Spongeplant<br>*Limnobium spongia* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*<br>**All species of *Limnobium* are Prohibited Matter** |
| Spotted knapweed<br>*Centaurea stoebe* subsp. *micranthos* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Tiger pear<br>*Opuntia aurantiaca* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Tiger pear<br>*Opuntia aurantiaca* | **Regional Recommended Measure**<br>Core infestation area: whole region except the exclusion zone of Wollongong, Kiama, Shellharbour, and Eurobadalla<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core infestation: Land managers should mitigate spread from their land.*<br>***This Regional Recommended Measure applies to all species of Opuntia except for Opuntia ficus-indica (Indian fig)** |

| | |
|---|---|
| Tropical soda apple<br>*Solanum viarum* | **Control Order**<br>Tropical Soda Apple Control Zone: Whole of NSW<br>*Tropical Soda Apple Control Zone (Whole of NSW): Owners and occupiers of land on which there is tropical soda apple must notify the local control authority of new infestations; destroy the plants including the fruit; ensure subsequent generations are destroyed; and ensure the land is kept free of the plant. A person who deals with a carrier of tropical soda apple must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant on the land, or on or in a carrier.* |
| Velvety tree pear<br>*Opuntia tomentosa* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |
| Velvety tree pear<br>*Opuntia tomentosa* | **Regional Recommended Measure**<br>Core infestation area: whole region except the exclusion zone of Wollongong, Kiama, and Shellharbour, and Eurobadalla<br>*Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core infestation: Land managers should mitigate spread from their land.*<br>**This Regional Recommended Measure applies to all species of Opuntia except for Opuntia ficus-indica (Indian fig)** |
| Water caltrop<br>*Trapa* species | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*<br>**All species in the *Trapa* genus are Prohibited Matter in NSW** |
| Water hyacinth<br>*Eichhornia crassipes* | **Prohibition on dealings**<br>*Must not be imported into the State or sold* |

| | |
|---|---|
| Water hyacinth<br>*Eichhornia crassipes* | **Biosecurity Zone**<br>The Water Hyacinth Biosecurity Zone applies to all land within the State, except for the following regions: Greater Sydney or North Coast, North West (but only the local government area of Moree Plains), Hunter (but only in the local government areas of City of Cessnock, City of Lake Macquarie, MidCoast, City of Maitland, City of Newcastle or Port Stephens), South East (but only in the local government areas of Eurobodalla, Kiama, City of Shellharbour, City of Shoalhaven or City of Wollongong).<br>*Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone* |
| Water lettuce<br>*Pistia stratiotes* | **Regional Recommended Measure**<br>*Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* |
| Water soldier<br>*Stratiotes aloides* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |
| Willows<br>*Salix* species | **Prohibition on dealings**<br>*Must not be imported into the State or sold*<br>**All species in the *Salix* genus have this requirement, except *Salix babylonica* (weeping willows ), *Salix x calodendron* (pussy willow) and *Salix x reichardtii* (sterile pussy willow)** |

| | |
|---|---|
| Witchweeds<br>*Striga* species | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*<br>**All species in the *Striga* genus are Prohibited Matter in NSW, except the native *Striga parviflora*** |
| Yellow burrhead<br>*Limnocharis flava* | **Prohibited Matter**<br>*A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* |

The content provided here is for information purposes only and is taken from the *Biosecurity Act 2015* and its subordinate legislation, and the Regional Strategic Weed Management Plans (published by each Local Land Services region in NSW). It describes the state and regional priorities for weeds in New South Wales, Australia.

transport.nsw.gov.au/

13 22 13

Customer feedback
Transport for NSW
Locked Bag 928,
North Sydney NSW 2059

**December 2020**

# Appendix G – Biodiversity Assessment Review

27 March 2024

Daniel Bojkovic
Project Engineer
Transport for NSW
Regional & Freight | Regional and Out Metropolitan
Level 4 Crown Street
Wollongong NSW 2500

Dear Daniel,

## Thredbo River Culvert Replacement – Biodiversity Assessment Report Review

**Project no. 40371**

Biosis Pty Ltd was commissioned to complete a review of the existing Biodiversity Assessment Report (BAR) prepared by EnviroKey Pty Ltd December 2020 on behalf of Transport for New South Wales (NSW) (TfNSW) for the Thredbo River Culvert Replacement project.

A review of the existing BAR was competed with the findings and recommendations presented on the following pages. The key findings included:

- Updated Plant Community Type (PCT) classification requires consideration.
- A discrepancy exists between the BAR 'project area' and current 'project area' outlined in the RFQ brief.
- Updated threatened species listings have occurred since the BAR was completed in 2020,these new listing would require consideration and potential further assessment.
- There is a potential requirement for additional significant impact assessment under the *Fisheries Management Act 1999* (FM Act).

Please contact me on 0438 049 470 if you would like to discuss further.

Yours sincerely



Dimity Bambrick
Senior Ecologist

**Biosis Pty Ltd**
**Albury**
593a Macauley Street
Albury NSW 2640
Phone: 02 6069 9200
ACN: 006 175 097
ABN: 65 006 175 097
Email: albury@biosis.com.au
biosis.com.au

# 1 Review findings

## 1.1 Plant Community Type classification updates

The NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) released an update to the classification of the Plant Community Types (PCTs) in December 2023. The PCTs identified within the existing BAR have been decommissioned and replaced. This change is summarised within Table 1 below.

An assessment against the new PCT classification found no changes to potential occurrence of Threatened Ecological Communities (TECs). The updated PCT classifications are not associated with any TECs under the NSW *Biodiversity Conservation Act 2016* (BC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Our conclusions regarding TECs assumes the correct PCTs were identified by EnviroKey in their 2020 report.

This change does not impact the findings of the BAR.

**Table 1 PCT Classification update summary**

| Existing PCT | | Updated PCT | |
|---|---|---|---|
| **PCT Number** | **PCT Name** | **PCT Number** | **PCT Name** |
| 641 | Alpine grassland/herbfield and open heathlands in Kosciuszko National Park, Australian Alps Bioregion | 3878 | Kosciuszko Forest Hollow Grassy Open Heath |
| 644 | Alpine Snow Gum – Snow Gum shrubby woodland at intermediate altitudes in northern Kosciuszko NP, South Eastern Highlands Bioregion and Australian Alps Bioregion | 3382 | Kosciuszko Eastern Slopes Mountain Gum Forest |

## 1.2 Discrepancy between BAR assessed area and current project area

The identified study area of the of the current RFQ (Figure 1) is different to that of assessed impact area of the BAR (Figure 2). If areas of native vegetation outside the identified study area of the BAR are to be impacted, it is recommended that an addendum is completed to incorporate and assess the additional areas of impact. To prepare this addendum additional fieldwork, reporting and mapping may be required.

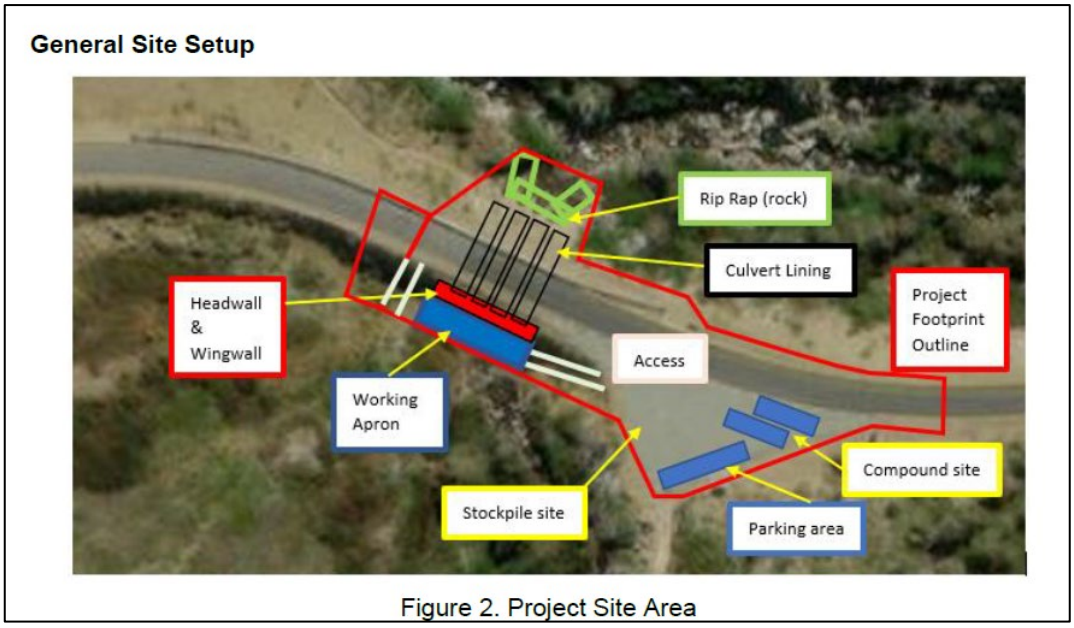



**Figure 1 Current RFQ project footprint**

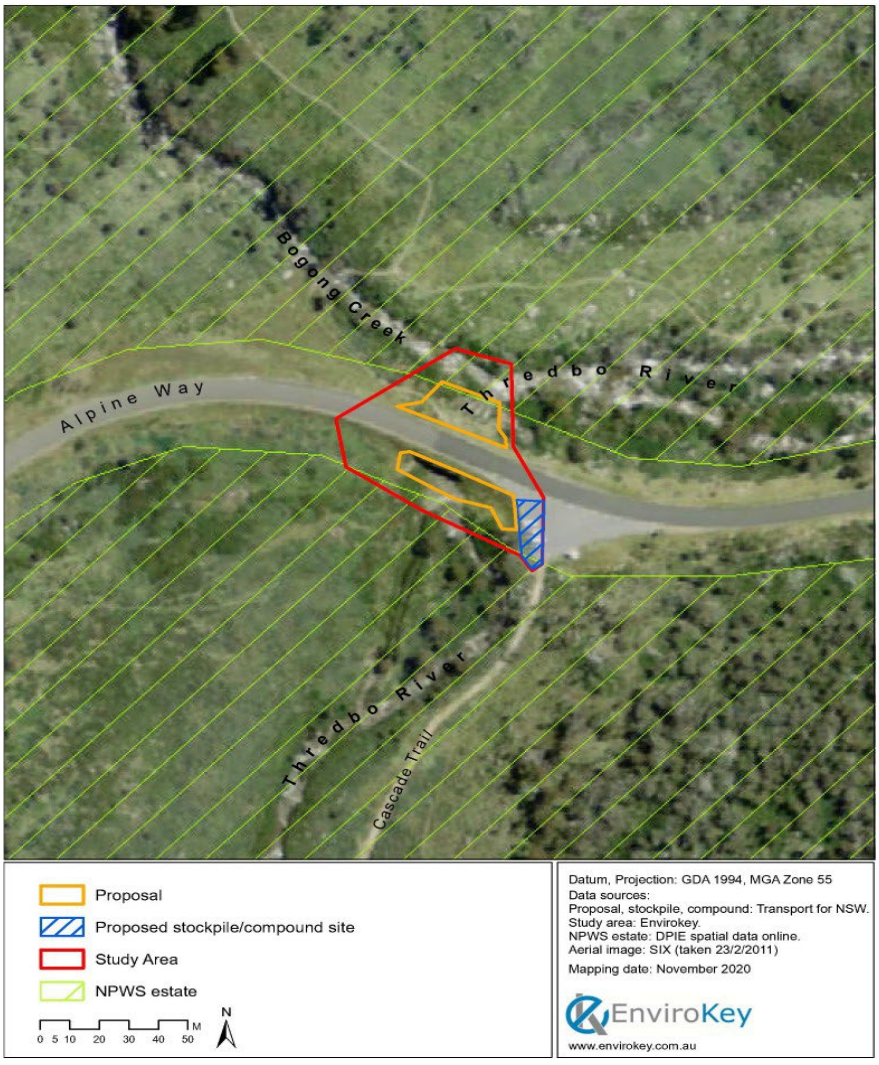



**Figure 2 Existing BAR (EnvioKey 2020)**

## 1.3 Threatened species listing updates

Since completion of the BAR December 2020, a number of listing changes have occurred under the BC Act and EPBC Act for threatened species. The following changes are noted for species identified in Table 3-2 of the BAR as having a moderate or higher likelihood of occurrence:

- Diamond Firetail *Stagonopleura guttata* is now listed as Vulnerable under the EPBC Act.
- Gang-Gang Cockatoo *Callocephalon fimbriatrum* is now listed as Endangered under the EPBC Act.
- Hooded Robin (SE) *Melanodryas cucullata cucullate* is now listed as Endangered under the EPBC Act.
- Broad Toothed Rat *Mastacomys fuscus mordicus* is now listed as Endangered under the EPBC Act.
- Hoary Sunray *Leucochrysum albicans* var. *tricolor* is now listed as Endangered under the BC Act.

Assessments of significant impact under the BC Act (Hoary Sunray) and EPBC Act (Diamond Firetail, Gang-Gang Cockatoo and Hooded Robin) should be completed for these species following the listing updates. The existing assessment under the EPBC Act for Broad Toothed Rat should be updated to the appropriate Significant Impact Guideline assessment questions for Endangered species.

An assessment of significant impact under the EPBC Act should be completed for all EPBC Act species.

Additional to this, the Alpine Redspot Dragonfly *Austropetalia tonyana* listed as Vulnerable under the *Fisheries Management Act 1994* (FM Act) was determined to have no chance of occurrence within the study area, however, this species is mapped under the NSW Department of Primary Industries (DPI) indicative mapping within the study area. An assessment of significant impact under the FM Act should be completed.

The background and database searches for the project were completed in 2020, it is recommended as a best practice that an update of these searches is completed to ensure no new species have been recorded within the locality. A number of reptile and flora species have been listed under the BC Act and EPBC Act since 2020, additional species, such as reptiles, are likely to require assessment for the potential occurrence within the study area.

# 2 Recommendations summary

- An addendum or update to the existing BAR should be completed if it is determined that the area of native vegetation to be impacted that was assessed in the existing BAR is less than that of the current design.
  - This may require a site visit to confirm the presence/absence of native vegetation by a suitably qualified botanist.
- Assessments of significant impact under the BC Act (Hoary Sunray) and EPBC Act (Diamond Firetail, Gang-Gang Cockatoo and Hooded Robin) should be completed for species with listing updates.
- The existing assessment under the EPBC Act for Broad Toothed Rat should be updated to the appropriate Significant Impact Guideline assessment questions for Endangered species.
- An assessment of significant impact under the FM Act should be completed for the Alpine Redspot Dragonfly *Austropetalia tonyana*.
- It is recommended as a best practice that an update of the background searches for threatened species is completed to ensure no new species have been recorded within the locality and subsequent update to the likelihood of occurrence assessment within the BAR.

# Appendix H – Ecology Desktop Assessment

30 May 2024

Daniel Bojkovic
Project Engineer
Regional & Freight | Regional and Outer Metropolitan
Transport for NSW
Level 4 Crown Street
Wollongong NSW 2500

Dear Daniel

## Desktop ecology assessment for Thredbo River culvert replacement Review of Environmental Factors and specialist studies

**Project no. 40371**

Biosis Pty Ltd (Biosis) was engaged by Transport for NSW (TfNSW) ('proponent') to provide a desktop ecology assessment for works to rehabilitate Culvert B10155 MR677 Thredbo River ('the proposal'). Biosis was engaged by TfNSW in 2024 to review the projects Biodiversity Assessment Report (BAR) prepared by EnviroKey Pty Ltd (EnviroKey 2020). This desktop ecology assessment serves as an update to EnviroKey (2020) and will be incorporated into a Review of Environmental Factors (REF) being prepared by Biosis for the project.

The methodology and scope of work for the below desktop ecology assessment was discussed in the first fortnightly progress meeting held on 10 April 2024. It was agreed that a desktop assessment, based on the recommendations made in the BAR Review produced by Biosis on 27 March 2024, is the preferred approach of TfNSW.

The key recommendation made within the BAR review was updating the background research and preparing additional Tests of Significance or Significant Impact Criteria Assessments under the *Biodiversity Conservation Act 2016* (BC Act) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) respectively for entities that have been updated or listed under either Act since the original 2020 BAR was completed.



*Biosis acknowledges the Aboriginal and Torres Strait Islander peoples as Traditional Custodians of the land on which we live and work. We pay our respects to the Traditional Custodians and Elders past and present and honour their connection to Country and ongoing contribution to society.*

# 1. Background

The proposal will be undertaken on Thredbo River at the intersection of Thredbo River track and Alpine Way (MR677) approximately 3 kilometres southwest of the Thredbo township within the Snowy Monaro Local Government Area (LGA).

The proposal involves repairing four culverts and undergoing improvement works at the inlet/outlet respectively. This will contribute to the ongoing longevity of the asset, assist with minimising the risk of scouring and degradation, and maintain safe road usage. The works will primarily include:

- Establish temporary compound and stockpile sites on existing parking area.
- Establish access to both sides of the inlet and outlet ends of the culverts.
- Install water diversion.
- Excavate and construct inlet apron.
- Build a new headwall and wingwall in front of the existing headwall and wingwall.
- Concrete lining of the corrugated steel culverts.
- Placement of rip rap rock scour protection at the culvert outlet.
- Site remediation and rehabilitation.

Transport for New South Wales are undertaking the proposed culvert upgrades under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and as such is both the proponent and determining authority. In accordance with subdivision 2, the determining authority has a duty to consider the environmental impact of their proposed activities. If the proposed upgrades are considered likely to have significant effects on threatened species and communities only, as stated in Part 7, Division 2(4) of the BC Act, a Species Impact Statement (SIS) or voluntary entry into the Biodiversity Offsets Scheme and the development of a Biodiversity Development Assessment Report (BDAR) can be prepared in lieu of an Environmental Impact Statement. As such this background assessment has been prepared to provide additional information on the level of impact the proposed culvert upgrade project will have on entities listed under the BC Act and/or EPBC Act. This update should be considered alongside the original BA (EnviroKey 2020).

# 2. Methodology

A Biodiversity Assessment Report (BAR) was produced by EnviroKey Pty. Ltd in December 2020. The BAR has since been reviewed by Biosis and a review was produced on the 27 March 2024. The review presented some key findings and recommendations. These were discussed in the progress meeting on 10 April 2024, and it was agreed that the new threatened species listings that have occurred under the NSW BC Act and EPBC Act since the BAR was completed in 2020 require consideration and further assessment. Furthermore, as best practice, new background searches should be undertaken to identify any additional threatened species that may require further assessment.

