

Snowy 2.0 Main Works

Biodiversity Monitoring Program: Year 4 Annual Monitoring Report (2023/2024)

Prepared for Snowy Hydro Limited

May 2025

Snowy 2.0 Main Works

Biodiversity Monitoring Program: Year 4 Annual Monitoring Report (2023/2024)

Snowy Hydro Limited

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May 2025

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Executive Summary

Snowy Hydro Limited (Snowy Hydro) is the proponent of the Snowy 2.0 Project (Snowy 2.0), a large-scale pumped hydro-electric storage and generation project that will increase hydro-electric capacity within the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme). An Environmental Impact Statement (EIS) for the Main Works for Snowy 2.0 (Main Works EIS) was submitted to the Department of Planning, Industry and Environment (DPIE) in September 2019 (EMM, 2019), with a Preferred Infrastructure Report and Response to Submissions submitted to DPIE in February 2020 (EMM, 2020a). Approval was granted in May 2020.

The Main Works Biodiversity Monitoring Program (BMP) (EMM, 2020b) forms Appendix B of the Main Works Biodiversity Management Plan (Snowy Hydro & FGJV, 2020) and sets out a monitoring framework to ensure that impacts arising from the Main Works project are consistent with those outlined in the EIS. The BMP is required to be implemented as part of the Main Works approval.

The objectives of this monitoring report are to:

- provide the biodiversity monitoring results for all monitoring programs for Year 4 that occurred between November 2023 and November 2024, comprising quarterly monitoring periods
- compare results across monitoring periods against threshold triggers for adaptive management prescribed in the BMP, identify any relevant additional trends related to Main Works impacts, and identify where adaptive management is required
- detail any changes or gaps to, or limitations of, the biodiversity monitoring methodology outlined in the BMP. This includes monitoring components, method of data collection (frequency and location), method of data analysis and reporting requirements
- provide recommendations for improvements and amendments to the BMP.

ES1.1 Monitoring effort

Twenty-eight field survey events were undertaken throughout 2023/2024, conducted over 129 days, including 1970 people hours. During the fourth year of monitoring a total of 190 impact and control sites were monitored across the Main Works project area and control areas, and included:

- threatened flora monitoring
- small mammal presence/absence monitoring
- Alpine Tree Frog occupancy monitoring
- Booroolong Frog occupancy monitoring
- Booroolong Frog habitat characteristics monitoring
- Alpine She-oak Skink occupancy monitoring
- feral animal occupancy monitoring
- feral animal abundance monitoring
- weed presence/absence monitoring
- Phytophthora presence/absence monitoring.

ES1.2 Adaptive management triggered in 2023/2024 monitoring period

Adaptive management actions have been triggered for the following monitoring components:

- Threatened flora monitoring: once impact site (TF04 - Tantangara Dam) has been triggered for Clover Glycine and Kiandra Leek Orchid as these species recorded a percentage decline in the number of plants at this impact site, observed over two consecutive monitoring periods and outside of the standard deviation observed at control sites. The decline was observed in conjunction with a primary impact, specifically an increase in weed cover and feral herbivores.
- Small terrestrial mammal presence/absence monitoring: Five impact sites have been triggered for adaptive management in Year 4 (SM05-I - LHRR Bottom, SM07-I - LHRR Bottom, SM22-I - Marica, SM23-I - Marica and SM24-I - Marica). Among these, four impact sites (SM05-I - LHRR Bottom, SM22-I - Marica, SM23-I - Marica, SM24-I - Marica) have been triggered for adaptive management due to the absence of the Smoky Mouse, which is combined with an observed increase or new occurrence of multiple primary impacts in comparison to baseline surveys. One impact site (SM07-I - LHRR North) remains triggered for adaptive management as the Eastern Pygmy Possum was not observed in Year 4. Adaptive management for SM18-I - LHRR North is no longer triggered as the species was found present at this site in Year 4. No adaptive management has been triggered for Broad toothed-Rat.
- Small terrestrial mammal habitat characteristic monitoring: two impact sites (SM20 - LHRR Bottom and SM27 - Marica) have been triggered for adaptive management due observed degradation in vegetation structure and habitat characteristics.
- Feral animal presence/absence and abundance monitoring: adaptive management has been triggered at all feral animal occupancy and abundance monitoring locations except sites FC08 - LHRR Bottom and FC09 - LHRR Bottom. Pest control in accordance with the Weed, Pest and Pathogen Management Plan (FGJV 2020) has been triggered due to the sighting of feral animals in proximity to known Smoky Mouse habitat.

Although adaptive management was not triggered for the remaining monitoring activities, additional recommendations have been identified as part of the project. These are discussed in their respective sections of this report and summarised in Section 5.

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1 Introduction

1.1 Project overview

Snowy Hydro Limited (Snowy Hydro) is the proponent of the Snowy 2.0 Project (Snowy 2.0), a large-scale pumped hydro-electric storage and generation project that will increase hydro-electric capacity within the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme). This will be achieved by linking the existing Tantangara and Talbingo reservoirs within the Snowy Scheme through a series of underground tunnels and new underground hydro-electric power station.

The nearest large towns are Cooma and Tumut, approximately 70 kilometres (km) south-east and 50 km north-northwest of the Main Works project, respectively (Figure 1.1). Several small communities and townships are located nearby, including Talbingo, Tumbarumba, Batlow, Cabramurra and Adaminaby. Talbingo and Cabramurra were built for the original Snowy Scheme workers and their families, and Adaminaby was relocated to alongside the Snowy Mountains Highway from its original location (now known as Old Adaminaby) in 1957 due to the construction of Lake Eucumbene.

Snowy Hydro and its project partner Future Generation Joint Venture (FGJV) are currently undertaking construction work for Snowy 2.0 ('Main Works') (Figure 1.2). The Main Works project includes pre-construction activities such as pre-clearing works, pre-construction/site establishment, geotechnical investigation and survey, and implementing environmental mitigation measures. Construction activities include access road and bridge work, excavation and tunnelling, excavated rock management, intake and gate-shaft construction, progressive rehabilitation, fit out, testing and commissioning, and final rehabilitation.

1.2 Project approval

On 7 March 2018, the New South Wales (NSW) Minister for Planning declared Snowy 2.0 to be State Significant Infrastructure (SSI) and Critical State Significant Infrastructure (CSSI), under the *Environmental Planning and Assessment Act 1979* (EP&A Act) on the basis that it is critical to NSW for economic, environmental, or social reasons.

The Environmental Impact Statement (EIS) for the Main Works project (Main Works EIS) was submitted to Department of Planning, Industry and Environment (DPIE or the Department) in September 2019 and was publicly exhibited between 26 September 2019 and 6 November 2019 (EMM, 2019). A total of 222 submissions were received during the public exhibition period. In February 2020, the Preferred Infrastructure Report and Response to Submissions Report (PIR) was issued to DPIE to outline the preferred project design and address the public and agency submissions (EMM, 2020a). The Main Works PIR included Revised Environmental Management Measures (REMMs) within Appendix C, which were also to be implemented for the project.

Following consideration of the Main Works EIS and PIR, approval was granted by the Minister for Planning and Public Spaces on 20 May 2020, through issue of Infrastructure Approval SSI 9687. In addition to the State approval, a referral (EPBC 2018/8322) was prepared and lodged with the Commonwealth Department of Agriculture, Water and Environment (DAWE) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Commonwealth Minister's delegate determined on 5 December 2018 that Snowy 2.0 Main Works is a "controlled action" under the EPBC Act, and the Project was assessed by accredited assessment under Part 5, Division 5.2 of the EP&A Act. Approval was granted under the EPBC Act on 29 June 2020 (EPBC 2018/8322).

1.3 Main Works overview

The Snowy 2.0 Main Works project includes, but is not limited to, construction of:

- an underground pumped hydro-electric power station complex
- water intake structures at Tantangara and Talbingo reservoirs
- power waterway tunnels, chambers, and shafts
- access tunnels
- new and upgraded roads to allow ongoing access and maintenance
- power, water, and communication infrastructure, including:
 - a cable yard to facilitate connection between the National Electricity Market (NEM) electricity transmission network and Snowy 2.0
 - permanent auxiliary power connection
 - permanent communication cables
 - permanent water supply to the underground power station
- post-construction revegetation and rehabilitation.

1.4 Aim, purpose and objectives

The Main Works EIS (EMM, 2019) and PIR (EMM, 2020a), prepared to assess impacts on the environment, included an assessment of biodiversity impacts. The EIS identified that the main biodiversity issues for the project were the impacts to several threatened flora and fauna species and their habitat, including the Kiandra Leek Orchid (*Prasophyllum retroflexum*), Clover Glycine (*Glycine latrobeana*), Smoky Mouse (*Pseudomys fumeus*), Eastern Pygmy Possum (*Cercartetus nanus*), Broad-toothed Rat (*Mastacomys fuscus*), Alpine She-oak Skink (*Cyclodomorphus praealtus*), Alpine Tree Frog (*Litoria verreauxii alpina*) and Booroolong Frog (*Litoria booroolongensis*), which were confirmed to be present within and adjacent to the Main Works project disturbance footprint. The EIS also identified potential indirect impacts to biodiversity, including the potential for introduction and/or exacerbation of weeds and pathogens, feral herbivores, and feral predators.

To address these issues, the Main Works Biodiversity Management Plan was developed (Snowy Hydro & FGJV, 2020). The Biodiversity Monitoring Program (BMP) (EMM, 2020b) forms Appendix B of the Biodiversity Management Plan (Snowy Hydro & FGJV, 2020) and sets out a monitoring framework to ensure that impacts arising from the Main Works project are consistent with those outlined in the EIS. The BMP was required to be implemented during pre-construction and construction stages of the Main Works project.

The aim of the BMP is to ensure that impacts arising from the Main Works project do not exceed those predicted to occur within the EIS. The key objectives of the BMP are to:

- identify the entities that require monitoring during construction
- specify the existing condition, distribution and presence of the monitored entities

- detail the monitoring parameters for each entity including:
 - survey method, frequency and location
 - data collection and analysis approach
 - reporting requirements
- provide threshold triggers for implementation of adaptive management procedures
- provide adaptive management procedures
- facilitate compliance with relevant conditions of approval.

EMM Consulting Pty Ltd (EMM) was commissioned by Snowy Hydro to undertake Main Works monitoring in line with the BMP. The 2020/2021 (i.e. Year 1) monitoring was undertaken between October 2020 and October 2021 and the 2021/2022 (i.e. Year 2) monitoring was undertaken between November 2021 and October 2022. The *'Biodiversity Monitoring Program: Year 1 Annual Monitoring Report (2020/2021)'* (EMM, 2022a) presents the results of all monitoring activities during Year 1. The *'Biodiversity Monitoring Program: Year 2 Annual Monitoring Report (2021/2022)'* (EMM, 2023a) presents the results of all monitoring activities conducted during Year 2. The *'Biodiversity Monitoring Program: Year 3 Annual Monitoring Report (2022/2023)'* (EMM, 2024a) presents the results of all monitoring activities conducted during Year 3.

The purpose of this report is to present the results of all monitoring activities during Year 4 (2023/2024) and to compare data results to Year 1, Year 2 and Year 3 to provide analysis on the efficacy of the implemented environmental management measures at mitigating the indirect biodiversity impacts of construction.

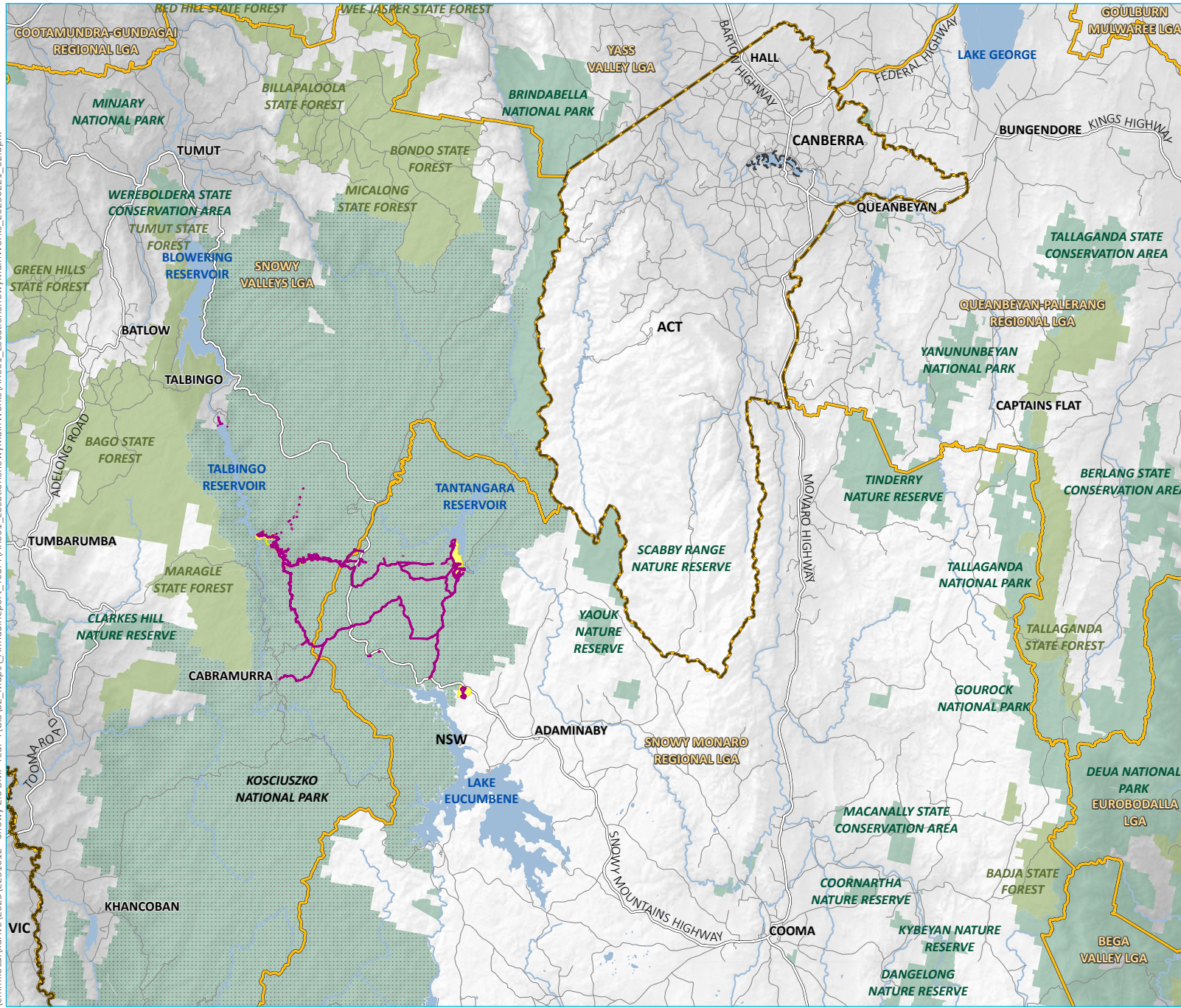
The objectives of the report are as follows:

- Detail any changes, gaps, or limitations to the biodiversity monitoring methodology outlined in the BMP. This includes monitoring components, method of data collection (frequency and location), method of data analysis, and reporting requirements.
- Provide the biodiversity monitoring results for all monitoring events between November 2023 and October 2024, comprising quarterly monitoring periods (EMM, 2024b) (EMM, 2024c) (EMM, 2024d) (EMM, 2024e).
- Compare results across monitoring periods against threshold triggers for adaptive management presented in the BMP, identifying any relevant additional trends related to Main Works impacts, and identify where adaptive management is required.
- Provide recommendations for improvements and amendments to the BMP.

The remainder of this annual report presents the methods, results, and a discussion of the data analysis for all monitoring components completed in Year 4. Recommendations are provided at the end of the report.

A detailed summary of all monitoring results and recommendations are provided in Appendix A.

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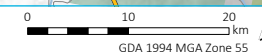
- KEY**
- Approved disturbance
 - Approved construction envelope
 - Existing environment
 - Major road
 - Minor road
 - Major watercourse
 - Waterbody
 - Kosciuszko National Park
 - NPWS reserve
 - State forest
 - Local government area
 - State boundary

Location of the Snowy 2.0 Main Works project in New South Wales

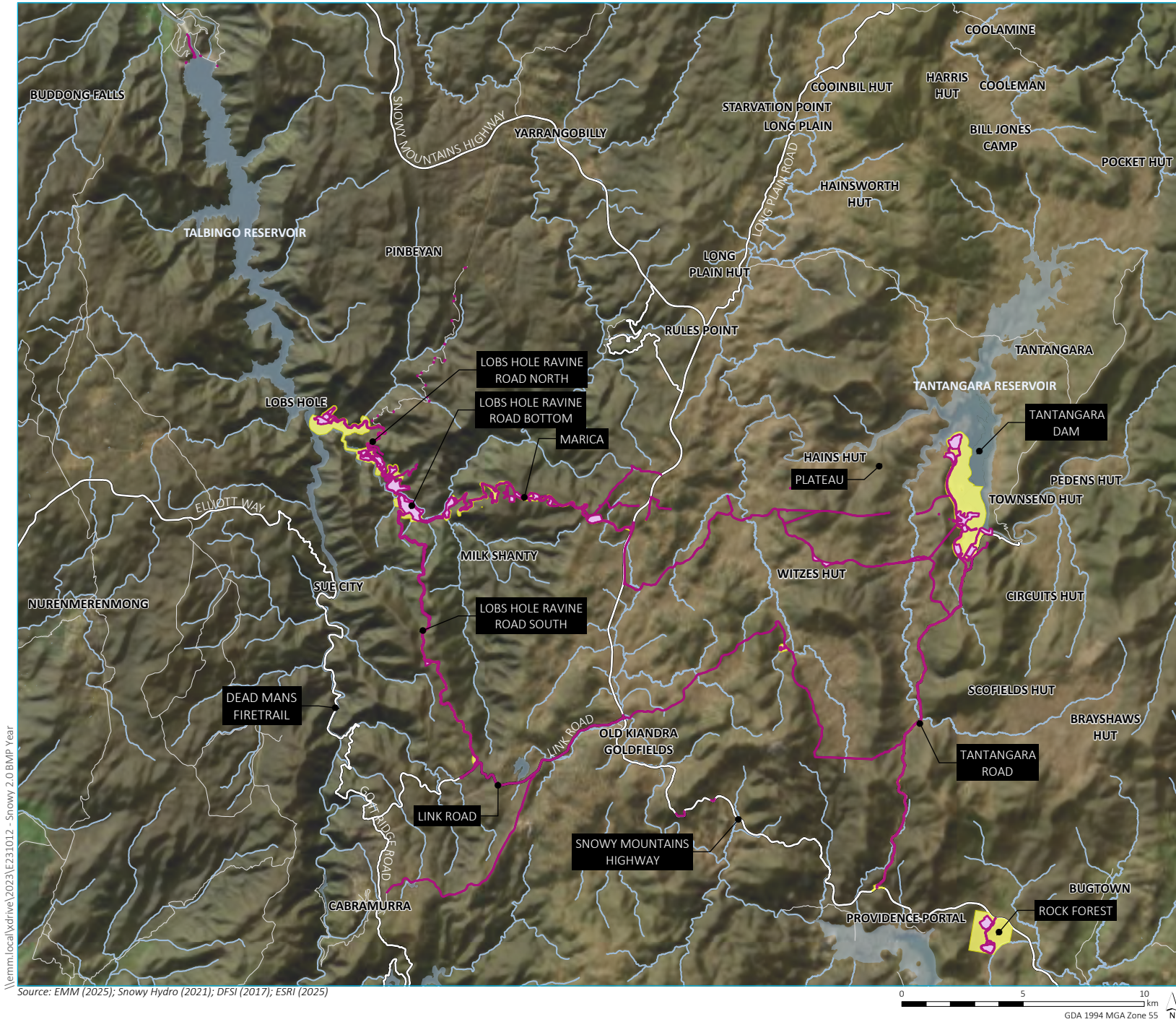
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 1.1



Source: EMM (2025); DFSI (2017); GA (2011); ASGC (2006)



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KEY

- Approved disturbance
- Approved construction envelope
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Location of Snowy 2.0 Main Works infrastructure

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 1.2



snowy 2.0



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2 Methods

The monitoring schedule and methods implemented during the 2023/2024 monitoring periods are largely consistent with those outlined in the BMP (EMM, 2020b).

A summary of the Year 4 BMP monitoring periods referred to throughout this report are provided in Table 2.1.

Table 2.1 **Summary of Main Works BMP monitoring periods in Year 4**

Monitoring period during construction	BMP Monitoring dates	Notes
Q1	1 November 2023 to 28 February 2024	Monitoring period extended to April 2024 for the Alpine She-oak skink survey only.
Q2	1 March 2024 to 31 May 2024	
Q3	1 June 2024 to 31 August 2024	Monitoring period extended to September 2024 for small mammal presence/absence monitoring.
Q4	1 September 2024 to 30 October 2024	Monitoring period extended to 30 November 2024.

2.1 Survey design

The components monitored in 2023/2024 are:

- threatened flora monitoring
- small mammal presence/absence monitoring
- small mammal habitat characteristic monitoring
- Alpine Tree Frog occupancy monitoring
- Booroolong Frog occupancy monitoring
- Booroolong Frog habitat characteristics monitoring
- Alpine She-oak Skink occupancy monitoring
- feral animal occupancy monitoring
- feral animal abundance monitoring
- weed presence / absence monitoring
- Phytophthora presence/absence monitoring.

Key infrastructure areas where impact and control monitoring sites were established are shown in Figure 1.2 and include:

- Lobs Hole Ravine Road North (LHRR North)
- Lobs Hole Ravine Road South (LHRR South)

- Lobs Hole Ravine Road Bottom (LHRR Bottom)
- Tantangara Dam
- Tantangara Road
- Plateau
- Marica
- Rock Forest.

No additional monitoring sites were established in Year 4, however the following changes were made:

- Three feral cameras were re-established at Lobs hole, FC03A, FC03B and FC08B; and one feral camera was re-established at Tantangara, FC19
- Two tile grids were established at Tantangara, TG12 and TG13, to replace tile grids TG10 and TG04 which were previously located at Tantangara
- Faecal pellet site FP18 was moved by 100m along Tantangara Road
- One small mammal camera site along Tantangara Road was dismissed (SM37)

Twenty-eight field survey events were undertaken throughout 2023/2024, conducted over 129 days, including 1,970 people hours. During the fourth year of monitoring a total of 190 impact and control sites were monitored across the Main Works project area and control areas (Figure 2.1 to Figure 2.6 and Appendix B).

An extensive amount of time has been implemented on data quality assurance (QA), collation and analysis to ensure the BMP is adequately assessing the potential impacts of the project.

The total number of sites monitored, and timing and frequency of monitoring during the 2023/2024 monitoring period is generally consistent with the prescriptions in the BMP.

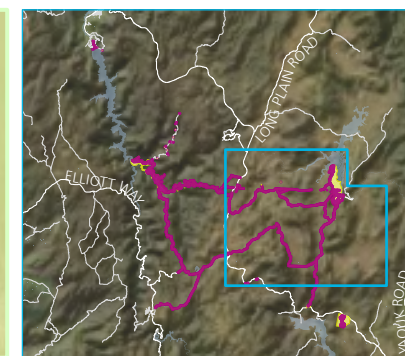
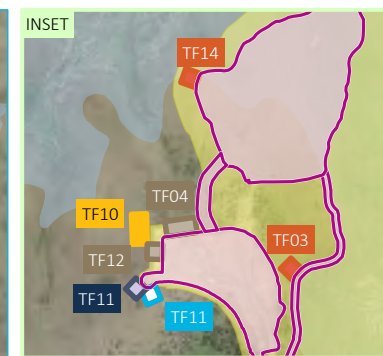
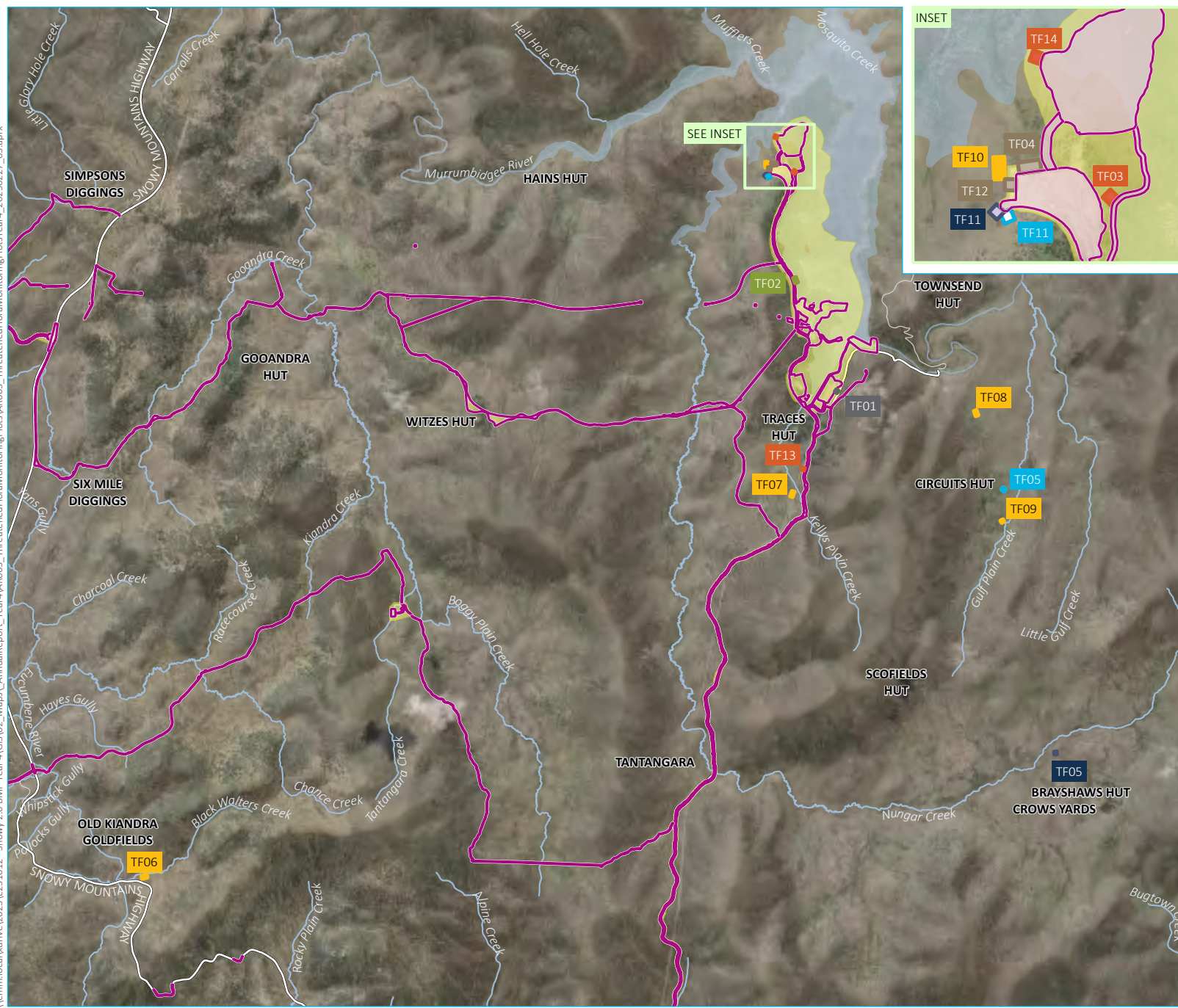
2.2 Limitations

Monitoring during Year 4 was influenced by several factors including:

- increasing construction activity limiting safe access to established monitoring sites
- unsafe river and road conditions and unsuitable weather conditions impacting frog occupancy monitoring
- inability to monitor some control sites from Thursday 4 April to Friday 4 October 2024 due to the NSW National Parks and Wildlife service (NPWS) closure of sections of Kosciuszko National Park.

Limitations encountered during monitoring are more thoroughly presented within their associated sections.

\\emm.local\drive\2023\231012 - Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR003_ThreatenedFloraMonitoringPlots\Year4_20250227_03.aprx



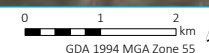
- KEY**
- Approved disturbance
 - Approved construction envelope
 - Threatened flora monitoring location
 - Control
 - Impact
 - Control - relocated in December 2022
 - Control - dismissed in December 2021
 - Control - dismissed in March 2022
 - Control - dismissed in December 2022
 - Impact - dismissed in December 2022
 - Existing environment
 - Major road
 - Minor road
 - Waterbody

Threatened flora monitoring plots -
Year 4

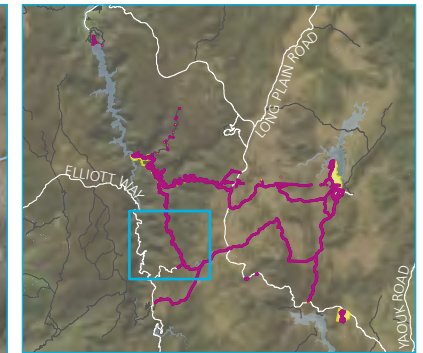
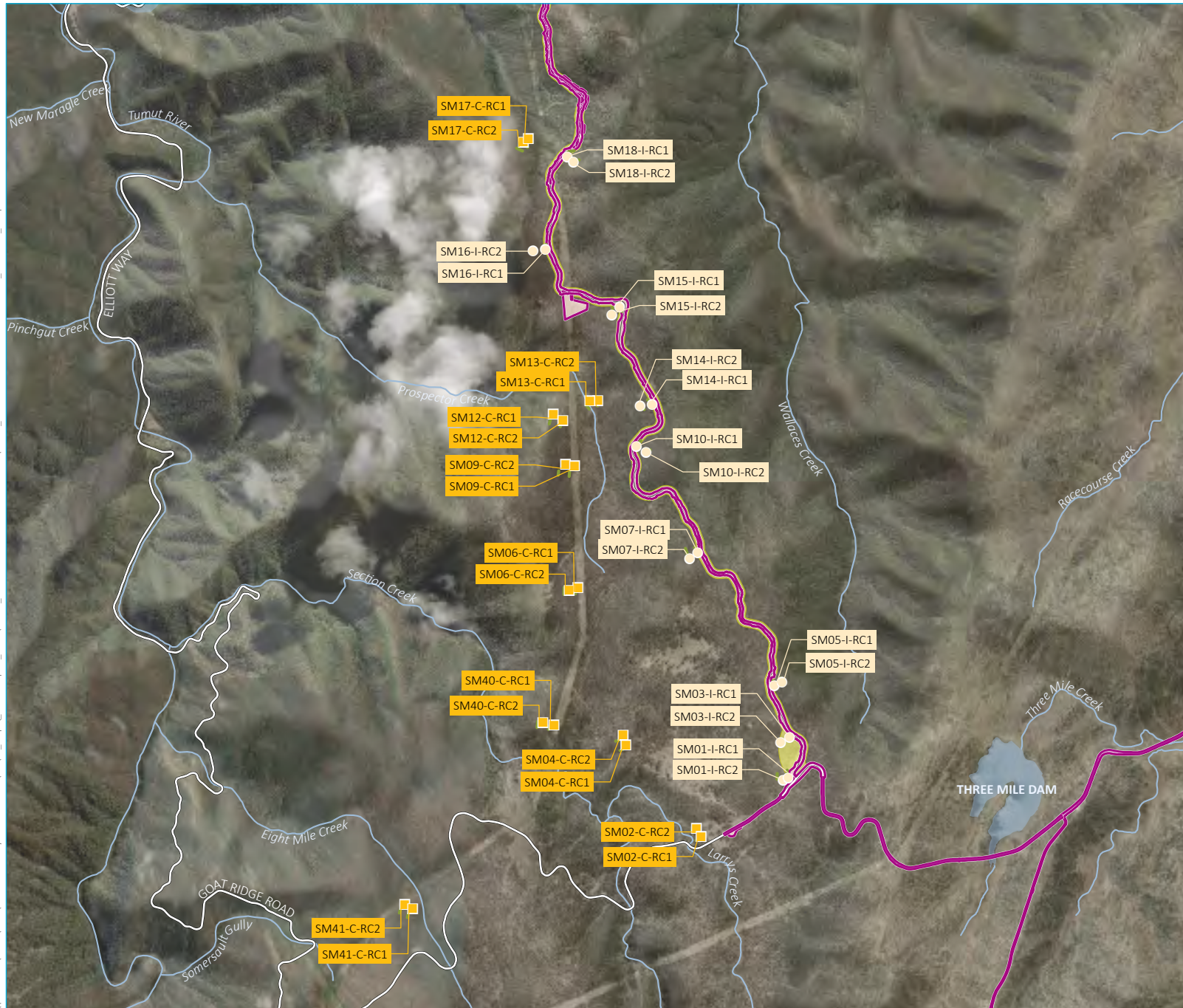
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.1



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



\\emm.local\drive\2023\K231012-Snowy 2.0\BMP Year 4\G5\02_Maps\AnnualReport_Year4\AR004_SmallMammalHabitatCharacteristics_20250227_03.aprx



KEY

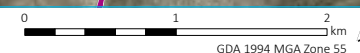
- Approved disturbance
- Approved construction envelope
- Small mammal habitat transect
- BTR fecal pellet**
 - Control
 - Impact
 - Dismissed in May 2024
 - Relocated in May 2024
- Small mammal RCMS**
 - Control
 - Impact
 - Relocated in June 2023
 - Dismissed in June 2023
- Existing environment**
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Small mammal occupancy
and habitat characteristic
monitoring sites – Year 4

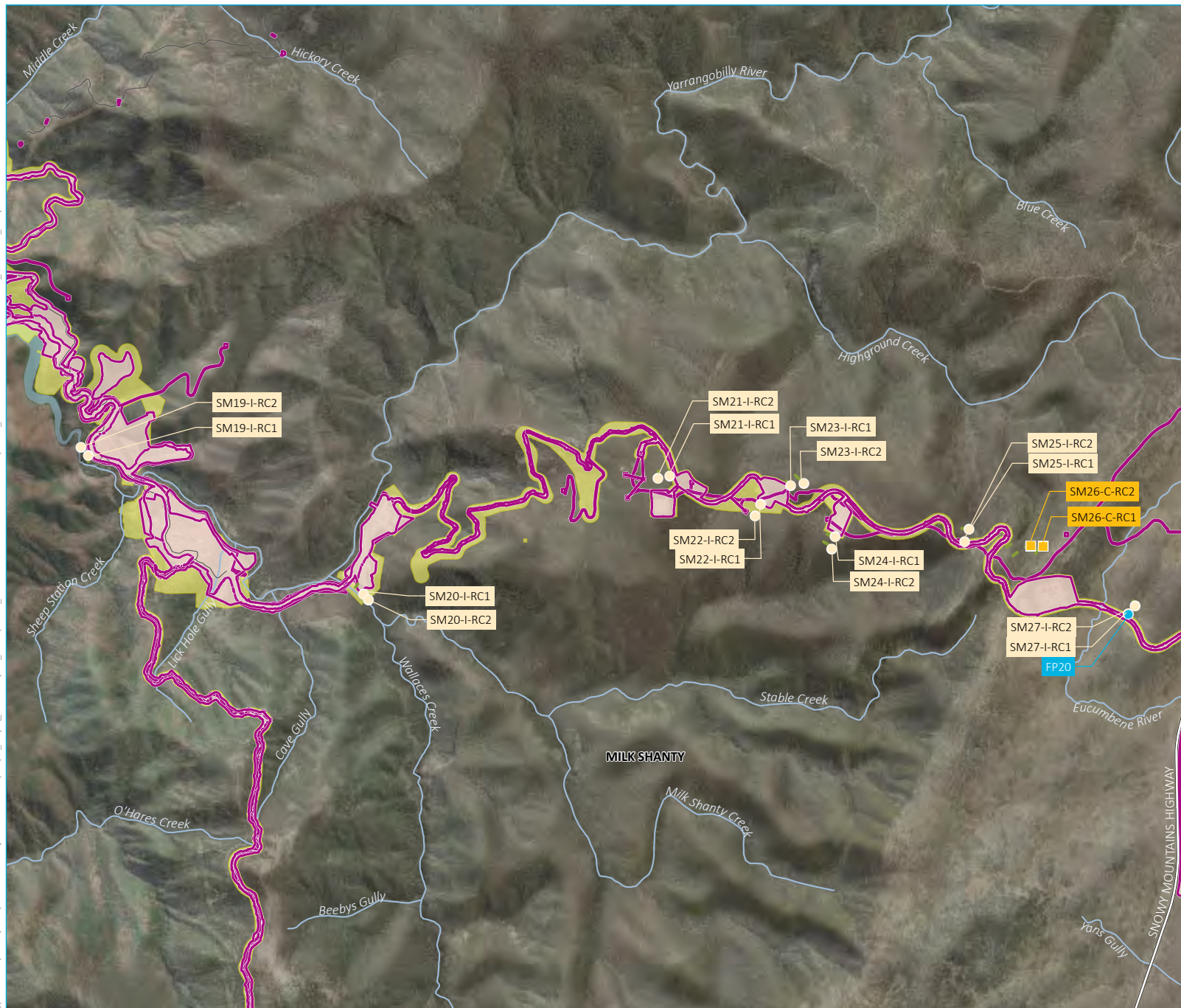
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.2a



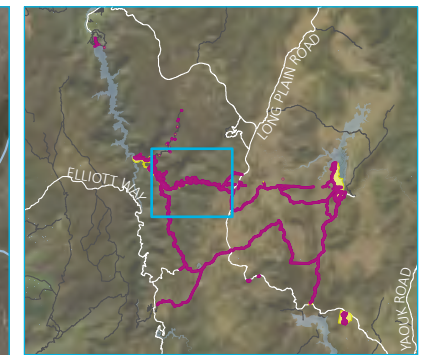
Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



\\emm.local\drive\2023\K231012-Snowy 2.0\BMP Year 4\AR004_SmallMammalHabitatCharacteristics\AR004_SmallMammalHabitatCharacteristics_20250227_03.aprx



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



KEY

- Approved disturbance
- Approved construction envelope
- Small mammal habitat transect
- BTR fecal pellet**
- Control
- Impact
- Dismissed in May 2024
- Relocated in May 2024
- Small mammal RCMS**
- Control
- Impact
- Relocated in June 2023
- Dismissed in June 2023
- Existing environment**
- Major road
- Minor road
- Named watercourse
- Waterbody

Small mammal occupancy and habitat characteristic monitoring sites – Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.2b

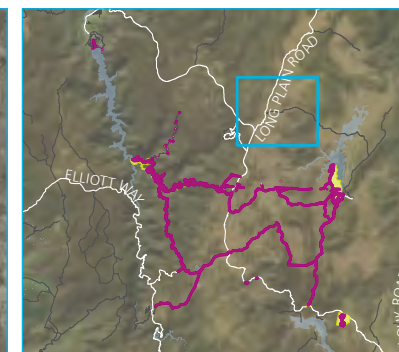


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GDA 1994 MGA Zone 55

\\emm.local\drive\2023\K231012-Snowy 2.0\BMP Year 4\G5\02_Maps\AnnualReport_Year4\AR004_SmallMammalHabitatCharacteristics_20250227_03.aprx



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



KEY

- Approved disturbance
- Approved construction envelope
- Small mammal habitat transect

BTR fecal pellet

- Control
- Impact
- Dismissed in May 2024
- Relocated in May 2024

Small mammal RCMS

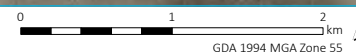
- Control
- Impact
- Relocated in June 2023
- Dismissed in June 2023

Existing environment

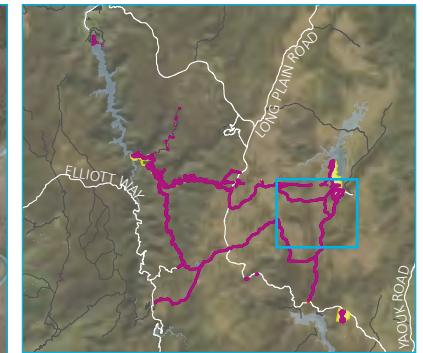
- Major road
- Minor road
- Named watercourse
- Waterbody

Small mammal occupancy and habitat characteristic monitoring sites – Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.2c



\\emm.local\drive\2023\K231012-Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR004_SmallMammalHabitatCharacteristics_20250227_03.aprx



KEY

- Approved disturbance
- Approved construction envelope
- Small mammal habitat transect

BTR fecal pellet

- Control
- Impact
- Dismissed in May 2024
- Relocated in May 2024
- Control
- Impact
- Relocated in June 2023
- Dismissed in June 2023

Existing environment

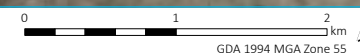
- Major road
- Minor road
- Named watercourse
- Waterbody

Small mammal occupancy and habitat characteristic monitoring sites – Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.2d



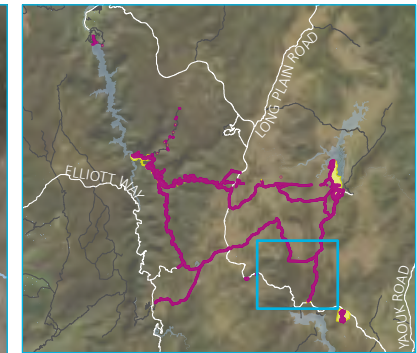
Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



\\emm.local\drive\2023\K231012-Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR004_SmallMammalHabitatCharacteristics_20250227_03.aprx



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



KEY

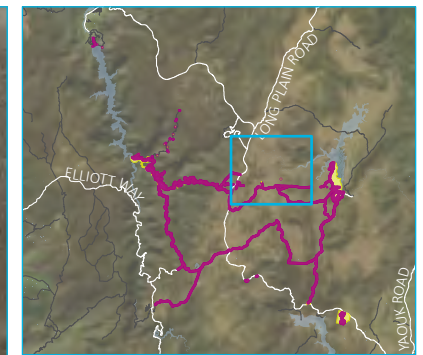
- Approved disturbance
- Approved construction envelope
- Small mammal habitat transect
- BTR fecal pellet
 - Control
 - Impact
 - Dismissed in May 2024
 - Relocated in May 2024
- Small mammal RCMS
 - Control
 - Impact
 - Relocated in June 2023
 - Dismissed in June 2023
- Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Small mammal occupancy and habitat characteristic monitoring sites – Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.2e



\\emm.local\drive\2023\K231012-Snowy 2.0\BMP Year 4\G5\02_Maps\AnnualReport_Year4\AR004_SmallMammalHabitatCharacteristics_20250227_03.aprx



KEY

- Approved disturbance
- Approved construction envelope
- Small mammal habitat transect

BTR fecal pellet

- Control
- Impact
- Dismissed in May 2024
- Relocated in May 2024

Small mammal RCMS

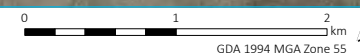
- Control
- Impact
- Relocated in June 2023
- Dismissed in June 2023

Existing environment

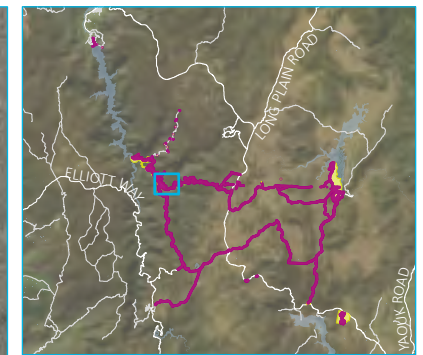
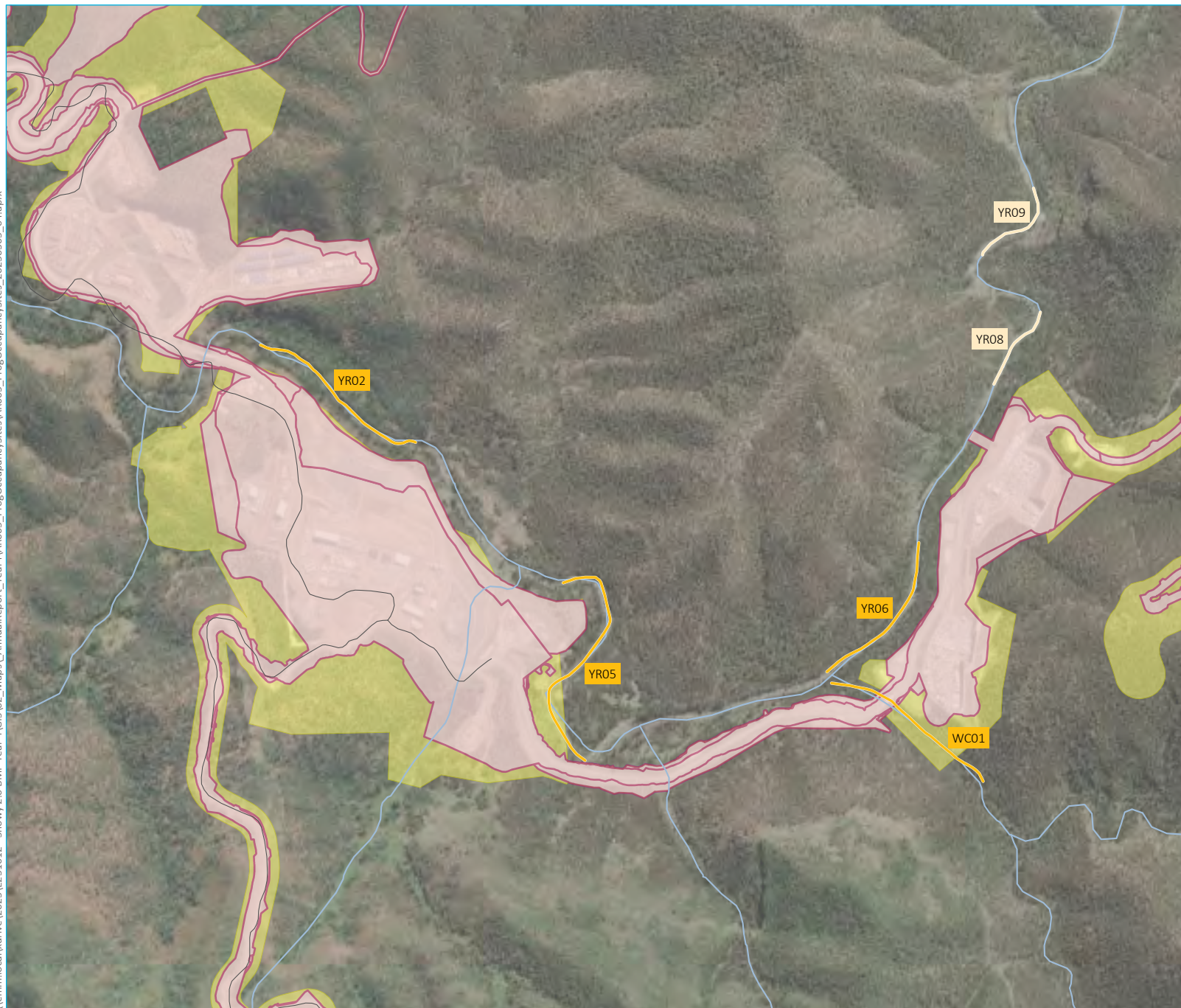
- Major road
- Named watercourse
- Waterbody

Small mammal occupancy and habitat characteristic monitoring sites – Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.2f



\\femm.local\ydrive\2023\E2 31012 - Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR005_FrogOccupancySites_20250305_04.aprx



KEY

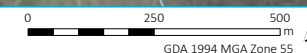
- Approved disturbance
- Approved construction envelope
- Booroolong frog monitoring location/habitat characteristic monitoring site
- Control
- Impact
- Existing environment
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Waterbody

Frog occupancy and Booroolong Frog habitat characteristic monitoring sites - Year 4

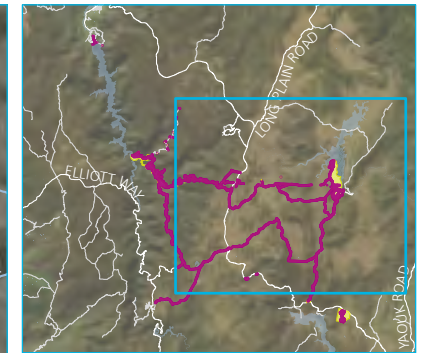
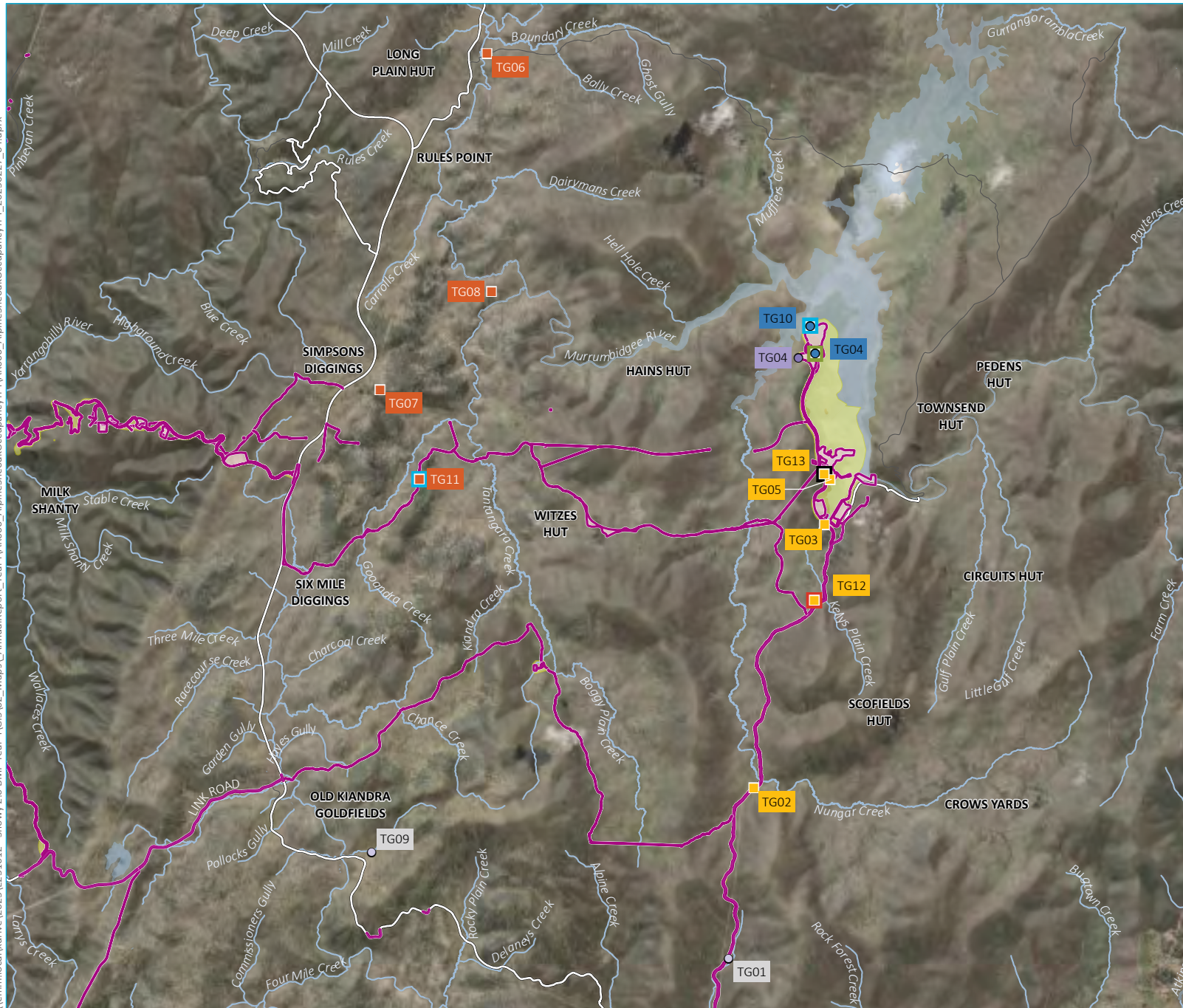
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.3



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



\\emm.local\drive\2023\231012 - Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR006_AlpineSheOakOccupancyYr4_20250227_04.aprx



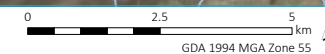
- KEY**
- Approved disturbance
 - Approved construction envelope
 - Alpine She-oak Skink monitoring location
 - Control
 - Impact
 - Decommissioned in March 2022
 - Decommissioned in January 2023
 - Decommissioned in April 2024
 - Established in March 2022
 - Established in January 2023
 - Established in April 2024
 - Established in August 2024
 - Existing environment
 - Major road
 - Minor road
 - Waterbody

Alpine She-oak Skink occupancy monitoring sites – Year 4

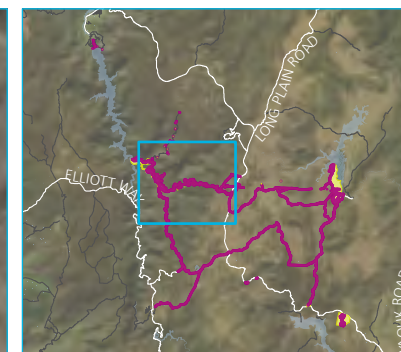
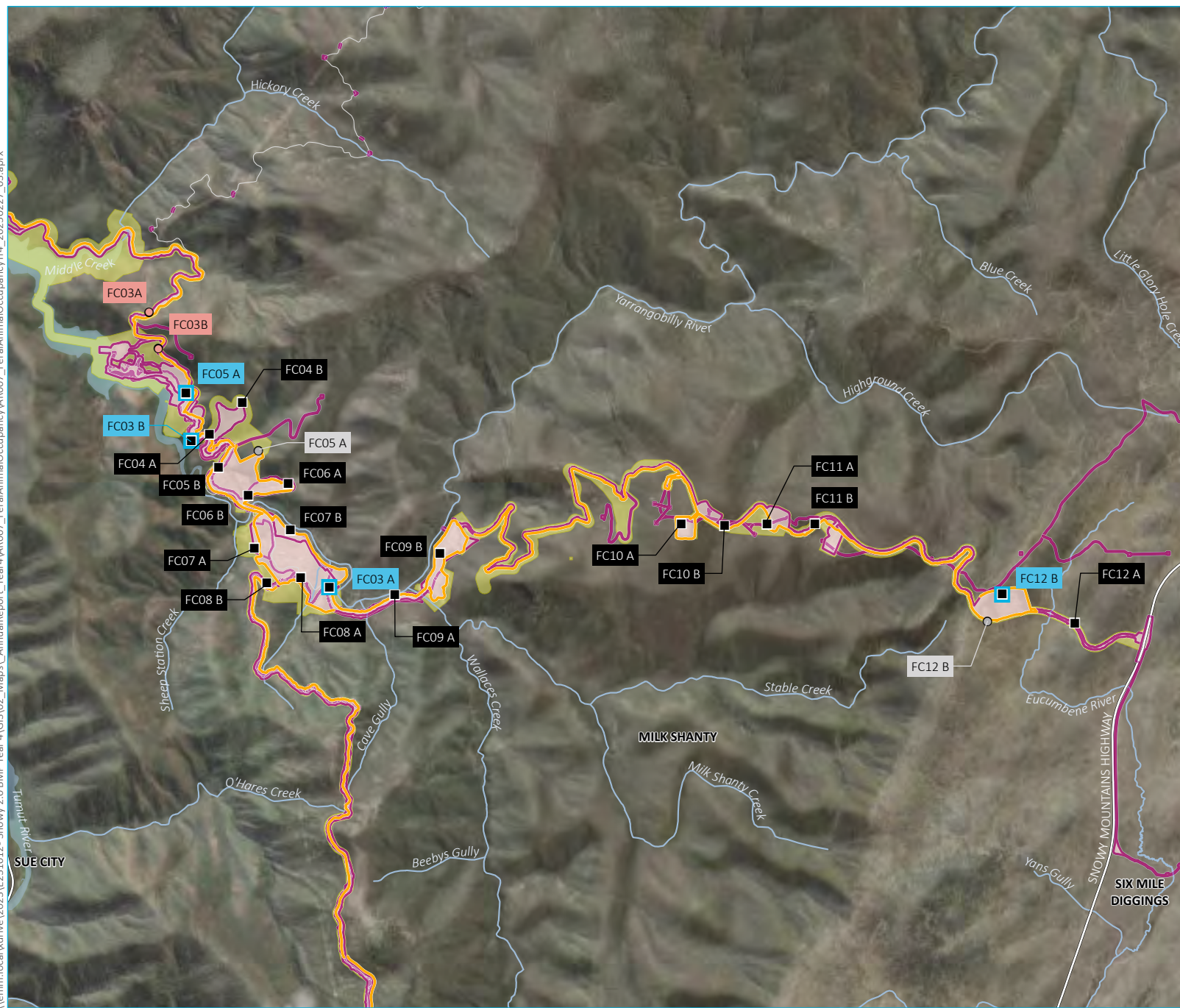
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.4



Source: EMM (2025); Snowy Hydro (2025); SMEC (2021); Robert Bird (2021); DFSI (2017); ESRI (2025)



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KEY

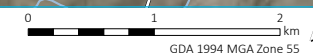
- Approved disturbance
- Approved construction envelope
- Spotlighting transect
- Feral animal camera
- Dismissed in 2024
- Dismissed in 2023
- Relocated in 2023
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Feral animal occupancy and abundance monitoring sites – Year 4

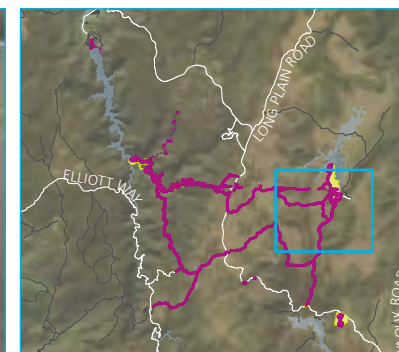
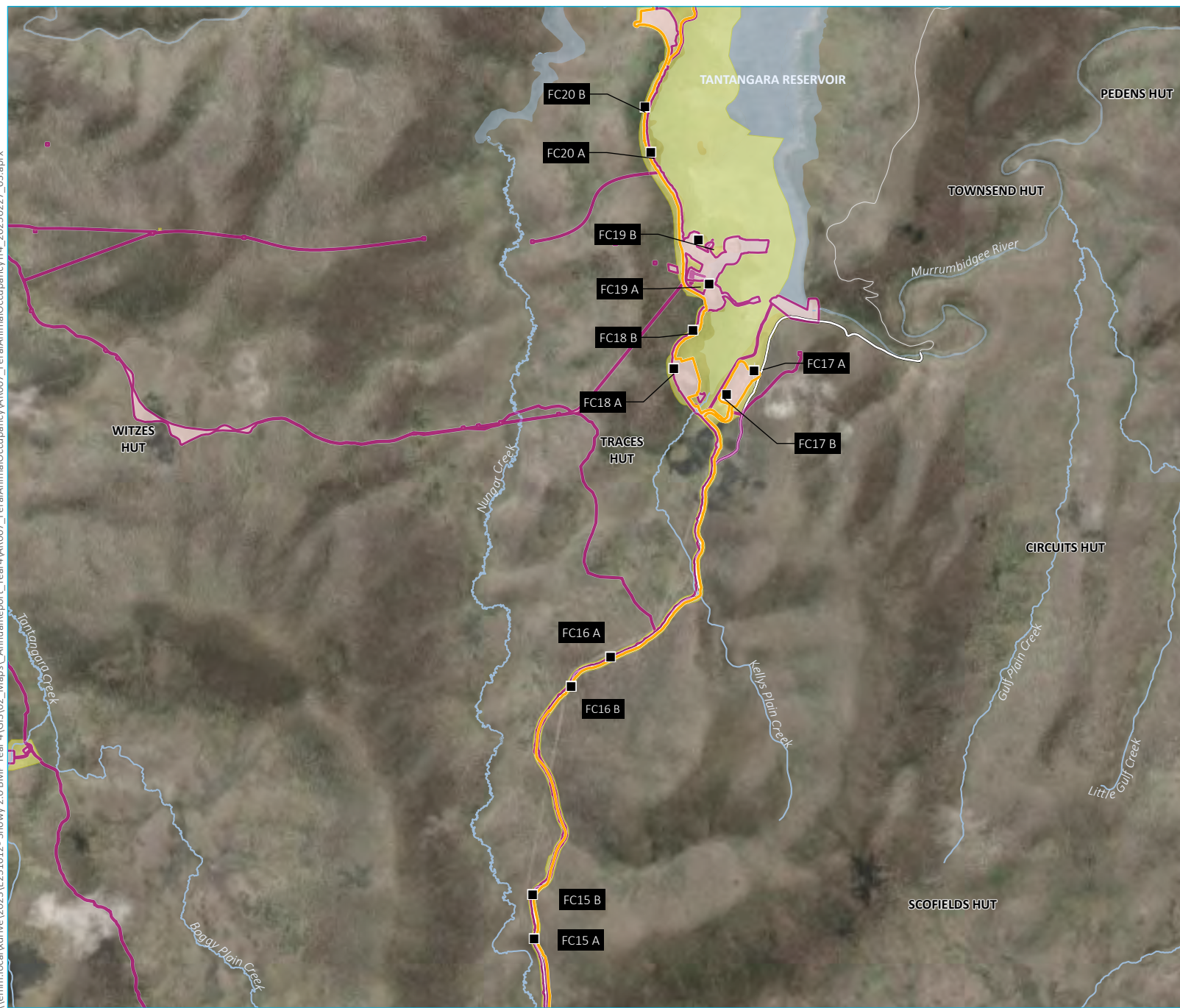
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.5a



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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KEY

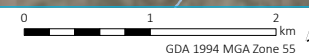
- Approved disturbance
- Approved construction envelope
- Spotlighting transect
- Feral animal camera
- Dismissed in 2023
- Relocated in 2023
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Feral animal occupancy and abundance monitoring sites – Year 4

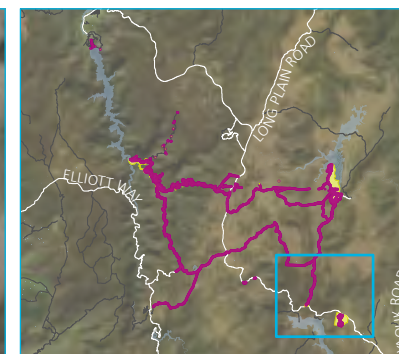
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.5b



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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KEY

- Approved disturbance
- Approved construction envelope
- Spotlighting transect
- Feral animal camera
- Dismissed in 2023
- Relocated in 2023
- Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Feral animal occupancy and abundance monitoring sites – Year 4

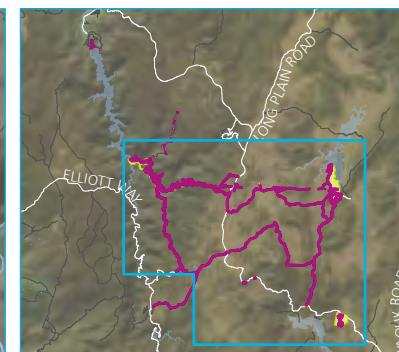
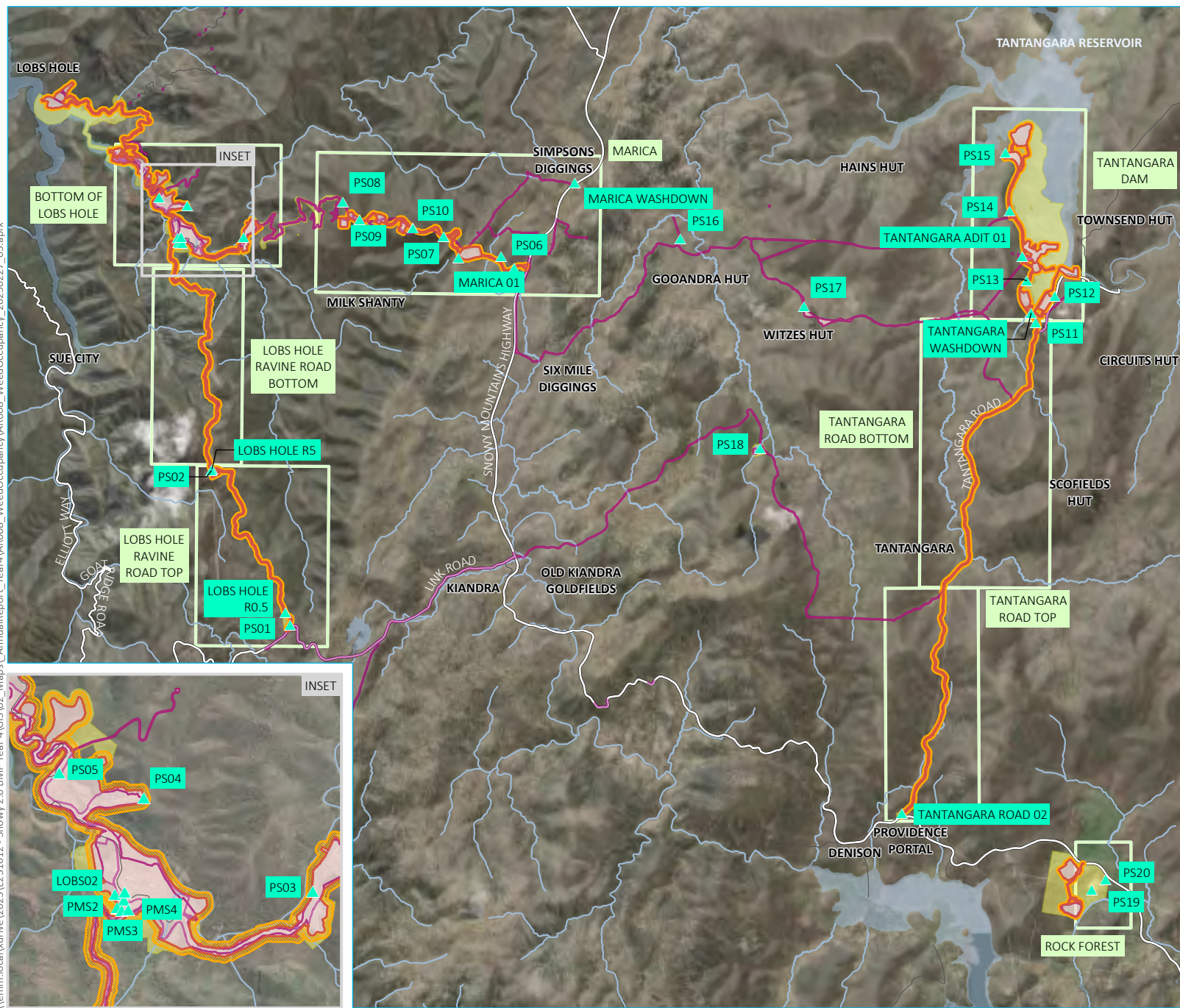
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.5c



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)

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KEY

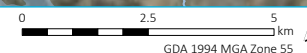
- Approved disturbance
- Approved construction envelope
- Phytophthora* sampling location
- Weed management zone
- Indicative weed mapping area
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Weed occupancy and abundance
locations and *Phytophthora*
occupancy monitoring sites – Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 2.6



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



3 Results

3.1 Threatened flora monitoring

The objective of the threatened flora monitoring is to determine the health of threatened flora populations of Clover Glycine (*Glycine latrobeana*) and Kiandra Leek Orchid (*Prasophyllum retroflexum*) located adjacent to the disturbance area, to document any changes as a result of the Main Works, and to implement additional controls if necessary.