The following tasks were completed to address the above:

- Significant Impact Criteria (SIC) assessments required under the EPBC Act for Diamond Firetail *Stagonopleura guttata* (Vulnerable, EPBC Act) and Gang-Gang Cockatoo *Callocephalon fimbriatum* (Endangered, EPBC Act).
- A Test of Significance (ToS) under the BC Act for Hoary Sunray *Leucochrysum albicans* var. *tricolor* (Endangered, BC Act)
- Update of the existing SIC assessment for Broad Toothed Rat *Mastacomys fuscus mordicus* (Endangered, EPBC Act).
- Assessment of significant impact under the *Fisheries Management Act 1994* (FM Act) for Alpine Redspot Dragonfly *Austropetalia tonyana* (Vulnerable, FM Act).
- Background searches, including:
  - Australian Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act.
  - NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) BioNet Atlas of NSW Wildlife, for items listed under the BC Act.
  - The NSW Department of Primary Industries (DPI) Spatial Data Portal for FM Act listed threatened species, populations and communities (entities).
- Habitat assessment for an additional 18 threatened entities not assessed in the BAR as a result of updated background searches (Appendix A).

# 3. Results

## 3.1. Background search results

Background searches undertaken by Biosis revealed an additional 12 threatened fauna species, five flora species and one Threatened Ecological Community (TEC) requiring assessment (Appendix A). Of these, the below threatened species are considered to have a moderate or higher likelihood of occurrence and have been assessed further in Sections 3.2 and 0:

- Mountain Skink *Liopholis montana* (Endangered, EPBC Act and BC Act)
- Alpine Bog Skink *Pseudemoia cryodroma* (Endangered, EPBC Act)

## 3.2. EPBC Act Significant Impact Criteria assessments

### 3.2.1. Gang-gang Cockatoo *Callocephalon fimbriatum*

#### Species background

The Gang-gang Cockatoo *Callocephalon fimbriatum* is listed as Endangered under the EPBC Act and Vulnerable under the BC Act. It is distributed from southern Victoria through to south and central-eastern NSW. In NSW, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory and is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee (OEH 2022).

The Gang-gang Cockatoo is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests in spring and summer. During autumn and winter, it often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and is often found in urban areas. It may also occur in Sub-alpine Snow Gum *Eucalyptus pauciflora* woodland and occasionally in temperate rainforests. It favours old growth forest and woodland attributes for nesting and roosting with nests located in hollows that are 10 centimetres in diameter or larger in eucalypts (OEH 2022).

Threats to the Gang-gang Cockatoo include, fire destroying key breeding and foraging habitat, loss of breeding and foraging habitat from forestry management practices and rural/urban development, Psittacine circovirus disease, invasive weeds and exclusion from forest and woodland habitat by Noisy Miners *Manorina melanocephala*.

#### Occurrence in the study area

Approximately 62 occurrences of Gang-gang Cockatoo have been recorded within 10 kilometres of the study area, and the closest occurring approximately 14 metres away (NSW DCCEEW 2024). Targeted survey was undertaken and the species was not detected within the study area, however Gang-gang Cockatoo is known to regularly occur in Sub-alpine vegetation and can be expected to forage and roost within or adjacent to the study area on occasion.

The proposed works will result in the removal of 0.04 hectares of potential foraging habitat for Gang-gang Cockatoo.

An assessment of whether the proposal is likely to lead to a significant impact on Gang-gang Cockatoo is provided below.

**Table 3-1 Gang-gang Cockatoo – Endangered species, assessment against Significant Impact Criteria (DoE 2013)**

| SIC assessment for critically endangered or endangered species |
|---|
| **Lead to a long-term decrease in the size of a population.** |
| The proposed works will result in the clearing of up to 0.04 ha of native vegetation representing potential foraging resources for the Gang-gang Cockatoo. While the proposal will result in the removal of potential foraging habitat, the total area of habitat being removed is minor in the context of habitat contiguous in the landscape and broader locality. Given the scale of the impact in the context of available habitat in the region, it is unlikely that the proposed impacts will lead to a long-term decrease in the size of the Gang-gang Cockatoo population. |
| **Reduce the area of occupancy of the species.** |
| It is considered likely that vegetation within the study area would constitute potential habitat to the foraging practices of the Gang-gang Cockatoo. However, given the overall context of the region and the extent of the vegetation connected to these areas, the 0.04 ha expected to be cleared is unlikely to have a significant impact to the occupancy of the species.<br>Given the size and connectivity available in the greater landscape, it is unlikely that this species would be negatively impacted by the proposed works. The species will continue to forage in retained habitat within the surrounding landscape. As such, it is unlikely that proposed works will reduce the area of occupancy of the species population. |
| **Fragment an existing population into two or more populations.** |
| In the scope of the greater context of the surrounding land, the 0.04 ha of potential Gang-gang Cockatoo habitat to be removed as a result of the proposed work represents less than 0.01% of the native vegetation within a 10 km radius. Additionally, the works are not expected to reduce connectivity throughout the landscape which would fracture multiple populations and vegetated corridors containing key Gang-gang Cockatoo habitat. As such the proposed works will not fragment an existing population into two or more populations. |
| **Adversely affect habitat critical to the survival of a species.** |
| No suitable hollow-bearing trees are present and impacts to dispersal habitat are expected to be negligible. Vegetation connectivity will be maintained throughout the landscape. Although some native vegetation will be removed, the proposal will not substantially impact upon any of the required Gang-gang Cockatoo habitat, and thus will not adversely affect habitat critical for the species' survival. |
| **Disrupt the breeding cycle of a population.** |
| The Gang-gang Cockatoo breeding usually occurs in tall mature sclerophyll forests that have a dense understorey, and occasionally in coastal forests, with nests commonly recorded in eucalypt hollows (greater than ten centimetres) in live trees close to water. Breeding takes place from October to January with most breeding pairs using the same nest each year. During autumn and winter the Gang-gang Cockatoo often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. The nests for breeding are likely to be in these lower altitude areas.<br>The study area contains potential foraging habitat, however no suitable hollows are present. Considering this, the proposal is unlikely to result in the disruption to the breeding cycle of the Gang-gang Cockatoo population as a whole. It is unlikely that disturbance from noise or lighting associated with the construction will substantially interfere with the species' ability to reproduce successfully. Gang-gang Cockatoo will continue to |

breed in areas unaffected by vegetation loss and as a result the breeding cycle of the population will not be disrupted.

**Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.**

The proposal is not likely to isolate populations as the impacts proposed within the study area is not likely to constitute a barrier to the movement of individuals of the species. Extensive areas of native vegetation occur surrounding the study area and will not be isolated by the clearing. The works are unlikely to affect the quality of the surrounding habitat, and mitigation measures will be put in place to prevent indirect impacts such as from sediment runoff. Whilst the pro will result in the removal of up to 0.04 ha of vegetation, this level of loss is not likely to modify, destroy, remove, isolate or decrease the availability of habitat to the extent that the species is likely to decline.

**Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.**

The proposal is unlikely to exacerbate the current level of invasive species threats operating within the study area.

**Introduce disease that may cause the species to decline**

The Gang-gang Cockatoo is susceptible to Psittacine circovirus disease (PCD) or 'beak and feather' disease that causes feather distortion and beak deformities. It is transmitted through faeces, feather dander and secretions, with inhalation of air contaminated by feathers and/or faecal dust the most common means of transmission. No Gang-gang Cockatoo individuals or feathers were identified during the surveys, and therefore the proposed vegetation clearance is unlikely to result in the introduction of this disease to any present populations. The proposed works are unlikely to result in the introduction of Psittacine circovirus disease or any disease that is harmful to the Gang-gang Cockatoo.

**Interfere with the recovery of the species.**

There is no National Recovery Plan for the Gang-gang Cockatoo, however, Saving our Species (SoS) has developed a strategy to secure the species from extinction. Key management sites are being identified, with the species identified as occurring in the Australian Alps, Brigalow belt south, NSW South western slopes, South east corner, South eastern highlands, and Sydney basin. The study area is located outside the priority management sites. The proposed works will not impact on the recovery of the Gang-gang Cockatoo or any areas mapped as priority management sites.

Habitat critical to survival for the species includes all foraging habitat during both the breeding and non-breeding season (DAWE 2022). Therefore, any habitat utilised by Gang-gang Cockatoo is considered habitat critical to survival of the species and impacts to habitat may interfere with the recovery of the species. The area of habitat to be removed by the proposed works is surrounded by contiguous areas of suitable foraging habitat. Given these factors it is considered unlikely that the removal of 0.04 ha of foraging habitat will interfere with the recovery of the species.

**Conclusion.**

Considering the above factors, it is unlikely that the proposed work will impose a significant impact on Gang-gang Cockatoo or their habitats as:

- The proposed works will not introduce any diseases or invasive species of the Gang-gang Cockatoo.
- The proposed works will not interfere with the recovery of the species or areas established by SoS as a priority management site.
- The removal of native vegetation is considered to be a threat to the recovery and ongoing survival of the species (DAWE 2022) however as the proposal will impact on only a very small area of potential habitat, surrounded by large swathes of habitat, it is not likely to significantly impact the species.

**SIC assessment for critically endangered or endangered species**

Based on the factors above, it is concluded that the proposed works are unlikely to lead to a significant impact on the Gang-gang Cockatoo.

### 3.2.2. Diamond Firetail *Stagonopleura guttata*

#### Species background

The Diamond Firetail *Stagonopleura guttata* is a large finch listed as Vulnerable under the EPBC Act and Vulnerable under the BC Act. It occurs on the south-east mainland of Australia from south-east Queensland to Eyre Peninsula, South Australia, and about 300 kilometres inland from the sea. Their range once extended to north Queensland inland from Cardwell, but they now occur only in the very south of the state. They have disappeared from many of the more settled parts of New South Wales, Australian Capital Territory and Victoria, and birds in South Australia appear to have been separated into three isolated subpopulations (Eyre Peninsula, Mt Lofty to Southern Flinders Ranges, and the south-east), with few records from a fourth (Yorke Peninsula) in the last decade.

Diamond firetails occur in eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats, including farmland and grassland with scattered trees. They prefer areas with relatively low tree density, few large logs, and little litter cover but high grass cover. Diamond firetails feed predominantly at ground level, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects. Between August and January, groups separate into small colonies to breed. Nests are bottle shaped and are made of green grass blades and stems lined with fine grasses and feathers. To safeguard their eggs and nestlings, diamond firetails often build their nests into the base of the large stick-nest of a bird of prey. Others choose to build their nests among the prickly foliage of shrubs such as hakeas, rose bushes, boxthorn and the sea urchin hakea.

#### Occurrence in the study area

No occurrences of Diamond Firetail have been recorded within 10 kilometres of the study area (NSW DCCEEW 2024). Targeted survey was undertaken and the species was not detected within the study area, however individuals may utilise the study area as foraging habitat.

The proposed works will result in the removal of 0.09 hectares of potential foraging habitat for Diamond Firetail. It unlikely the species utilises the study area for breeding purpose.

An assessment of whether the proposal is likely to lead to a significant impact on Diamond Firetail is provided below. For the purposes of the assessment below, an important population is assumed to be present despite the species not being recorded during diurnal bird survey.

Table 3-2 Diamond Firetail – Endangered species, assessment against Significant Impact Criteria (DoE 2013)

| SIC assessment for vulnerable species |
| --- |
| **Lead to a long-term decrease in the size of an important population of a species.** |
| The proposed works will result in the clearing of up to 0.09 ha of native vegetation representing potential foraging resources for Diamond Firetail. While the proposal will result in the removal of potential foraging habitat, the total area of habitat being removed is minor in the context of habitat contiguous in the landscape and broader locality. Given the scale of the impact in the context of available habitat in the region, it is unlikely that the proposed impacts will lead to a long-term decrease in the size of the Diamond Firetail population. |
| **Reduce the area of occupancy of an important population.** |
| It is considered likely that vegetation within the study area would constitute potential habitat to the foraging practices of the Diamond Firetail. However, given the overall context of the region and the extent of the vegetation connected to these areas, the 0.09 ha expected to be cleared is unlikely to have a significant impact to the occupancy of the species.<br>Given the size and connectivity available in the greater landscape, it is unlikely that this species would be negatively impacted by the proposed works. The species will continue to forage in retained habitat within the surrounding landscape. As such, it is unlikely that proposed works will reduce the area of occupancy of the species population. |
| **Fragment an existing important population into two or more populations.** |
| In the scope of the greater context of the surrounding land, the 0.09 ha of potential Diamond Firetail habitat to be removed as a result of the proposed work represents less than 0.01 % of the native vegetation within 10 km. Additionally, the works are not expected to reduce connectivity throughout the landscape which would fracture multiple populations and vegetated corridors containing key Diamond Firetail habitat. As such the proposed works will not fragment an existing population into two or more populations. |
| **Adversely affect habitat critical to the survival of a species.** |
| No suitable breeding habitat is present and impacts to dispersal habitat are expected to be negligible. Vegetation connectivity will be maintained throughout the landscape. Although some native vegetation will be removed, the proposal will not substantially impact upon any of the required Diamond Firetail habitat, and thus will not adversely affect habitat critical for the species' survival. |
| **Disrupt the breeding cycle of an important population.** |
| The study area contains potential foraging habitat, however no suitable breeding habitat is present. Considering this, the proposal is unlikely to result in the disruption to the breeding cycle of the Diamond Firetail population as a whole. It is unlikely that disturbance from noise or lighting associated with the construction will substantially interfere with the species' ability to reproduce successfully. Diamond Firetail will continue to breed in areas unaffected by vegetation loss and as a result the breeding cycle of the population will not be disrupted. |
| **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.** |
| The proposal is not likely to isolate populations as the impacts proposed within the study area is not likely to constitute a barrier to the movement of individuals of the species. Extensive areas of native vegetation occur surrounding the study area and will not be isolated by the clearing. The works are unlikely to affect the quality of the surrounding habitat, and mitigation measures will be put in place to prevent indirect impacts such as from sediment runoff. Whilst the proposal will result in the removal of up to 0.09 ha of vegetation, this level of loss is not likely to modify, destroy, remove, isolate or decrease the availability of habitat to the extent that the species is likely to decline. |

| SIC assessment for vulnerable species |
| --- |
| **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.** |
| The proposal is unlikely to exacerbate the current level of invasive species threats operating within the study area. |
| **Introduce disease that may cause the species to decline** |
| The Diamond Firetail is not known to be susceptible to any diseases. It is unlikely the proposal would introduce disease that may cause the species to decline. |
| **Interfere with the recovery of the species.** |
| There is no National Recovery Plan for Diamond Firetail nor has a conservation program under the Saving our Species (SoS) project been developed.<br>Habitat critical to survival for the species includes all foraging habitat during both the breeding and non-breeding seasons. Therefore, any habitat utilised by Diamond Firetail is considered habitat critical to survival of the species and impacts to habitat may interfere with the recovery of the species. The area of habitat to be removed by the proposed works is surrounded by contiguous areas of suitable foraging habitat. Given these factors it is considered unlikely that the removal of 0.09 ha of foraging habitat will interfere with the recovery of the species. |
| **Conclusion.** |
| Considering the above factors, it is unlikely that the proposed work will impose a significant impact on Diamond Firetail or their habitats as:<br>• The proposed works will not introduce any diseases or invasive species of the Diamond Firetail.<br>• The proposed works will not interfere with the recovery of the species.<br>• The removal of native vegetation is considered to be a threat to the recovery and ongoing survival of the species (DAWE 2022) however as the proposal will impact on only a very small area of potential habitat, surrounded by large swathes of habitat, it is not likely to significantly impact the species.<br>• Breeding habitat is unlikely to be affected.<br>Based on the factors above, it is concluded that the proposed works are unlikely to lead to a significant impact on the Diamond Firetail. |

### 3.2.3. Broad-toothed Rat *Mastacomys fuscus mordicus*

#### Species background

The Broad-toothed Rat *Mastacomys fuscus mordicus* is a rodent listed as Endangered under the EPBC Act. The historical distribution of the Broad-toothed Rat is known from New South Wales, the Australian Capital Territory, Victoria and South Australia, with numerous sub-fossil deposits found that lie well outside its current recognised distribution and habitat. The subspecies occupies a variety of areas across its range, but typically is highly selective in any region. Preferred habitat includes alpine and subalpine heathlands, grassland adjacent to boulder outcrops, swamps, sedgelands, coastal grassy or shrubby dunes, and sometimes forests with grassy understories. Habitat suitability is largely determined by the availability of cover and grasses. Proximity to drainage lines is also important, with a decreasing likelihood of detecting the subspecies with increasing distance from a drainage line. In mainland alpine areas its preferred habitat has rocks, grasses and shrubs.

#### Occurrence in the study area

Approximately 46 occurrences of Broad-toothed Rat have been recorded within 10 kilometres of the study area, and the closest occurring approximately 522 metres away (NSW DCCEEW 2024). Targeted survey was not undertaken and the species is considered to have a high likelihood of occurring within the study area.

The proposed works will result in the removal of 0.05 hectares of potential foraging habitat for Broad-toothed Rat.

An assessment of whether the proposal is likely to lead to a significant impact on Broad-toothed Rat is provided below.