3.1.1 Year 4

Clover Glycine and Kiandra Leek Orchid were surveyed across 12 sites, including six impact sites and six control sites (Figure 3.1). Two impact sites in Tantangara (TF01 and TF02) were not surveyed during December 2023 and January 2024 monitoring events as these sites were cleared as part of the Main Works project in Year 2 (further details in section iii below). These sites have not been relocated as Kiandra Leek Orchid and Glover Glycine were unable to be located within the area adjacent to the footprint. Targeted searches for these species where previous records occurred could not confirm their presence and therefore no suitable impact sites could be established to replace TF01 and TF02. Threatened flora presence/absence at each monitoring site in Year 4 is summarised in Table 3.1 and presented in Plate 3.1 and Plate 3.2. Monitoring events and further details of each record are presented in Appendix C, including photographs from photo points established at each monitoring site.

i Tantangara

Clover Glycine was recorded at two impact sites (TF03 and TF14). 44 Clover Glycine individuals were recorded. No individuals of Clover Glycine were recorded at four impact sites (TF04, TF11, TF12, and TF13).

The Kiandra Leek Orchid was recorded at three impact sites (TF11, TF13, and TF14). A total of 12 individuals of Kiandra Leek Orchid were recorded across the three impact sites. No individuals were recorded at three impact sites (TF03, TF04, and TF12).

ii Off-Site/Remote

Clover Glycine was recorded at four control sites (TF07, TF08, TF09 and TF10). 154 individuals of Clover Glycine were recorded. The remaining two control sites (TF05 and TF06) did not record any Clover Glycine.

The Kiandra Leek Orchid was recorded at three control sites (TF06, TF07 and TF09). A total of 34 individuals of Kiandra Leek Orchid were recorded across the three control sites. No individuals were recorded at three control sites (TF05, TF08, and TF10).

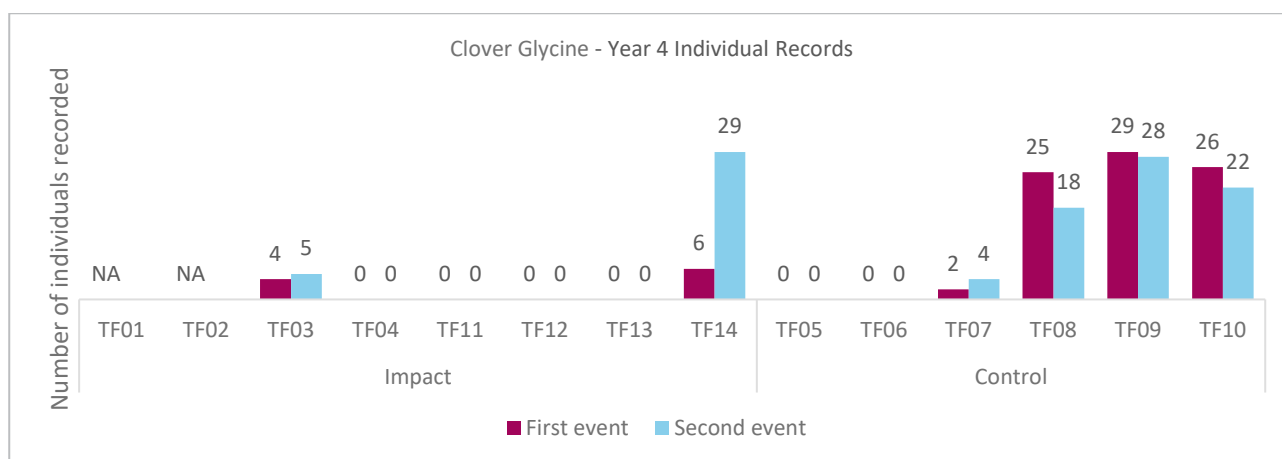
iii Limitations

In Year 4, the inability to relocate two monitoring sites that had previously been cleared in Year 2 continued. These two impact sites (TF01 and TF02) were unable to be relocated because records of Kiandra Leek Orchid (*Prasophyllum retroflexum*) and Clover Glycine (*Glycine latrobeana*) could not be found in adjacent suitable habitat to the plots that were cleared within the disturbance footprint. TF01 never recorded these species in previous surveys, while TF02 recorded Clover Glycine in both Year 1 and Year 2. The exclusion of these monitoring sites is not considered to increase the likelihood of requiring adaptive management actions for Kiandra Leek Orchid as a result. Nonetheless, the exclusion may influence the results of the Clover Glycine monitoring.

Table 3.1 **Number of threatened flora individuals recorded**

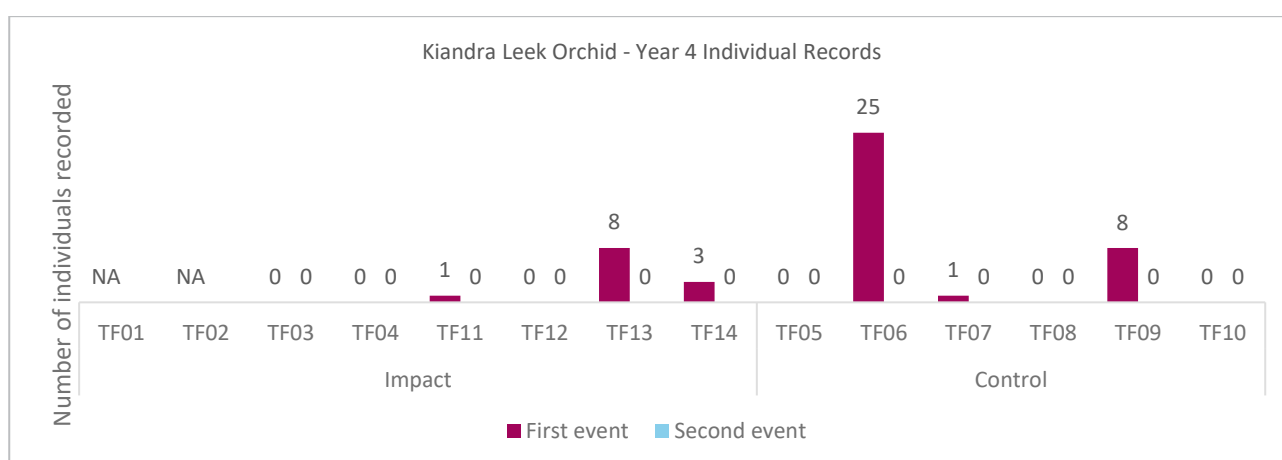
Site	Clover Glycine		Kiandra Leek Orchid	
	December 2023	January 2024	December 2023	January 2024
Impact				
TF01	NA	NA	NA	NA
TF02	NA	NA	NA	NA
TF03	4	5	0	0
TF04	0	0	0	0
TF11	0	0	1	0
TF12	0	0	0	0
TF13	0	0	8	0
TF14	6	29	3	0
Total (impact)	10	34	12	0
Control				
TF05	0	0	0	0
TF06	0	0	25	0
TF07	2	4	1	0
TF08	25	18	0	0
TF09	29	28	8	0
TF10	26	22	0	0
Total (control)	82	72	34	0
TOTAL	92	106	46	0

Notes: NA – survey not conducted due to clearing as a result of construction works.



Notes: NA – survey not conducted due to clearing as a result of construction works.

Plate 3.1 Clover Glycine records during Year 4



Notes: NA – survey not conducted due to clearing as a result of construction works.

Plate 3.2 Kiandra Leek Orchid records during Year 4

3.1.2 Comparative analysis- Year 3 and Year 4

Between Year 3 and Year 4, an overall decline in Clover Glycine numbers was observed at one impact site (TF03) and two control sites (TF07 and TF09) (Plate 3.3). An increase in Clover Glycine numbers was observed at one impact site (TF14) and two control sites (TF08 and TF10). Two impact sites (TF04 and TF12) recorded no individuals in Year 3 and Year 4 after recording individuals in Year 2.

No percentage decline in the number of Clover Glycine was observed over two consecutive monitoring periods and outside of the standard deviation observed at control sites as no individuals were observed.

Between Year 3 and Year 4, an overall decline in Kiandra Leek Orchid numbers was observed at one impact site (TF13) and two control sites (TF07 and TF09). An increase in Kiandra Leek Orchid numbers was observed at two impact sites (TF11 and TF14) and one control site (TF06). The remaining plots (impact site TF03, TF04 and TF12, and control sites TF05, TF08 and TF10) recorded no individuals of Kiandra Leek Orchid in Year 2 or Year 3.

No percentage decline in the number of Kiandra Leek Orchid was observed over two consecutive monitoring periods and outside of the standard deviation observed at control sites as no individuals were observed.

One control site (TF05) has never recorded individuals of Clover Glycine or Kiandra Leek Orchid.

A comparison of Year 4, Year 3, Year 2 and Year 1 (baseline) is presented in Plate 3.3 for Clover Glycine, and Plate 3.4 for Kiandra Leek Orchid.

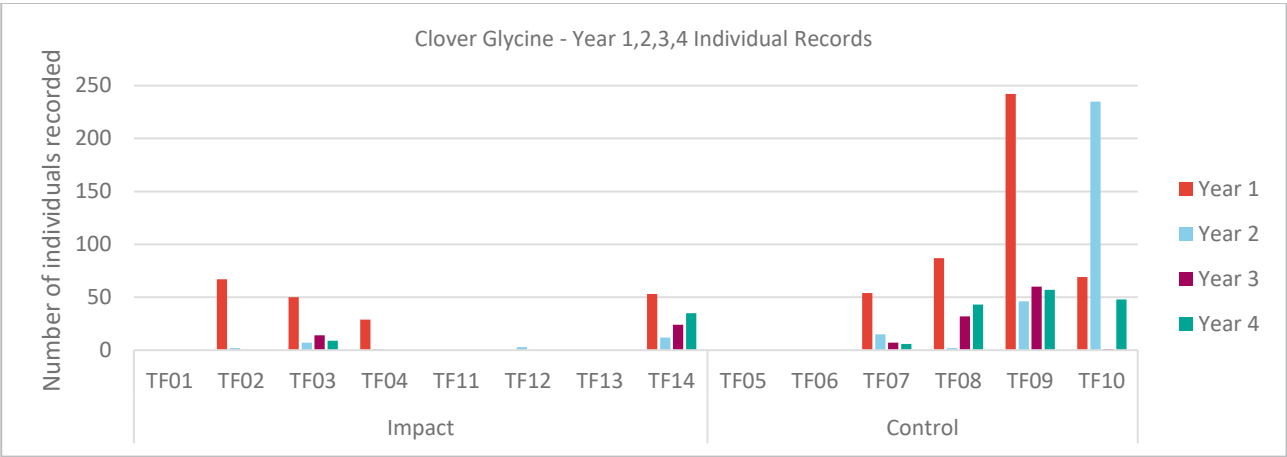


Plate 3.3 Clover Glycine records during Year 4 compared to Year 3, Year 2 and baseline (Year 1)

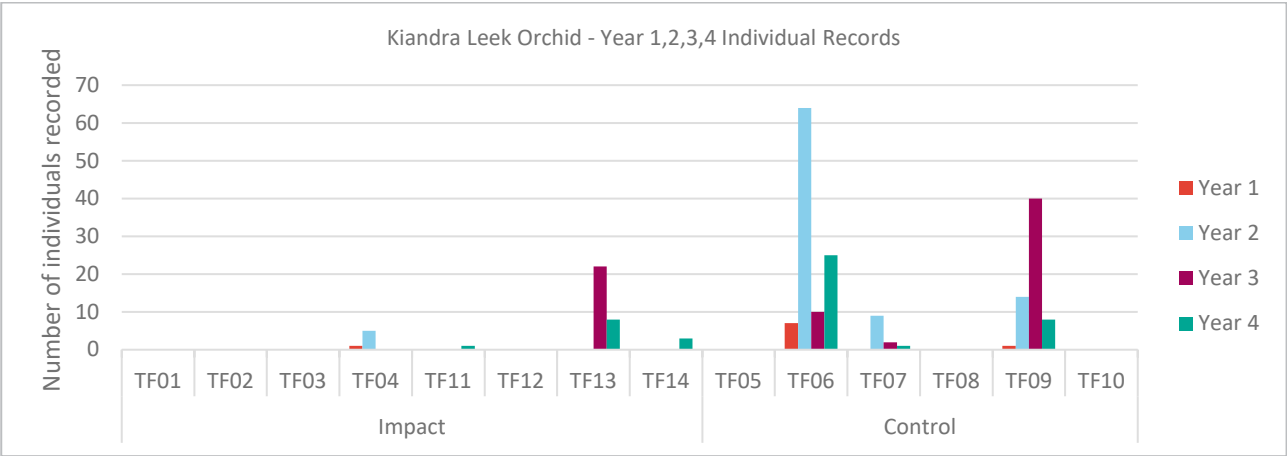
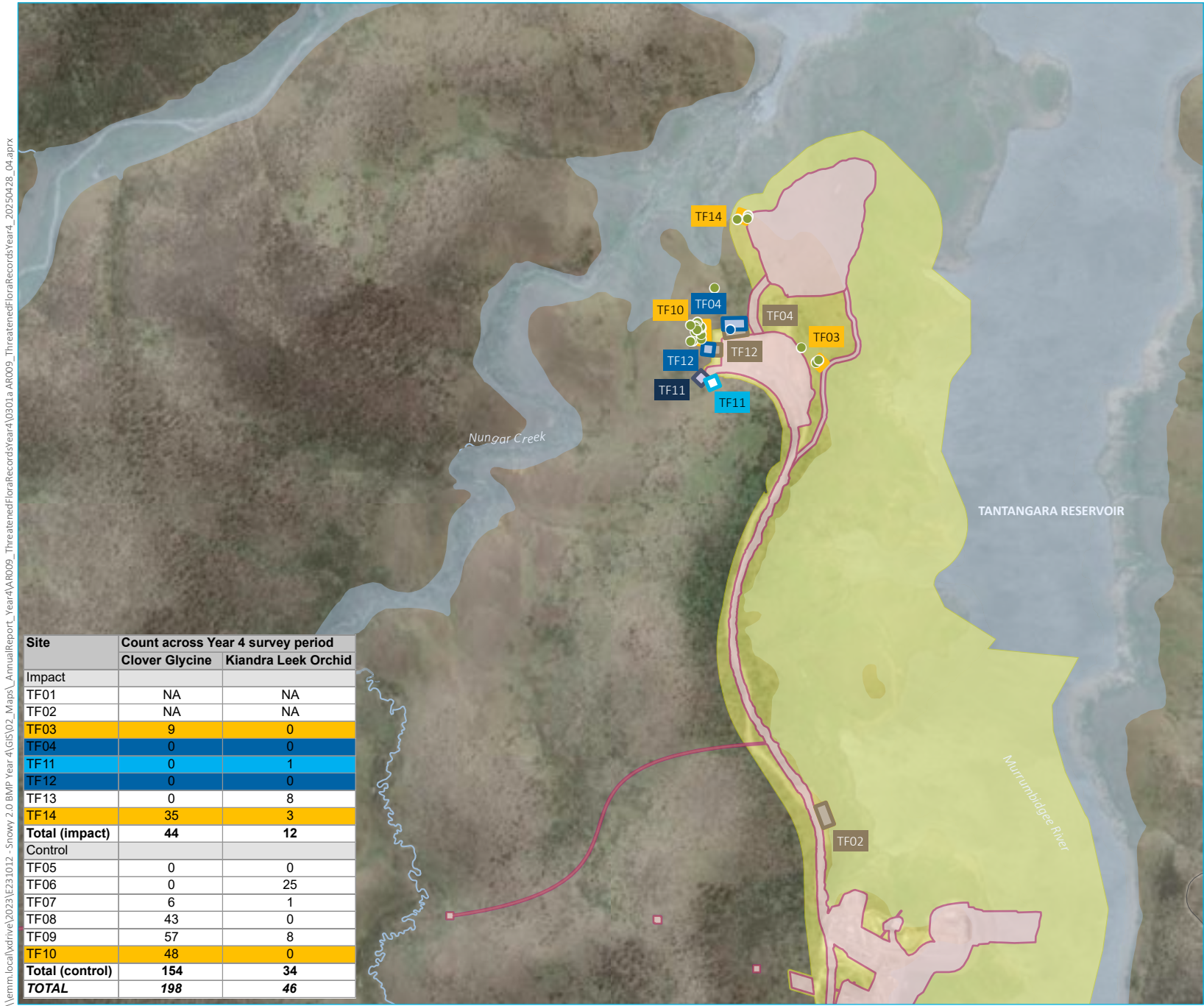
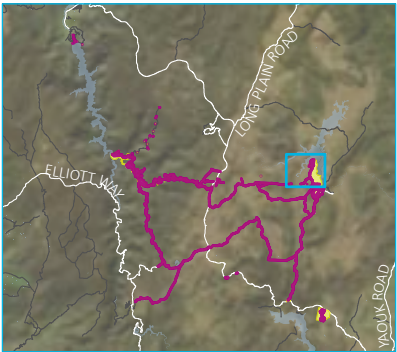


Plate 3.4 Kiandra Leek Orchid records during Year 4 compared to Year 3, Year 2 and baseline (Year 1)

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Site	Count across Year 4 survey period	
	Clover Glycine	Kiandra Leek Orchid
Impact		
TF01	NA	NA
TF02	NA	NA
TF03	9	0
TF04	0	0
TF11	0	1
TF12	0	0
TF13	0	8
TF14	35	3
Total (impact)	44	12
Control		
TF05	0	0
TF06	0	25
TF07	6	1
TF08	43	0
TF09	57	8
TF10	48	0
Total (control)	154	34
TOTAL	198	46



- KEY
- Approved disturbance
 - Approved construction envelope
 - Threatened flora monitoring location
 - Impact - relocated in December 2022
 - Impact - dismissed in December 2022
 - Control - dismissed in December 2022
 - Control - dismissed in December 2021
 - Control - dismissed in March 2022
 - Control - relocated in December 2022
- Flora record
- Clover Glycine
 - Kiandra Leek Orchid
- Existing environment
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Waterbody

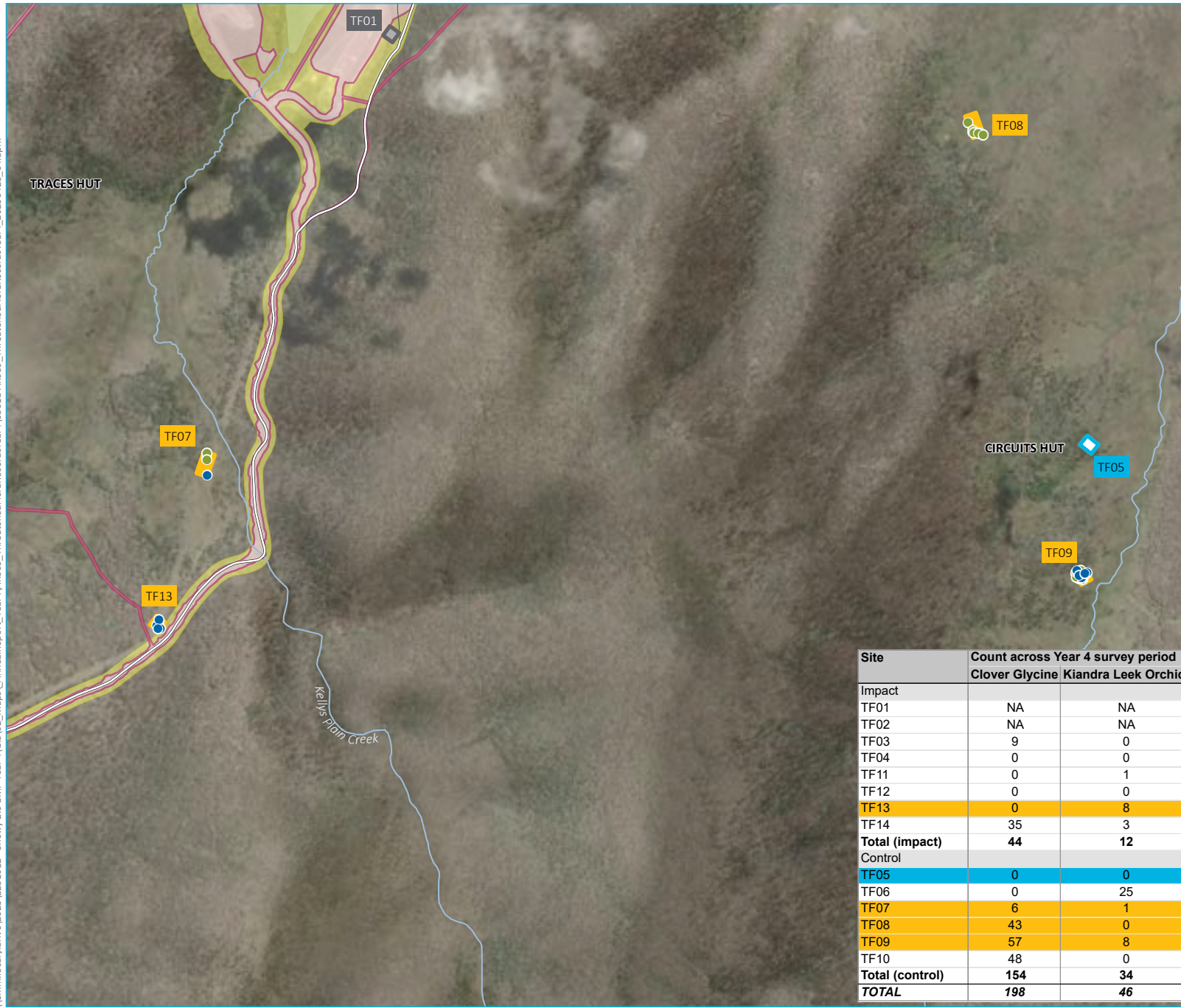
Threatened flora records during Year 4

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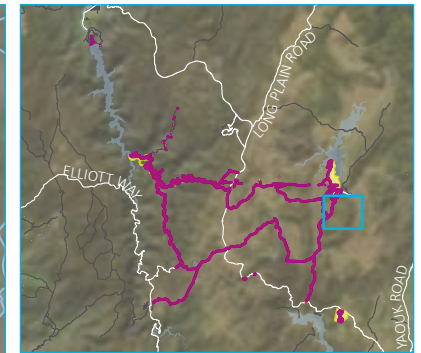


Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)

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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



KEY

- Approved disturbance
- Approved construction envelope
- Threatened flora monitoring location
- Impact - dismissed in December 2022
- Control - dismissed in December 2022
- Control - dismissed in December 2021
- Control - dismissed in March 2022
- Control - relocated in December 2022

Flora record

- Clover Glycine
- Kiandra Leek Orchid

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Waterbody

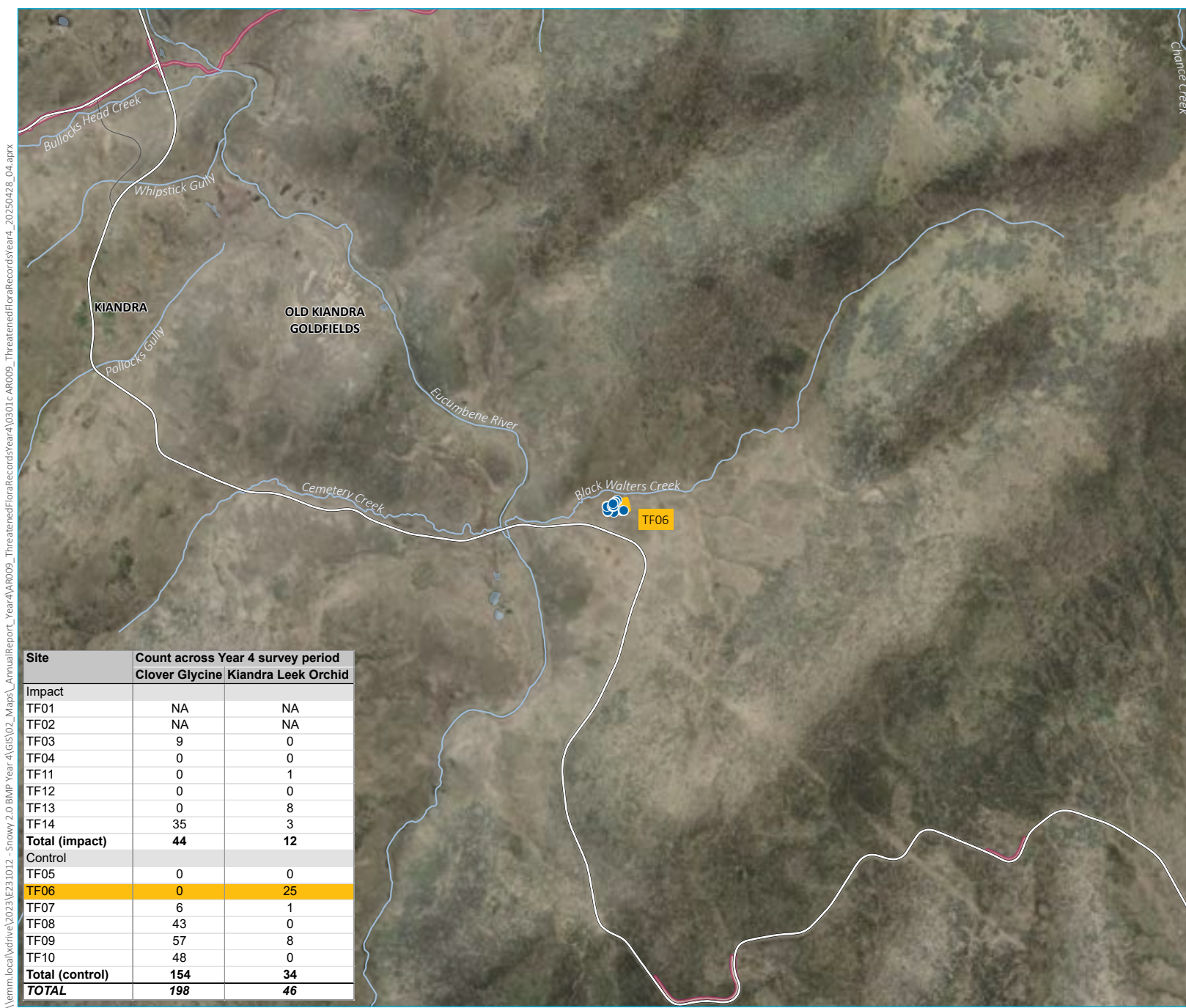
Site	Count across Year 4 survey period	
	Clover Glycine	Kiandra Leek Orchid
Impact		
TF01	NA	NA
TF02	NA	NA
TF03	9	0
TF04	0	0
TF11	0	1
TF12	0	0
TF13	0	8
TF14	35	3
Total (Impact)	44	12
Control		
TF05	0	0
TF06	0	25
TF07	6	1
TF08	43	0
TF09	57	8
TF10	48	0
Total (control)	154	34
TOTAL	198	46

Threatened flora records during Year 4

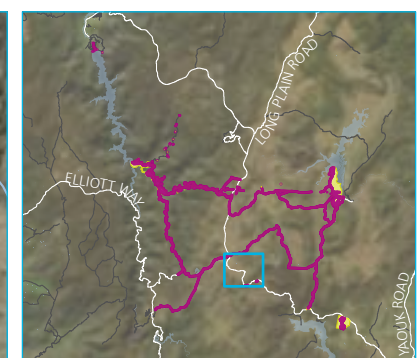
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.1b



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Site	Count across Year 4 survey period	
	Clover Glycine	Kiandra Leek Orchid
Impact		
TF01	NA	NA
TF02	NA	NA
TF03	9	0
TF04	0	0
TF11	0	1
TF12	0	0
TF13	0	8
TF14	35	3
Total (impact)	44	12
Control		
TF05	0	0
TF06	0	25
TF07	6	1
TF08	43	0
TF09	57	8
TF10	48	0
Total (control)	154	34
TOTAL	198	46

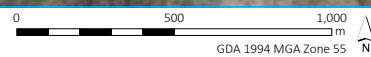


- KEY
- Approved disturbance
 - Approved construction envelope
 - Threatened flora monitoring location
 - Impact - dismissed in December 2022
 - Control - dismissed in December 2022
 - Control - dismissed in December 2021
 - Control - dismissed in March 2022
 - Control - relocated in December 2022
- Flora record
- Clover Glycine
 - Kiandra Leek Orchid
- Existing environment
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Waterbody

Threatened flora records during Year 4



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



3.2 Small terrestrial mammal monitoring

3.2.1 Occupancy (presence/absence) monitoring

The objective of the small terrestrial mammal occupancy monitoring is to determine presence/absence of the Smoky Mouse, Eastern Pygmy-possum, and Broad-toothed Rat at sites within proximity to the project and document any changes as a result of the Main Works.

During Year 4, 39 remote camera monitoring sites (two cameras per site) were surveyed during each of four monitoring events. Each site comprises paired cameras, one placed at approximately 20 m and a second placed at approximately 120 m from the road verge. The 39 monitoring sites include 22 impact monitoring sites and 17 control sites, with a total of 78 cameras deployed to record target species.

Limitations

Instances of theft in previous years resulting in the loss of some equipment has led to some sites not being surveyed in Year 4. A number of cameras experienced battery depletion and SD cards becoming full, attributed to heightened vehicle activity in the area or false triggers, compromising their functionality and data collection capabilities. Fourteen cameras were unable to be surveyed during Q2 and Q3 as they were located within closed areas of Kosciuszko National Park. NPWS did not grant access between Thursday 4 April and Friday 4 October 2024. Four cameras had no data in Q4 as they were located within closed areas of Kosciuszko National Park and did not receive maintenance during Q3, which caused SD cards to become full prior to Q4. Two camera locations recorded less than 30 days of Q4 data for the same reasons. For further details on the number of cameras that reported issues during Year 4, refer to Appendix A.

ii Smoky Mouse

a Year 4

All the impact sites that previously recorded Smoky Mouse presence did not record the species for greater than one year. Smoky Mouse presence/absence at each monitoring site is summarised in (Table 3.2). Further detailed information including monitoring dates and presence/absence at each camera is provided in Appendix D.

Lobs Hole

There are no small mammal cameras targeting Smoky Mouse at Lobs Hole due to the absence of suitable habitat for this species.

Ravine Road

There were no Smoky Mouse records on Ravine Rd in Year 4. One impact site (SM05-I) recorded an absence of the Smoky Mouse, which was previously recorded during pre-construction / baseline surveys. Three impact sites (SM10, SM14 and SM18) on Ravine Road recorded Smoky Mouse in Year 2 of construction but have not recorded the species since. The remaining Ravine Road sites have never recorded Smoky Mouse (SM01-I, SM03-I, SM07-I, SM15-I and SM16-I).

Marica

There were no smoky mouse records at Marica during Year 4. Three impact sites (SM22-I, SM23-I and SM24-I) recorded an absence of the Smoky Mouse, which was previously recorded during pre-construction / baseline surveys. The remaining three suitable sites at Marica have never recorded Smoky Mouse (SM21-I, SM25-I and SM26-I). SM27-I is not placed within suitable Smoky Mouse habitat and is therefore not targeting the species.

Tantangara

There are no small mammal cameras targeting Smoky Mouse at Tantangara due to the absence of suitable habitat for this species.

Rock Forest

There are no small mammal cameras targeting Smoky Mouse at Rock Forest due to the absence of suitable habitat for this species.

Off site/Remote

Smoky Mouse (*Pseudomys fumeus*) (Photograph 3.1) were recorded at two control sites on Dead Mans Trail (SM09-C and SM12-C) during Year 4, representing 6% of all sites surveyed. SM09-C recorded the species' presence during Q2 (Autumn), Q3 (Winter) and Q4 (Spring). SM12-C recorded the species' presence during Q4 (Spring) (Plate 3.5). One control site (SM17-C) located on O'Hares Trail, off Ravine Road, that previously recorded Smoky Mouse presence, recorded the absence of the species for greater than one year. One impact site located on Alpine Creek Trail (SM35-I) recorded an absence of the Smoky Mouse, which was previously recorded during pre-construction / baseline surveys. The remaining off site/remote small mammal sites consisted of seven sites in unsuitable smoky mouse habitat (SM28-C, SM29-C, SM30-C, SM31-C, SM32-C, SM33-C and SM38-C) and seven sites which have never recorded Smoky Mouse presence during the Year 1 – Year 4 monitoring period (SM02-C, SM04-C, SM06-C, SM13-C, SM26-C, SM40-C and SM41-C).



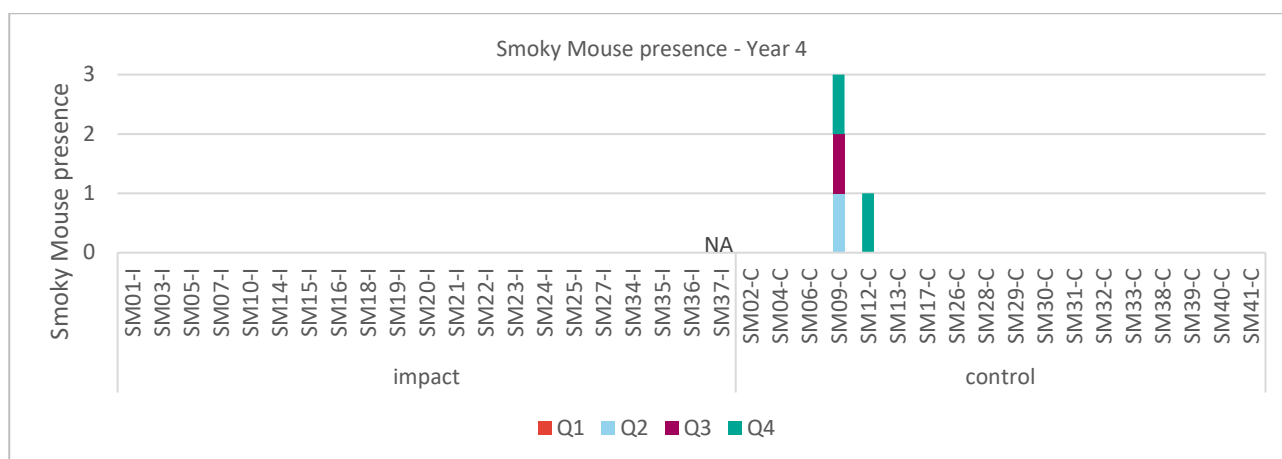
Photograph 3.1 Smoky Mouse recorded in Year 4 at site SM09-C-RC1

Table 3.2 Smoky Mouse remote camera presence/absence (Year 4)

Site	Previously recorded in Year 1	Previously recorded in Year 2	Previously recorded in Year 3	Year 4				
				Q1 (Summer)	Q2 (Autumn)	Q3 (Winter)	Q4 (Spring)	
Impact								
SM01-I								
SM03-I								
SM05-I	Present							
SM07-I								
SM10-I		Present						
SM14-I			Present					
SM15-I								
SM16-I								
SM18-I		Present						
SM19-I								
SM20-I								
SM21-I		Present						
SM22-I	Present		Present					
SM23-I	Present	Present						
SM24-I	Present							
SM25-I								
SM27-I	NA							
SM34-I								
SM35-I	Present					NA	NA	
SM36-I								
SM37-I			NA	NA	NA	NA	NA	
Total sites where detected	5	6	0	0	0	0	0	
Total sites where detected (% of total impact sites)	26%	30%	0%	0%	0%	0%	0%	

Site	Previously recorded in Year 1	Previously recorded in Year 2	Previously recorded in Year 3	Year 4			
				Q1 (Summer)	Q2 (Autumn)	Q3 (Winter)	Q4 (Spring)
Control							
SM02-C							
SM04-C							
SM06-C	NA						
SM09-C	Present	Present			Present	Present	Present
SM12-C		Present					Present
SM13-C							
SM17-C	Present	Present					
SM26-C							
SM28-C					NA	NA	
SM29-C					NA	NA	
SM30-C					NA	NA	
SM31-C					NA	NA	
SM32-C					NA	NA	
SM33-C					NA	NA	
SM38-C							
SM39-C							
SM40-C							
SM41-C							
Total sites where detected	2	3	0	0	1	1	2
Total sites where detected (% of total control sites)	12%	17%	0%	0%	9%	9%	12%
TOTAL (impact and control)	7 (18%)	9 (24%)	0 (0%)	0 (0%)	1 (3%)	1 (3%)	2 (5%)

Notes: Cells highlighted in grey represent sites with unsuitable habitat for the Smoky Mouse. Blank cells represent absence of species. NA indicates sites not surveyed during that monitoring period.



Notes: NA – data missing due to camera moved, stolen, lost data or hardware errors.

Plate 3.5 Smoky Mouse presence across monitoring periods (Year 4)

b Comparative analysis- Year 1, Year 2 and Year 3 and Year 4

An overall increase in the number of monitoring sites reporting Smoky Mouse presence was observed between Year 1 (seven sites, 18% detection rate) and Year 2 (nine sites, 24% detection rate), representing a 33% increase. However, in Year 3, none of the monitoring sites documented the species' presence. In Year 4, two sites reported detections, resulting in a 5% detection rate, indicating a partial recovery.

The data indicates that overall, there has been a decline in the number of sites where Smoky Mouse was detected from Year 2 to Year 4, with a significant decrease in Year 3.

A comparison of Year 2, Year 3 and Year 4 presence compared to Year 1 baseline is presented in Plate 3.6.

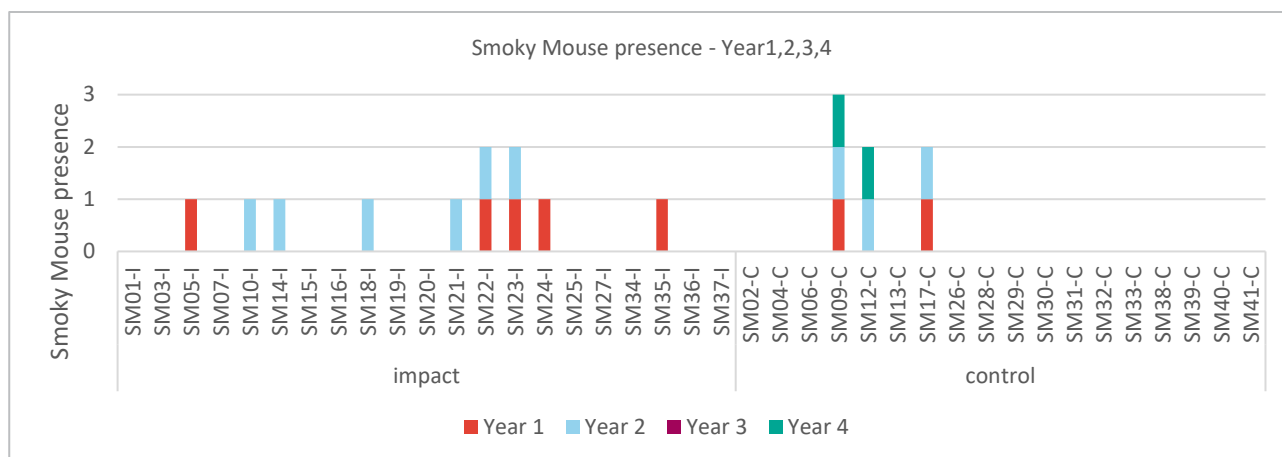
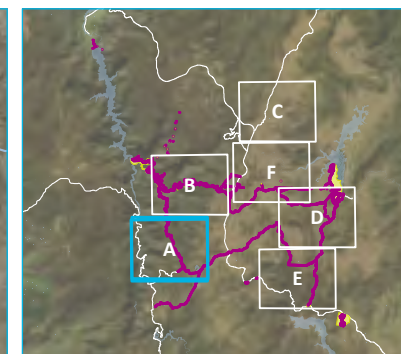


Plate 3.6 Year 2, Year 3 and Year 4 Smoky Mouse presence compared to baseline (Year 1)

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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



KEY

- Approved disturbance
- Approved construction envelope
- Camera records - Smoky Mouse
- Presence
- Absence
- Unsuitable habitat
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

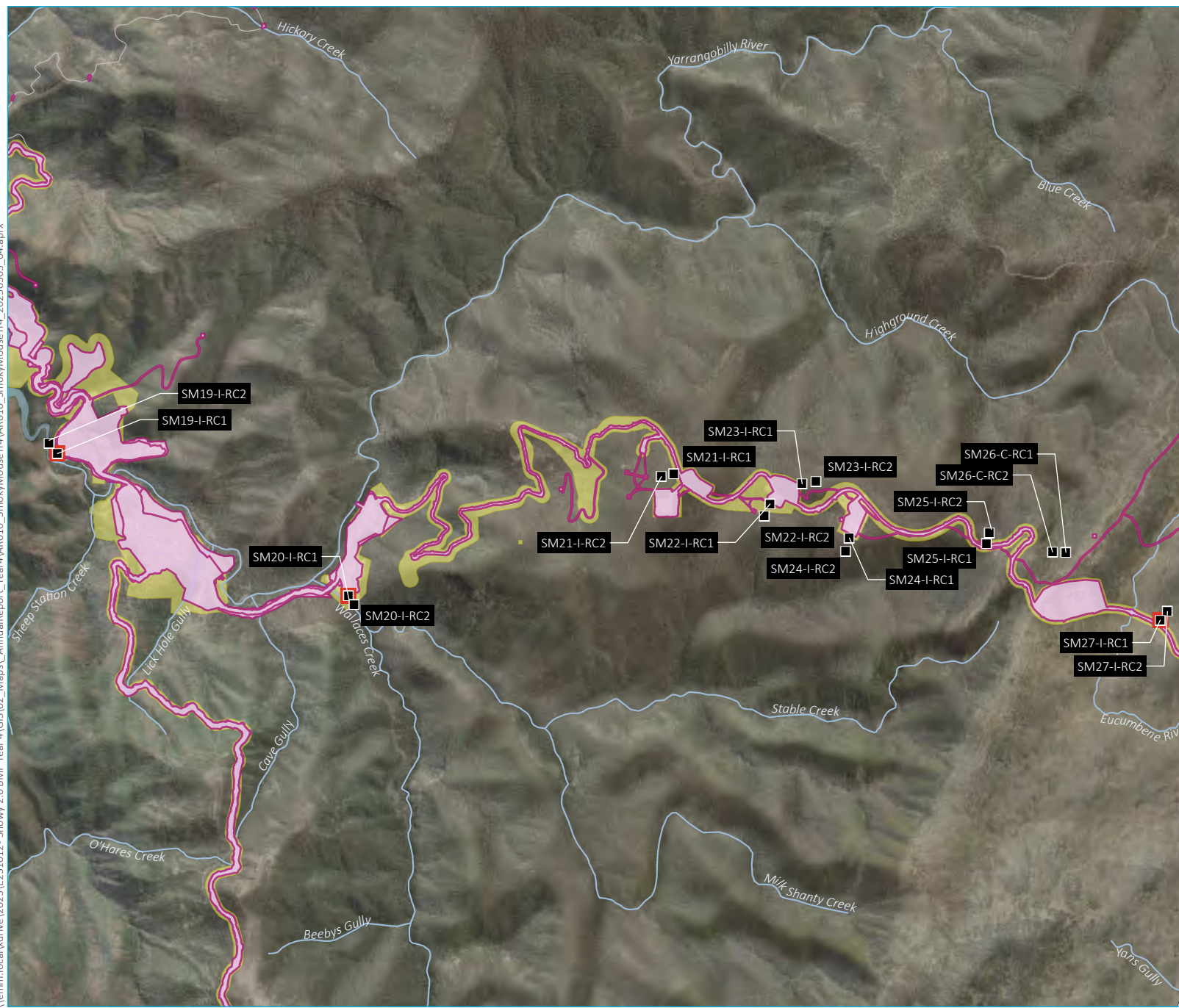
Smoky Mouse presence/absence during Year 4

Snowy 2.0
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Annual report
Figure 3.2a

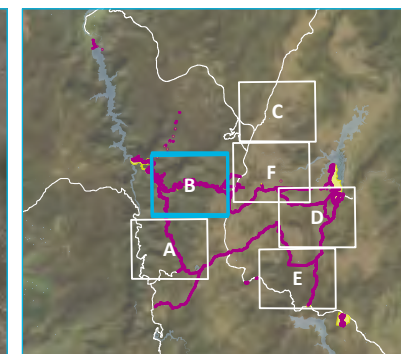


0 1 2 km
GDA 1994 MGA Zone 55

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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



KEY

- Approved disturbance
- Approved construction envelope
- Camera records - Smoky Mouse
- Presence
- Absence
- Unsuitable habitat
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Smoky Mouse presence/absence
during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.2b

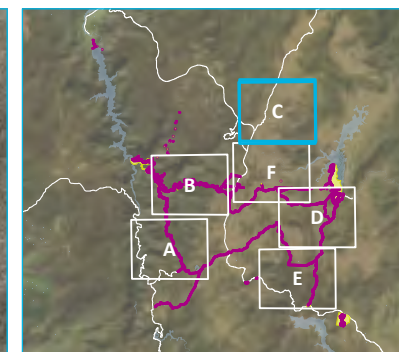
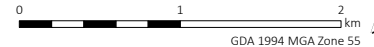


0 1 2 km
GDA 1994 MGA Zone 55

\\lemn.local\drive\2023\2231012 - Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR010_SmokyMouseYr4_20250305_04.aprx



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



KEY

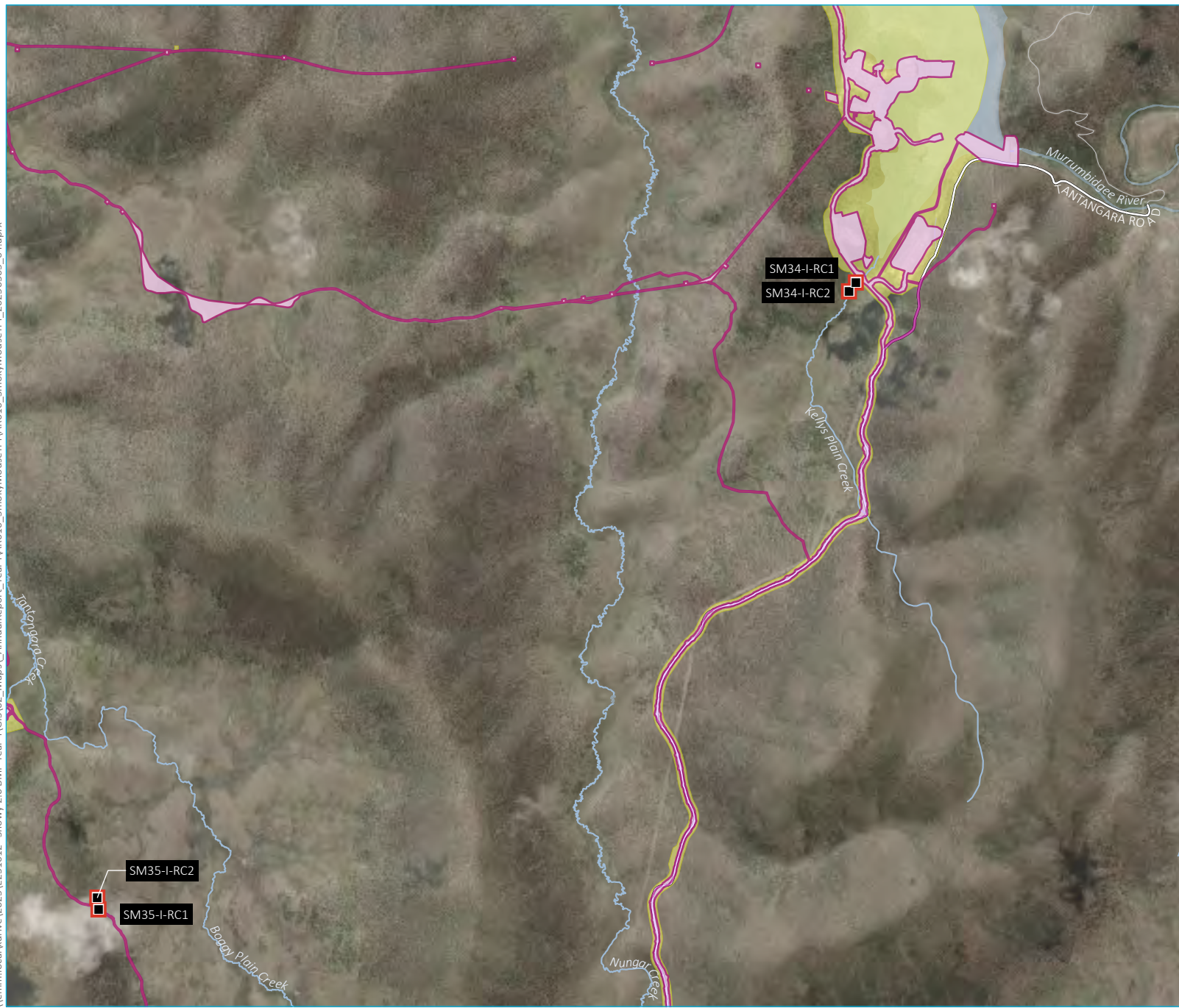
- Approved disturbance
- Approved construction envelope
- Camera records - Smoky Mouse
- Presence
- Absence
- Unsuitable habitat
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Smoky Mouse presence/absence during Year 4

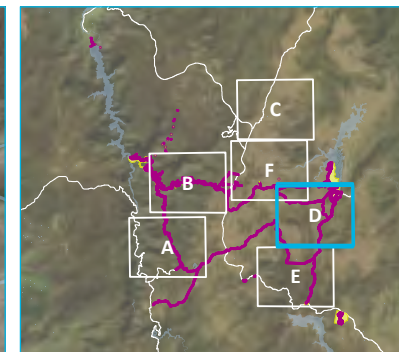
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.2c



\\lemh.local\drive\2023\E231012 - Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR010_SmokyMouseYr4_20250305_04.aprx



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)

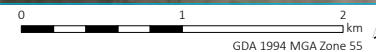


KEY

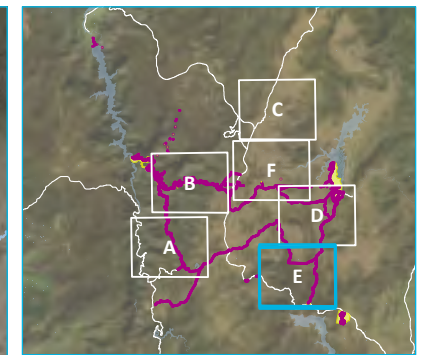
- Approved disturbance
- Approved construction envelope
- Camera records - Smoky Mouse
- Presence
- Absence
- Unsuitable habitat
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Smoky Mouse presence/absence during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.2d



\\lemm.local\drive\2023\E231012 - Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR010_SmokyMouseYr4_20250305_04.aprx



KEY

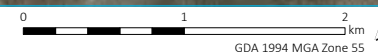
- Approved disturbance
- Approved construction envelope
- Camera records - Smoky Mouse
- Presence
- Absence
- Unsuitable habitat
- Existing environment
- Major road
- Named watercourse
- Waterbody

Smoky Mouse presence/absence during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.2e



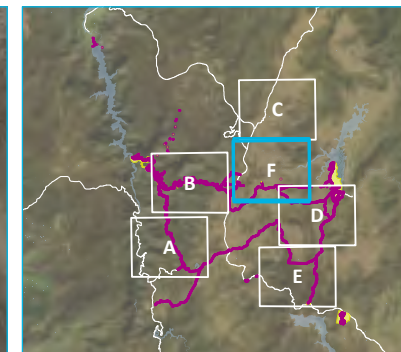
Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



KEY

- Approved disturbance
- Approved construction envelope
- Camera records - Smoky Mouse
- Presence
- Absence
- Unsuitable habitat
- Existing environment
- Major road
- Named watercourse
- Waterbody

Smoky Mouse presence/absence during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.2f



0 1 2 km
GDA 1994 MGA Zone 55

iii Eastern Pygmy-possum

a Year 4

The Eastern Pygmy-possum (*Cercartetus nanus*) (Photograph 3.2) was recorded at 15 sites during Year 4, including ten impact sites and five control sites (Figure 3.3). The records at the ten impact sites represent presence at 48% of all impact monitoring sites and 55% of impact sites supporting suitable habitat for the Eastern Pygmy-possum.

Eastern Pygmy-possum presence/absence at each monitoring site is summarised in Table 3.3 and presented in Plate 3.7. Further detailed information including monitoring dates and presence/absence at each camera is provided in Appendix D.

Lobs Hole

There were no records of Eastern Pygmy Possums at the two sites located at Lobs Hole (SM19-I and SM20-I). Both sites have recorded the species in previous years.

Ravine Road

Eastern Pygmy Possums were recorded at five impact sites along Ravine Road in Year 4 (SM03-I, SM14-I, SM15-I, SM16-I, SM18-I). The species was not recorded at the remaining four sites along Ravine Road (SM01-I, SM05-I, SM07-I and SM10-I). All sites along Ravine Road have previously recorded Eastern Pygmy Possum.

Marica

Eastern Pygmy possums were recorded at five impact sites at Marica in Year 4 (SM21-I, SM23-I, SM24-I, SM25-I, SM26-I) but were absent from one site (SM22-I) where it has been previously recorded. The remaining small mammal camera at Marica is not located within suitable habitat for this species (SM27-I).

Tantangara

There are no small mammal cameras targeting Eastern Pygmy Possum at Tantangara due to the absence of suitable habitat for this species.

Rock Forest

There are no small mammal cameras targeting Eastern Pygmy Possum at Rock Forest due to the absence of suitable habitat for this species.

Off-site/Remote

Eastern Pygmy Possums were recorded at five off-site/remote control sites. They were recorded at one site along Link Road (SM02-C), three sites along Dead Mans Trail (SM06-C, SM09-C and SM40-C) and one site along O'Hares Trail (SM17-C). Seven remote sites (SM28-C, SM29-C, SM30, SM31-C, SM32-C, SM33-C, SM35-I) were unable to be surveyed during Q2 (Autumn) and Q3 (Winter) as they are located within closed areas of Kosciuszko National Park that NPWS were not able to grant access to.



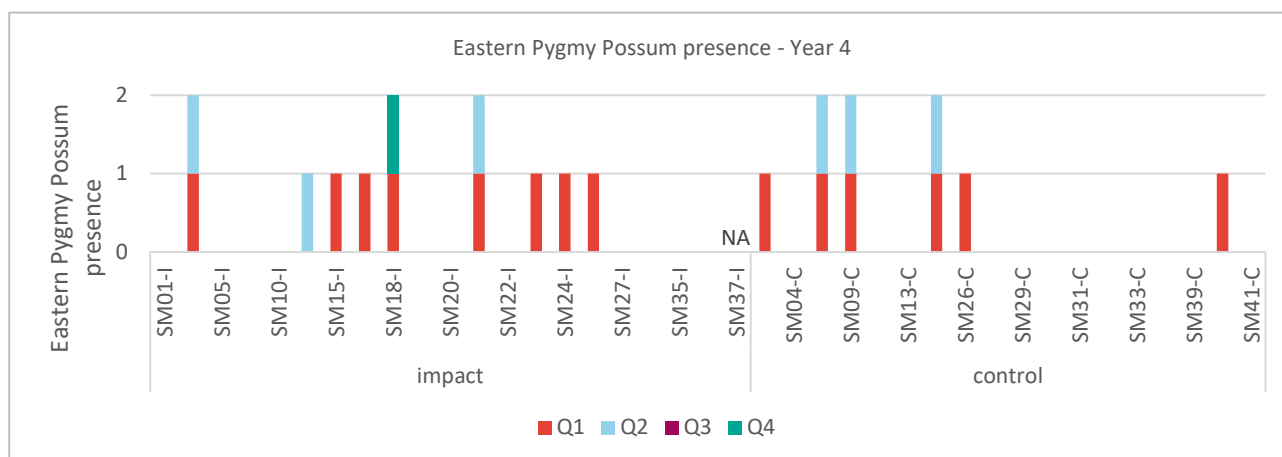
Photograph 3.2 Eastern Pygmy-possum recorded from site SM06-C-RC1 (left) and SM21-I-RC2 (right) in Year 4

Table 3.3 Eastern Pygmy-possum remote camera records (Year 4)

Site	Previously recorded in Year 1	Previously recorded in Year 2	Previously recorded in Year 3	Q1 (Summer)	Q2 (Autumn)	Q3 (Winter)	Q4 (Spring)
Impact							
SM01-I		Present					
SM03-I	Present	Present	Present	Present	Present		
SM05-I	Present		Present				
SM07-I	Present						
SM10-I	Present		Present				
SM14-I	Present	Present	Present		Present		
SM15-I	Present	Present	Present	Present			
SM16-I	Present	Present	Present	Present			
SM18-I	Present			Present			Present
SM19-I		Present					
SM20-I	Present		Present				
SM21-I	Present	Present	Present	Present	Present		
SM22-I	Present		Present				
SM23-I	Present	Present	Present	Present			
SM24-I	Present	Present	Present	Present			
SM25-I		Present	Present	Present			
SM27-I							
SM34-I							
SM35-I		Present			NA	NA	
SM36-I							
SM37-I			NA	NA	NA	NA	NA
Total sites where detected	13	11	12	8	3	0	1
Total sites where detected (% of total impact sites)	62%	52%	60%	40%	16%	0%	5%

Site	Previously recorded in Year 1	Previously recorded in Year 2	Previously recorded in Year 3	Q1 (Summer)	Q2 (Autumn)	Q3 (Winter)	Q4 (Spring)
Control							
SM02-C	Present			Present			
SM04-C	Present		Present				
SM06-C	Present	Present	Present	Present	Present		
SM09-C	Present	Present	Present	Present	Present		
SM12-C		Present	Present				
SM13-C		Present	Present				
SM17-C	Present	Present	Present	Present	Present		
SM26-C				Present			
SM28-C					NA	NA	
SM29-C		Present			NA	NA	
SM30-C					NA	NA	
SM31-C					NA	NA	
SM32-C					NA	NA	
SM33-C					NA	NA	
SM38-C							
SM39-C							
SM40-C	Present		Present	Present			
SM41-C		Present	Present				
Total sites where detected	6	7	8	6	3	0	0
Total sites where detected (% of total control sites)	33%	39%	44%	33%	25%	0%	0%
TOTAL (impact and control)	19 (49%)	18 (46%)	20 (53%)	14 (37%)	6 (19%)	0 (0%)	1 (3%)

Notes: Cells highlighted in grey represent sites with unsuitable habitat for the Eastern Pygmy-possum. Blank cells represent absence of species. NA indicates sites not surveyed during that monitoring period.



Notes: NA – data missing due to camera moved, stolen, lost data or hardware errors.

Plate 3.7 Eastern Pygmy-possum presence across monitoring periods (Year 4)

b Comparative analysis- Year 1, Year 2, Year 3 and Year 4

A slight decline in the number of monitoring sites reporting Eastern Pygmy Possum presence was observed between Year 1 (19 sites) and Year 2 (18 sites), representing a 5% decrease. In Year 3, the species was detected at 20 monitoring sites – corresponding to a 5% increase relative to Year 1 and a 11% increase relative to Year 2. In Year 4; however, detections declined to 15 sites, representing a 21% decrease relative to Year 1 and a 25% decrease relative to Year 3.

In Year 4, the Eastern Pygmy Possum was not detected at five impact sites (SM05-I, SM07-I, SM10-I, SM20-I, and SM22-I) that had previously recorded its presence during pre-construction/baseline surveys. Amongst these, one impact site (SM07-I) has recorded an absence of the species for over one year. One control site (SM04-C), which had also previously recorded the species during pre-construction/baseline surveys, reported an absence; however, this absence has not persisted for more than one year.

A comparison of Year 2, 3 and Year 4 presence compared to Year 1 baseline is presented in Plate 3.8.