**Table 3-3 Broad-toothed Rat – Endangered species, assessment against Significant Impact Criteria (DoE 2013)**

| SIC assessment for critically endangered or endangered species |
|---|
| **Lead to a long-term decrease in the size of a population.** |
| The proposed works will result in the clearing of up to 0.05 ha of native vegetation representing potential habitat for the Broad-toothed Rat. While the proposal will result in the removal of potential habitat, the total area of habitat being removed is minor in the context of habitat contiguous in the landscape and broader locality. Given the scale of the impact in the context of available habitat in the region, it is unlikely that the proposed impacts will lead to a long-term decrease in the size of the Broad-toothed Rat population. Furthermore, recommendations detailed within Section 6 of the BAR provide a framework for minimising potential direct and indirect impacts to this species. |
| **Reduce the area of occupancy of the species.** |
| It is considered likely that vegetation within the study area would constitute potential habitat. However, given the overall context of the region and the extent of the vegetation connected to these areas, the 0.05 ha expected to be cleared is unlikely to have a significant impact to the occupancy of the species. |



*Biosis acknowledges the Aboriginal and Torres Strait Islander peoples as Traditional Custodians of the land on which we live and work. We pay our respects to the Traditional Custodians and Elders past and present and honour their connection to Country and ongoing contribution to society.*

| SIC assessment for critically endangered or endangered species |
| --- |
| Given the size and connectivity available in the greater landscape, it is unlikely that this species would be negatively impacted by the proposed works. The species will continue to inhabit retained habitat within the surrounding landscape. As such, it is unlikely that proposed works will reduce the area of occupancy of the population. |
| **Fragment an existing population into two or more populations.** |
| In the context of the quality and extent of the adjacent native vegetation, the 0.05 ha of potential Broad-toothed Rat habitat to be removed as a result of the proposed work represents less than 0.01 % of the native vegetation within a 10 km radius. Additionally, the works are not expected to reduce connectivity throughout the landscape which would fracture multiple populations and vegetated corridors containing key Broad-toothed Rat habitat. As such the proposed works will not fragment an existing population into two or more populations. |
| **Adversely affect habitat critical to the survival of a species.** |
| Any habitat where Broad-toothed Rat could occur is considered critical to the survival of the species. Although some native vegetation that is considered habitat will be removed, the proposal will not substantially impact upon optimal habitat relied upon for the sustenance of a potential population, and thus will not adversely affect habitat critical for the species' survival. |
| **Disrupt the breeding cycle of a population.** |
| There are large areas of existing native vegetation in the wider locality which would remain unaffected by the proposal and would continue to provide habitat for this species in the locality. As such it is unlikely that the breeding cycle of a population would be affected. |
| **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.** |
| The potential habitat proposed for removal is a small area in the context of the adjacent native vegetation in the Alpine National Park. There are large areas of existing native vegetation in the wider locality which would remain unaffected by the proposal and would continue to provide habitat for this species in the locality. |
| **Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.** |
| The proposal is unlikely to exacerbate the current level of invasive species threats operating within the study area. |
| **Introduce disease that may cause the species to decline** |
| Recommendations within Section 6 of the BAR provide a framework for managing potential risks to biodiversity. |
| **Interfere with the recovery of the species** |
| Mitigation measures outlined within Section 6 of the BAR suggest that it is unlikely that the proposed action would have an impact on the recovery of this species given the relatively minor level of impact proposed and that a range of mitigation measures designed specifically to minimise potential impacts would be implemented. |
| **Conclusion** |
| Considering the above factors, it is unlikely that the proposed work will impose a significant impact on Broad-toothed Rat or their habitats as:<br>• The proposed works will not introduce any diseases or invasive species of the Broad-toothed Rat.<br>• The proposed works will not interfere with the recovery of the species. |

**SIC assessment for critically endangered or endangered species**

- The removal of native vegetation is considered to be a threat to the recovery and ongoing survival of the species, however as the proposal will impact on only a very small area of potential habitat, surrounded by large swathes of habitat, it is not likely to significantly impact the species.

Based on the factors above, it is concluded that the proposed works are unlikely to lead to a significant impact on the Broad-toothed Rat.

### 3.2.4. Mountain Skink *Liopholis montana* and Alpine Bog Skink *Pseudemoia cryodroma*

#### Species background

The Mountain Skink occurs in montane and subalpine areas stretching from the Bimberi Range in the Australian Capital Territory, through the Snowy Mountains in New South Wales, into Victoria. Populations also occur in Wombat State Forest to the northwest of Melbourne at an elevation of 620 metres and at Sassafras in the Dandenong ranges, Victoria, at a similar elevation.

The Mountain Skink occupies habitats with granite and basalt boulders, rocks, slabs, rock screes or tors and large logs in tall open-forest, woodland, and heathland vegetation in montane and subalpine areas of south-east Australia from 600–1700 metres above sea level.

The Alpine Bog Skink is endemic to the Australian Alps Bioregion. It occurs above 1000 metres elevation throughout subalpine and alpine Victoria and may also occur in adjacent alpine regions of New South Wales. The total population of the Alpine Bog Skink is fragmented into 'sky islands' due to its patchy high-altitude distribution in the Australia Alps Bioregion. Specimens collected from the Mt Kosciuszko-Thredbo area in New South Wales require species confirmation following taxonomic reviews.

The Alpine Bog Skink occurs primarily in alpine bog, riparian and wet heath areas and less commonly in alpine and subalpine grassland and dry treeless heath, drainage lines in subalpine meadows, and in snow gum woodland.

#### Occurrence in the study area

Neither species are known to inhabit the study area, however targeted surveys for reptiles were not undertaken for the BAR. It is therefore assumed that these species could occur based on what is known about the ecology of both species.

The proposed works will result in the disturbance of 0.09 hectares of potential habitat for Mountain Skink and Alpine Bog Skink.

An assessment of whether the proposal is likely to lead to a significant impact on Mountain Skink and Alpine Bog Skink is provided below.

**Table 3-4 Mountain Skink and Alpine Bog Skink – Endangered species, assessment against Significant Impact Criteria (DoE 2013)**

| SIC assessment for critically endangered or endangered species |
|---|
| **Lead to a long-term decrease in the size of a population.** |
| The proposed works will result in the disturbance of up to 0.09 ha of native vegetation representing potential habitat for these species. Injury and mortality will be managed using the framework of mitigation measures outlined in Section 6 of the BAR. The area of habitat being impacted is minor in the context of habitat contiguous in the landscape and broader locality. Given the scale of the impact in the context of available habitat in the region, it is unlikely that the proposed impacts will lead to a long-term decrease in the size of a population of either endangered skink. |
| **Reduce the area of occupancy of the species.** |
| Given the overall context of the region and the extent of the vegetation connected to these areas, the 0.09 ha expected to be cleared is unlikely to have a significant impact to the occupancy of these species. |
| **Fragment an existing population into two or more populations.** |
| In the scope of the greater context of the surrounding land, the 0.09 ha of potential habitat to be impacted represents less than 0.01 % of the native vegetation within a 10 km radius. Additionally, the works are not expected to reduce connectivity throughout the landscape which would fracture multiple populations and vegetated corridors. As such the proposed works will not fragment an existing population into two or more populations. |
| **Adversely affect habitat critical to the survival of a species.** |
| Although some native vegetation will be removed, the proposal will not substantially impact upon any of the specific habitat types utilised by these species, and thus will not adversely affect habitat critical for these species' survival. |
| **Disrupt the breeding cycle of a population.** |
| Implementing the framework and mitigation measures provided in Section 6 of the BAR, it is unlikely the proposal would disrupt the breeding cycle of either species. |
| **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.** |
| The proposal is not likely to isolate populations as the impacts proposed within the study area is not likely to constitute a barrier to the movement of individuals of either species. Extensive areas of native vegetation occur surrounding the study area that will not be isolated by the clearing. The works are unlikely to affect the quality of the surrounding habitat, and mitigation measures will be put in place to prevent direct and indirect impacts. Whilst the proposal will result in the removal of up to 0.09 ha of vegetation, this level of loss is not likely to modify, destroy, remove, isolate or decrease the availability of habitat to the extent that either species is likely to decline. |
| **Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.** |
| The proposal is unlikely to exacerbate the current level of invasive species threats operating within the study area. |
| **Introduce disease that may cause the species to decline** |

| SIC assessment for critically endangered or endangered species |
| --- |
| It is unlikely the proposal would introduce disease that would affect reptiles. |
| **Interfere with the recovery of the species.** |
| Neither species has a national recovery plan. Given the small scale of the proposal and the framework of mitigation that will be in place, it is unlikely the recovery of either species would be interfered with. |
| **Conclusion.** |
| Considering the above factors, it is unlikely that the proposed work will impose a significant impact on Mountain Skink, Alpine Bog Skink or their habitats as:<br>• The proposed works will not introduce any diseases or invasive species.<br>• The proposed works will not interfere with the recovery of either species.<br>• Direct and indirect impacts can be managed effectively through the framework of mitigation measures outlined in Section 6 of the BAR.<br>Based on the factors above, it is concluded that the proposed works are unlikely to lead to a significant impact on Mountain Skink or Alpine Bog Skink. |

## 3.3. BC Act Test of Significance

### 3.3.1. Hoary Sunray *Leucochrysum albicans* var. *tricolor*

#### Species background

Hoary Sunray *Leucochrysum albicans* var. *tricolor* is a perennial everlasting daisy listed as Endangered under the BC Act. It is endemic to south-eastern Australia, where it is currently known from three geographically separate areas in Tasmania, Victoria and south-eastern NSW and ACT.

Hoary Sunray occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils. It can also occur in modified habitats such as semi-urban areas and roadsides and is highly dependent on the presence of bare ground for germination. In some areas, disturbance is required for successful establishment.

#### Occurrence in the study area

No occurrences of Hoary Sunray have been recorded within 10 kilometres of the study area (NSW DCCEEW 2024). Targeted survey was undertaken for the BAR and the species was not detected. However, the BAR notes that the species *could occur post-construction as a result of ground disturbance* and a moderate likelihood of occurrence was given.

The proposed works will result in the disturbance of 0.09 hectares of potential habitat for Hoary Sunray.

An assessment of whether the proposal is likely to lead to a significant effect on Hoary Sunray is provided below.

**Table 3-5 Test of Significance Hoary Sunray**

| Test of Significance for Hoary Sunray |
|---|
| ***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.*** |
| Targeted survey for Hoary Sunray did not detect this species, therefore, it is unlikely that individuals are at risk of direct impact. The BAR posits that the disturbance from the proposal may encourage any propagules present in the affected soil to germinate. Considering the above, it is unlikely the proposal would place any local population of the species at risk of extinction. |
| ***In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:***<br>***1. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***<br>***2. 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 – this species is not an ecological community. |
| ***In relation to the habitat of a threatened species or ecological community:***<br>***1. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and***<br>***2. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and***<br>***3. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.*** |
| The proposed works include disturbance of up to 0.09 ha of native vegetation, considered habitat for Hoary Sunray.<br>The proposed works are unlikely to result in further fragmentation or significantly increase isolation for this species due to the small scale of disturbance associated with the proposed works. The native vegetation to be impacted by the proposed works represent marginal habitat and is unlikely to be relied upon for the long-term survival of the species in the locality. |
| ***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).*** |
| The proposed works will not have an adverse effect on any declared areas of outstanding biodiversity value. |
| ***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.*** |
| Key threatening processes (KTP) relevant to Hoary Sunray include clearing of native vegetation and weeds.<br>The disturbance of up to 0.09 ha of native vegetation will reduce the availability of marginal habitat for this species, albeit temporarily. However, the vegetation being removed is already subject to edge effects and the small-scale removal is not considered to significantly exacerbate key threatening processes to this species.<br>Measures are outlined in the BAR for the management of weeds. |
| ***Conclusion*** |
| In consideration of the above five factors, the proposed activity is not likely to significantly impact Hoary Sunray within the study area or wider locality, as:<br>• No direct impacts (loss of individuals) is anticipated.<br>• The proposed works will only result in impacts to 0.09 ha of potential marginal habitat.<br>• Disturbance from the proposal may facilitate germination of Hoary Sunray propagules, if present.<br>• The proposed works do not significantly contribute to a KTP for Hoary Sunray. |

### 3.3.2. Mountain Skink *Liopholis montana*

#### Species background

The Mountain Skink occurs in montane and subalpine areas stretching from the Bimberi Range in the Australian Capital Territory, through the Snowy Mountains in New South Wales, into Victoria. Populations also occur in Wombat State Forest to the northwest of Melbourne at an elevation of 620 metres and at Sassafras in the Dandenong ranges, Victoria, at a similar elevation.

The Mountain Skink occupies habitats with granite and basalt boulders, rocks, slabs, rock screes or tors and large logs in tall open-forest, woodland, and heathland vegetation in montane and subalpine areas of south-east Australia from 600–1700 metres above sea level.

#### Occurrence in the study area

Mountain Skink may inhabit the study area, however targeted surveys for reptiles were not undertaken for the BAR. It is therefore assumed that this species could occur based on what is known about the ecology of the species.

The proposed works will result in the disturbance of 0.09 hectares of potential habitat for Mountain Skink.

An assessment of whether the proposal is likely to lead to a significant impact on Mountain Skink is provided below.

**Table 3-6 Test of Significance Mountain Skink**

| **Test of Significance for Mountain Skink** |
|---|
| ***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.*** |
| Impacts to native vegetation are relatively minor and generally confined to the existing roadway and open disturbed areas which is the least suitable habitat within the study area for this species. Direct and indirect impacts to more suitable areas of habitat neighbouring the proposal area will be managed using the framework of mitigation measures outlined in Section 6 of the BAR.<br>In light of the above, the proposal is considered unlikely to place a local viable population at risk of extinction. |
| ***In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:***<br>***1. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***<br>***2. 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 – this species is not an ecological community. |
| ***In relation to the habitat of a threatened species or ecological community:***<br>***1. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and***<br>***2. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and***<br>***3. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.*** |

| Test of Significance for Mountain Skink |
|---|
| The proposed works include disturbance of up to 0.09 ha of native vegetation, considered largely sub-optimal habitat for Mountain Skink. |
| The proposed works are unlikely to result in further fragmentation or significantly increase isolation for this species due to the small scale of disturbance associated with the proposed works. The native vegetation to be impacted by the proposed works represent marginal habitat and is unlikely to be relied upon for the long-term survival of the species in the locality. |
| ***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).*** |
| The proposed works will not have an adverse effect on any declared areas of outstanding biodiversity value. |
| ***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.*** |
| Key threatening processes (KTP) relevant to Mountain Skink include clearing of native vegetation and weeds. |
| The disturbance of up to 0.09 ha of native vegetation will reduce the availability of marginal habitat for this species, albeit temporarily. However, the vegetation being removed is already subject to edge effects and the small-scale removal is not considered to significantly exacerbate key threatening processes to this species. |
| Measures are outlined in the BAR for the management of weeds. |
| ***Conclusion*** |
| In consideration of the above five factors, the proposed activity is not likely to significantly impact Mountain Skink within the study area or wider locality, as:<br>• No direct impacts (loss of individuals) is anticipated.<br>• The proposed works will only result in impacts to 0.09 ha of potential marginal habitat.<br>• The proposed works do not significantly contribute to a KTP for Mountain Skink. |

## 3.4. FM Act 7 Part Test

### 3.4.1. Alpine Redspot Dragonfly *Austropetalia tonyana*

#### Species background

The Alpine Redspot Dragonfly *Austropetalia tonyana* is listed as Vulnerable under the FM Act. It is one of three species in the genus *Austropetalia*. All three species are endemic to south-eastern Australia and have rounded reddish-brown spots on the leading edges of their wings. The Alpine Redspot Dragonfly is a habitat specialist, occurring only within very specific geographic locations. It is naturally rare, with few recordings of the species in New South Wales since the 1950s.

In NSW, the Alpine Redspot Dragonfly is restricted to mountainous regions below 35°S that reach above 600 – 1,800 metres above sea level. Individuals have extremely specific habitat requirements. Nymphs are only known to occur among rocks, logs and moss in the spray zone of waterfalls. Adults are found within the waterfall splash zone.

#### Occurrence in the study area

There are no records of Alpine Redspot Dragonfly within 10 kilometres of the study area. The BAR found that there is no likelihood the species could occur within the study area. However, NSW DPI has possible habitat mapped for the species along Thredbo River, which intersects the study area.

An assessment of whether the proposal is likely to lead to a significant impact on Alpine Redspot Dragonfly is provided below.

**Table 3-7 7 Part Test Alpine Redspot Dragonfly**

| **The following factors must be taken into account in making a decision on the potential impact:** | |
|---|---|
| **Criteria** | |
| **(a) In the case of a threatened species, whether the action proposed 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.** | Based on habitat assessment presented in the BAR, it is unlikely Alpine Redspot Dragonfly inhabits the study area due to lack of very specific habitat requirements. As such, it is unlikely the proposal would place the species at risk of extinction. |
| **(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.** | Under the FM Act this species is not listed as part of a threatened population. Therefore, this criterion does not apply. |
| **(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**<br>**(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**<br>**(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.** | N/A |
| **(d) in relation to the habitat of a threatened species, population or ecological community:**<br>**(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**<br>**(ii) whether an area of habitat is likely to become fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;**<br>**(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.** | Based on habitat assessment presented in the BAR, it is unlikely Alpine Redspot Dragonfly inhabits the study area due to lack of very specific habitat requirements. As such, the proposal is not considered to be reducing the extent, modifying or fragmenting an area of habitat. |
| **(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)** | Based on habitat assessment presented in the BAR, it is unlikely Alpine Redspot Dragonfly inhabits the study area due to lack of very specific habitat requirements. Therefore, it cannot be said the |

| The following factors must be taken into account in making a decision on the potential impact: | |
|---|---|
| | proposal is likely to impact habitat critical to the survival of the species. |
| **(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan** | A recovery plan has been created for this species. However, given the proposal is not thought to impact habitat for Alpine Redspot Dragonfly, the proposal is unlikely to compromise the recovery of the species. |
| **(g) Whether the action proposed constitutes or is part of a key threatened process or is likely to result in the operation of, or increase the impact of, a key threatening process.** | Key threatening processes listed in Schedule 6 of the FAM Act relevant to Alpine Redspot Dragonfly and the proposal include:<br>• Degradation of native riparian vegetation along New South Wales water courses.<br>• Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams.<br>Given the study area is not considered to contain the specific habitat requirements Alpine Redspot Dragonfly, the proposal cannot be said to contribute to these key threatening processes in this instance. |
| **Conclusion** | |
| A significant impact on this species is considered unlikely where:<br>• This species is not considered likely to inhabit the study area.<br>• The proposed works will not incur an increase in or constitute a key threatening process.<br>• The proposed works will not interfere with the recovery of this species.<br>• The habitat to be modified is not likely to be considered important to the long-term survival of this species. | |

## Conclusion

The following threatened species received new or updated significant impact assessment or tests of significance as required under NSW and Commonwealth legislation:

- Diamond Firetail (Vulnerable, EPBC Act).
- Gang-Gang Cockatoo (Endangered, EPBC Act).
- Hoary Sunray (Endangered, BC Act).
- Broad Toothed Rat (Endangered, EPBC Act).
- Redspot Dragonfly (Vulnerable, FM Act).
- Mountain Skink (Endangered, EPBC Act and BC Act).
- Alpine Bog Skink (Endangered, EPBC Act).