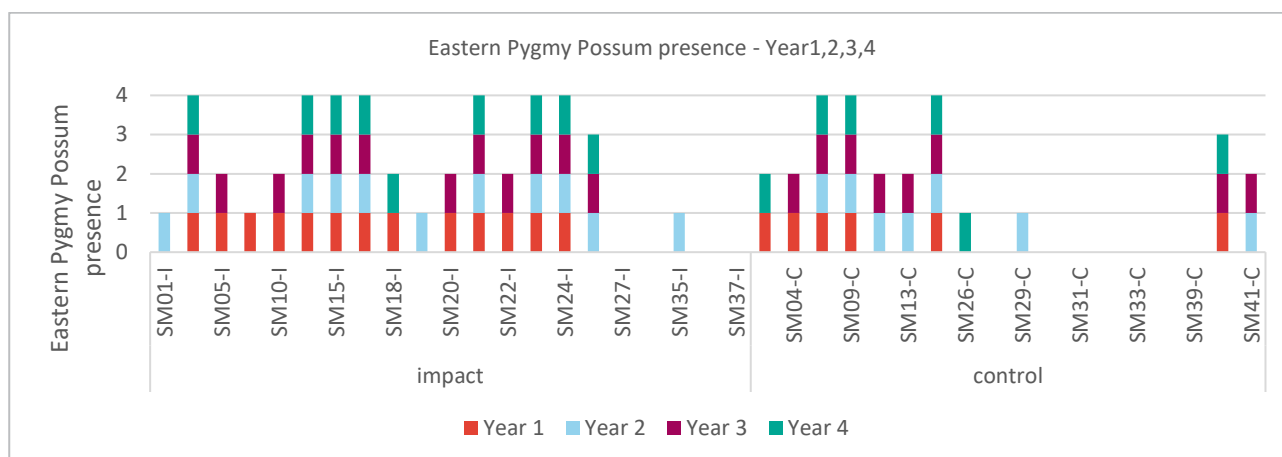
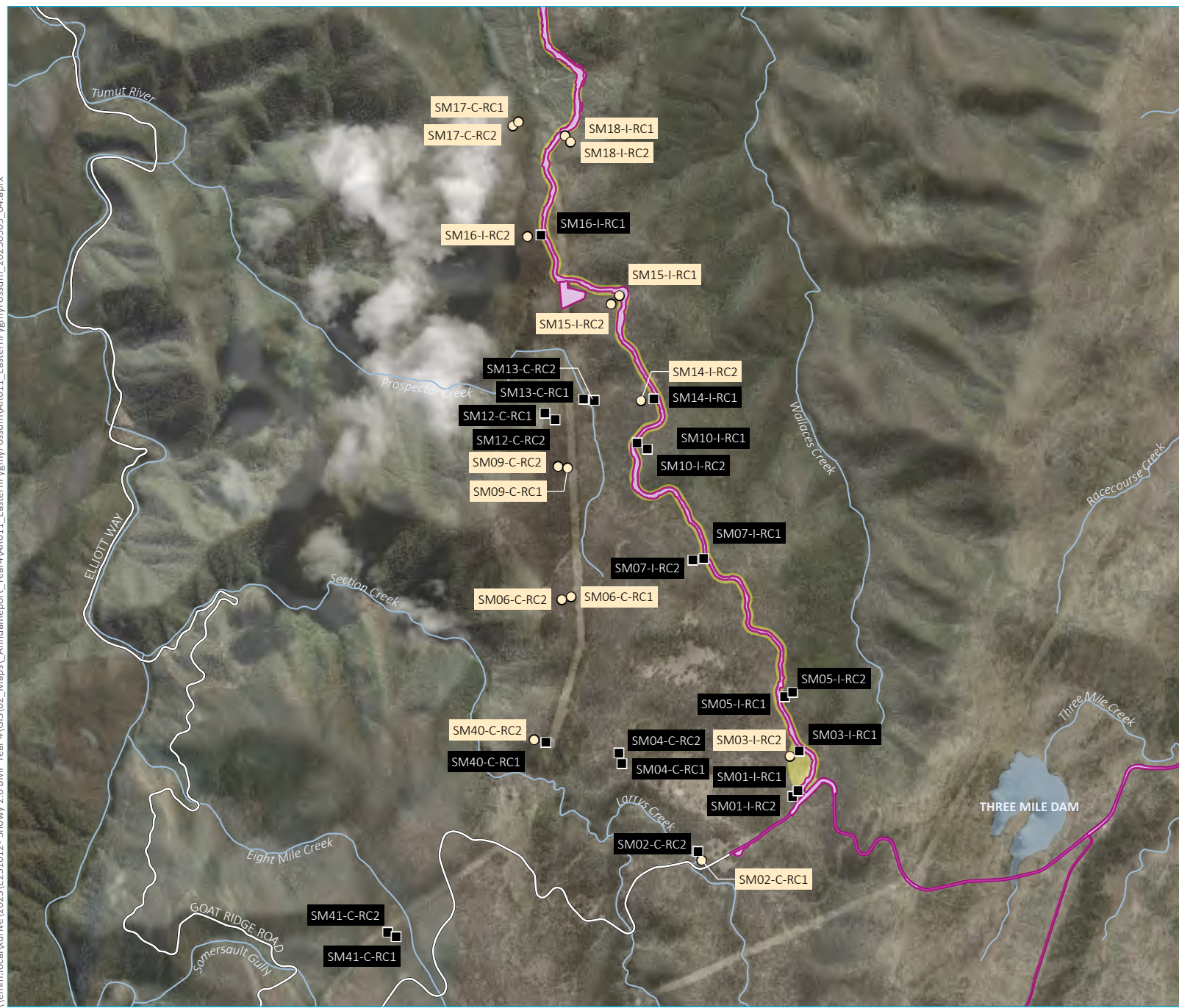
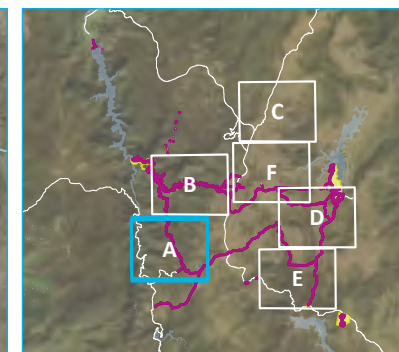


Plate 3.8 Year 2, Year 3 and Year 4 Eastern Pygmy-possum presence compared to baseline (Year 1)

\\emh.local\drive\2023\E231012 - Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR011_EasternPygmyPossum_20250305_04.aprx



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



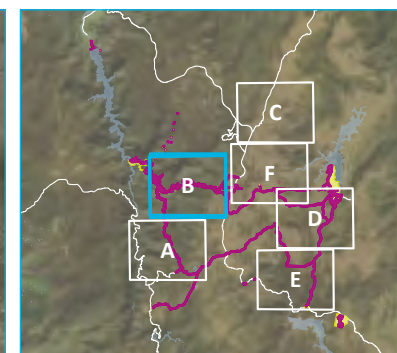
- KEY**
- Approved disturbance
 - Approved construction envelope
 - Camera records- Eastern Pygmy Possum
 - Presence
 - Absence
 - Unsuitable habitat
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Eastern Pygmy-possum presence/absence during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.3a



\\lemm.local\drive\2023\E231012 - Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR011_EasternPygmyPossum_20250305_04.aprx



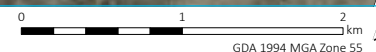
- KEY**
- Approved disturbance
 - Approved construction envelope
 - Camera records - Eastern Pygmy Possum
 - Presence
 - Absence
 - Unsuitable habitat
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Eastern Pygmy-possum presence/absence during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.3b



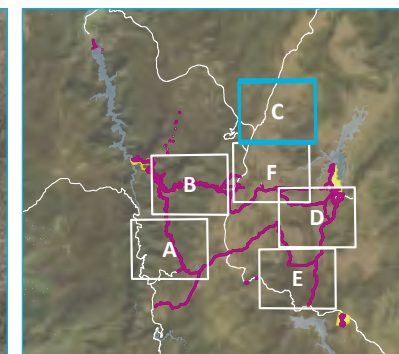
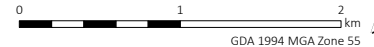
Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



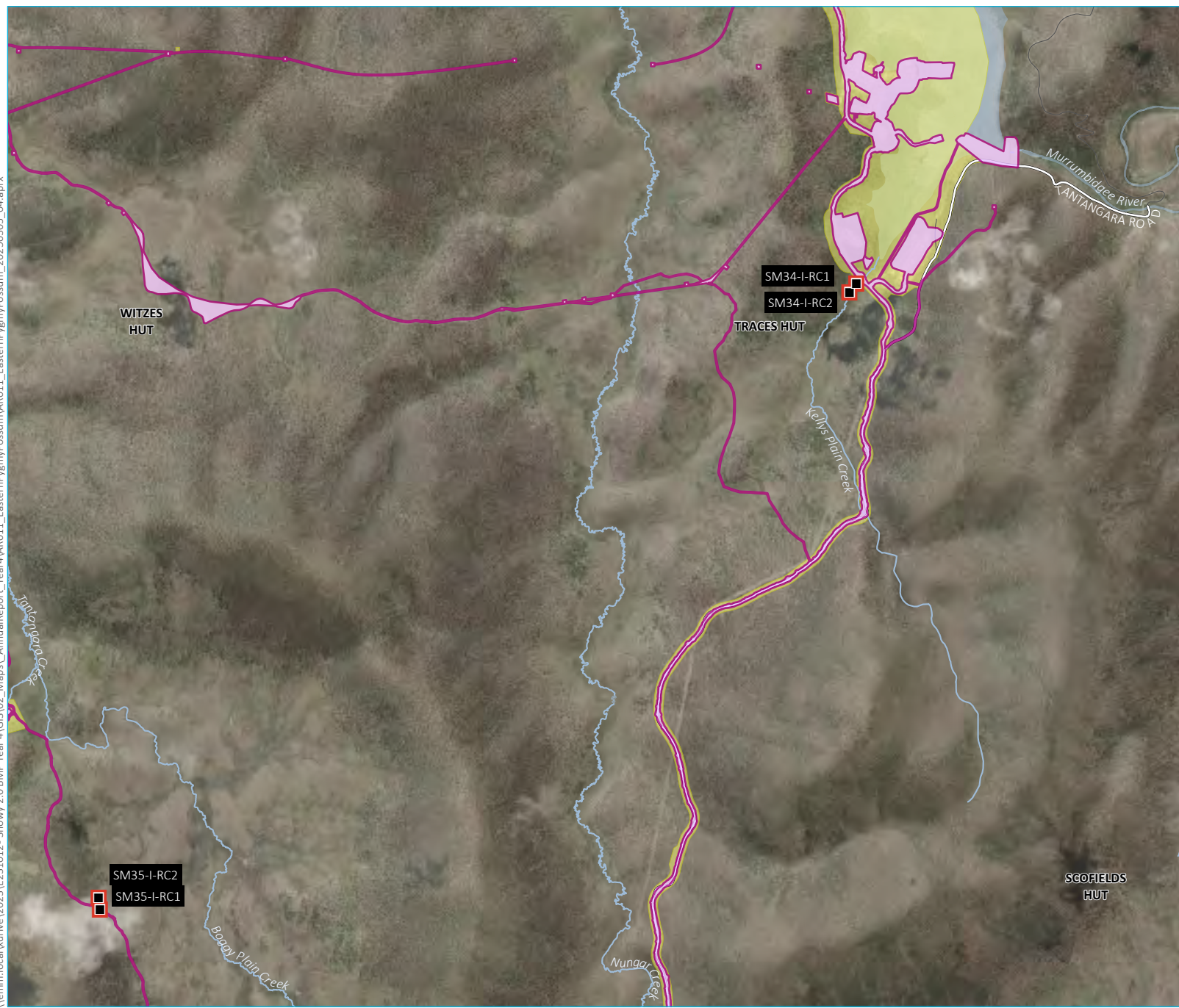
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 - Camera records - Eastern Pygmy Possum
 - Presence
 - Absence
 - Unsuitable habitat
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Eastern Pygmy-possum presence/absence during Year 4

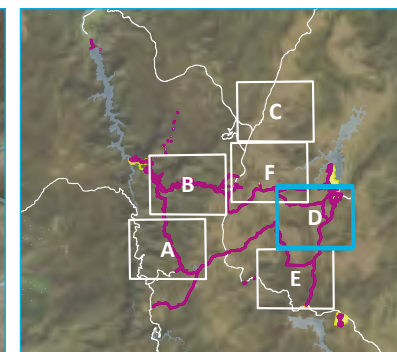
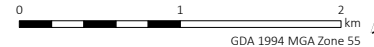
Snowy 2.0
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Annual report
Figure 3.3c



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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



KEY

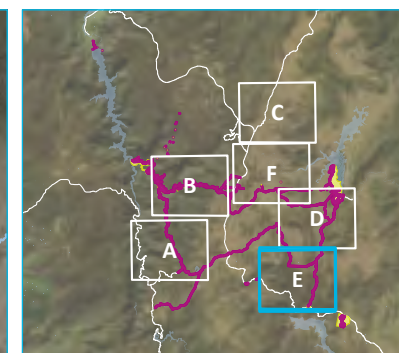
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- Approved construction envelope
- Camera records- Eastern Pygmy Possum
 - Presence
 - Absence
 - Unsuitable habitat
- Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Eastern Pygmy-possum presence/
absence during Year 4

Snowy 2.0
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Figure 3.3d



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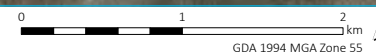
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 - Approved construction envelope
 - Camera records - Eastern Pygmy Possum
 - Presence
 - Absence
 - Unsuitable habitat
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Eastern Pygmy-possum presence/absence during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.3e



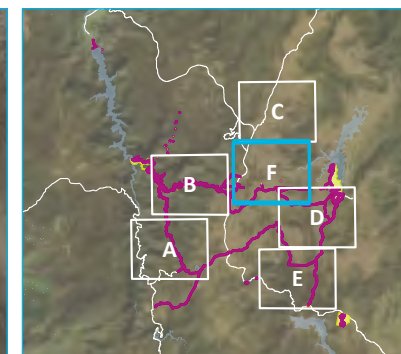
Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



\\femm.local\drive\2023\E231012 - Snowy 2.0 BMP Year 4\GIS\02_Maps\AnnualReport_Year4\AR011_EasternPygmyPossum_20250305_04.aprx



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)

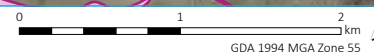


KEY

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- Approved construction envelope
- Camera records- Eastern Pygmy Possum
 - Presence
 - Absence
 - Unsuitable habitat
- Existing environment
 - Major road
 - Named watercourse
 - Waterbody

Eastern Pygmy-possum presence/absence during Year 4

Snowy 2.0
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Annual report
Figure 3.3f



iv Broad-toothed Rat

a Camera traps

Year 4

The Broad-toothed Rat (*Mastacomys fuscus*) (Photograph 3.3) was recorded at 13 sites during Year 4, including three impact sites and ten control sites (Figure 3.4). The target species was detected at 14% of all monitored impact site and was recorded at 33% of impact sites with suitable habitat. During Q1, the Broad-toothed Rat was recorded at one impact site (SM18-I) and nine control sites (SM02-C, SM04-C, SM17-C, SM28-C, SM30-C, SM31-C, SM32-C, SM33-C and SM39-C), representing 26% of all sites surveyed. During Q2, the species was recorded at one impact site (SM34-I) and four control sites (SM02-C, SM04-C, SM17-C and SM39-C), representing 16% of all sites surveyed. During Q3, the species was recorded at one impact site (SM34-I) and one control site (SM39-C), representing 6% of all sites surveyed. During Q4, the Broad-toothed Rat was recorded at two impact sites (SM14-I and SM34-I) and five control sites (SM28-C, SM30-C, SM32-C, SM39-C and SM40-C), representing 19% of all sites surveyed.

Broad-toothed Rat presence/absence at each monitoring site is summarised in Table 3.4 and presence at sites is presented in Plate 3.9. Further detailed information including monitoring dates and presence/absence at each camera is provided in Appendix D.

Lobs Hole

There are no small mammal cameras targeting Broad-tooth Rat at Lobs Hole due to the absence of suitable habitat for this species.

Ravine Road

There are no small mammal cameras targeting Broad-tooth Rat at Ravine Road due to the absence of suitable habitat for this species. Despite this, Broad-tooth Rat was recorded at two impact sites along Ravine Road (SM14-I and SM18-I).

Marica

One impact site (SM27-I) within Marica is located within suitable Broad-tooth Rat habitat but is yet to record the species.

Tantangara

Broad-tooth Rat was recorded at one impact site (SM34-I) and one control site (SM39-C) during Year 4.

Rock Forest

There are no small mammal cameras targeting Broad-tooth Rat at Rock Forest due to the absence of suitable habitat for this species.

Off-site/Remote

The species was recorded at the following control sites. One site along Link Road (SM02-C), two sites along Dead Mans Trail (SM04-C and SM40-C), one site along O'Hares Trail (SM17-C), three sites along Bullocks Hill Trail (SM28-C, SM30-C and SM31-C) one site along Hains Hut Trail (SM32-C) and one site along Port Phillip Trail (SM33-C). Seven sites (SM28-C, SM29-C, SM30, SM31-C, SM32-C, SM33-C, SM35-I) were unable to be surveyed during Q2 (Autumn) and Q3 (Winter) due to closures of parts of Kosciuszko National Park.



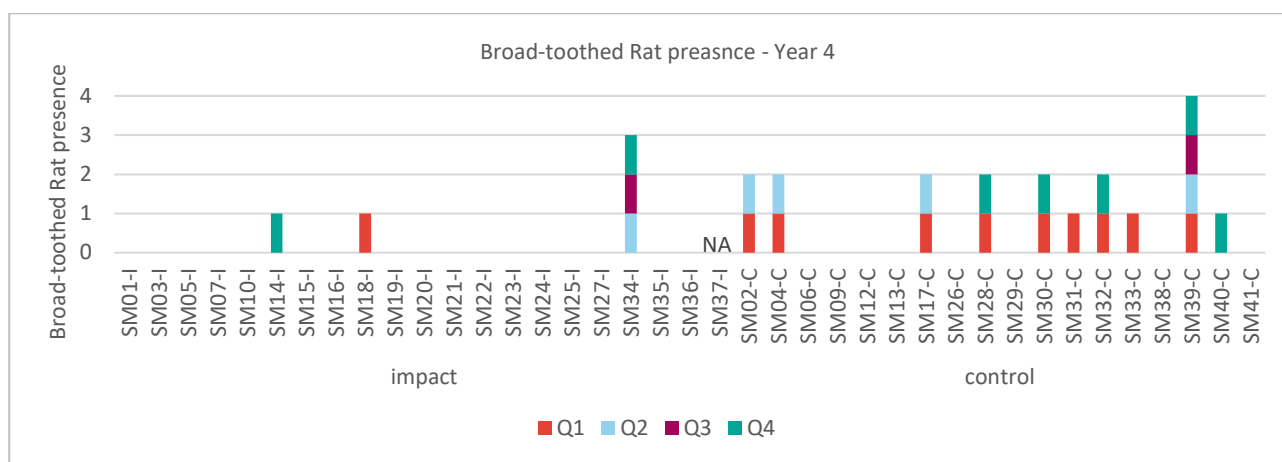
Photograph 3.3 Broad-toothed Rat recorded in Year 4 from site SM32-C-RC2 (left) and SM39-C-RC2 (right)

Table 3.4 Broad-toothed Rat remote camera records

Site	Previously recorded in Year 1	Previously recorded in Year 2	Previously recorded in Year 3	Q1 (Summer)	Q2 (Autumn)	Q3 (Winter)	Q4 (Spring)
Impact							
SM01-I		Present	Present				
SM03-I							
SM05-I							
SM07-I		Present					
SM10-I							
SM14-I							Present
SM15-I							
SM16-I							
SM18-I				Present			
SM19-I							
SM20-I							
SM21-I							
SM22-I							
SM23-I							
SM24-I							
SM25-I							
SM27-I							
SM34-I			Present		Present	Present	Present
SM35-I					NA	NA	
SM36-I		Present					
SM37-I			NA	NA	NA	NA	NA
Total sites where detected	0	3	2	1	1	1	2
Total sites where detected (% of total impact sites)	0%	14%	10%	5%	5%	5%	10%

Site	Previously recorded in Year 1	Previously recorded in Year 2	Previously recorded in Year 3	Q1 (Summer)	Q2 (Autumn)	Q3 (Winter)	Q4 (Spring)
Control							
SM02-C			Present	Present	Present		
SM04-C			Present	Present	Present		
SM06-C							
SM09-C							
SM12-C							
SM13-C							
SM17-C				Present	Present		
SM26-C							
SM28-C	Present		Present	Present	NA	NA	Present
SM29-C					NA	NA	
SM30-C	Present	Present	Present	Present	NA	NA	Present
SM31-C		Present	Present	Present	NA	NA	
SM32-C	Present	Present	Present	Present	NA	NA	Present
SM33-C	Present	Present	Present	Present	NA	NA	NA
SM38-C	Present	Present					
SM39-C	Present	Present	Present	Present	Present	Present	Present
SM40-C							Present
SM41-C							
Total sites where detected	6	6	8	9	4	1	5
Total sites where detected (% of total control sites)	33%	33%	44%	50%	33%	8%	29%
TOTAL (impact and control)	6 (15%)	9 (23%)	10 (26%)	10 (26%)	5 (16%)	2 (6%)	7 (19%)

Notes: Highlighted cells represent sites with unsuitable habitat for the Broad-toothed Rat. Blank cells represent absence of species. NA indicates sites not surveyed during that monitoring period.



Notes: NA – data missing due to camera moved, stolen, lost data or hardware errors.

Plate 3.9 Broad-toothed Rat presence across monitoring periods (Year 4)

Comparative analysis- Year 1, Year 2, Year 3 and Year 4

Between Year 1 (six sites) and Year 2 (nine sites), there was a 50% increase in the number of monitoring sites that reported Broad-toothed Rat presence. In Year 3, 10 sites recorded the species, representing a further increase from Year 2. By Year 4, detections rose to 13 sites, indicating a continued upward trend compared to previous years. Overall, this progression from six sites in Year 1 to 13 sites in Year 4 represents more than a twofold increase in the number of sites recording Broad-toothed Rat presence.

In Year 4, three impact sites (SM01-I, SM07-I, and SM36-I) recorded the absence of the Broad-toothed Rat, despite previous detections at these locations. However, as the species was not recorded during pre-construction/baseline surveys, none of these sites met the adaptive management triggers. One control site (SM38-C), which previously recorded Broad-toothed Rat presence during the pre-construction / baseline surveys, recorded the absence of the species for greater than one year.

A comparison of Year 2, Year 3 and Year 4 presence compared to Year 1 baseline is presented in Plate 3.13.

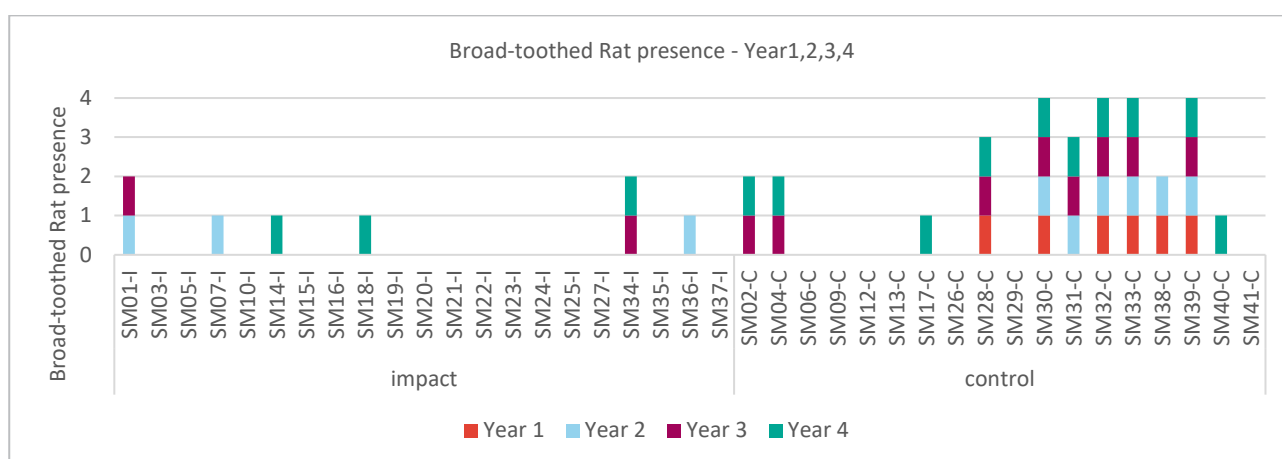


Plate 3.10 Year 2, Year 3 and Year 4 Broad-toothed Rat presence compared to baseline (Year 1)

b Faecal Pellet searches

Year 4

Broad-toothed Rat faecal pellet searches give an additional measure of occupancy (presence/absence) at monitoring sites where the species has been previously recorded.

During Year 4, Broad-toothed Rat (Photograph 3.3) faecal pellet searches weren't undertaken at five control sites (Off-site/remote: FP26, FP27, FP31, FP32, FP33) during Q2 and Q3, due to closures of Kosciuszko National Park (Figure 3.4). Broad-toothed Rat presence was recorded at all control sites (Tantangara Road FP24; Off-site/remote: FP26, FP27, FP30, FP31, FP32 and FP33) and all impact sites (Marica FP 20; Tantangara FP19, FP18 and FP17). Across Year 4, control and impact sites comprised rare, uncommon, common, and abundant faecal pellets of all ages (fresh, intermediate, and old).

Broad-toothed Rat faecal pellet presence/absence at each monitoring site is summarised in Table 3.5 and presence at sites is presented in Plate 3.11. Further detailed information including monitoring dates is provided in Appendix D.

Limitations

Five faecal pellet control sites were unable to be surveyed during Q2 and Q3 as they were located within closed areas of Kosciuszko National Park. NPWS did not grant access between Thursday 4 April and Friday 4 October 2024. The inability to access these sites is not considered to increase the likelihood of requiring adaptive management actions for Broad-toothed rat and has been considered during analysis of Year 4 data.

Table 3.5 Broad-toothed Rat faecal pellet presence, including abundance and age

Site	Monitoring event			
	First (Q1)	Second (Q2)	Third (Q3)	Fourth (Q4)
Impact				
FP17	Abundant (Fresh)	Common (Intermediate)	Abundant (Fresh)	Abundant (Old)
FP18	Abundant (Fresh)	Common (Intermediate)	Abundant (Fresh)	Common (Intermediate)
FP19	Uncommon (Intermediate)	Uncommon (Intermediate)	Common (Fresh)	Abundant (Old)
FP20	Rare (Old)	0	0	0
Control				
FP24	Common (Intermediate)	Common (Fresh)	Abundant (Fresh)	Abundant (Old)
FP26	Common (Intermediate)	NA	NA	Abundant (Fresh)
FP27	Rare (Intermediate)	NA	NA	Abundant (Intermediate)
FP30	Rare (Intermediate)	Common (fresh)	Abundant (Fresh)	Uncommon (Old)
FP31	Common (Old)	NA	NA	Uncommon (Old)
FP32	Abundant (Old)	NA	NA	Abundant (Intermediate)
FP33	Abundant (Fresh)	NA	NA	Common (Old)

Notes: Faecal pellet abundance: Abundant >200 faecal pellets, common = 100-200 faecal pellets, uncommon = 50-100 faecal pellets, rare <50 faecal pellets and t present = faecal pellets recorded; faecal pellet age: Old = completely dry, fresh = bright olive green, intermediate = between old and fresh; and 0 represents absence of pellets at the monitoring site. NA = unable to be accessed during Q2 and Q3 due to the closure of Kosciuszko National Park

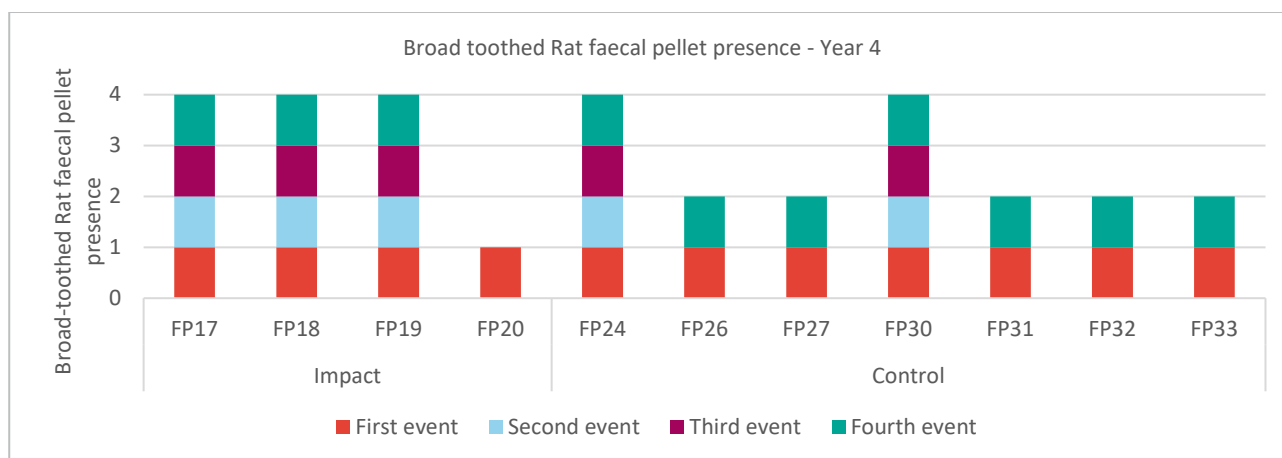


Plate 3.11 Broad-toothed Rat faecal pellet presence across monitoring periods

Comparative analysis- Year 1, Year 2, Year 3 and Year 4

Between Year 1 and Year 2, an overall increase in the presence of Broad-toothed Rat faecal pellets was observed across all sites, with the exception of two impact sites (FP17 and FP20) and one control site (FP30). At these three sites, change in Broad-toothed Rat faecal pellet presence was recorded. In Year 3, all sites recorded the presence of the target species across the same or higher numbers of monitoring events, except for impact site FP18. At FP18, records were made only during one monitoring event in Year 3, two monitoring events in Year 2 and zero in Year 1. Impact site FP20 recorded the presence of the species for the first time in Year 3.

In Year 4, all sites recorded the presence of the target species across the same or higher numbers of monitoring events compared to Year 3, except for sites in which only two monitoring events were conducted due to Kosciuszko National Park closures. Impact site FP20 was the only site to record the target species in less than two monitoring events. Monitoring events Q2 and Q3 recorded the target species at five out of the six sites which were accessible during the survey period.

A comparison of Year 2, Year 3 and Year 4 presence compared to Year 1 baseline is presented in Plate 3.12.

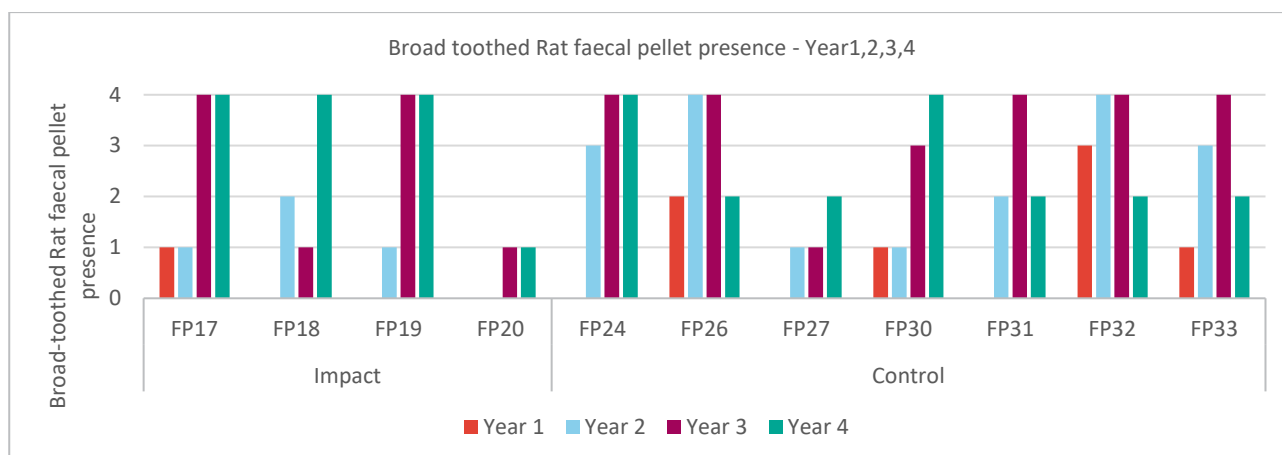


Plate 3.12 Broad-toothed Rat faecal pellet presence during Year 2, Year 3 and Year 4 compared to baseline (Year 1)

In Year 2, the species' presence was recorded during the first monitoring event (Q1) for the first time. In Year 1 and Year 2, the greatest number of sites recording Broad-toothed Rat presence was documented in the third monitoring event (Q3). In Year 4 all monitoring events presented high numbers of surveyed sites (83%-100%) recording the target species with the highest number recorded in the first monitoring event.