In all cases, a significant impact is considered unlikely. As such, preparation of a Species Impact Statement, consideration of the NSW Biodiversity Offset Scheme, and/or referral of the proposal to the Commonwealth Minister for the Environment is not required.

Recommendations contained in the original BAR (EnviroKey 2020) should be considered in the design and project planning and carried over into the REF and a Construction Environmental Management Plan.

Please contact me on 0400 259 383 if there are any queries.

Yours sincerely,



Brendon True

Senior Botanist - Major Projects

# Appendix A. Habitat Assessment

## Fauna

**Table A.8 Additional threatened fauna species recorded or predicted to occur within 10 km of the study area**

| Scientific Name | Common Name | Conservation status | | | Most recent record | Likely occurrence in study area | Rationale for likelihood ranking | Habitat description* |
|---|---|---|---|---|---|---|---|---|
| | | EPBC | BC | FM | | | | |
| **Birds** | | | | | | | | |
| ***Aphelocephala leucopsis*** | Southern Whiteface | VU | VU | | # | Low | Found at lower elevations. | Southern whitefaces occupy open acacia or eucalypt-dominated woodlands and shrublands on ranges, foothills, lowlands, and plains. This species favours open woodlands and shrublands with low tree densities and a herbaceous litter cover or grassy understory. |
| ***Falco hypoleucos*** | Grey Falcon | VU | VU | | # | Negligible | Semi-arid species | Found over open country and wooded lands of tropical and temperate Australia. Mainly found on sandy and stony plains of inland drainage systems with lightly timbered acacia scrub. |
| ***Neophema chrysogaster*** | Orange-bellied Parrot | CE | CE | | 1917 | Negligible | Coastal salt marsh specialist. | A single breeding population of fewer than 200 individuals occur in a narrow coastal strip of south-west Tasmania. Adult birds depart Tasmania for the mainland in February. The first adults begin leaving the mainland for Tasmania in September with the last birds having departed by November. It is a coastal species inhabiting saltmarshes, sedge plains, |

| Scientific Name | Common Name | Conservation status | | | Most recent record | Likely occurrence in study area | Rationale for likelihood ranking | Habitat description* |
|---|---|---|---|---|---|---|---|---|
| | | EPBC | BC | FM | | | | |
| | | | | | | | | coastal dunes, pastures, shrublands and moorlands, generally within 10 km of the coast. Critical winter habitat for the species includes natural saltmarshes dominated by *Sarcocornia quinqueflora* (Beaded Glasswort) and *Sclerostegia arbuscula* (Shrubby Glasswort), as well as the associated grassy or weedy pastures. Historical records indicate that the Orange-bellied Parrot was formerly more abundant and widespread in NSW than it is now, however the species' distribution continues to extend into south-eastern NSW where suitable habitat is still available. |
| ***Neophema chrysostoma*** | Blue-winged Parrot | VU | VU | | # | Negligible | Found at lower elevations | The Blue-winged Parrot is a small parrot found in Tasmania and southeast mainland Australia. Some populations are known to migrate to Tasmania from the mainland during summer months. The species feeds predominantly on the ground and occurs in savannah woodlands and grasslands. |
| ***Polytelis swainsonii*** | Superb Parrot | VU | VU | | # | Negligible | Found at lower elevations | Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Forages primarily in grassy box woodland, feeding in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. |

| Scientific Name | Common Name | Conservation status | | | Most recent record | Likely occurrence in study area | Rationale for likelihood ranking | Habitat description* |
|---|---|---|---|---|---|---|---|---|
| | | EPBC | BC | FM | | | | |
| ***Pycnoptilus floccosus*** | Pilotbird | VU | | | 2017# | Low | Occurs at lower elevations in Montane forests. | The pilotbird is found from the Wollemi National Park and Blue Mountains National Park in New South Wales through to the Dandenong Ranges, near Melbourne in Victoria. Its natural habitat is temperate wet sclerophyll forests and occasionally temperate rainforest, where there is dense undergrowth with abundant debris. [ALA 2022]. |
| **Mammals** | | | | | | | | |
| ***Myotis macropus*** | Southern Myotis | | VU | | 2020 | Low | Occurs at lower elevations. | Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects. |
| ***Petaurus australis australis*** | Yellow-bellied Glider (south-eastern) | VU | VU | | # | Low | Not present at higher elevations. | Restricted to tall native forests in regions of high rainfall along the coast of NSW. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees |

| Scientific Name | Common Name | Conservation status | | | Most recent record | Likely occurrence in study area | Rationale for likelihood ranking | Habitat description* |
|---|---|---|---|---|---|---|---|---|
| | | EPBC | BC | FM | | | | |
| | | | | | | | | suitable for den sites and a mosaic of different forest types. |
| **Reptiles** | | | | | | | | |
| ***Liopholis montana*** | Mountain Skink | EN | EN | | # | Moderate | Distribution is poorly understood. | This skink occurs in scattered populations across the high country in NSW, VIC, and the ACT at altitudes between 900-1800 m elevation. This species is associated with rocky habitats in subalpine woodlands or dry open forests. |
| ***Pseudemoia cryodroma*** | Alpine Bog Skink, Alpine Bog-skink | EN | | | # | Moderate | Common in similar vegetation types in Victoria. Records present on the Kosciusko main range and from near Perisher Valley. | The Alpine Bog Skink is a small metallic brown-green skink species found in the Australian Alps Bioregion across both NSW and VIC. This species typically occurs in wet, open areas in and around subalpine bogs, wet heath, and riparian areas above 1100 m elevation. |
| **Fish** | | | | | | | | |
| ***Bidyanus bidyanus*** | Silver Perch, Bidyan | CE | | VU | # | Low | Found in larger river systems | Silver perch are endemic to the Murray-Darling system (including all states and sub-basins). Hatchery-bred silver perch are also stocked out of their range in a number of impoundments on east coast river systems, where they seemingly fail to reproduce. However, a self-sustaining population of silver perch occurs in Cataract Dam in the Hawkesbury/Nepean system. |

| Scientific Name | Common Name | Conservation status | | | Most recent record | Likely occurrence in study area | Rationale for likelihood ranking | Habitat description* |
|---|---|---|---|---|---|---|---|---|
| | | EPBC | BC | FM | | | | |
| ***Galaxias supremus*** | Kosciuszko Galaxias | CE | | CE | # | Low | Generally found where Trout are excluded. No habitat linkages to the study area and known populations. | This fish is distributed throughout the upper Snowy River catchment. This species inhabits permanent, cold and clear flowing creeks from Blue Lake within Kosciuszko National Park |

## Flora and ecological communities

**Table A.9 Additional threatened flora species and ecological communities recorded or predicted to occur within 10 km of the study area**

| Scientific Name | Common Name | Conservation status | | Most recent record | Likely occurrence in study area | Rationale for likelihood ranking | Habitat description* |
|---|---|---|---|---|---|---|---|
| | | EPBC | BC | | | | |
| ***Caladenia concolor*** | Crimson Spider-orchid, Maroon Spider-orchid | VU | EN | # | Negligible | No suitable habitat | Small orchid, recorded from two populations at Bethungra and Burrinjuck Nature reserve with the other at Nail Can Hill Crown Reserve near Albury. Grows in regrowth woodland on granite ridge country in Upper Riverina Dry Sclerophyll Forest and Western Slopes Grassy Woodlands. Grows in clay loams and gravel beds. |
| ***Carex archeri*** | Archer's Carex | | EN | 1951 | Low | Generally found at higher elevations. | Loosely tufted herb restricted to Kosciuszko National Park. Grows in alpine heath, sod tussock grasslands and tall alpine herbfields. |
| ***Diuris ochroma*** | Pale Golden Moths | VU | EN | # | Low | Not previously recorded from the search area. | Terrestrial orchid recorded in the Kosciuszko National Park and Kybean area. Grows in Temperate Montane Grasslands, Subalpine Woodlands and Tableland Clay Grassy Woodlands. |
| ***Pimelea bracteata*** | | CR | CR | # | Low | Only recorded twice form the Main Range at higher elevations around Charlottes Pass and near Dainers Gap. | A subalpine shrub which grows up to 2 m tall. The shrub is endemic to NSW, known to occur in and adjacent to the northern area of Kosciuszko National Park and Scabby Range Nature Reserve. This species grows in wetland areas, along waterways and stream edges in treeless subalpine valleys. This shrub can also be found growing in damp heathy areas. |

| Scientific Name | Common Name | Conservation status | | Most recent record | Likely occurrence in study area | Rationale for likelihood ranking | Habitat description* |
|---|---|---|---|---|---|---|---|
| | | EPBC | BC | | | | |
| ***Viola improcera*** | Dwarf Violet | EN | | # | Low | Not recorded from the Main Range previously. | The Dwarf Violet is a perennial herb known from at least 5 subpopulations within NSW, VIC, and the ACT. In NSW, this species is only known to occur on Big Badja Hill in Deua National Park. This species grows in open shrubland and snow gum woodland at high altitudes |
| ***Windswept Feldmark in the Australian Alps Bioregion*** | | | CE | | Negligible | No associated vegetation present. | |

# Appendix I – Consultation with NSW Department of Primary Industries (Fisheries) (DPI Fisheries)

Alison Mclean
Fisheries Manager Murray Darling
Department of Primary Industries, Fisheries
Department of Regional NSW
Email: Alison.mclean@dpi.nsw.gov.au

5 June 2024

Dear Alison Mclean,

## Proposed Thredbo River culvert work on Alpine Way at Thredbo

Further to earlier correspondence sent to NSW Department of Primary Industries, Fisheries (DPI Fisheries) dated 29th July 2020 and a follow up site visit in November 2023, Transport for New South Wales (Transport) would like to consult with DPI Fisheries on the proposal to carry out culvert rehabilitation work on the Thredbo River culverts, Alpine Way at Thredbo.

Under *Section 199 of the Fisheries Management Act 1994*, Transport is required to consult with the Minister of Primary Industries (DPI Fisheries) on the proposal. Transport would consider any matters concerning the proposed work raised by the Minister within 21 days after the giving of this notice.

Work is planned to start in February 2025 and delivered over four months, weather permitting. If delays are encountered due to weather conditions the work will be completed in two stages. Stage one will be completed in February and March 2025 and any outstanding work will be completed in late 2025 or early 2026 (stage 2).

Work will involve (figure 2):

- Establishing a temporary work site and site office (use of Cascade Hut trail carpark)
- Construction of a temporary access track at the culvert inlet
- Construction of a concrete working apron at the inlet end
- Relining of the four existing culverts with tunnel lining products
- Construction of a new inlet headwall and wing wall structure
- Placement of rip rap treatment on the outlet end.

The work will ensure future use of the culverts and road, prevent further deterioration of the headwall, and help reduce the risk of scour damage to the riverbanks and riverbeds downstream.

To carry out particular construction activities, we will need to close the road to traffic in both directions. There will be up to six full road closures throughout the four months of planned work. The road will be closed between 9am and 3pm. Road closure dates will be confirmed and communicated prior to work starting.

The community will notice lane closures, reduced speed limits and some delays to their journeys. There will be no public access to the Cascade Hut Trail car park. We aim to manage our work to avoid impacts to the community and the environment.

The proposed work will be subject to an environmental assessment under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW).* A copy of the determined assessment will be published on Transport for NSW's website.

Please submit feedback to this notice by 26 June 2024.

If you have any further questions or require more information, please contact Daniel Bojkovic on 0447 541 579 or daniel.bojkovic@transport.nsw.gov.au.

Sincerely,



Daniel Bojkovic
Project Engineer
Transport for NSW

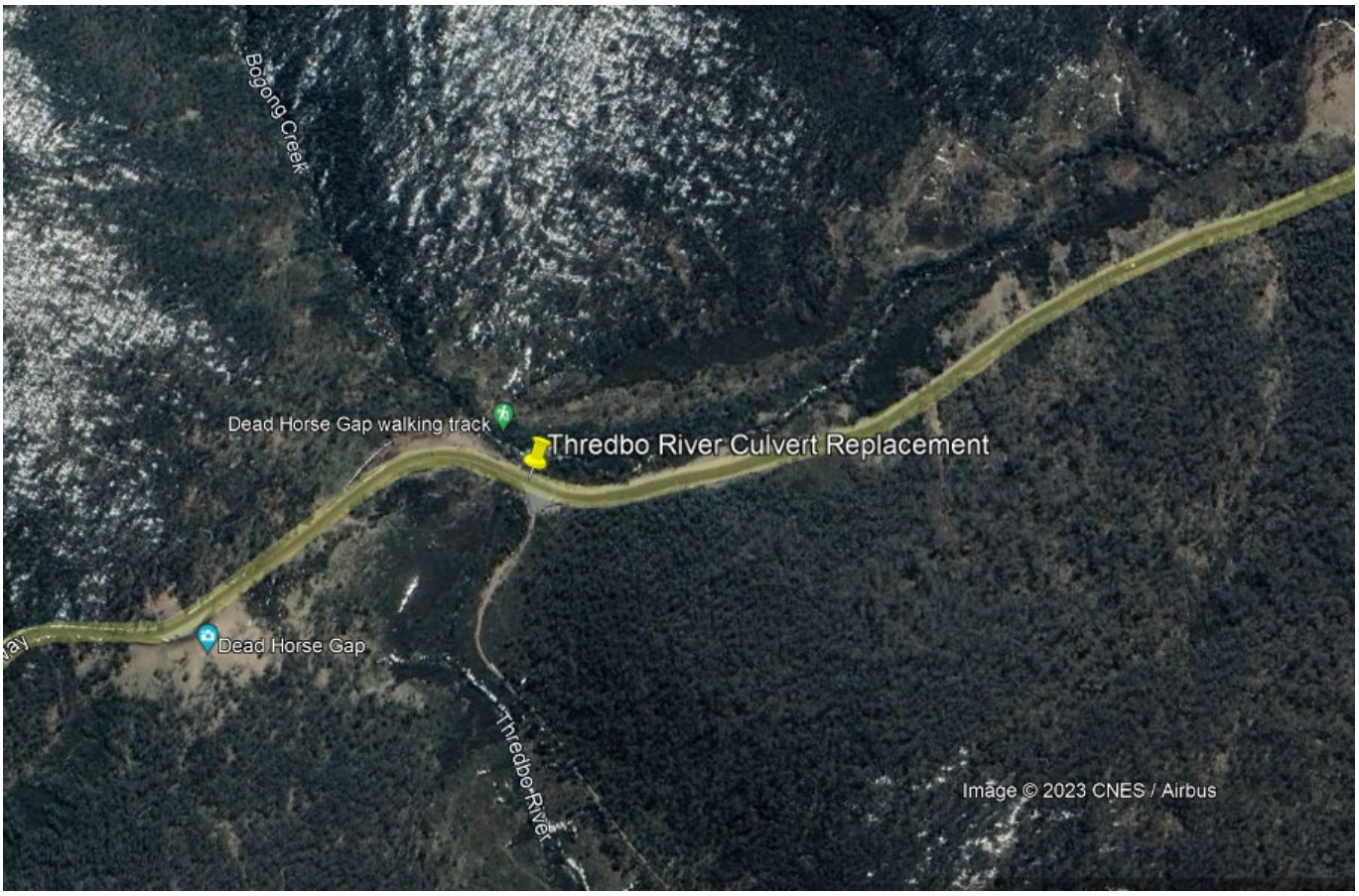



Figure 1 – Location of proposed Works, Thredbo River Culverts Alpine Way

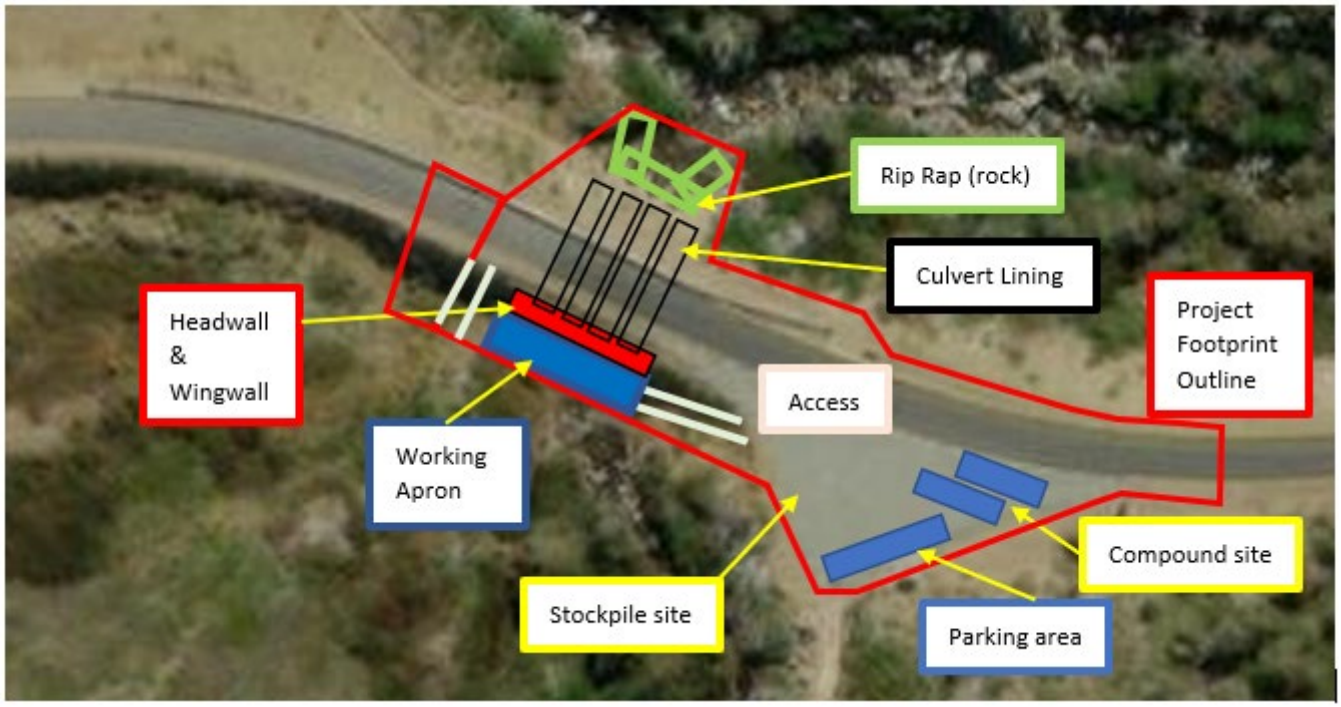



Figure 2 – Project footprint showing the scope and work areas.



Figure 3 – Photos of Thredbo River Culverts

**Department of Primary Industries (Fisheries)**
Department of Regional NSW

FE24/688 C24/492

11 June 2024

**Daniel Bojkovic**
**Project Engineer, Transport for NSW**
**Level 1, 101 Crown Street**
**Wollongong NSW 2500**

Re: Consultation under s.199 of the Fisheries Management Act 1994 for dredging/reclamation works associated with culvert rehabilitation – Thredbo River – Alpine Way, Thredbo

Dear Daniel,

Thank you for referring the above-mentioned proposal to the Department of Primary Industries - Fisheries (DPI Fisheries) on 05/06/2024 in accordance with s.199 of the Fisheries Management Act 1994. DPI Fisheries assesses applications for dredging and reclamation works in accordance with Part 7 and 7A of the Fisheries Management Act 1994 and the *Policy and Guidelines for Fish Habitat Conservation and Management (2013)* (P&G).

The Thredbo River at Thredbo is considered TYPE 1 Key Fish Habitat and is known and/or potential habitat for a dragonfly species and an aquatic community of fish and invertebrates listed under threatened species provisions of the *Fisheries Management Act 1994* (FM Act), namely the Alpine Redspot Dragonfly and the Snowy River Endangered Ecological Community.

It is understood that the proposed works involve construction of a temporary access track at the culvert inlet, construction of a concrete working apron at the inlet, relining the 4 existing culverts, construction of a new headwall and rip rap treatment at the outlet.

DPI Fisheries has no objections to the works being undertaken as described and provides the following considerations in accordance with the *Fisheries Management Act 1994* (Attachment 1).

The matters raised by DPI Fisheries relate to the Department's responsibilities for ensuring fish stocks are conserved and that there is "no net loss" of key fish habitats upon which they depend. Please contact me on 0484 907 343 or via email Alison.McLean@dpi.nsw.gov.au if you require any further information.

**Alison McLean**
Fisheries Manager, Murray Darling
Freshwater Environment Branch
NSW Department of Primary Industries

**Attachment 1**

**MATTERS FOR CONSIDERATION UNDER s199 of the *Fisheries Management Act 1994*.**

1. All relevant approval documentation, including authorities such as landowners consent should be maintained by the proponent or their contractor operating on site.

   *Reason – A DPI Fisheries Compliance Officer may wish to check that the works are being undertaken in accordance with relevant approvals*.

2. The subject works, in construction methodology and final built design, must be consistent with the proposal outlined in the s199 referral to DPI Fisheries. Please closely consider whether proposed changes could create additional impacts on aquatic habitat and should be referred to DPI Fisheries for further s199 consultation.
   *Reason – This s199 consultation has been prepared following an assessment of the potential impacts of the described works upon the aquatic and neighbouring environments. Other works, which were not described in the referral have not been assessed and may have significant adverse impacts*.

SEDIMENT AND EROSION CONTROL

3. Erosion and sediment mitigation devices are to be erected in a manner consistent with currently accepted Best Management Practice (i.e. Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004) to prevent the entry of sediment into the waterway prior to any earthworks being undertaken. These are to be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal.

   *Reason – To ensure that sediment generated by the exposure of soil is not transported into the aquatic environment.*

4. DPI Fisheries recommends stockpiles are located away from adjacent water land[1], riparian and aquatic vegetation[2].

   *Reason – To ensure that sediment generated by the exposure of soil is not transported into the aquatic environment.*

DEWATERING

[1] "Water land" means land submerged by water:

a) whether permanently or intermittently, or
b) whether forming an artificial or natural body of water,

and includes *wetlands* and any other land prescribed by the regulations.

*Wetlands* include marshes, mangroves, swamps, or other areas that form a shallow body of water when inundated intermittently or permanently with fresh, brackish or salt water, and where the inundation determines the type and productivity of the soils and the plant and animal communities.

[2] "Aquatic vegetation" is a term used to describe native vegetation that inhabits freshwater but does not include noxious weeds within the meaning of the *Noxious Weeds Act* 1993.

5. Dewatering at the site is to be undertaken in accordance with accepted Best Management Practice (ie Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004) including the use of mitigation controls such as a sediment fence between the sump water release outlet and the waterway.
*Reason – To minimise turbidity impacts from the site and ensure that downstream water quality is not adversely affected.*

TIMING OF WORKS FOR LOW FLOWS

6. Works should be undertaken during periods of low flows in the waterway, and where possible when the Bureau of Metrological forecast for the Region indicates clear, dry weather.
*Reason – Timing the works for appropriate conditions can reduce delays and minimise impacts on the aquatic environments.*

INSTREAM WORKS

7. DPI Fisheries recommend that

   - machinery should only enter or work from the waterway in accordance with best management practice and an agreed work method statement.
   - machinery is appropriately cleaned, degreased and serviced prior to use at the site and entry into the waterway.
   - Emergency Spill Kits appropriate for containing and cleaning up petroleum and solvent product spills within waterways are available on site at all times during works.

   *Reason – To reduce the threat of an unintended pollution incident impacting upon the aquatic environment.*

8. Snags[3] are not to be realigned, relocated, or removed without prior consultation with and agreement from DPI Fisheries.
*Reason – "Removal of large woody debris from NSW rivers and streams" is listed as a Key Threatening Process under the provisions of the FM Act. This approval has been granted on the basis that snags are not to be removed*.

ARMOURING WORKS

9. Only clean rock (no fines) should be used at the site.

10. Rock is to be of suitable size to not be displaced by high velocity flows.

11. *Reason – To avoid fines, clay and other sediment un-necessarily entering the waterway and ensure rock armouring is constructed using Best Management Practice techniques*.

[3] "Snags" is a term used to describe **large woody debris** from trees and shrubs, including whole fallen trees, broken branches and exposed roots that have fallen or washed into a waterway and are now wholly or partially submerged by water. Snags also includes submerged large rocks (of greater than 500 mm in two dimensions).

WATERWAY CROSSINGS

12. Scour protection must abut the surface edge of the crossing at the same level to ensure there is no drop in elevation at the join.

AVOIDING HARM TO RIPARIAN AND AQUATIC VEGETATION

13. To protect riparian and aquatic vegetation DPI Fisheries recommends identifying and appropriately delineating riparian and aquatic vegetation on water land as "No Go" areas (with the aim of avoiding harm to these areas).
*Reason – To ensure that impacts on aquatic habitats and the riparian zone are minimised.*

POST WORKS REHABILITATION OF SITE

14. On completion of the works, that the site is rehabilitated and stabilised including:
    - removal from the site of surplus construction materials and temporary structures (other than silt fences and other erosion and sediment control devices) installed during the course of the works.
    - Removal of all imported material that formed temporary crossing and side track.
    - Reinstatement of the side track footprint to a stable grade generally consistent with the upstream and downstream bank profile and re-established with native endemic riparian and aquatic vegetation.
    - Appropriate maintenance of erosion and sediment control devices undertaken until the vegetation has successfully established and the site has stabilised.
    *Reason – To ensure that habitats are restored as quickly as possible, public safety is not compromised, aesthetic values are not degraded and sediment inputs into the waterway are reduced.*

FISH KILL CONTINGENCY

15. Observations of dead or distressed fish should be immediately reported to DPI Fisheries. If a fish kill occurs DPI Fisheries recommend works cease until the cause of the kill is identified and rectified.

# Appendix J – Consultation with National Parks and Wildlife Service (NPWS)

**From:** Tristan Ricketson <Tristan.Ricketson@environment.nsw.gov.au>
**Sent:** Wednesday, 18 September 2024 1:25 PM
**To:** Daniel Bojkovic
**Cc:** Luke McLachlan; Campbell Young; Tabatha Cann; John Turville; Rochelle Ahio; Craig Robinson
**Subject:** Re: MR677 Thredbo River Culverts Rehabilitation Works - Transport ISEPP Consultation Letter - NSW National Parks and Wildlife Services

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

Hi Dan - cheers for the conversation. Happy with the below and attached map detailing access for walkers. We will also be looking to float some heavy plant out there to access up the Cascade Fire Trail.

Let me know if you need anything further
Tristan

**Tristan Ricketson**
Manager, Snowy River Area
Southern Ranges Branch
NSW National Parks and Wildlife Service

**Ph (02) 6450 5577**
**M** 0408 367 557
**W** nationalparks.nsw.gov.au



**From:** Daniel Bojkovic <daniel.bojkovic@transport.nsw.gov.au>
**Sent:** Wednesday, September 11, 2024 15:19
**To:** Tristan Ricketson <Tristan.Ricketson@environment.nsw.gov.au>
**Cc:** Luke McLachlan <Luke.McLachlan@environment.nsw.gov.au>; Campbell Young

<Campbell.Young@environment.nsw.gov.au>; Tabatha Cann <Tabatha.R.CANN@transport.nsw.gov.au>; John Turville <John.Turville@transport.nsw.gov.au>; Rochelle Ahio <rochelle.ahio@transport.nsw.gov.au>; Craig Robinson <Craig.ROBINSON@transport.nsw.gov.au>
**Subject:** RE: MR677 Thredbo River Culverts Rehabilitation Works - Transport ISEPP Consultation Letter - NSW National Parks and Wildlife Services

Hi Tristan,

Sorry I missed you over the phone today but I'm sending another email to confirm if you have reviewed the information from my emails below? Please send me a confirmation email to confirm the topics and agree with the approaches moving forward. This would be ideal to include as part of the ISEPP consultation with National Parks as part of our environmental assessments.

Regards,

Daniel Bojkovic
Project Engineer
Regional & Freight
Regional and Outer Metropolitan
**Transport for NSW**

**M** 0447 541 579
101 Crown Street Wollongong NSW 2500

NSW GOVERNMENT | Transport for NSW

---

OFFICIAL

**From:** Daniel Bojkovic
**Sent:** Wednesday, August 28, 2024 9:05 AM
**To:** Tristan Ricketson <tristan.ricketson@environment.nsw.gov.au>
**Cc:** Luke McLachlan <Luke.McLachlan@environment.nsw.gov.au>; Campbell Young <Campbell.Young@environment.nsw.gov.au>; Tabatha Cann <Tabatha.R.CANN@transport.nsw.gov.au>; John Turville <John.Turville@transport.nsw.gov.au>; Rochelle Ahio <rochelle.ahio@transport.nsw.gov.au>; Craig Robinson <Craig.ROBINSON@transport.nsw.gov.au>
**Subject:** FW: MR677 Thredbo River Culverts Rehabilitation Works - Transport ISEPP Consultation Letter - NSW National Parks and Wildlife Services

Hi Tristan,

I would like to include some more information to help with the items we discussed over the phone. Attached is a sketch showing components of the proposed pedestrian movement plan.

I would like to request a confirmation on the items we discussed were consistent with the information in my previous email and that you would be happy for us to continue with our methods to address the listed concerns.

Regards,

Daniel Bojkovic
Project Engineer
Regional & Freight
Regional and Outer Metropolitan
**Transport for NSW**

**M** 0447 541 579
101 Crown Street Wollongong NSW 2500

---

**From:** Daniel Bojkovic
**Sent:** Wednesday, August 7, 2024 3:12 PM
**To:** Tristan Ricketson <Tristan.Ricketson@environment.nsw.gov.au>
**Cc:** Luke McLachlan <Luke.McLachlan@environment.nsw.gov.au>; John Turville <John.Turville@transport.nsw.gov.au>; Rochelle Ahio <rochelle.ahio@transport.nsw.gov.au>; Campbell Young <Campbell.Young@environment.nsw.gov.au>; Tabatha Cann <Tabatha.R.CANN@transport.nsw.gov.au>
**Subject:** RE: MR677 Thredbo River Culverts Rehabilitation Works - Transport ISEPP Consultation Letter - NSW National Parks and Wildlife Services

Hi Tristan,

I'm sending this email to confirm the information and other discussions Craig, you, and I had over the phone in regards to Thredbo River Culvert Rehabilitation Works. Please excuse the wall of text.

In regards to maintaining the access for the Cascade Trail, TfNSW will not be providing carpark spaces at the Cascade Trail Carpark due to safety concerns and will impact our work. We discussed that, TfNSW will be providing access by providing parking spots for the public up at Dead Horse Gap Lookout. Pedestrians from Dead Horse Gap Lookout will walk down along the road to the guardrail, cross the road onto the disturbed embankment on the southbound side and then travel down to the Dead Horse Gap Trail. Pedestrians will then cross the road again at the carpark, around the compound site and access the southeastern corner to access the Cascade Trail. This applies to tour guides as well.

Emergency responders and pest animal control workers were discussed and will use the same. If emergency vehicles need to enter the Cascade or parking within the compound for quick access here, they will need to notify our supervisor and will enter through the two large gates (one on north side of compound for entry and another at the south end to access Cascade Trail if required). They will be given access through to Cascade Trail. This applies for fire responders as well.

For helicopter access, TfNSW unfortunately will not be able to guarantee helicopter access to the Cascade Trail Carpark. You mentioned that the helicopter crew is able to land on road. Seeing as we will have traffic control in place, TfNSW will be slowing traffic naturally. It was identified that Dead Horse Gap Lookout and Siberia could be used for landings alternatively.

TfNSW no longer intends to use full road closures. Emergency responders will have access, albeit some forms of traffic controls needs to be established for the safety of workers. Ideally emergency responders to notify the supervisor as above. TfNSW aims to keep occupation short to prevent increasing fire risks from delaying fire responders.

Variable Message Sign strategies will be developed and followed to establish and then alert the public and tour operators to the activity down the road (especially for Thredbo Village and Khancoban). A general notification will be sent out to the general public either side of the works so that they are aware well in advance. A notification will be sent out to Thredbo Resort and Snowy Hydro just in case. The Thredbo Resort's environmental sustainability officer will assist us in distributing the information to the locals there too.

A running event was mentioned occurring usually in December. Works as discussed will be held during February to the end of May. Additional track work (by National Parks and Wildlife Services) on the Dead Horse Gap and Thredbo River Tracks will need to be coordinated as crews plan to undertake works at nearly the same time. Large vehicles may be needed by National Parks and will be allowed to briefly enter our site through the two gates if required. Notifications and site inductions are required.

It would be advantageous to include the information regarding our project on a webpage within your domain. I will discuss with the team if feasible and if so, forward you the necessary information to best represent the work and impacts.

Please let me know if you are happy with my summary, missed anything, and/or have any comments. If you are happy, I will contact you again later this year once we have a more definite plan of our work.

Regards,

Daniel Bojkovic
Project Engineer
Regional & Freight
Regional and Outer Metropolitan
**Transport for NSW**

**M** 0447 541 579
101 Crown Street Wollongong NSW 2500

---

**From:** Tristan Ricketson <Tristan.Ricketson@environment.nsw.gov.au>
**Sent:** Friday, June 14, 2024 2:36 PM
**To:** Daniel Bojkovic <daniel.bojkovic@transport.nsw.gov.au>
**Cc:** Luke McLachlan <Luke.McLachlan@environment.nsw.gov.au>; John Turville <John.Turville@transport.nsw.gov.au>; Rochelle Ahio <rochelle.ahio@transport.nsw.gov.au>; Campbell Young <Campbell.Young@environment.nsw.gov.au>
**Subject:** Re: MR677 Thredbo River Culverts Rehabilitation Works - Transport ISEPP Consultation Letter - NSW National Parks and Wildlife Services

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

Good afternoon - Thanks for the correspondence. Feb is peak fire season for us and Feb/March is peak visitation for this area and there is a significant amount of work is planned. We would be looking at working with you to enable:

- Maintaining limited parking in cascades carpark and access through to Cascades Fire Trail. This is for:

- Walkers and mountain bike riders wishing to access the Pilot Wilderness Area, Dead Horse Gap and the Thredbo River Walk;
- Emergency response (including bushfire and search and rescue);
- Pest animal control work;
- Commercial Tour operators; and
- Significant fire trail works accessed via the carpark

- Utilising Cascades carpark if to fly out of for track works on the Dead Horse Gap track and Thredbo River Walk. . This would be for a couple of hours at a time and if the road was open we could potentially fly out of the Dead Horse Gap area

and,

- Maintaining access through the Alpine Way during closure periods for emergency response, including bush fire and search and rescue (if possible)
- Where possible be given advanced warning of when road closures will be so that we are able to:
  - advise commercial tour operators who have clients travelling to Tom Groggin and Geehi and using the Alpine Way
  - advise campers who have booked to alter their travel arrangements.

NPWS is also happy to put a notice on our website if appropriate to advise of the changed conditions

It would be good to catch up to discuss

Thanks
Tristan

**Tristan Ricketson**
Manager, Snowy River Area
Southern Ranges Branch
NSW National Parks and Wildlife Service

**Ph (02) 6450 5577**
**M** 0408 367 557
**W** nationalparks.nsw.gov.au



**From:** Daniel Bojkovic <daniel.bojkovic@transport.nsw.gov.au>
**Sent:** Wednesday, June 5, 2024 15:43
**To:** Tristan Ricketson <Tristan.Ricketson@environment.nsw.gov.au>
**Cc:** Luke McLachlan <Luke.McLachlan@environment.nsw.gov.au>; John Turville <John.Turville@transport.nsw.gov.au>; Rochelle Ahio <rochelle.ahio@transport.nsw.gov.au>
**Subject:** MR677 Thredbo River Culverts Rehabilitation Works - Transport ISEPP Consultation Letter - NSW National Parks and Wildlife Services

Hi Tristan,

This is Daniel Bojkovic from Transport and I'm contacting you in regard to the rehabilitation work at the Thredbo River culverts.

As stated in the SEPP for Transport and Infrastructure 2021 clause 2.15, I'm contacting you on behalf of Transport to provide you information on the proposal and ask for your timely response to this notice within the next few weeks.

Please find attached letter providing information regarding the proposed works.