The presence recorded at the four monitoring events in Year 2 and Year 3 compared to Year 1 baseline is presented in Plate 3.13.

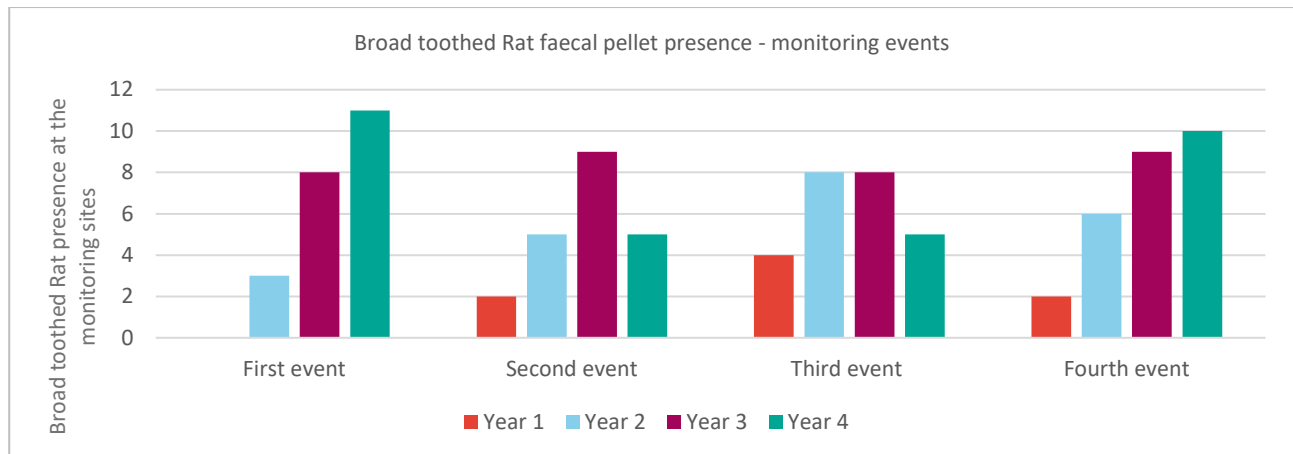
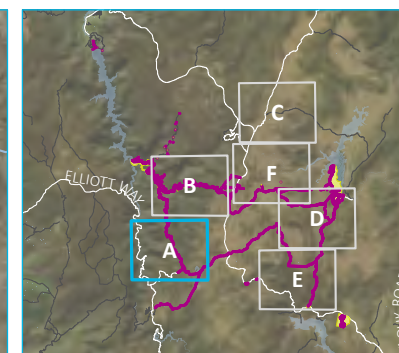
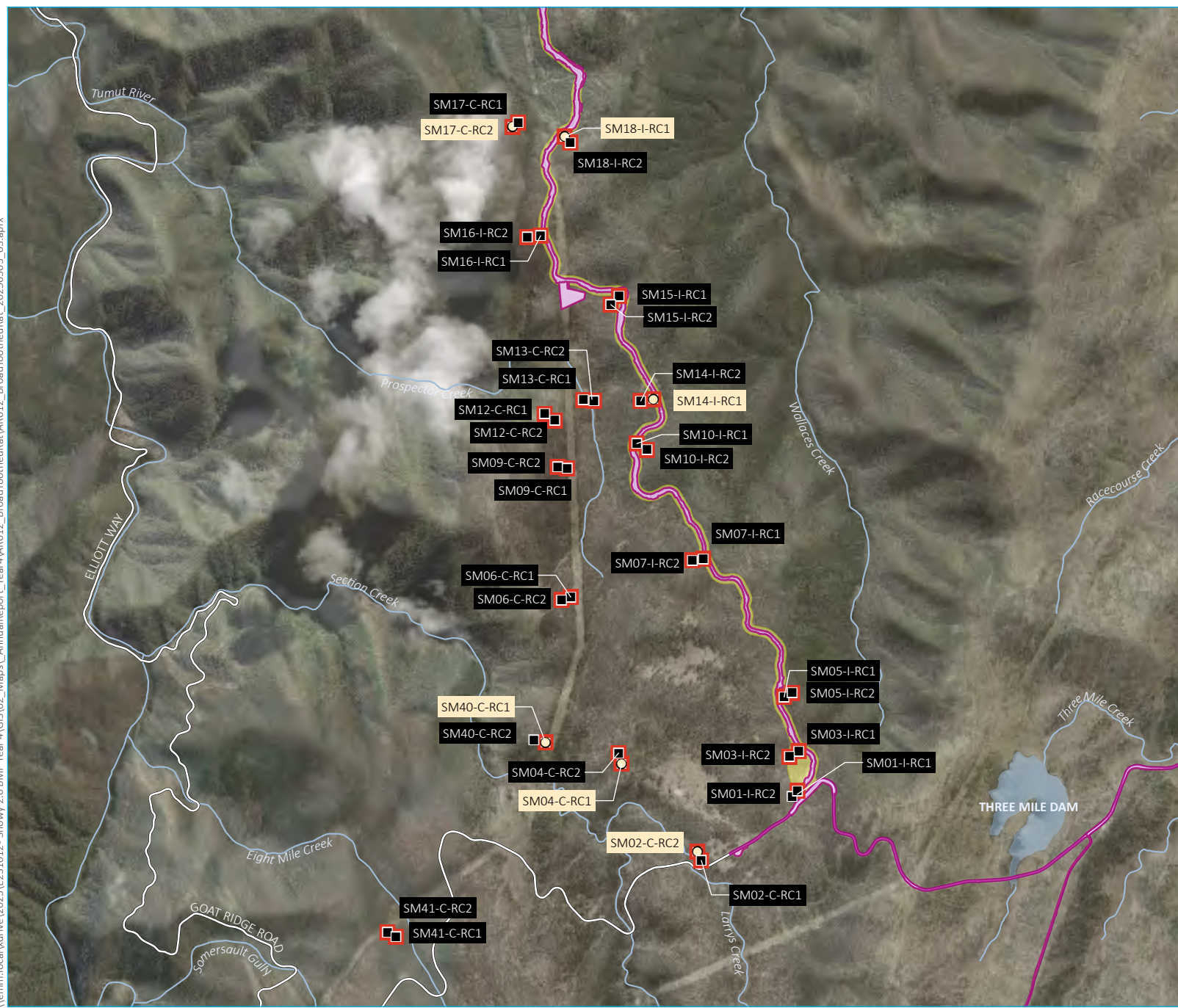


Plate 3.13 Broad-toothed Rat faecal pellet presence recorded at the monitoring sites during the four monitoring events of Year 2 Year 3 and Year 4 compared to baseline (Year 1)

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KEY

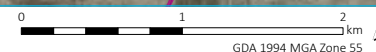
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- Approved construction envelope
- Camera records- Broad-toothed Rat
 - Presence
 - Absence
 - Unsuitable habitat
- Faecal records- Broad-toothed Rat
 - Absence
 - Presence
- Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Broad-toothed Rat presence/absence during Year 4

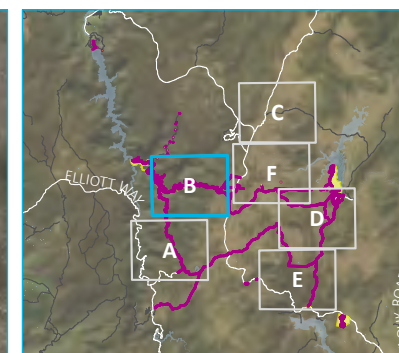
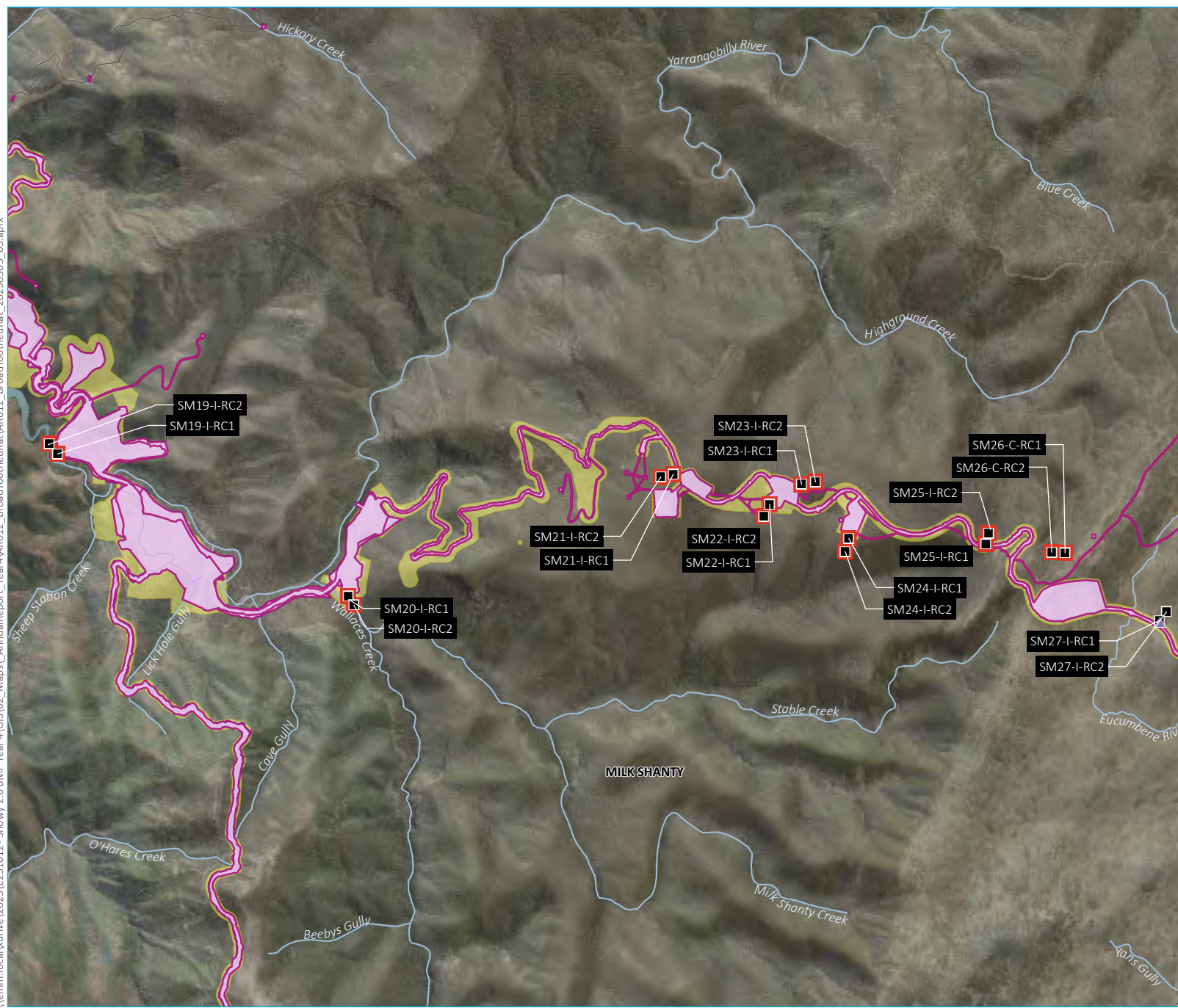
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Figure 3.4a



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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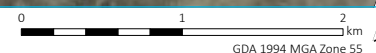
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- Camera records- Broad-toothed Rat
 - Presence
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- Faecal records- Broad-toothed Rat
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Broad-toothed Rat presence/absence during Year 4

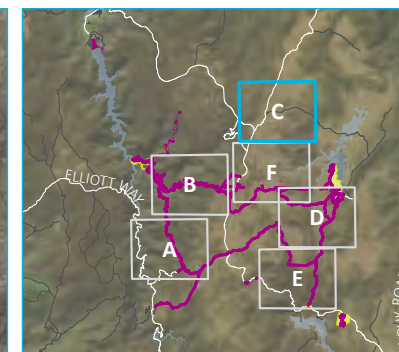
Snowy 2.0
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Figure 3.4b



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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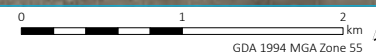
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- Faecal records- Broad-toothed Rat
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Broad-toothed Rat presence/absence during Year 4

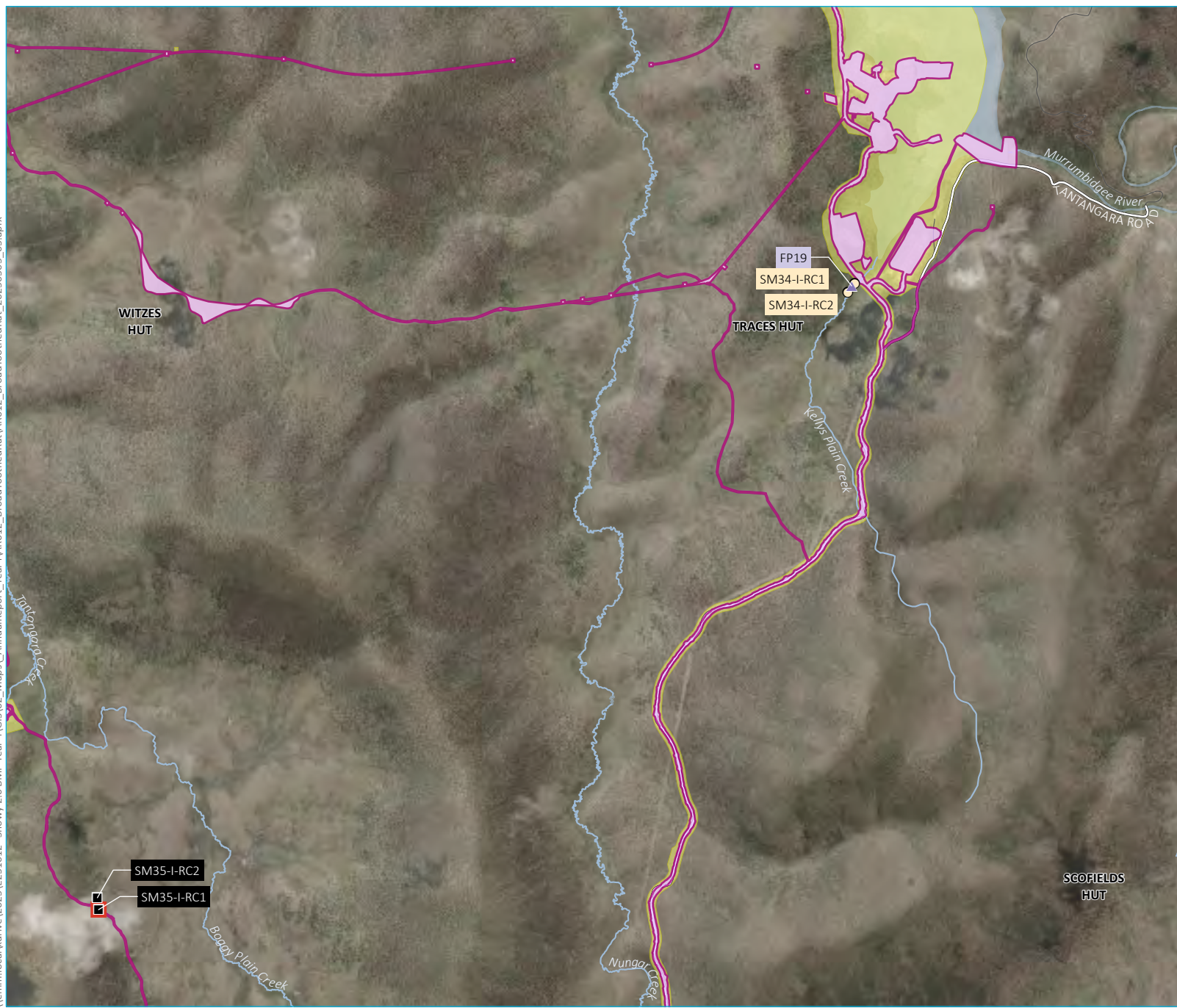
Snowy 2.0
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Figure 3.4c



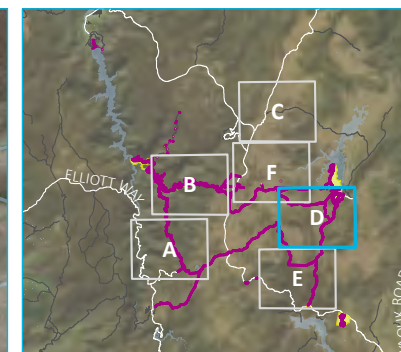
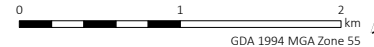
Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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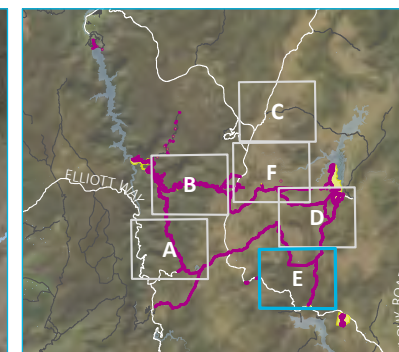
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- Absence
- Unsuitable habitat
- Faecal records- Broad-toothed Rat
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- Presence
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Broad-toothed Rat presence/absence during Year 4

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Figure 3.4d



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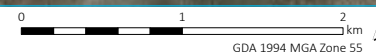
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- Approved construction envelope
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- Presence
- Absence
- Unsuitable habitat
- Faecal records- Broad-toothed Rat
- ▲ Absence
- ▲ Presence
- Existing environment
- Major road
- Named watercourse
- Waterbody

Broad-toothed Rat presence/absence during Year 4

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Figure 3.4e



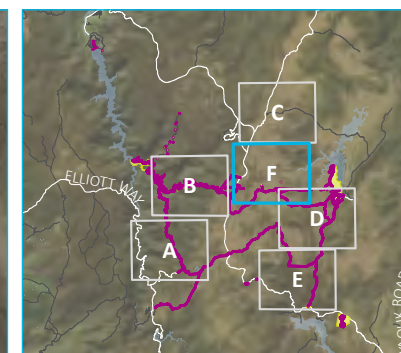
Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



KEY

- Approved disturbance
- Approved construction envelope

Camera records- Broad-toothed Rat

- Presence
- Absence
- Unsuitable habitat

Faecal records- Broad-toothed Rat

- ▲ Absence
- ▲ Presence

Existing environment

- Major road
- Named watercourse
- Waterbody

Broad-toothed Rat presence/absence during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.4f



0 1 2 km
GDA 1994 MGA Zone 55

3.2.2 Habitat characteristic monitoring

The objective of the small terrestrial mammal habitat characteristic monitoring is to determine the habitat characteristics of occupied Smoky Mouse, Eastern Pygmy-possum, and Broad-toothed Rat habitat within proximity to the Main Works project and document any changes to the habitat arising from the Main Works project.

According to the BMP, any native or exotic flora species, or other habitat structures (deep (>5 cm) leaf litter, logs or coarse woody debris), recorded at each monitoring site was scored to gain an estimate of habitat complexity below 1.5 m and exotic cover. Cover was split into three categories (native, exotic and habitat structure) and percentage recorded at three height intervals (<0.5 m, 1–1.5 m, 1–1.5 m).

i Year 4

During Year 4, 39 sites were surveyed (Appendix D).

During Year 4, native vegetation cover was higher or equivalent at impact sites when compared to control sites for all height classes, with a percentage difference range between 0% and 22%. Impact and control sites recorded an equal average cover of native species (70%) below 0.5 m. Greater native vegetation cover occurred at impact sites at 0.5–1 m; 52% at the impact sites and 30% at the control sites. Impact sites also had greater native cover at 1–1.5 m; 22% at impact sites and 15% at control sites.

During Year 4, exotic vegetation cover was similar at impact and control sites for all height classes, with an average percentage difference range between 1% and 7%. Impact sites recorded a greater average cover of exotic species below 0.5 m (17%) compared to control sites (15%). Specifically, two control sites on Dead Mans Trail and Link Road (SM40-C and SM41-C respectively) and ten impact sites (Ravine Road: SM15-I, SM16-I, SM18-I; Lobs Hole: SM20-I; Marica SM21-I, SM22-I, SM24-I, SM27-I; Tantangara SM34-I; and Alpine Creek Trail SM35-I) recorded exotic species cover $\geq 20\%$. Impact sites recorded a greater average exotic vegetation cover at 0.5–1 m, (7%) compared to control sites (0%). A greater average of exotic cover occurred at 1–1.5 m at 1% at impact sites but not at control sites.

During Year 4, habitat structure cover was similar at impact and control sites for all height classes, with an average percentage difference range between 1% and 12%. The average habitat structure cover was greater at impact sites at the <0.5 m height class, with impact sites averaging 19% and control sites averaging 7% cover. Impact sites recorded a greater average habitat structure at 0.5–1 m with 7% at impact sites but not at control sites. Habitat structure at the 1–1.5 m height class was similar between control (0%) and impact sites (1%).

Data is presented in Table 3.6 and presented in Plate 3.14. Data is provided for each site in Appendix D.

Table 3.6 Minimum, maximum and average cover scores by height class for native vegetation, exotic vegetation and habitat structure at control and impact sites

Component		<0.5 m		0.5–1 m		1–1.5 m	
		Control	Impact	Control	Impact	Control	Impact
Native	Minimum	42%	21%	0%	3%	0%	0%
	Maximum	97%	105%	90%	82%	65%	76%
	Average	70%	70%	30%	52%	15%	22%
Exotic	Minimum	0%	0%	0%	0%	0%	0%
	Maximum	54%	91%	5%	52%	2%	20%
	Average	15%	17%	0%	7%	0%	1%
Habitat structure	Minimum	0%	0%	0%	0%	0%	0%
	Maximum	40%	64%	3%	27%	1%	3%
	Average	7%	19%	0%	7%	0%	1%

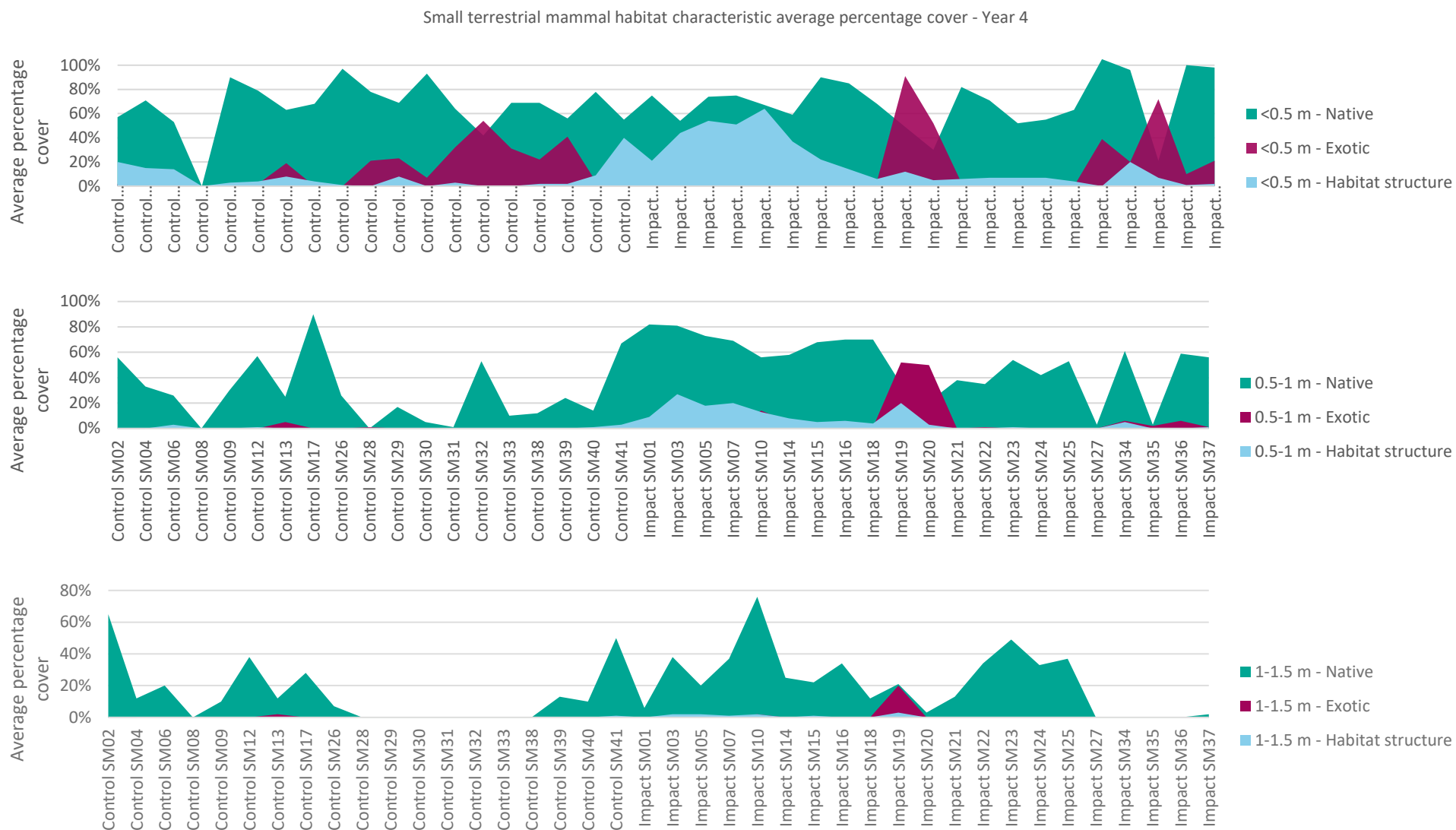


Plate 3.14 Average percentage cover (native, exotic, and habitat structure) below 1.5 m recorded during Year 4

The average cover scores recorded across the four monitoring years is presented in Table 3.7.

Average cover scores for native vegetation at both impact and control sites increased or remained the same across all three height intervals between Year 1 and Year 2. In Year 3, the average native species cover either increased or remained the same as in previous years, or slightly decreased, but never by more than 2% compared to the percentage recorded in Year 1. Similarly in Year 4, the average native species cover either increased or slightly decreased, but never by more than 4% compared to the percentage recorded in Year 1. The 0.5–1 m cover interval saw the greatest increases for both control and impact with increases of 14% and 34% respectively compared to the Year 3.

Average cover scores for exotic vegetation at impact sites increased or remained the same across all three height intervals between Year 1 and Year 2. In Year 3, the percentage declined, reaching lower values than the ones recorded in Year 1. In Year 4, the average cover scores for exotic vegetation at impact sites increased between 6 and 5% at both <0.5 m interval and 0.5–1 m interval, but decreased by 1% at the 1–1.5 m interval in comparison to Year 3. In comparison to the control sites, the impact sites in Year 4 recorded a greater average exotic cover by 1% to 7%. In Year 4, the average exotic cover remained highest at the <0.5 m interval.

Average cover scores for habitat structure at both impact and control increased, decreased or remained the same compared to Year 3 with changes being no greater than 5%. The <0.5 m interval at control sites had the greatest difference compared to Year 1, decreasing from 18% to 7%. Habitat structure at the 0.5–1 m interval was the greatest difference compared to Year 3 with an increase of 5%.

A comparison of Year 4, Year 3, Year 2 and Year 1 (baseline) is presented in Plate 3.15 for the average native vegetation, exotic vegetation and habitat structure cover.

Table 3.7 Average cover scores by height class for native vegetation, exotic vegetation and habitat structure at control and impact sites across the four monitoring years

Component	Monitoring year	<0.5 m		0.5–1 m		1–1.5 m	
		Control	Impact	Control	Impact	Control	Control
Native	Year 1	74%	74%	15%	17%	2%	3%
	Year 2	90%	90%	18%	19%	4%	9%
	Year 3	78%	72%	16%	18%	9%	16%
	Year 4	70%	70%	30%	52%	15%	22%
Exotic	Year 1	18%	14%	1%	2%	0%	0%
	Year 2	9%	19%	0%	1%	0%	0%
	Year 3	8%	12%	1%	1%	0%	2%
	Year 4	15%	17%	0%	7%	0%	1%
Habitat structure	Year 1	18%	18%	0%	1%	0%	0%
	Year 2	27%	25%	1%	1%	0%	0%
	Year 3	8%	15%	1%	2%	0%	1%
	Year 4	7%	19%	0%	7%	0%	1%



Plate 3.15 Average vegetation cover (from the top: native, exotic and habitat structure cover) by height class across the four monitoring years

3.3 Frog monitoring

3.3.1 Occupancy (presence/absence) monitoring

The objective of the frog occupancy monitoring is to determine occupancy distribution of the threatened frog target species, Alpine Tree Frog (*Litoria verreauxii alpina*) and Booroolong Frog (*Litoria booroolongensis*) and document any changes arising from the Main Works.

i Alpine Tree Frog occupancy

a Year 4

The Alpine Tree Frog (Photograph 3.4) was recorded at all eight sites across the three monitoring events conducted during Year 4 (Figure 3.5). Due to unsuitable weather conditions at NC01 (rain) and MR01 (temperature lower than 10 degrees) and unsafe road conditions at NC03, the first monitoring event for these three sites (NC01, MR01 and NC03) was conducted during a third monitoring event between 9 February and 10 February 2024 as opposed to the other five sites (ER02, KPC01, TC02, TC03, and TR01) which were surveyed between 12 January and 15 January 2024. The second monitoring event for site ER02 was also postponed to 9 February 2024, due to unsuitable weather conditions while all other seven sites were surveyed between 21 January and 24 January 2024. Limitations of the delayed survey outside of the suggested survey window are presented and discussed in Section 3.3.3.

Over the three monitoring events conducted in Year 4, 75 Alpine Tree Frogs were recorded across all four impact sites (Tantangara Road NC01; Alpine Creek Trail TC02; and Tantangara TR01 and KPC01). At the control sites, 82 Alpine Tree Frogs were recorded across the four sites (Bullocks Hill Trail TC03; Snowy Mountains Highway ER02; Tantangara Road MR01; and Circuits Trail NC03). The control sites had the highest number of sightings, however, impact site TR01 recording the highest (43 records) number of individuals.

Alpine Tree Frog presence/absence at each monitoring site is summarised in Table 3.8 and presented in Plate 3.16. Further detailed information including monitoring dates is provided in Appendix E.

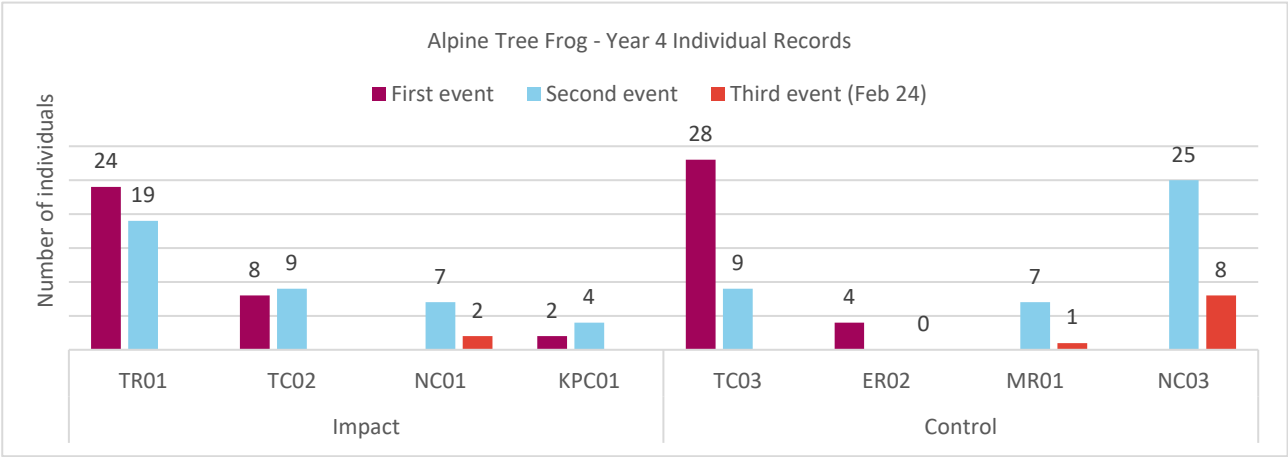


Photograph 3.4 Alpine Tree Frog recorded during January 2024 monitoring surveys

Table 3.8 **Number of Alpine Tree Frog individuals recorded in Year 4**

Site	Monitoring event	
	First (January-February 2024)	Second (January-February 2024)
Impact		
TR01	24	19
TC02	8	9
NC01	2*	7
KPC01	2	4
Total (impact)	36	39
Control		
TC03	28	9
ER02	4	0*
MR01	1*	7
NC03	8*	25
Total (control)	41	41
TOTAL	77	80

Notes: * – survey was conducted during the third survey event between 9 February and 10 February 2024.