Let me know via email or call if you require any further information prior to your response.

Regards,

Daniel Bojkovic
Project Engineer
Regional & Freight
Regional and Outer Metropolitan
**Transport for NSW**

**M** 0447 541 579
Level 1, 101 Crown Street Wollongong NSW 2500

This email is intended only for the addressee and may contain confidential information. If you receive this email in error please delete it and any attachments and notify the sender immediately by reply email. Transport for NSW takes all care to ensure that attachments are free from viruses or other defects. Transport for NSW assume no liability for any loss, damage or other consequences which may arise from opening or using an attachment.

**Consider the environment. Please don't print this e-mail unless really necessary.**

OFFICIAL

---

This email is intended for the addressee(s) named and may contain confidential and/or privileged information.
If you are not the intended recipient, please notify the sender and then delete it immediately.
Any views expressed in this email are those of the individual sender except where the sender expressly and with authority states them to be the views of the NSW Office of Environment, Energy and Science.

PLEASE CONSIDER THE ENVIRONMENT BEFORE PRINTING THIS EMAIL
This email is intended only for the addressee and may contain confidential information. If you receive this email in error please delete it and any attachments and notify the sender immediately by reply email. Transport for NSW takes all care to ensure that attachments are free from viruses or other defects. Transport for NSW assume no liability for any loss, damage or other consequences which may arise from opening or using an attachment.
**Consider the environment. Please don't print this e-mail unless really necessary.**
---
---
This email is intended for the addressee(s) named and may contain confidential and/or privileged information.
If you are not the intended recipient, please notify the sender and then delete it immediately.
Any views expressed in this email are those of the individual sender except where the sender expressly and with authority states them to be the views of the NSW Office of Environment, Energy and Science.
PLEASE CONSIDER THE ENVIRONMENT BEFORE PRINTING THIS EMAIL

# Appendix K – Options Report

# MR677 Alpine Way Thredbo River Culvert Relining

Options Report – version 2

# Contents


1 Overview ..... 5
1.1 Background ..... 5
1.2 Objectives ..... 5
1.3 Summary of Outcomes ..... 5

2 Project Overview – Thredbo River Culvert B10155 ..... 6
2.1 Background and context ..... 6
2.2 Project objectives ..... 6

3 Assessment of Issues ..... 7
3.1 Issue 1 – The Deteriorating Condition of Stone Pitching on the Inlet ..... 7
3.1.1 Defects ..... 7
3.1.2 Options and Assessment ..... 7
3.1.3 Option Preference ..... 8
3.2 Issue 2 – The Deteriorating Condition of the Pipe Culverts ..... 8
3.2.1 Defects ..... 8
3.2.2 Options ..... 9
3.2.3 Options Preference ..... 10
3.3 Issue 3 – Scour at the Outlet end of the Culvert ..... 10
3.3.1 Defects ..... 10
3.3.2 Options ..... 10
3.3.3 Option Preference ..... 11

4 Culvert Images ..... 12



| | |
|---|---|
| **Author:** | Craig Robinson – Project/ Contract Manager (Project Services South) |
| **Date:** | 29/03/2022 |
| **Version:** | 2 |
| **Reference:** | P.0056675 |
| **Division:** | ROM |
| **Review date:** | 15/03/2023 |

# 1 Overview

## 1.1 Background

Recent inspection of culvert B10155 on Alpine Way has identified a number of significant issues that require urgent attention to prevent more serious damage occurring to the road network. The following issues have been identified and are addressed within this report:

1. **Major cracking and movement in the stone headwall at the inlet**
2. **Corrosion and deformation of the steel pipe culverts**
3. **Scour at the outlet end of the culvert**

Further options and assessment for of each of these issues is provided in this report.

## 1.2 Objectives

The objective of the options assessment was to determine the optimum option for each arising issue and therefore allow the team to progress to the detailed design phase.

## 1.3 Summary of Outcomes

The outcome of discussions has resulted in the following options being selected to address each issue:

1. **Major cracking and movement in the stone headwall at the inlet**

The preferred option is 5, which includes the installation of a new concrete inlet structure in front of the existing. This option will provide the best outcome for long-term durability with the lowest construction impacts.

2. **Corrosion and deformation of the steel pipe culverts**

The preferred option is 3d which includes the installation of a reinforced concrete lining inside the steel pipe. This option will adequately satisfy the structural and durability requirements of the project without the need to remove the existing pipe culverts.

3. **Scour at the outlet end of the culvert.**

The preferred option is 1 which includes the placement of rock protection at the outlet. This option will provide protection around the outlet reducing the potential for further scour and movement in the batter whilst avoiding any major issues with the provision of vehicular access down to the outlet area. The existing slump in the batter will be monitored and further protective measures would be implemented as required.

It is recommended that each these options be employed in a detailed design to ensure the optimum outcome for the project.

# 2 Project Overview – Thredbo River Culvert B10155

## 2.1 Background and context

In general, corrugated steel pipe culverts are no longer used in road construction projects undertaken by TfNSW, this is primarily due to issues with long term durability, such as is evident at this site. In order to enhance the integrity and safe operation of the road network TfNSW provides funding to rehabilitate or replace damaged steel culverts using modern materials that will meet the requirements for +100yr design life.

Routine inspections of this culvert have revealed that the corrugated steel pipes have been affected by corrosion and are showing signs of deterioration in the lower portion of the pipes to an extent that they are beginning to deform. Further investigation identified that the stone headwall at the inlet is severely cracked and is allowing water to pass in behind several of the steel pipes. In addition, the lack of a suitable outlet structure has resulted in scour at the end of the pipes which is beginning to undermine the toe of the road batter. It has been determined that the culvert must be rehabilitated to prevent further damage and minimise significant impacts to the road network and surrounding environment.

## 2.2 Project objectives

The key objectives of this project are:

- Ensure the stability of the culvert, embankments, and headwalls to provide a safe and structurally stable road environment.
- Prevent scouring and reduce sediment loss in the river and surrounding environment
- Improve the durability of the culvert by using materials that will last for +100yrs

# 3 Assessment of Issues

## 3.1 Issue 1 – Major cracking and movement in the stone headwall at the inlet

### 3.1.1 Defects

The following defects have been observed on the stone pitching at the inlet of the culvert:

- Stone wall between Cell No.3 and No. 4 has broken away and is allowing water under the pipes.
- Large horizontal settlement crack in the stone wall above cell No. 1, No. 2, and No. 3 pipes. The top section is projecting out by 75mm.
- Breaking up of stone at Cell No. 1.
- A diagonal crack at Cell No. 4 pipe, is going away from the pipe towards the bank.
- A cracked layer above Cell No. 2, No. 3, and No. 4 approximately 500mm from the top of the stone wall.
- Stone pitching around Cell No.4 at the inlet end is falling away.
- Further scouring of the inlet end of Cell No. 4. Fill has been scoured away exposing more of the stone wall.

### 3.1.2 Options and Assessment

**Option 1 – Localised repair of the cracks and holes in the inlet headwall and wingwalls by using similar materials.**

This option provides a short-term fix to the issues however could lead to further damage in the medium to long-term as further cracking develops in the wall. This option would not resolve any of the potential structural issues such as the projection of sections of the wall highlighted in defect b) listed above. Due to the numerous issues with the stone pitching on the inlet headwall, as listed above, it is not feasible to undertake effective repair of the wall without complete dismantling and rebuilding from similar materials. Option 1 is not considered to be feasible option for medium to long-term repair of the culvert headwall and wing walls.

**Option 2 – Full demolition and reconstruction of the inlet headwall and wing walls using similar materials.**

This option will increase the impact on the surrounding road and adjacent embankment during construction as benching would be required above the headwall prior to any demolition works. The road would likely need to be closed during the works in order to maintain the safety of the public. The footprint for the work site would need to be increased to cater for excess spoil generated. The increase in area of exposed soil is seen as a high environmental risk due to the works being close to the river in a pristine national park.

**Option 3 – Construction of a new headwall using similar materials in front of the existing wall.**

This option would not require the existing headwall to be removed thus reducing the impact to the surrounding embankment. The new headwall would still retain the aesthetics of the original

structure and the heritage value would also be preserved if constructed in a similar manner to that of the existing. Based on the durability of the existing headwall, it is not considered that this option would meet the +100yr design life required. This is primarily due to freeze-thaw effects in this location which are exacerbated by the porous nature of the materials being used.

**Option 4 – New inlet structure in front of the existing with a stone pitching façade**

This option includes construction of a new concrete headwall, wingwalls and apron with a stone façade like existing. This option would provide a durable structure that meets the 100yr design life. It is considered that the stone façade would likely be subject to failure sooner than the concrete structure which could potentially lead to delamination and require additional maintenance over the long term however, this would not affect the overall performance of the structure. Due to the façade the structure would retain much of the existing aesthetics of the original headwall however, its heritage value would be significantly diminished due to the introduction of the new concrete structure.

**Option 5 – Replacement with a new concrete headwall and wingwalls in front of the existing structure and a new concrete apron.**

This option includes construction of a new concrete headwall, wingwalls and apron. The concrete headwall will be tapered into each of the pipes increasing the flowrate and capacity during high flow conditions, thus reducing the risk and impact of potential flood events. This option would provide an inlet structure that meets the 100yr design life specified. Construction timeframes and footprint would be minimised with this option and further reductions could be made with the use of pre-cast elements.

### 3.1.3 Option Preference

**Option 5 – Replacement with a new concrete headwall and wingwalls in front of the existing structure and a new concrete apron.**

The preferred option is 5 as it will provide the best outcome for long-term durability with the lowest construction impacts.

## 3.2 Issue 2 – Corrosion and deformation of the steel pipe culverts

### 3.2.1 Defects

The following defects have been observed in the pipe culverts:

- Pipe No. 1 and No. 4 appear to be bowed in the centre and are out of alignment.
- Cross-sectional measurements have indicated that the pipes have been compressed by approximately 10%.
- Galvanising has worn off on the lower sides of the steel pipes in all cells with corrosion beginning to appear.

Based of works conducted previously on similar culvert types, intervention is required to prevent further deformation of the culvert and to avoid full replacement of the pipes in the future.

### 3.2.2 Options

**Option 1 – Repair the areas of corrosion in the culvert.**

This option involves removal of corrosion on sections of the pipe and protection with galvanising paint. This is not recommended as a suitable long-term treatment as it would not address the structural damage and compression of the pipes.

**Option 2 – Remove and replace the culverts.**

Remove and replace techniques are similar to those generally used in the construction of a new roads. Replacement costs are higher than rehabilitation of existing culverts. Construction impacts to surrounding environment and road users would be significantly higher for a full replacement of the pipes.

**Option 3 – Relining the culverts with a suitable lining material.**

This a cost-effective way to extend the life of the culvert without undertaking a full replacement. The works can be undertaken in-situ with minimal impact to the surrounding environment. There are several methods/materials that can be used to effectively reline pipe culverts, however, not all methods will meet the 100yr durability requirement:

- **Option 3a – HDPE lined**

  Inserting a high-density polyethylene pipe into a steel culvert. Joints are butt welded outside the culvert before being pushed or pulled into place along rails. This method is more suited to smaller sized pipes and therefore is not feasible for this culvert.

- **Option 3b – Spiral wound plastic structural lining**

  These liners are formed by spirally winding a continuous strip of plastic into the deteriorated culvert and step-by-step locking or welding the edges of the strip together to form a pipe. The plastic strip is usually smooth on the inside and ribbed on the outside. For larger diameters, the plastic may be reinforced with steel in the ribs of the strips.

- **Option 3c – GRP slip liner**

  Glass fibre reinforced slip lining is similar to HDPE slip lining. Mechanical joints are used. Some GPR liners have been found to provide the required structural integrity and durability for the culvert. Further investigation with the manufacturer of the GRP slip liners has revealed that this type of liner will not be suitable for application in large culvert sizes. Therefore, this option has unfortunately been found to be unsuitable for this site.

- **Option 3d – Reinforced concrete lining**

  Reinforced concrete lining around the entire circumference of the existing steel pipe. A temporary platform and formwork will be constructed to move through the culvert and

progressively in sections, install steel reinforcement and then pour concrete. Each section of liner is then allowed to set before moving to the next section. This option provides superior strength and durability however it is a more expensive and labour-intensive lining solution.

### 3.2.3 Options Preference

The preferred option is 3 more specifically option 3d. This option is for a reinforced concrete lining around the entire circumference of the existing steel pipe. This option provides a high level of structural integrity and will meet the +100yr durability specification. Although this option comes at a higher initial cost than some other options it is considered a cost-effective solution as it will not require the removal of the existing pipes, thus reducing the impact to the surrounding environment and road users. This option should provide excellent protection from the harsh environmental conditions in this area including freeze / thaw effects and should only require minimal maintenance throughout its lifecycle. Other benefits are that the reinforced concrete liner can more effectively be integrated with a new concrete inlet headwall and tapered to suit the existing outlet thus providing a seamless concrete pipe culvert structure at completion.

## 3.3 Issue 3 – Scour at the Outlet end of the Culvert

### 3.3.1 Defects

The following defects have been observed at the outlet of the culverts:

- No structure present at the outlet, therefore scour has occurred around the pipes
- Large voids are present between each of the pipes
- The embankment has slumped above the area between the pipes
- There is a void under the pipe No. 3

If left unchecked the toe of the batter at the culvert outlet will continue to be undermined and potentially lead to destabilisation of the road in the future. This batter is used as link to nearby walking tracks which would also be affected by any movement.

### 3.3.2 Options

**Option 1 – Install rock armouring at outlet.**

This option involves placement of various sized rocks in a around the outlet area. Large rocks would be installed by a crane from the road above with smaller size rocks placed by hand. The rock will reduce the rate of scour around the outlet and thus reduce the rate of slumping in the batter. The movement that has already occurred in the batter would not be fixed however the placement of scour protection at the toe of the batter would slow the movement in the future. This option relatively cost effective, simple to construct and have a very low impact on the surrounding environment.

**Option 2 – Stabilise batter using shotcrete, soil nails, stabilised sand, foam, no-fines concrete.**

This option would allow for the repair of the outlet batter providing greater stability for the road in the long term. Construction however would require a large footprint increasing the risk for impacts to the surrounding environment. It is considered that the large area of concrete covering the batter would significantly detract from the visual amenity of the surrounding environment.

**Option 3 – Extend pipes to a sufficient length so that the outlet will no longer affect the road batter.**

This option would result in an increase in the durability of the batter however it could result in the pipes encroaching on the national parks land and similar issues will develop at the new outlet point potentially eroding the surrounding river embankments. Construction would require pipes to be placed on the riverbed increasing the work area and as the risk of adverse impacts.

**Option 4 – Construction of a new concrete outlet structure including new concrete apron.**

This option includes construction of a new concrete headwall, wingwalls and apron. This option would improve the durability of the structure and meet the 100yr design life specified. As above, this option would also allow for a minor extension of the culvert which will increase the stability of the batter and road above. However, the construction footprint and impacts to the surrounding environment would be significantly increased. Due to the steepness of the batter, providing vehicle access to the outlet would be very difficult and would require cutting a significant track in the existing batter approximately 80m in length. Provision of the access to the outlet would result in addional environmental impacts in the area.

### 3.3.3 Option Preference

**Option 1 – Install rock armouring at outlet.**

The preferred option is 1 as it provides a good level of protection around the toe of the batter reducing further scour and movement whilst avoiding any major issues with the provision of vehicular access down to the outlet area. The existing slump in the batter will be monitored and further protective measures would be implemented as required.

# 4 Culvert Images



Figure 1 - Cell No. 1, has skewed out of alignment and has corroded




Figure 2 - View of Inlet end showing cracks on the upper side of the pipe culverts




Figure 3 - View of outlet end



Figure 4 - Water getting in behind Cell No. 4 at the outlet

# Appendix L - Heritage Impact Letter of Advice

Transport for NSW

Daniel Bojkovic
Project Engineer
Regional & Freight
Regional and Outer Metropolitan
E:daniel.bojkovic@transport.nsw.gov.au

## Re: Rehabilitation of Thredbo Culvert B10155 on the Alpine Way MR 677

19 June 2024

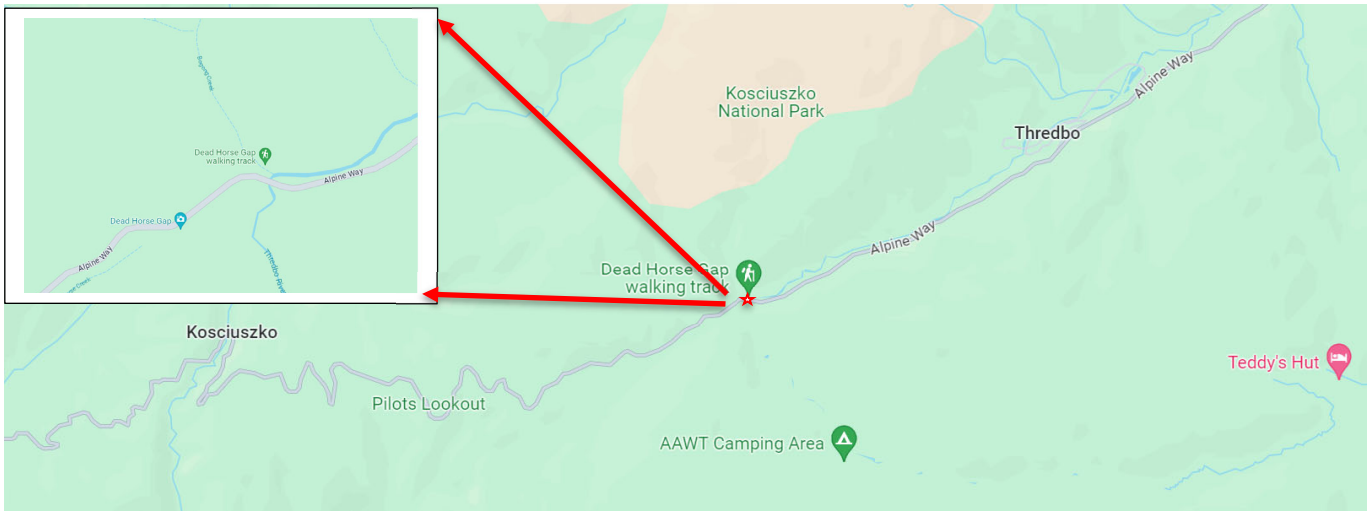
Dear Daniel ,

The Alpine Way, MR677, is located within Kosciuszko National Park and was built in the 1950s by the Snowy Mountains Authority for access to the Murray 1 and 2 Power Stations located in Khancoban. It formed part of a larger road construction program supporting the Snowy Mountains Hydro-Electric Scheme, which is listed on the National Heritage List (NHL). The Alpine Way traverses Ngarigo Aboriginal Country.

## The Alpine Way and proposed culvert requiring rehabilitation

The Alpine way extends from Kosciuszko Road (3km west of Jindabyne) to 400m west of the crossing of Khancoban Creek (east of Khancoban). Transport for NSW is the roads authority within Kosciuszko National Park.

The Thredbo River crosses the Alpine Way located approximately 5km southwest of Thredbo Village. The Thredbo River crossing contains a culvert which requires rehabilitation works to address issues with identified structural integrity and ensuring the safety of road users. It is the only road connection between Thredbo and Kosciuszko.




*A) shows the location of culvert B10155 (red star) on the Alpine Way between Thredbo and Kosciuszko with detail of the location inset.*


Address Level 4, 7 Harvest Street, MACQUARIE PARK, NSW 2113
Mob: 0422 996 645

## Culvert Description B10155

The culvert contains four corrugated galvanised steel pipe culverts/cells (internal diameter of 2400mm) which are built with random rubble cemented stone headwalls facing both sides of the river (Figures B and C). The design employs local materials, with other examples found on the Alpine Way, employing other temporary techniques like sandbags filled with cement, which were typical of the 1950s and 1960s.

| | |
|---|---|
|  |  |
| *B) South face of culvert, source: NICHE, 2023, Plate 7* | *C) North face of culvert, source: NICHE 2023, Plate 8* |

The culvert type is consistent with "type 4" described within an assessment of culvert types along an adjoining but separate section of the Alpine Way, described as:

| | | |
|---|---|---|
| 4 | Outlet consists of random rubble cemented stone headwalls. Headwall angles out to form wingwalls on either side of outlet.<br><br>Rolled corrugated galvanised steel or concrete conduit. Stones are undressed and rolled river pebbles. No apron visible. (Biosis 2011:9) |  |

Biosis's assessment of Types 4 and 6 demonstrated local significance under criteria for association with the Alpine Way, and Snowy Mountains Scheme, and representative values, for these types of culverts built on the Alpine Way.

The Biosis report recommended avoidance in the first instance, and if this was not possible, that a representative sample of Types 4 and 6 culverts on the Alpine Way should be selected (at a minimum of 10%) with the best original condition for accessioning and ongoing management within the agency's Section 170 Heritage and Conservation Register (s170 register) (Biosis 2011: 17).

The Biosis recommendation required further work by the road's asset managers together with the environment and heritage team to select the most appropriate sample of Type 4 and 6 culverts for inclusion into the S170 register linked to future road upgrades. This is a current action sitting with Transport.

Biosis provided guidance in how to identify the sample while ensuring that there was flexibility in managing the future road upgrades and seeking to retain examples of these locally significant culverts *in situ.* Biosis identified 197 examples of the type 4 culvert along part of the Alpine Way which did not include the Thredbo River culvert (B10155). (Biosis 2011: 17-18).

## Culvert Condition

Three defects/condition issues were identified during visual inspections of culvert B10155. They are set out below and discussed in an Options Analysis, prepared by Craig Robinson, Transport for NSW ROM, March 2023, v2, section 3.1.1), which identifies that remediation actions need to ensure serious damage is avoided to the road.

Table 1 below sets out the three defects /condition issues with recommended engineering options to address them. Photographs (Figures D-G) are also included which show some of the condition issues discussed in the Options report.

### Table 1: Options considered by Transport (2023, v2, Section 3).

| Defects/Condition Issue | Options considered (Preferred option in bold) |
|---|---|
| **Issue 1 - Major cracking and movement in the stone headwall at the inlet (Figure D).**<br><br>Stone pitching at the inlet of the culvert has resulted in the following defects:<br><br>• "Stone wall between Cell No.3 and No. 4 has broken away and is allowing water under the pipes. (Figure F)<br>• Large horizontal settlement crack in the stone wall above cell No. 1, No. 2, and No. 3 pipes. The top section is projecting out by 75mm. (Figure D)<br>• Breaking up of stone at Cell No. 1.<br>• A diagonal crack at Cell No. 4 pipe, is going away from the pipe towards the bank.<br>• A cracked layer above Cell No. 2, No. 3, and No. 4 approximately 500mm from the top of the stone wall. (Figure D).<br>• Stone pitching around Cell No.4 at the inlet end is falling away. (Figure F)<br>• Further scouring of the inlet end of Cell No. 4. Fill has been scoured away exposing more of the stone wall". | **1.** Localised repair of the cracks and holes in the inlet headwall and wingwalls by using similar materials.<br><br>**2.** Full demolition and reconstruction of the inlet headwall and wing walls using similar materials.<br><br>**3.** Construction of a new headwall using similar materials in front of the existing wall.<br><br>**4.** New inlet structure in front of the existing with a stone pitching façade<br><br>**5. Replacement with a new concrete headwall and wingwalls in front of the existing structure and a new concrete apron.** |

| | |
|---|---|
| **Issue 2 - Corrosion and deformation of the steel pipe culverts (Figure E)**<br><br>• Pipe No. 1 and No. 4 appear to be bowed in the centre and are out of alignment.<br>• Cross-sectional measurements have indicated that the pipes have been compressed by approximately 10%.<br>• Galvanising has worn off on the lower sides of the steel pipes in all cells with corrosion beginning to appear. | 1. Repair the areas of corrosion in the culvert.<br><br>2. Remove and replace the culverts.<br><br>3. **Relining the culverts with a suitable lining material**. A) HDPE lined B) Spiral wound plastic structural lining C) GRP slip liner **D) Reinforced concrete lining** |
| **Issue 3 - Scour at the outlet end of the culverts. (Figure G)**<br><br>• No structure present at the outlet, therefore scour has occurred around the pipes<br>• Large voids are present between each of the pipes<br>• The embankment has slumped above the area between the pipes<br>• There is a void under the pipe No. 3 | **1. Install rock armouring at outlet.**<br><br>**2.** Stabilise batter using shotcrete, soil nails, stabilised sand, foam, no-fines concrete.<br><br>**3.** Extend pipes to a sufficient length so that the outlet will no longer affect the road batter.<br><br>**4.** Construction of a new concrete outlet structure including new concrete apron. |

## Photographs showing defects/condition issues with culvert B10155




*D) South face of culvert, showing weathering of mortar and limewash and cracks on the upper side of the pipe culverts. Pipes are numbered 1-4, Source: Craig Robinson Transport for NSW ROM, Options Analysis, 2023, v2, Figure 2*



*E) Detail of Cell No 1 showing the pipe is skewed and out of alignment with corrosion present. source: Craig Robinson Transport for NSW ROM, Options Analysis, 2023, v2, Figure 1.*

| | |
|---|---|
|  |  |
| *F) Water getting in behind Cell No 4 at the outlet. source: Craig Robinson Transport for NSW ROM, Options Analysis, 2023, v2, Figure 4.* | *G) Corrosion and scour at the end of the outlets. source: Craig Robinson Transport for NSW ROM, Options Analysis, 2023, v2, Figure 3.* |

## Proposed Scope of Works

Following the options analysis prepared by Transport for NSW (Robinson, Options Analysis, 2023, v2) to address culvert B10155's defects/condition issues and rehabilitate it, the following package of works was developed. The works are proposed to be assessed under a Review of Environmental Factors (REF):

- Construct temporary access track from parking lot to inlet end. G40
- Build an apron on the inlet end, extending to the outer edge of wing walls. R11, B80, R53.
- Reline the existing culverts with concrete/grout relining systems. R11, R53.
- Construct a new inlet headwall and wing wall structure in front of existing stone-pitched headwall on culvert inlet. 3201, R53, R11, B30, B80.
- Build culvert batter extension and pipe connection between new headwall and culvert reline. R44, G40.
- Place rip rap treatment on the riverbed and banks of the culvert outlet end via crane. R55.

Additional risks guiding the package included:

- Impact on pristine drinking water with environmental controls needing to be of high quality, including the works area, noting it is within the National Park.
- Aboriginal cultural heritage and, where present, non-Indigenous heritage.
- Design for construction of the new headwall (with capacity, strength and constructability shaping design).

- The section of the Alpine Way between Thredbo and Kosciuszko is the only road and needs to remain open.

## Heritage Status of B10155 and surrounding landscape

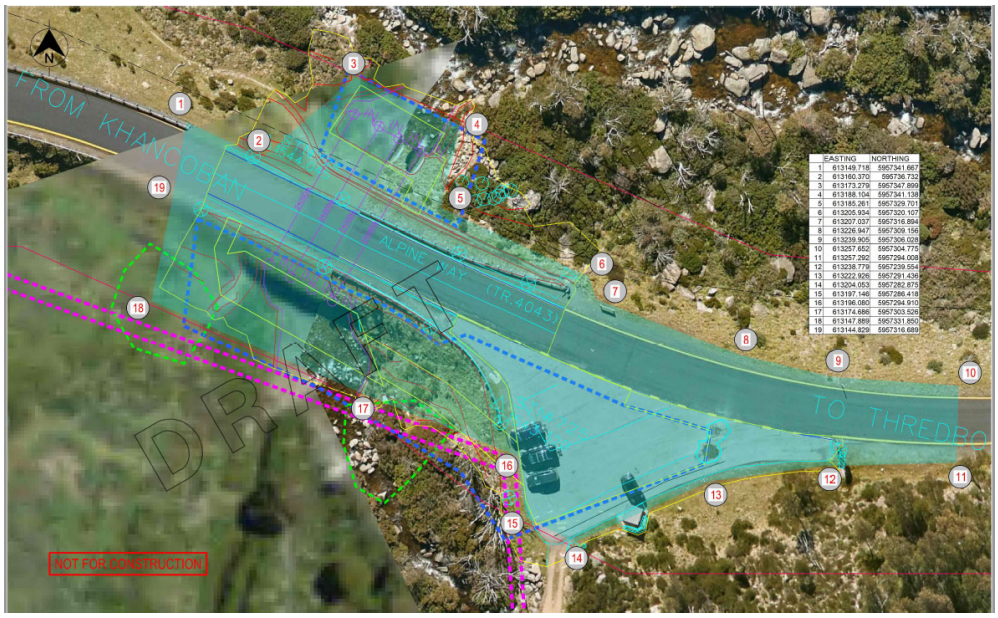
**The culvert is not currently heritage listed** under:

- The Transport for NSW s170 Register, or
- Local Environmental Plans for Bombala Council, Cooma Monaro Shire Council or Snowy River Shire Council.

A significant Aboriginal cultural heritage pathway, known as the Bundian Way, also intersects with this landscape which now contains the Alpine Way. The Bundian Way is approximately 265km long extending from Targangal (Mount Kosciuszko) to Bilgalera (Eden). It was recognised by listing on the NSW State Heritage Register (SHR) in 2013 (SHR#01906).

As part of the project assessment, a concurrent assessment of impact to Aboriginal cultural heritage was undertaken applying the Transport for NSW Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI), 2011. The process prepared a draft Aboriginal Cultural Heritage Assessment Report (ACHAR) which shows the relationship of the study area to the Bundian Way SHR item.

**Works proposed to culvert B10155 are located outside, but adjacent to the curtilage of the SHR listed Bundian Way (Figure H).**




*H) Figure shows the study area (shaded light blue) with the Bundian way shown as a pink dotted line outside and adjacent to the works area.*

**Conclusion: There are no identified non Aboriginal heritage items within the project study area. However, the SHR listed Bundian Way is adjacent to the study area.**

## Heritage analysis of options to rehabilitate culvert B10155

Culvert B10155 is not an identified heritage item, but has been identified within a broader range of culverts as retaining heritage value and could be part of a sample for retention, if appropriate.

Transport sought to understand the potential implications of the defects with the culvert, together with the engineering options, proposed scope of works and risks discussed above, to consider whether it would be possible to retain B10155 as part of the broader type 4 culvert sample on the Alpine Way for inclusion on the s170 register.

NICHE Environment and Heritage was engaged to prepare a Statement of Heritage Impact (Draft April 2023) to consider the matter. However, in preparing their assessment NICHE focused on the culvert in isolation, rather than the broader remit put forward by Biosis to consider a sample of appropriate culverts in good condition for retention which were located on the Alpine way.

Table 2 sets out the options analysis from NICHE which focuses on five possible options for how to approach the rehabilitation work which are summarised below.

Table 2: Options analysis by NICHE Environment and Heritage (NICHE 2023, Table 12, p 35):

| Option | Description | Analysis of Transport for NSW feasibility (Preferred option in bold) |
|---|---|---|
| 1 | Localised repair of the cracks and holes in the inlet headwall and wingwalls by using similar materials | • Short term fix may lead to further damage as cracking develops<br>• Does not resolve structural issues<br>• Repair of inlet headwall cannot be undertaken without completely dismantling and reconstruction |
| 2 | Full demolition and reconstruction of the inlet headwall and wing walls using similar materials | • Road closures needed to complete works<br>• Works footprint needs increase due to spoil<br>• Increase in exposed soil may be increased environmental risk |
| 3 | Construction of a new headwall using similar materials in front of the existing wall | • Does not require headwall removal<br>• Headwall retains existing aesthetic<br>• Durability will not meet 100+ year design life |
| 4 | New inlet structure in front of the existing with a stone pitching façade | • Durable structure, meets 100+ year design life<br>• Potential stone delamination requiring extra maintenance<br>• Retains much of original aesthetic<br>• Heritage value diminished by insertion of new concrete elements |
| **5** | **Replacement with a new concrete headwall and wingwalls in front of the existing structure and a new concrete apron (with relining of culvert)** | • **Design will reduce risk of future flood events**<br>• **Meets 100 year design life**<br>• **Minimised footprint of works** |

Given the defects/condition issues identified with B10155 which includes “Major cracking and movement in the stone headwall at the inlet, Corrosion and deformation of the steel pipe culverts and Scour at the outlet end of the culverts” (Options Analysis 2023 v2), the NICHE recommendation to *“retain as much as possible any material relating to the culvert and its original condition, or use new material which retains the existing culvert design” (NICHE 2023, 45)* was not considered to adequately respond to the engineering and maintenance needs associated with the culvert at this location.

While NICHE’s recommended approach would be appropriate if selected as part of the representative sample for inclusion on the s170 register, the culvert was being reviewed, but had not been selected for this sample. NICHE’s approach did not consider the broader context put forward by Biosis to select a representative sample of the type 4 Alpine way culverts selected on condition, and whether B10155 was appropriate for this sample given its defects/condition issues.

## Conclusion

Transport considered the defects/condition issues with B10155, the options analysis undertaken, the risks guiding the package of works, and concluded that replacement of the culvert headwall, relining the culvert and installing new scour protection (Option 5) is the preferred approach for this culvert on the Alpine Way.

In reviewing the options, Transport considered whether B10155 was an appropriate example to include in the sample of Type 4 culverts in good condition on the Alpine Way for inclusion on the Transport for NSW S170 Heritage and Conservation Register. However, as discussed in this report and outlined in the Options Analysis, known defects/condition issues preclude its selection.

An outstanding action from the Biosis 2011 report sits with Transport for NSW to select a representative sample of Types 4 and 6 culverts on the Alpine way for inclusion on the S170 Heritage and Conservation Register. Resolution of this action would better support forward planning of works on the Alpine Way.

The Bundian Way is a significant Aboriginal cultural heritage pathway listed on the NSW State Heritage Register (SHR), which is located adjacent to the project boundary. Appropriate identification and avoidance of this area during works will support its protection.

To support the conclusions in this report the following actions are recommended for the REF:

1. Works can proceed to culvert B10155 as proposed with no further heritage requirements. This letter report, together with the NICHE Draft SOHI are a record of the decision.

2. Transport for NSW commits to selecting an appropriate sample of Alpine Way Type 4 and 6 culverts (identified by Biosis in their 2011 report) which represent the best original condition for inclusion on the S170 Heritage and Conservation Register, within 12 months of REF approval. If following review, condition issues associated with their construction mean a smaller sample of these culvert types is identified, document and proceed with this approach. A short online brochure outlining the history of the Alpine Way including its construction methods seen in these culverts, should be produced within this timeframe to explain the relationship and social significance of the Alpine Way to the nationally significant Snowy Hydro scheme.

3. The Bundian Way is adjacent to the project area and Aboriginal cultural heritage assessment is managed under PACHCI. To ensure avoidance and protection of the Bundian Way, the project should confirm with the project's Aboriginal Cultural Heritage Partner the most appropriate delineation of the Bundian Way on site as a "no-go" environmental zone, mapped from the SHR geospatial coordinates.

Sincerely,



Felicity Barry
Snr Environment Officer (Heritage)
**Transport for NSW**

Mobile: 0422 996 645
Environment Safety, Environment and Regulation
transport.nsw.gov.au

7 Harvest Street
MACQUARIE PARK NSW 2113

**Attachment:** Biosis, *Historical Heritage Assessment – Alpine Way Culverts, Report prepared for KMH Environmental*, dated August 2011

## References

Biosis, *Historical Heritage Assessment – Alpine Way Culverts, Report prepared for KMH Environmental*, dated August 2011

NICHE Environment and Heritage, *Draft Statement of Heritage Impact Thredbo Culvert Works (B10155), Alpine Way, Thredbo,* prepared for Transport for NSW dated April 2023.

Transport for NSW, *Reserve Project Brief, "MR677 Thredbo River Culverts Rehabilitation Works, Thredbo River crossing on Alpine Way, 5km Southwest of Thredbo Village*, V1, dated 30 June 2021.

Transport for NSW, *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI), 2011

Robinson, Craig (Transport for NSW), Options Analysis MR677 Alpine Way Thredbo River Culvert Relining: Options Report, unpublished report prepared for Regional and Outer Metropolitan Division, dated March 2023 v2.