Notes: Due to unsuitable weather conditions at NC01 (rain) and MR01 (temperature lower than 10 degrees), unsafe road conditions at NC03 the first monitoring event for these three sites was conducted between 9 February and 10 February 2024. Due to excess fatigue, the second monitoring event for ER02 was also conducted between 9 February and 10 February 2024.

Plate 3.16 **Alpine Tree Frog records during Year 4**

b Comparative analysis- Year 1, Year 2, Year 3 and Year 4

The total number of Alpine Tree frog records was 160 individuals in Year 1, 165 individuals in Year 2, 146 in Year 3 and 157 individuals in Year 4. The total number of Alpine Tree Frogs recorded at impact sites was 16 in Year 1, 27 in Year 2, 21 in Year 3 and 75 in Year 4. The number of Alpine Tree Frogs recorded at control sites was 144 in Year 1, 138 in Year 2, 125 in Year 3 and 82 in Year 4. Compared to previous years the number of individuals has remained similar. However, control sites have shown a decrease in numbers while impact sites have shown an increase of records.

In comparison to Year 1, there was a 369% increase of records at impact sites and a 43% decline at control sites surveyed in Year 4. In comparison to Year 2, there was a 178% increase of records at impact sites and a 41% decline at control sites surveyed in Year 4. In comparison to Year 3, there was a 257% increase in records at impact sites and 34% decline at control sites surveyed in Year 4. In Year 4, all impact sites have shown an increase in records when compared to both the previous survey season (Year 3) and baseline surveys (Year 1). However, three control sites (TC03, ER02 and MR01) showed a decrease in records in Year 4 compared to Year 1 and three control sites (ER02, MR01 and NC03) showed a decrease in records in Year 4 compared to Year 3.

During Year 1, the number of individuals recorded in the second monitoring event was 48% lower than in the first monitoring event. During Year 2, the number of individuals recorded in the second monitoring event was 368% greater than in the first monitoring event. During Year 3, the number of individuals recorded in the second monitoring event was 32% lower than in the first monitoring event. During Year 4, three sites were unable to be surveyed in the first monitoring event and one was unable to be surveyed in the second monitoring event. To ensure all transects were surveyed twice in Year 4, additional surveys were conducted in February 2024; however, calculations presented in Section 3.3.3 show that two transects (ER02 and MR01) recorded a number of individuals that falls outside of the standard deviation observed between Year 1 and Year 3. Accordingly, ER02 and MR01 were excluded from comparisons with previous years in this section. Calculating percentage differences between the first and second monitoring events, excluding ER02 and MR01, showed that the second monitoring event recorded an 18% higher number of individuals compared to the first monitoring event.

Plate 3.17 shows the comparison between the number of Alpine Tree Frogs recorded during Year 1, Year 2, Year 3 and Year 4. Plate 3.18 shows the comparison between monitoring events conducted across the four monitoring years.

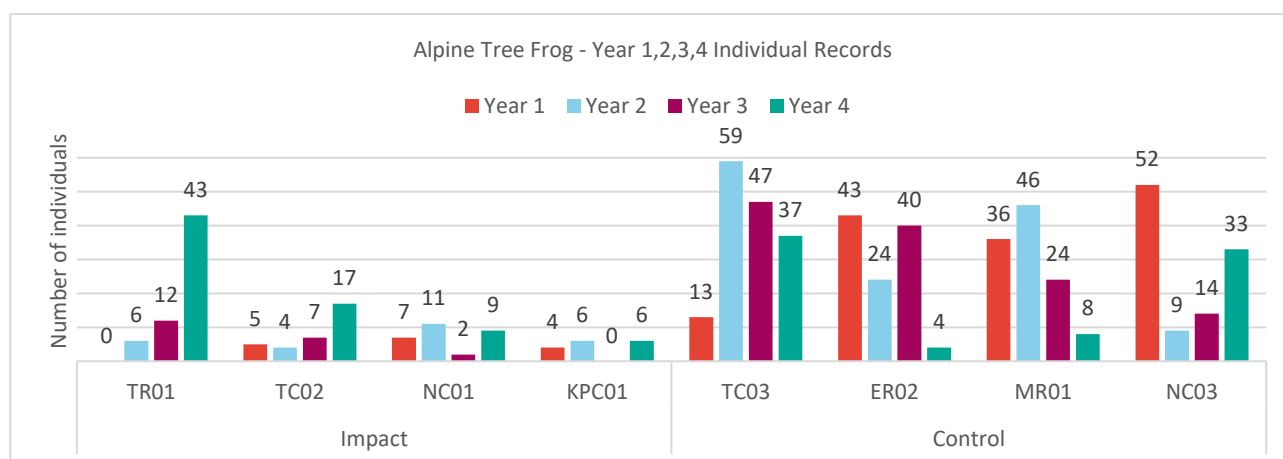
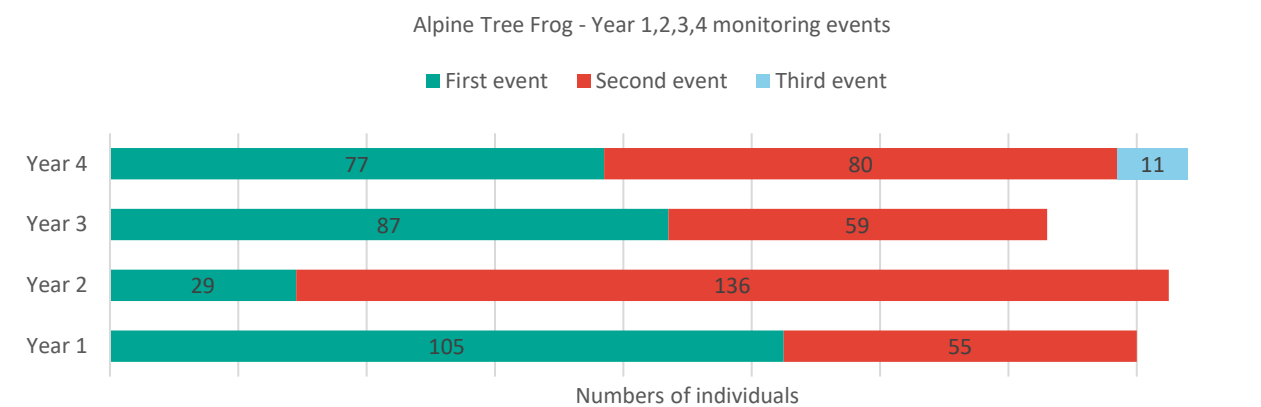


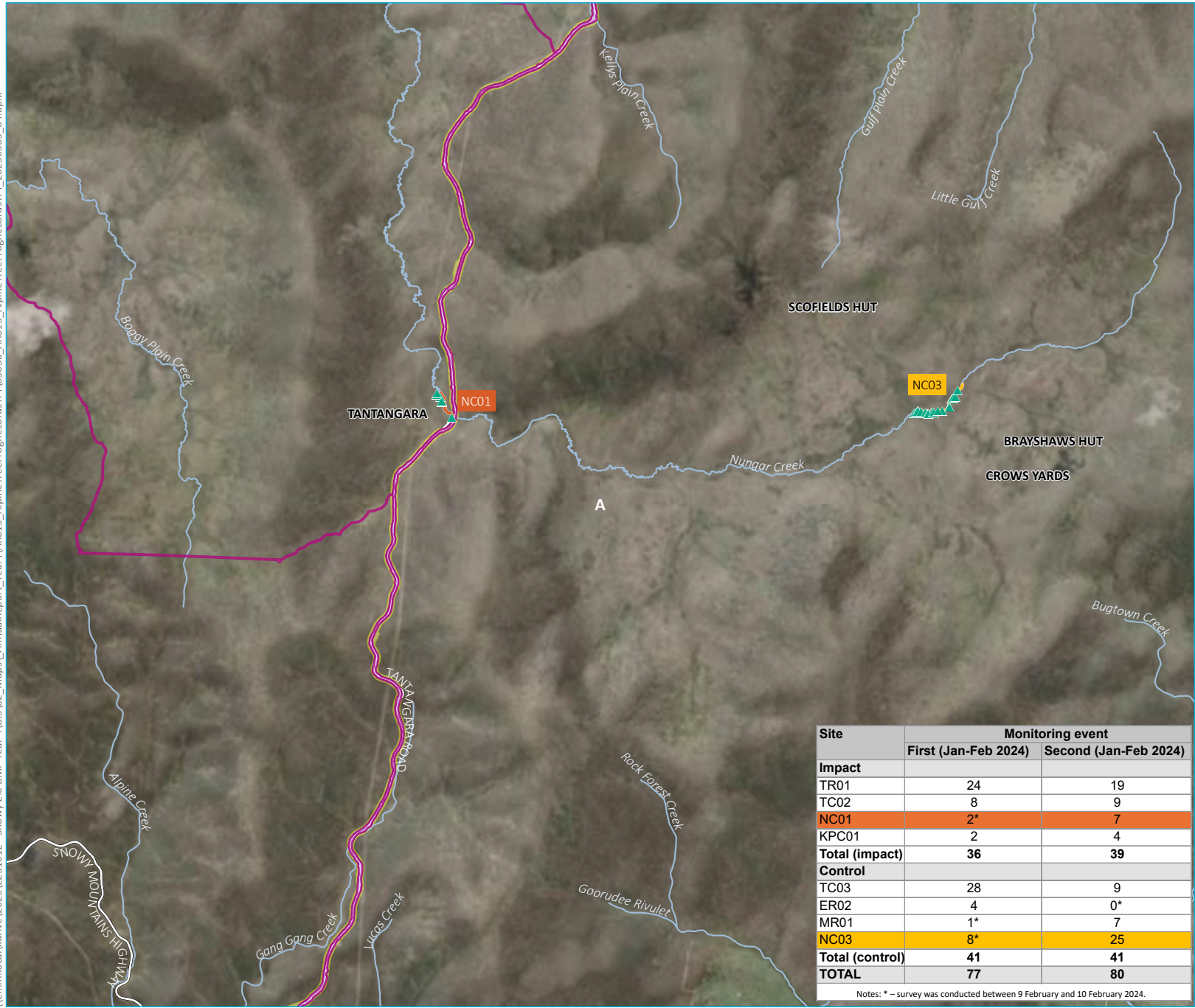
Plate 3.17 Alpine Tree Frog records during Year 1, Year 2, Year 3 and Year 4



Notes: Due to unsuitable weather conditions at NC01 (rain) and MR01 (temperature lower than 10 degrees), unsafe road conditions at NC03 the first monitoring event for these three sites was conducted between 9 February and 10 February 2024. Due to excess fatigue, the second monitoring event for ER02 was also conducted between 9 February and 10 February 2024.

Plate 3.18 Alpine Tree Frog records during first and second event of Year 1, Year 2, Year 3 and Year 4

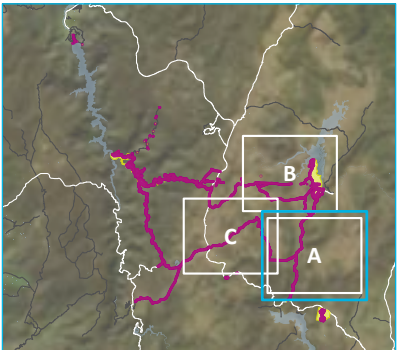
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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)

Site	Monitoring event	
	First (Jan-Feb 2024)	Second (Jan-Feb 2024)
Impact		
TR01	24	19
TC02	8	9
NC01	2*	7
KPC01	2	4
Total (impact)	36	39
Control		
TC03	28	9
ER02	4	0*
MR01	1*	7
NC03	8*	25
Total (control)	41	41
TOTAL	77	80

Notes: * – survey was conducted between 9 February and 10 February 2024.



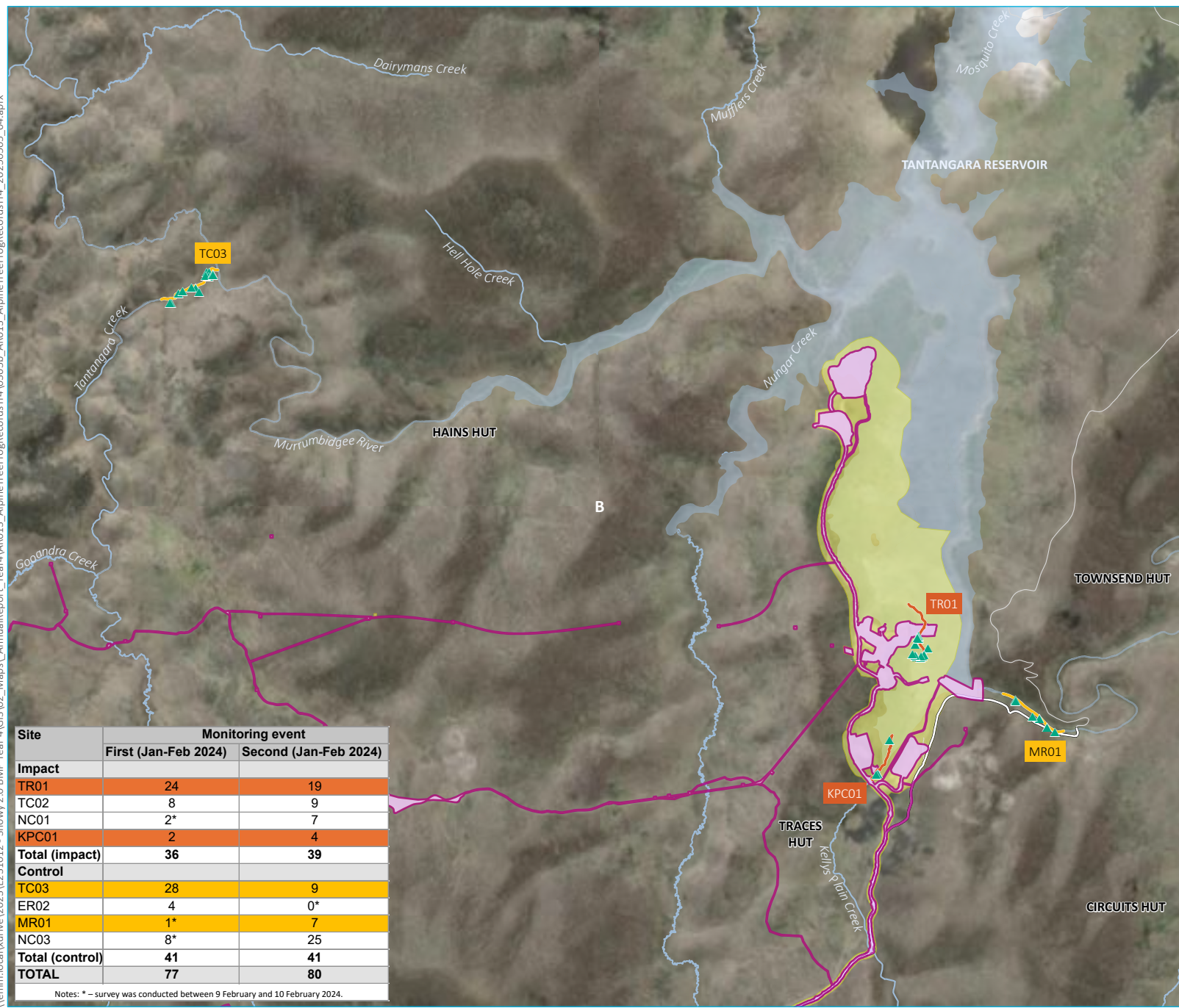
- KEY
- Approved disturbance
 - Approved construction envelope
 - Alpine Tree Frog records
 - Alpine Tree Frog monitoring location
 - Control
 - Impact
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Alpine Tree Frog records during Year 4

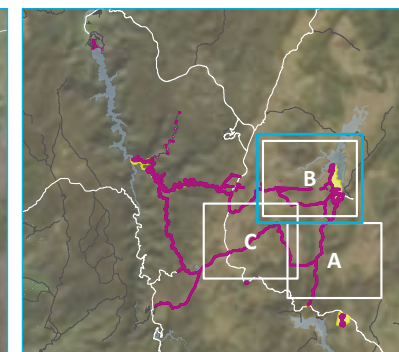
Snowy 2.0
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Annual report
Figure 3.5a



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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



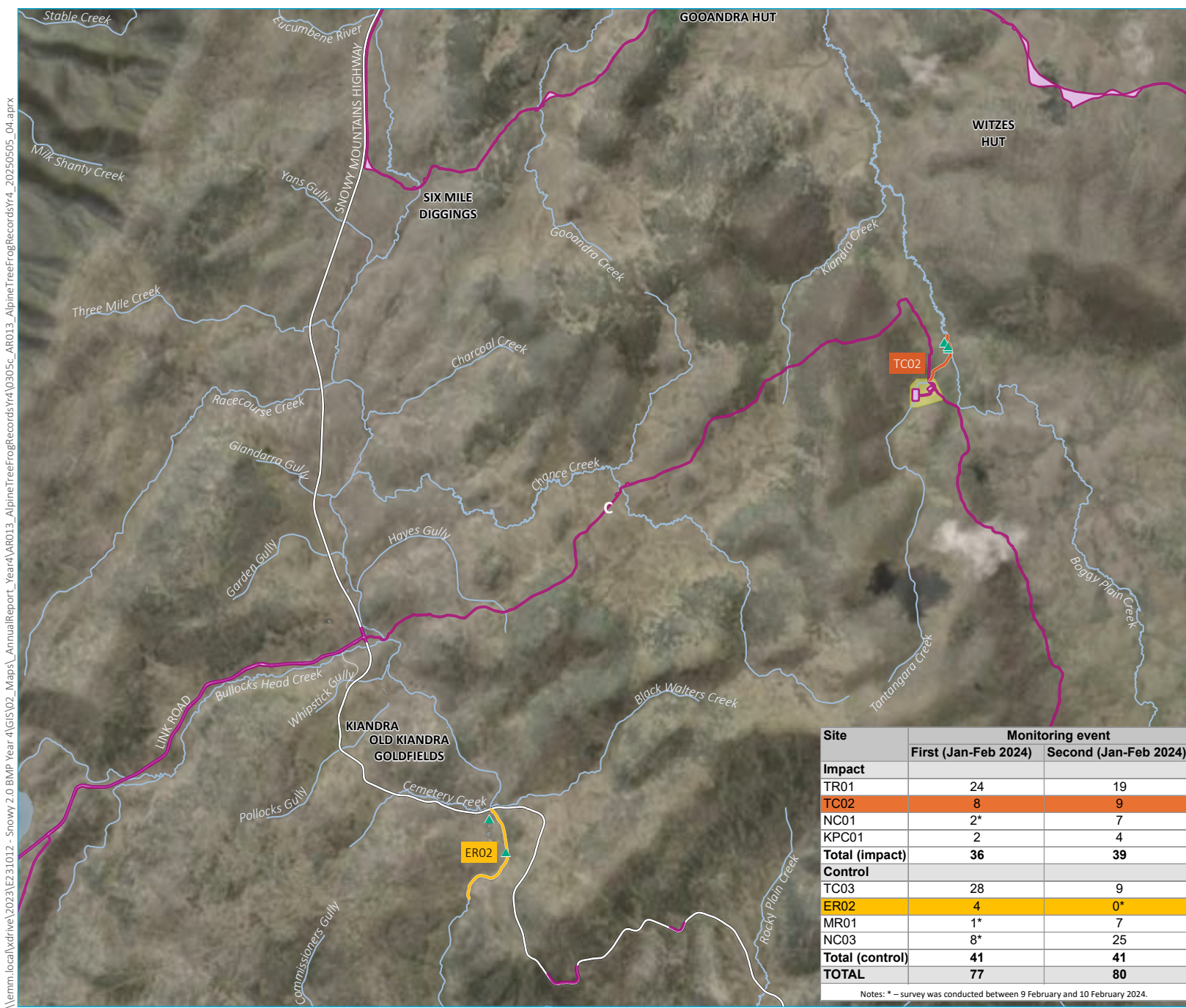
- KEY**
- Approved disturbance
 - Approved construction envelope
 - Alpine Tree Frog records
 - Alpine Tree Frog monitoring location
 - Control
 - Impact
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Alpine Tree Frog records during Year 4

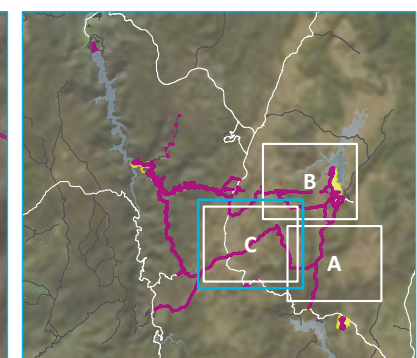
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.5b



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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



- KEY**
- Approved disturbance
 - Approved construction envelope
 - Alpine Tree Frog records
 - Alpine Tree Frog monitoring location
 - Control
 - Impact
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Site	Monitoring event	
	First (Jan-Feb 2024)	Second (Jan-Feb 2024)
Impact		
TR01	24	19
TC02	8	9
NC01	2*	7
KPC01	2	4
Total (impact)	36	39
Control		
TC03	28	9
ER02	4	0*
MR01	1*	7
NC03	8*	25
Total (control)	41	41
TOTAL	77	80

Notes: * – survey was conducted between 9 February and 10 February 2024.

Alpine Tree Frog records during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.5c



ii Booroolong Frog occupancy

a Year 4

During Year 4, the Booroolong Frog (Photograph 3.5) was recorded at five out the six monitoring sites occurring along the Yarrangobilly River and Wallace's Creek at Lobs Hole (Figure 3.6). The first survey event was undertaken in December 2023. Due to unsafe weather conditions, the first monitoring event for two sites (YR02 and YR05) was postponed and conducted on 8 February 2024, during the third monitoring event. The second survey event was undertaken between 22 January and 24 January 2024. Limitations of the delayed survey conducted outside of the suggested survey window are presented and discussed in Section 3.3.3. The Year 4 data falls within the range defined by the standard deviation of the data from Year 1, Year 2, and Year 3; therefore, the results were included in the analysis.

Overall, 23 Booroolong Frogs were recorded across three impact sites (WC01, YR05 and YR06) and five individuals across the two control sites (YR08 and YR09). No Booroolong Frogs were recorded at one impact site (YR02), while YR05 recorded the highest (19 records) number of individuals.

Booroolong Frog presence/absence at each monitoring site is summarised in Table 3.9 and presented in Plate 3.19. Further detailed information including monitoring dates is provided in Appendix E.

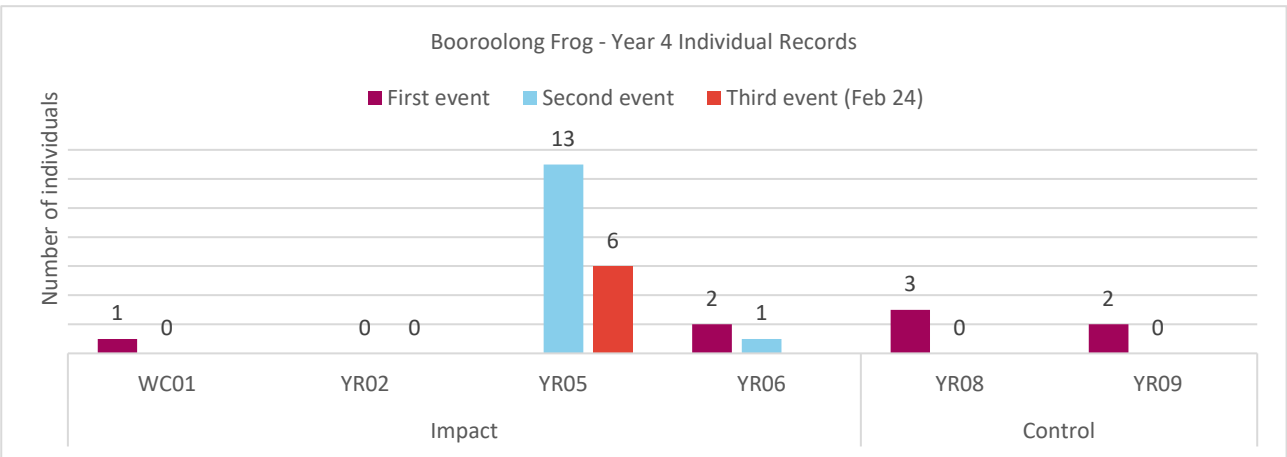


Photograph 3.5 Booroolong Frog recorded at control site YR06 during monitoring period

Table 3.9 **Number of Booroolong Frog individuals recorded in Year 4**

Site	Monitoring event	
	First (December 2023-February 2024)	Second (January 2024)
Impact		
WC01	1	0
YR02	0*	0
YR05	6*	13
YR06	2	1
Total (impact)	9	14
Control		
YR08	3	0
YR09	2	0
Total (control)	5	0
TOTAL	14	14

Notes: * survey was cancelled in December 2023 due to unsafe weather conditions and was conducted in February 2024



Notes: Survey was cancelled in December 2023 at YR02 and YR05 due to unsafe weather conditions and was conducted in February 2024

Plate 3.19 **Booroolong Frog records during Year 4**

b **Comparative analysis- Year 1, Year 2, Year 3 and Year 4**

The total number of Booroolong Frog records was 25 individuals in Year 1, 8 individuals in Year 2, 14 individuals in Year 3 and 28 individuals in Year 4. At impact sites, the number of Booroolong Frogs recorded was 20 in Year 1, 4 in Year 2, 9 in Year 3 and 23 in Year 4. At control sites, the number of Booroolong Frogs recorded was 5 in Year 1, 4 in Year 2, 5 in Year 3, and 5 in Year 4.

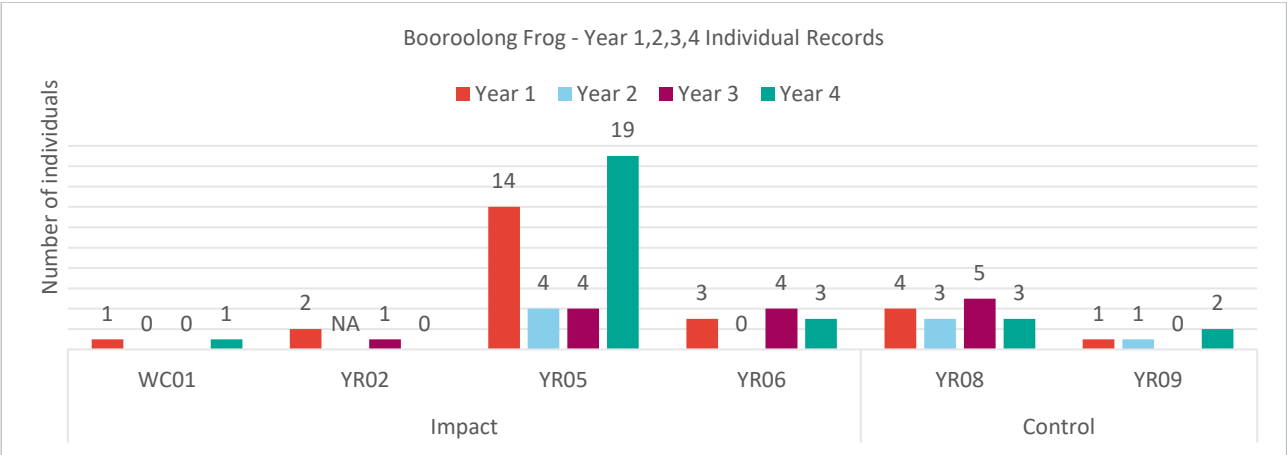
In comparison to Year 1, there was a 15% increase of records at impact sites and no difference at control sites surveyed in Year 4. In comparison to Year 2, there was a 475% increase of records at impact sites and a 25% increase at control sites surveyed in Year 4. In comparison to Year 3, there was a 156% increase of records at impact sites and no difference at control sites.

In Year 4, one impact site (YR02) recorded a decline of 100% in the relative number of Booroolong Frogs in comparison to Year 1, whilst one control site (YR08) showed a decline of 25%. In Year 4, two impact sites recorded a decline in relative abundance of 100% (YR02) and 25% (YR06), and one control site recorded a decline of 40% (YR08).

All impact sites surveyed either recorded a slight increase in the number of records or remained consistent compared to Year 2. In Year 4, three impact sites (WC01, YR06 and YR02) increased or decreased by one record while one impact site (YR05) increased by 15 records in comparison to Year 3.

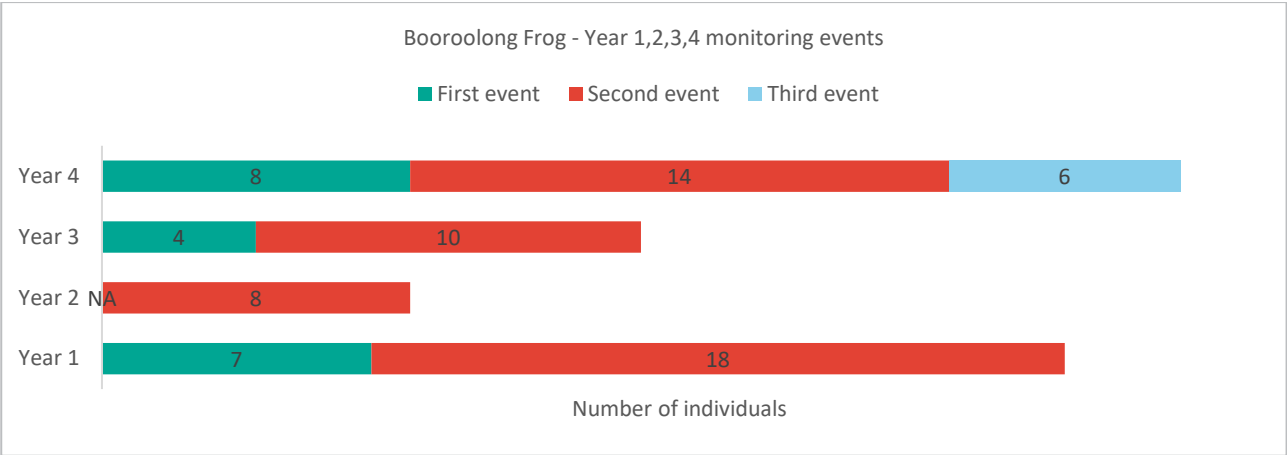
During Year 1, the number of individuals recorded in the second monitoring event was 157% higher than in the first monitoring event. During Year 2, only one monitoring event was conducted. During Year 3, the number of individuals recorded in the second monitoring event was 150% higher than in the first monitoring event. During Year 4, to ensure consistency, the third monitoring event was excluded from comparisons. Calculating percentage differences between the first and second monitoring events, using only the sites that were surveyed in both events, showed that the second monitoring event recorded an 88% lower number of individuals compared to the first monitoring event.

Plate 3.20 shows the comparison between the number of Booroolong Frogs recorded during Year 1, Year 2, Year 3 and Year 4. Plate 3.21 shows the comparison between monitoring events conducted across the four monitoring years.



Notes: NA: Survey was cancelled due to constraints including wet weather, flooding, and the COVID-19 pandemic.