# Appendix M – Consultation with Council

David Hogan
Chief Executive Officer
Snowy Monaro Regional Council

Email: David.Hogan@snowymonaro.nsw.gov.au

Cc: smrcexecoffice@snowymonaro.nsw.gov.au

19 June 2024

Dear David Hogan,

## Proposed Thredbo River culvert work on Alpine Way at Thredbo

Under the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (clause 2.10 (1) (b)), Transport is required to consult with Councils where developments have impacts on Council related infrastructure or services. Transport is required to take into consideration any response to this notice within 21 days after the notice is given.

Work is planned to start in February 2025 and delivered over four months, weather permitting. If delays are encountered due to weather conditions the work will be completed in two stages. Stage one will be completed in February and March 2025 and any outstanding work will be completed in late 2025 or early 2026 (stage 2).

Work will involve (figure 2):

- Establishing a temporary work site and site office (use of Cascade Hut trail carpark)
- Construction of a temporary access track at the culvert inlet
- Construction of a concrete working apron at the inlet end
- Relining of the four existing culverts with tunnel lining products
- Construction of a new inlet headwall and wing wall structure
- Placement of rip rap treatment on the outlet end.

The work will ensure future use of the culverts and road, prevent further deterioration of the headwall, and help reduce the risk of scour damage to the riverbanks and riverbeds downstream.

To carry out particular construction activities, we will need to close the road to traffic in both directions. There will be up to six full road closures throughout the four months of planned work. The road will be closed between 9am and 3pm. Road closure dates will be confirmed and communicated prior to work starting.

The community will notice lane closures, reduced speed limits and some delays to their journeys. There will be no public access to the Cascade Hut Trail car park. We aim to manage our work to avoid impacts to the community and the environment.

The proposed work will be subject to an environmental assessment under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW).* A copy of the determined assessment will be published on Transport for NSW's website.

Please submit feedback to this notice by 10 July 2024.

If you have any further questions or require more information, please contact Daniel Bojkovic on 0447 541 579 or daniel.bojkovic@transport.nsw.gov.au.

Sincerely,



Daniel Bojkovic
Project Engineer
Transport for NSW

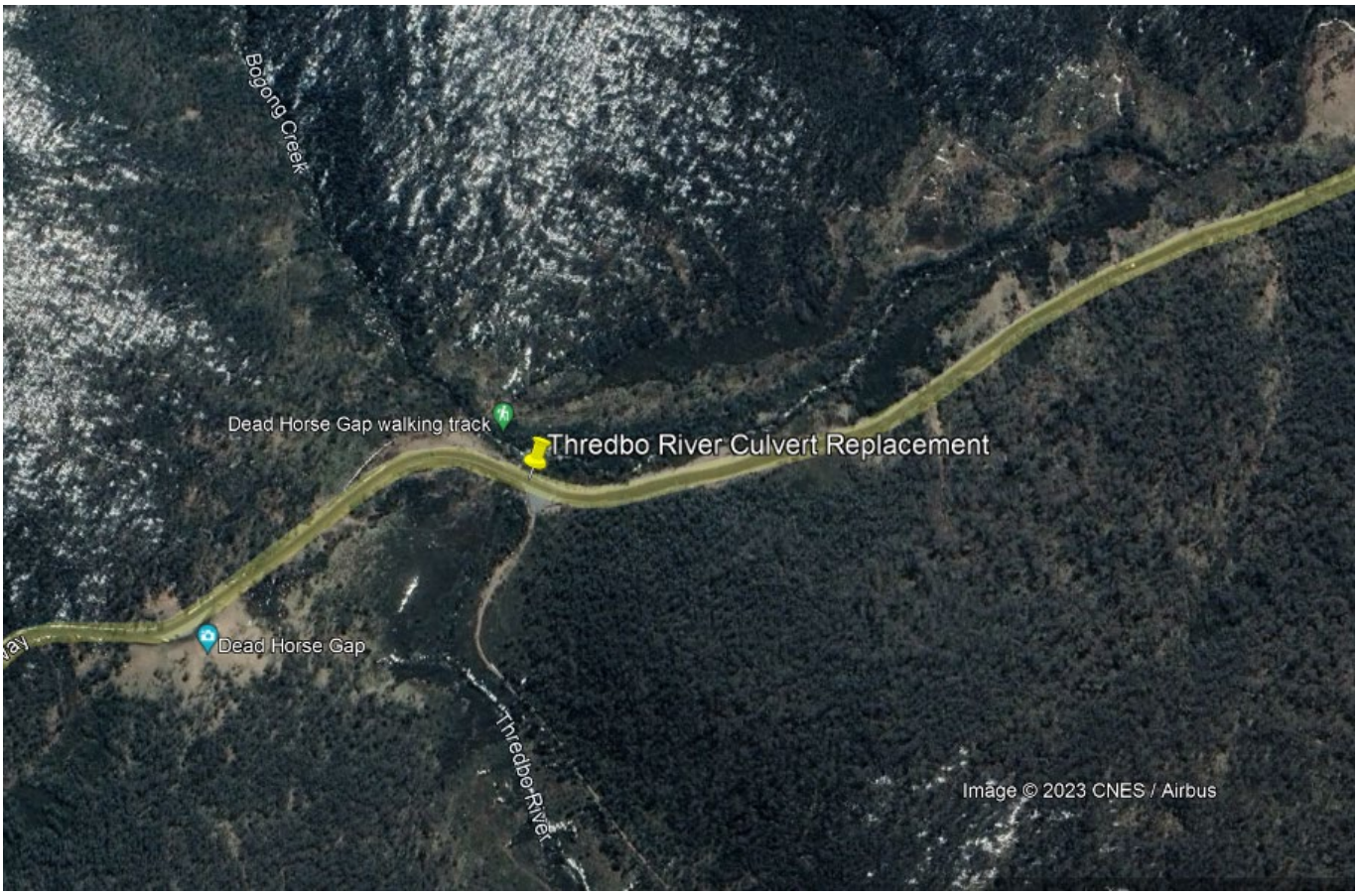



Figure 1 – Location of proposed Works, Thredbo River Culverts Alpine Way

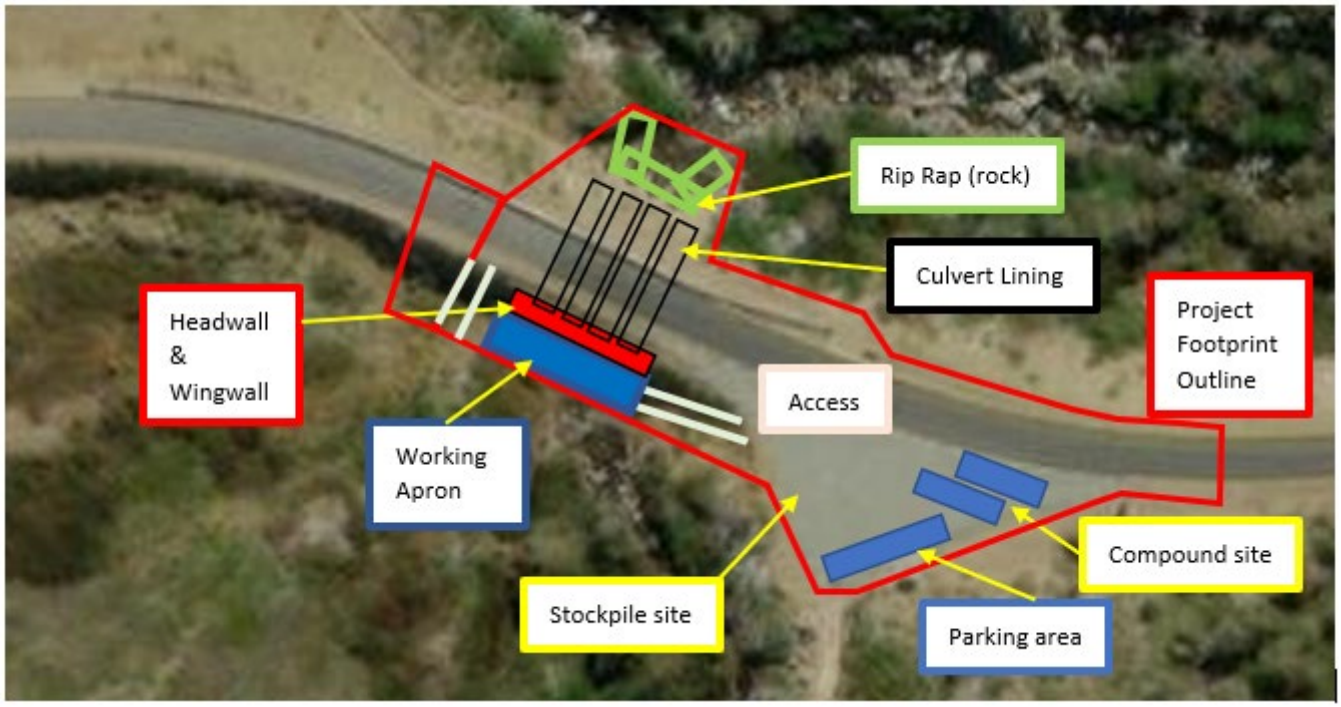



Figure 2 – Project footprint showing the scope and work areas.



Figure 3 – Photos of Thredbo River Culverts

Steven Pinnuck
Interim General Manager
Snowy Valleys Council

Email: spinnuck@svc.nsw.gov.au

Cc: jmoran-fahey@svc.nsw.gov.au

19 June 2024

Dear Steven Pinnuck,

## Proposed Thredbo River culvert work on Alpine Way at Thredbo

Under the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (clause 2.10 (1) (b)), Transport is required to consult with Councils where developments have impacts on Council related infrastructure or services. Transport is required to take into consideration any response to this notice within 21 days after the notice is given.

Work is planned to start in February 2025 and delivered over four months, weather permitting. If delays are encountered due to weather conditions the work will be completed in two stages. Stage one will be completed in February and March 2025 and any outstanding work will be completed in late 2025 or early 2026 (stage 2).

Work will involve (figure 2):

- Establishing a temporary work site and site office (use of Cascade Hut trail carpark)
- Construction of a temporary access track at the culvert inlet
- Construction of a concrete working apron at the inlet end
- Relining of the four existing culverts with tunnel lining products
- Construction of a new inlet headwall and wing wall structure
- Placement of rip rap treatment on the outlet end.

The work will ensure future use of the culverts and road, prevent further deterioration of the headwall, and help reduce the risk of scour damage to the riverbanks and riverbeds downstream.

To carry out particular construction activities, we will need to close the road to traffic in both directions. There will be up to six full road closures throughout the four months of planned work. The road will be closed between 9am and 3pm. Road closure dates will be confirmed and communicated prior to work starting.

The community will notice lane closures, reduced speed limits and some delays to their journeys. There will be no public access to the Cascade Hut Trail car park. We aim to manage our work to avoid impacts to the community and the environment.

The proposed work will be subject to an environmental assessment under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW).* A copy of the determined assessment will be published on Transport for NSW's website.

Please submit feedback to this notice by 10 July 2024.

If you have any further questions or require more information, please contact Daniel Bojkovic on 0447 541 579 or daniel.bojkovic@transport.nsw.gov.au.

Sincerely,



Daniel Bojkovic
Project Engineer
Transport for NSW

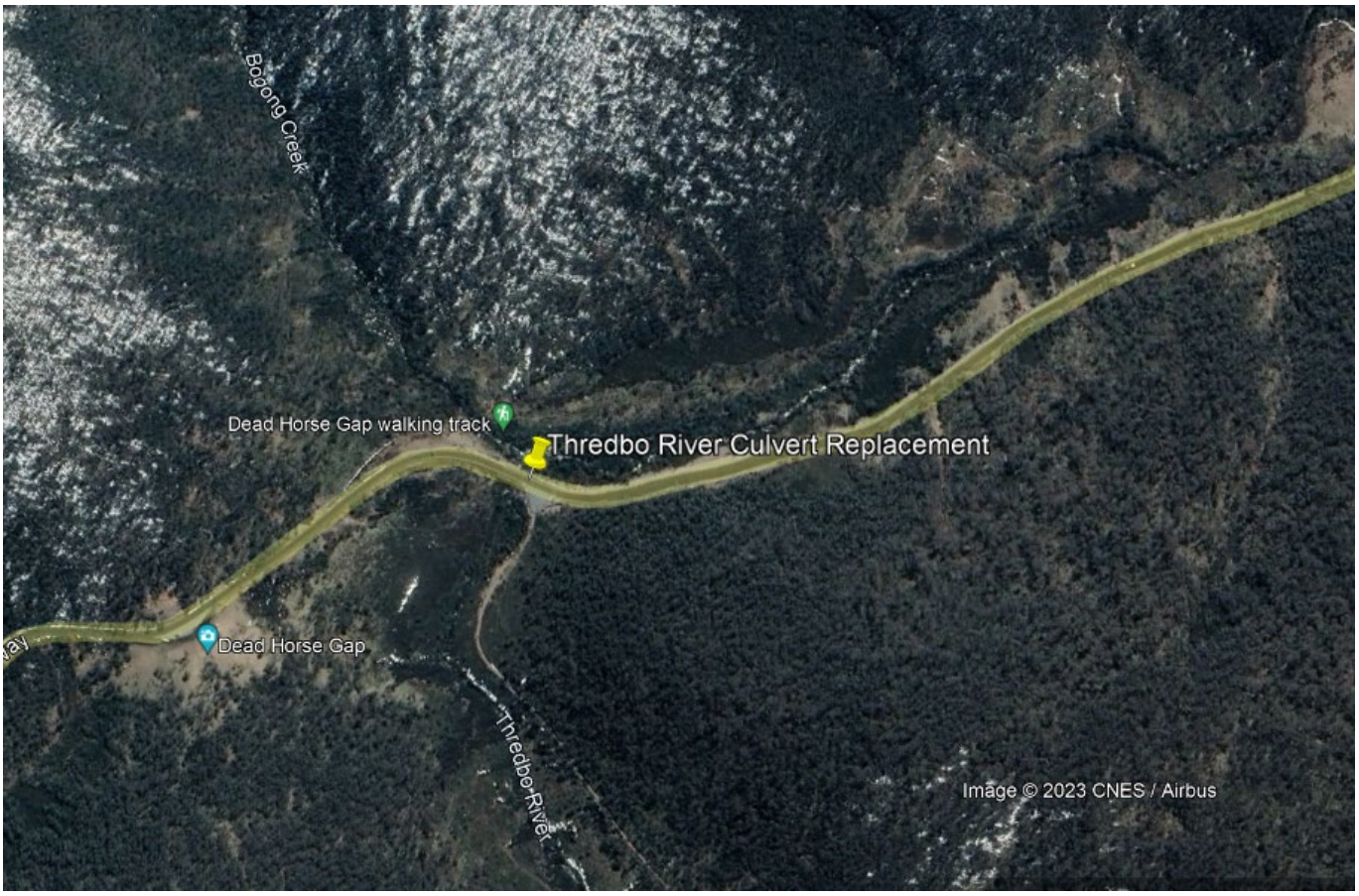



Figure 1 – Location of proposed Works, Thredbo River Culverts Alpine Way

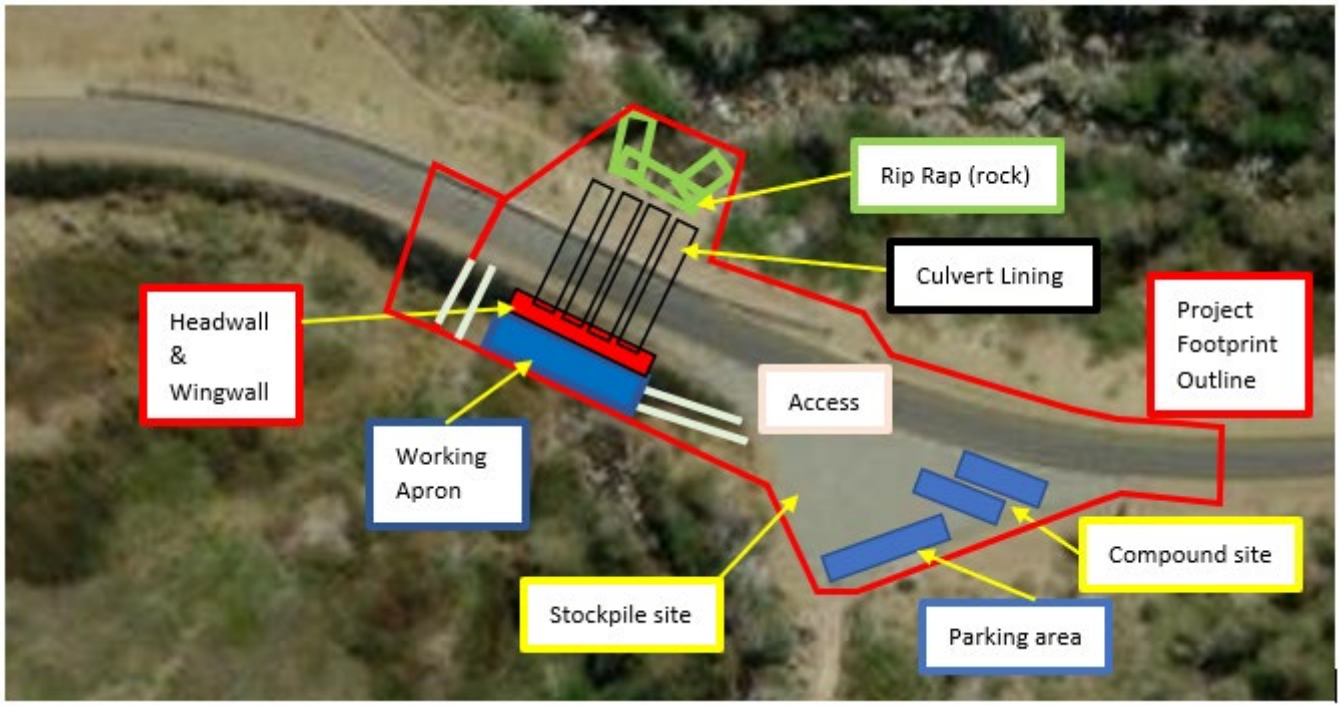



Figure 2 – Project footprint showing the scope and work areas.



Figure 3 – Photos of Thredbo River Culverts

**© Transport for New South Wales**

Copyright: The concepts and information contained in this document are the property of Transport for NSW. Use or copying of this document in whole or in part without the written permission of Transport for NSW constitutes an infringement of copyright.

NSW GOVERNMENT