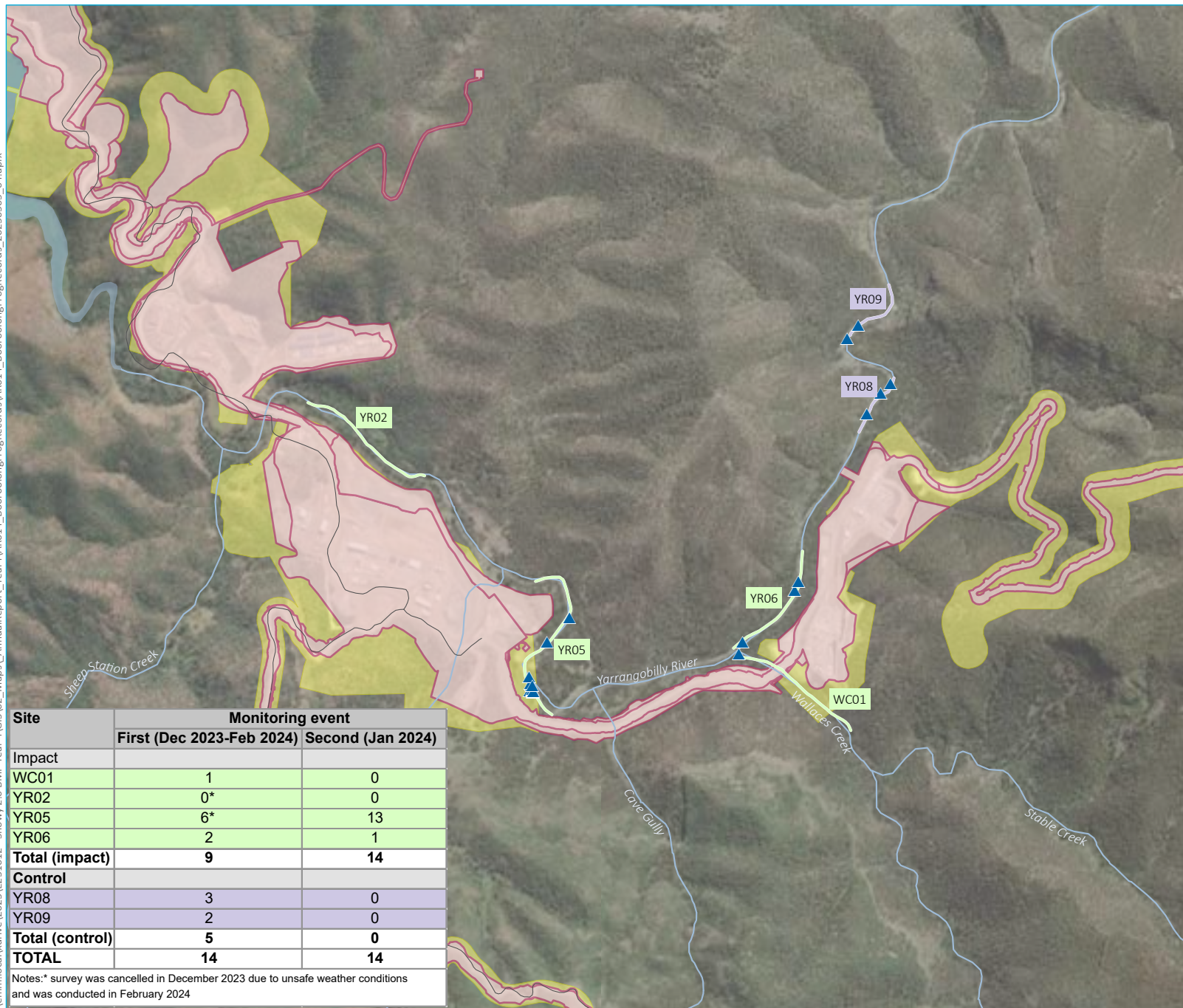
Plate 3.20 Booroolong Frog records during Year 1, Year 2, Year 3, and Year 4



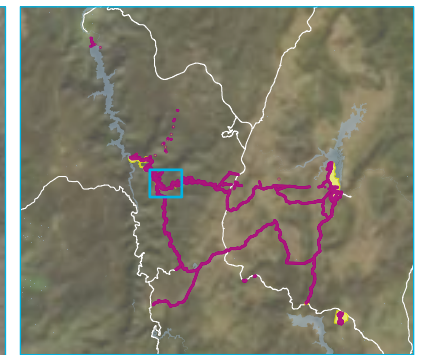
Notes: Survey was cancelled in December 2023 at YR02 and YR05 due to unsafe weather conditions and was conducted in February 2024.

Plate 3.21 Booroolong Frog records during first and second event of Year 1, Year 2, Year 3 and Year 4

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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)

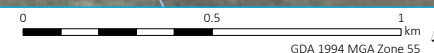


KEY

- Approved disturbance
- Approved construction envelope
- Booroolong frog record
- Booroolong frog monitoring location
- Control
- Impact
- Existing environment
- Minor road
- Named watercourse
- Waterbody

Booroolong Frog records during Year 4

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Figure 3.6



3.3.2 Booroolong Frog habitat characteristic monitoring

The objective of the Booroolong Frog habitat characteristic monitoring is to monitor rocky breeding habitat and depth of pools within sections of the Yarrangobilly River and Wallaces Creek that occur within and adjacent to the project area and document any changes arising from the project. Specific objectives are:

- to compare shifts in distribution and abundance of rocky breeding habitat between impact (Yarrangobilly River and Wallaces Creek in the project area) and reference sections of the Yarrangobilly River (upstream of the project area).

i Year 4

Year 4 data was collected in December 2023 at six monitoring sites occurring along the Yarrangobilly River and Wallace's Creek at Lobs Hole. The habitat characteristics monitoring survey was conducted at all impact and control transects. The BMP (EMM, 2020b) states that processing of the drone-captured data will include high resolution imagery, a 3D model of the transect, a point cloud to assist in change detection data comparison, and line graphics of each transect. These outputs were scaled back during Year 1 by the SHL team and as such there is only high-resolution imagery available for analysis in Year 4.

Overall, the only habitat feature average that was within the standard deviation observed at control sites was pools. The average extent of the bed rock bank, cobble bank, mud bank, riffle, riparian vegetation, rocky bank, run and other all fell outside the standard deviation observed at control sites. Mud bank cover was absent at one impact site (WC01).

The percentage of change for these eight features varied from 105% less coverage at an impact site for rocky banks up to 83% less coverage at an impact site for other when compared to the control site averages.

Stream features mapped during Year 4 included bed rock bank, cobble bank, mud bank, pool, riffle, riparian vegetation, rocky bank and run (Figure 3.7 to Figure 3.12). Composition of stream features at each transect in Year 4 is summarised in Table 3.10 and presented in Plate 3.22.

Table 3.10 Stream feature area (ha) for Year 4

Transect		Stream feature area (ha)							
		Bed rock bank	Cobble bank	Mud bank	Pool	Riffle	Riparian vegetation	Rocky bank	Run
Impact	WC01	0.001	0.014	0.000	0.001	0.042	3.066	0.009	0.176
	YR02	0.023	0.030	0.024	0.005	0.408	3.105	0.034	0.245
	YR05	0.123	0.186	0.020	0.035	0.192	4.604	0.002	0.640
	YR06	0.022	0.057	0.009	0.003	0.172	3.465	0.016	0.343
Control	YR08	0.037	0.022	0.008	0.010	0.153	1.743	0.026	0.110
	YR09	0.015	0.046	0.000	0.001	0.184	1.821	0.037	0.141

Note: Values have been rounded to 3 decimal places.

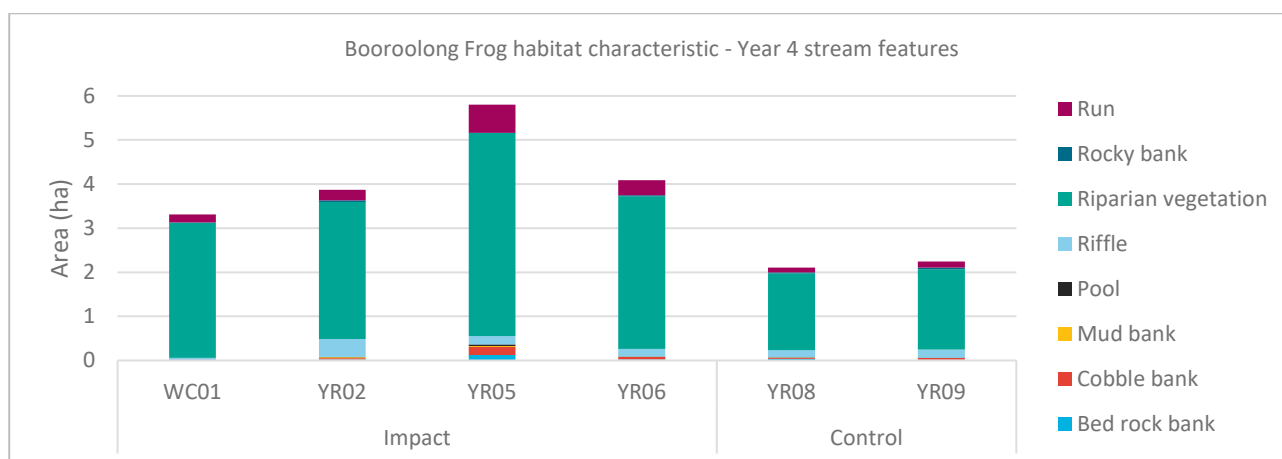


Plate 3.22 Composition of stream features during Year 4 habitat characteristic monitoring

ii Comparative analysis- Year 1, Year 2, Year 3 and Year 4

In Year 2, the mapped area was greater than that of Year 1, making it difficult to draw a comparison between the two monitoring years. In Year 3, all three mapping extents were overlaid, and the extent covered by the three surveys was used to identify a new boundary for each transect and therefore improve consistency across years. The imagery for Year 1, Year 2 and Year 3 were clipped to the new boundary and calculations for the area of each stream feature was re-run.

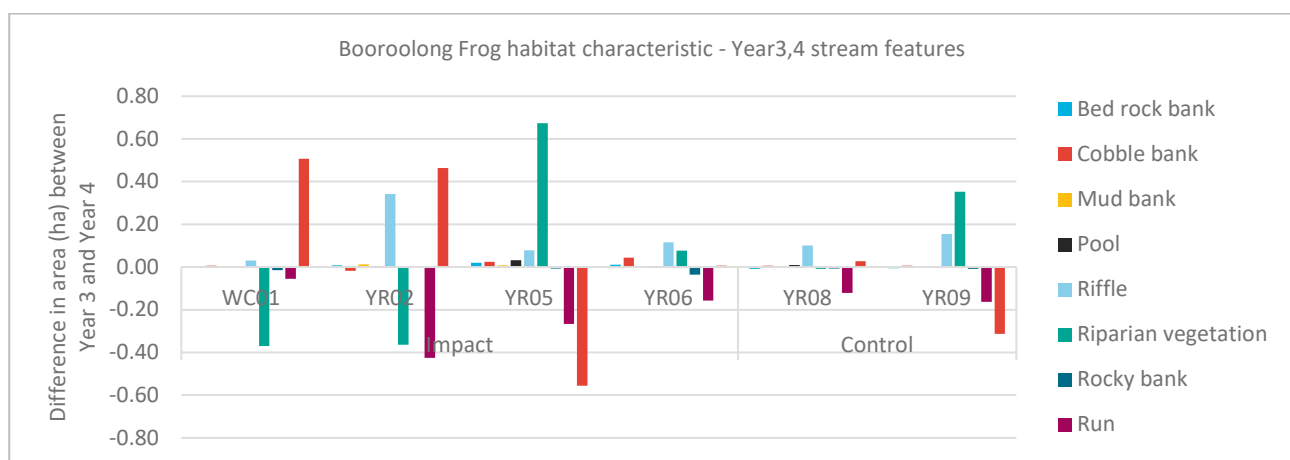
In the comparative analysis between Year 3 and Year 4, the majority of stream feature areas were similar, except for the extent of riparian vegetation, riffle, run, and other. Riparian vegetation increased by 2% and 17% at two impact sites (YR06 and YR05 respectively) and decreased between 11% and 10% at two impact sites (WC01, YR02). Riffle habitat increased across all impact sites (YR06, YR05, WC01, and YR02) ranging from a 69% increase to a 533% increase. Run habitat decreased across all impact sites from a between 24% and 63%.

In Year 4, there was an increase in the stream feature class designated as "other", which comprised various elements such as other vegetation, access tracks, and cleared land. Other decreased by 65% at one control site (YR09) and increased by 486% at another control site (YR08). At impact sites, it decreased by between 58% (YR05) and 10,631% (YR06) and increased by between 73% (WC01) and 138% (YR02). Due to the small size of the numbers, percentage results become less meaningful as small changes can result in large percentage changes.

The differences in stream feature area for each transect between Year 3 and Year 4 are presented in Table 3.11 and shown in Plate 3.23.

Table 3.11 **Difference in stream feature area (ha) for each transect between Year 3 and Year 4**

Site type	Transect	Stream feature area (ha)							
		Bed rock bank	Cobble bank	Mud bank	Pool	Riffle	Riparian vegetation	Rocky bank	Run
Impact	WC01	0.00	0.01	0.00	0.00	0.03	-0.37	-0.01	-0.06
	YR02	0.01	-0.02	0.01	0.01	0.34	-0.36	0.00	-0.42
	YR05	0.02	0.02	0.01	0.03	0.08	0.67	-0.01	-0.27
	YR06	0.01	0.04	0.00	0.00	0.12	0.08	-0.04	-0.16
Control	YR08	-0.01	0.01	0.00	0.01	0.10	-0.01	-0.01	-0.12
	YR09	-0.01	0.01	0.00	0.00	0.16	0.35	-0.01	-0.16



Notes: WC01 Mud Bank was not recorded in Year 4; YR02, YR06, YR08 and YR09 pool cover were not recorded in Year 3

Plate 3.23 **Difference in composition of stream feature (ha) for each transect between Year 4 and Year 3**

3.3.3 Frog monitoring limitations

In Year 4, Alpine Tree Frog and Booroolong occupancy surveys were conducted outside the survey period recommended in the BMP (EMM, 2020b). To assess the impact of the delayed survey, the standard deviation from the mean recorded between Year 1 and Year 3 at the transects of interest was compared with Year 4 data and presented in Table 3.12.

For the Alpine Tree Frog, four monitoring sites were surveyed outside of the suggested survey window (December to January). Due to unsuitable weather conditions at NC01 (rain) and MR01 (temperature lower than 10 degrees), and unsafe road conditions at NC03, the first monitoring event for these three sites was conducted between 9 February and 10 February 2024. The second monitoring event at ER02 was also conducted between 9 February and 10 February 2024. As shown in Table 3.12, the results recorded in Year 4 fall within the standard deviation observed in previous years at two out of the four transects (NC01 and NC03). The remaining two transects (ER02 and MR01) recorded a number of individuals lower than the interval identified by the standard deviation observed between Year 1 and Year 3. This limitation has been considered in Section 4.3.1 when addressing the triggers for adaptive management.

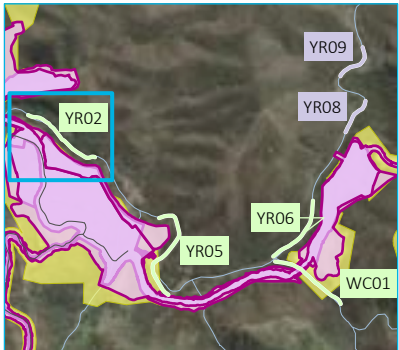
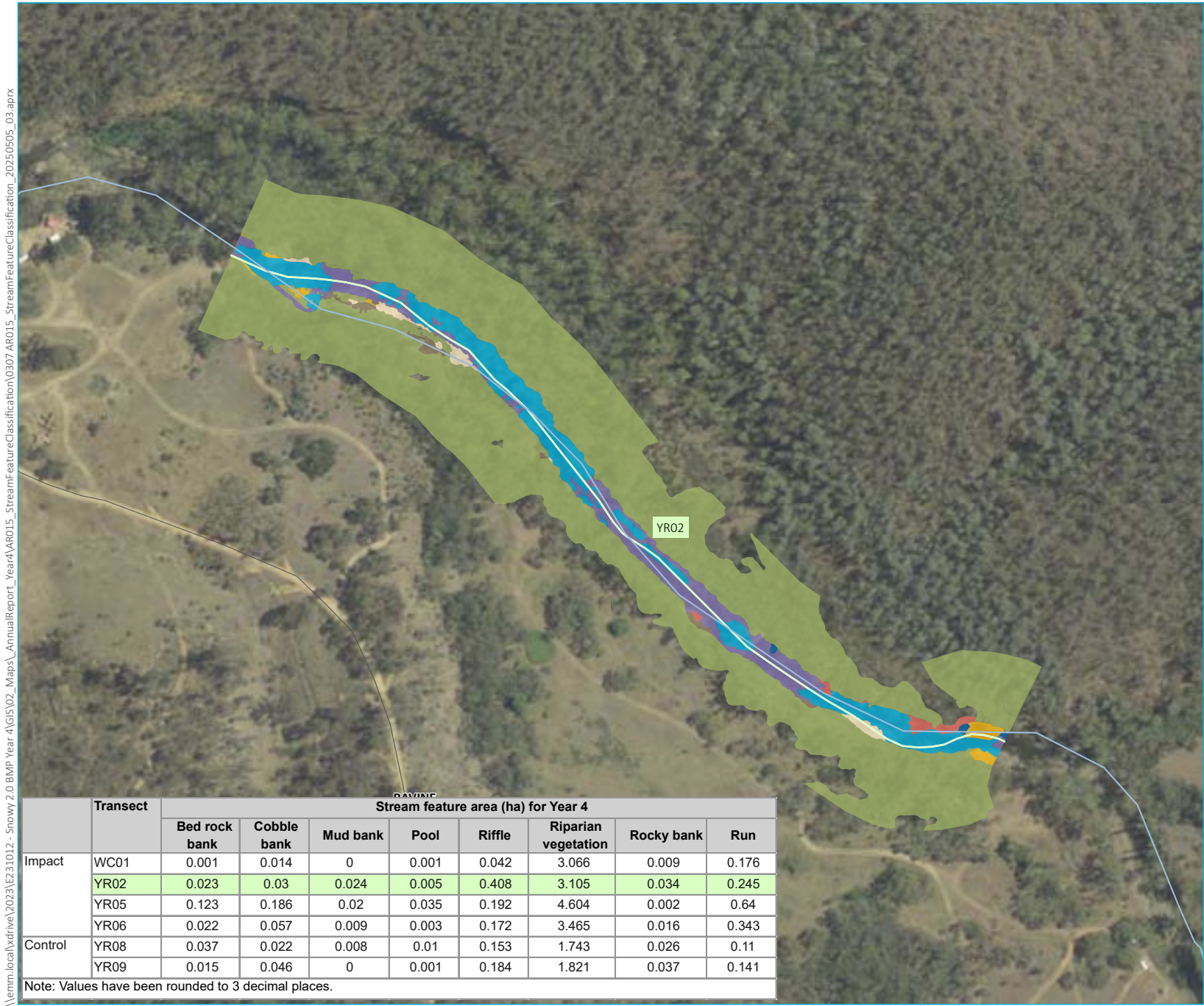
For the Booroolong Frog, the first monitoring event for two sites (YR02 and YR05) was postponed and conducted on 8 February 2024, due to unsafe weather conditions, and the second survey event was undertaken between 22 January and 24 January 2024, outside of the recommended survey window (November to mid-December). As shown in Table 3.12, the results recorded at all sites in Year 4 fall within the interval identified by the standard deviation observed in previous years. Therefore, the results from Year 4 were included in the analysis with no major implications.

Additionally, poor weather conditions during surveys led to the cancellation of the last 100 m of transect WC01 during the first survey effort in December, ensuring the safety of field staff. This resulted in incomplete data collection for that specific area.

Table 3.12 Comparisons between Year 1 to Year 3 results and Year 4 data collected outside of the survey window in Year 4

Transect	Year 1	Year 2	Year 3	Mean (Year 1- Year 3)	SD	Mean - SD	Mean + SD	Year 4	Does Year 4 fall within SD?
Alpine Tree Frog									
Impact									
NC01	7	11	2	7	5	2	11	9	yes
Control									
ER02	43	24	40	36	10	25	46	4	no
MR01	36	46	24	35	11	24	46	8	no
NC03	52	9	14	25	24	1	49	33	yes
Booroolong Frog									
Impact									
WC01	1	0	0	0	1	-1	1	1	yes
YR02	2	0	1	1	2	-1	3	0	yes
YR05	14	4	4	7	15	-8	22	19	yes
YR06	3	0	4	2	2	0	4	3	yes
Control									
YR08	4	3	5	4	2	2	6	3	yes
YR09	1	1	0	1	2	-1	3	2	yes

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- KEY**
- Approved disturbance
 - Approved construction envelope
 - Booroolong frog monitoring location
 - Control
 - Impact
 - Stream feature classification
 - Bedrock bank
 - Cobble bank
 - Riparian vegetation
 - Pool
 - Riffle
 - Run
 - Mud bank
 - Rocky bank
 - Existing environment
 - Minor road
 - Named watercourse

Stream feature classification during Year 4 – YR02

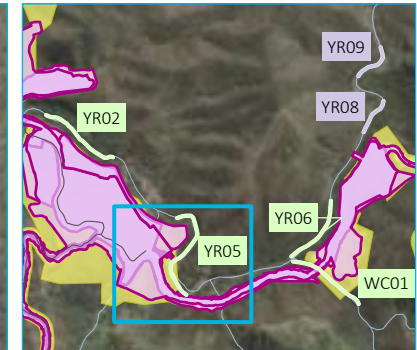
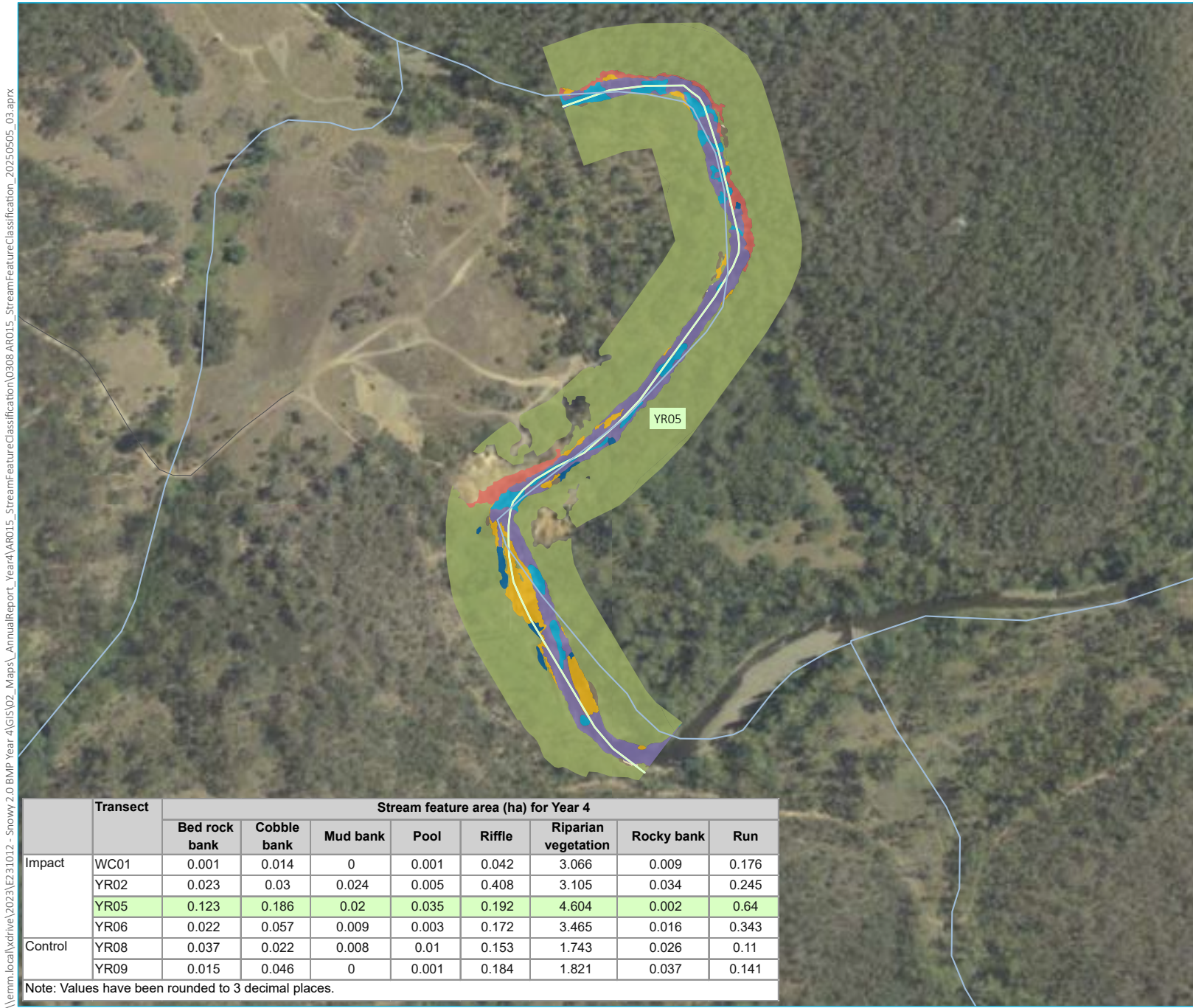
	Transect	Stream feature area (ha) for Year 4							
		Bed rock bank	Cobble bank	Mud bank	Pool	Riffle	Riparian vegetation	Rocky bank	Run
Impact	WC01	0.001	0.014	0	0.001	0.042	3.066	0.009	0.176
	YR02	0.023	0.03	0.024	0.005	0.408	3.105	0.034	0.245
	YR05	0.123	0.186	0.02	0.035	0.192	4.604	0.002	0.64
	YR06	0.022	0.057	0.009	0.003	0.172	3.465	0.016	0.343
Control	YR08	0.037	0.022	0.008	0.01	0.153	1.743	0.026	0.11
	YR09	0.015	0.046	0	0.001	0.184	1.821	0.037	0.141

Note: Values have been rounded to 3 decimal places.

Source: EMM (2025); Snowy Hydro (2024); DFSI (2017)



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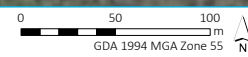
- KEY**
- Approved disturbance
 - Approved construction envelope
 - Booroolong frog monitoring location
 - Control
 - Impact
 - Stream feature classification
 - Bedrock bank
 - Cobble bank
 - Riparian vegetation
 - Pool
 - Riffle
 - Run
 - Mud bank
 - Rocky bank
 - Existing environment
 - Minor road
 - Named watercourse

Stream feature classification during Year 4 – YR02

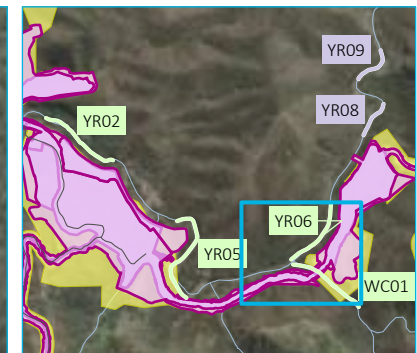
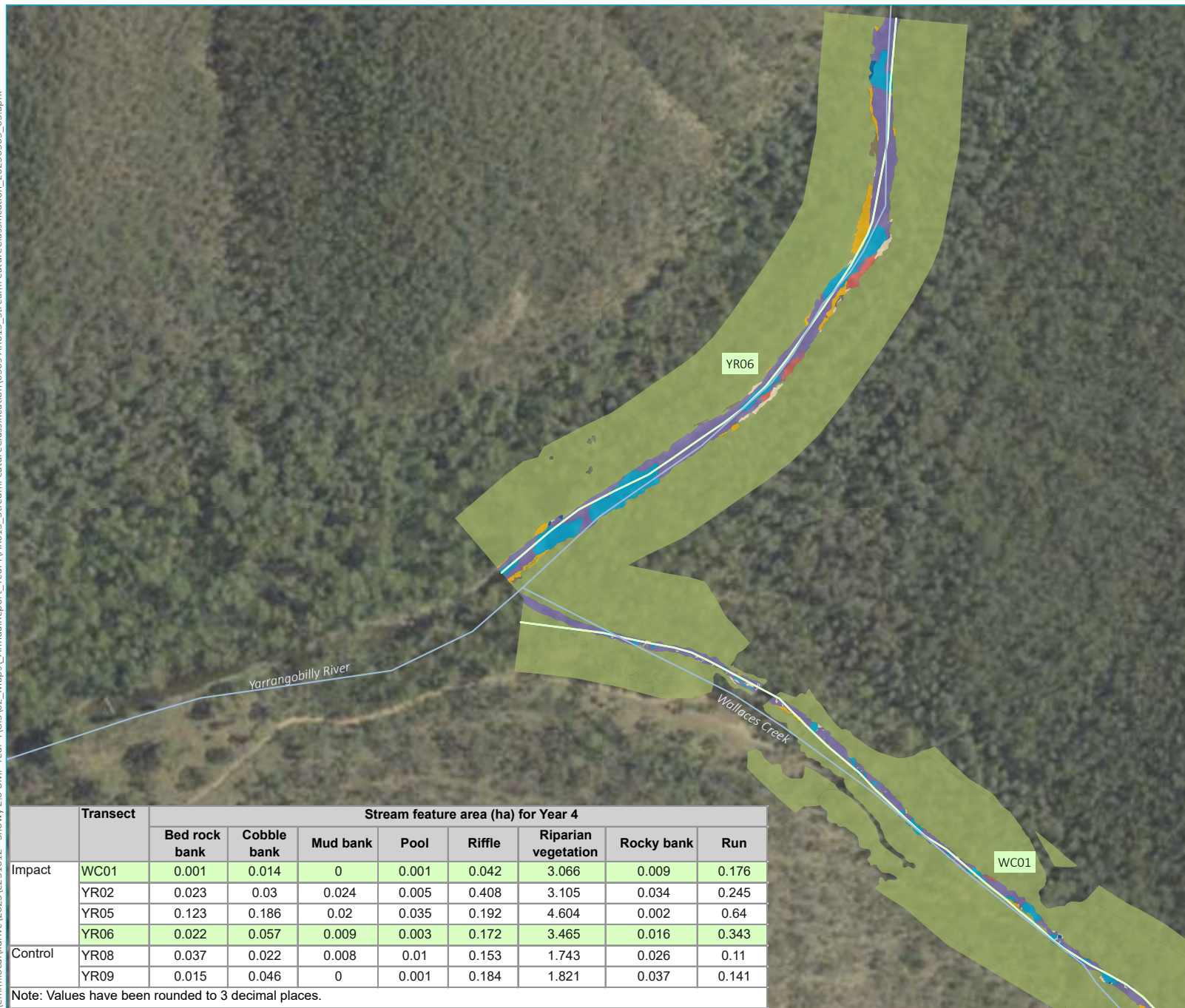
	Transect	Stream feature area (ha) for Year 4							
		Bed rock bank	Cobble bank	Mud bank	Pool	Riffle	Riparian vegetation	Rocky bank	Run
Impact	WC01	0.001	0.014	0	0.001	0.042	3.066	0.009	0.176
	YR02	0.023	0.03	0.024	0.005	0.408	3.105	0.034	0.245
	YR05	0.123	0.186	0.02	0.035	0.192	4.604	0.002	0.64
	YR06	0.022	0.057	0.009	0.003	0.172	3.465	0.016	0.343
Control	YR08	0.037	0.022	0.008	0.01	0.153	1.743	0.026	0.11
	YR09	0.015	0.046	0	0.001	0.184	1.821	0.037	0.141

Note: Values have been rounded to 3 decimal places.

Source: EMM (2025); Snowy Hydro (2024); DFSI (2017)



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- KEY
- Approved disturbance
 - Approved construction envelope
 - Booroolong frog monitoring location
 - Control
 - Impact
 - Stream feature classification
 - Bedrock bank
 - Cobble bank
 - Riparian vegetation
 - Pool
 - Riffle
 - Run
 - Mud bank
 - Rocky bank
 - Existing environment
 - Named watercourse

Stream feature classification during Year 4 – YR02

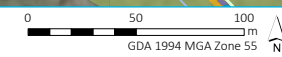
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Figure 3.9



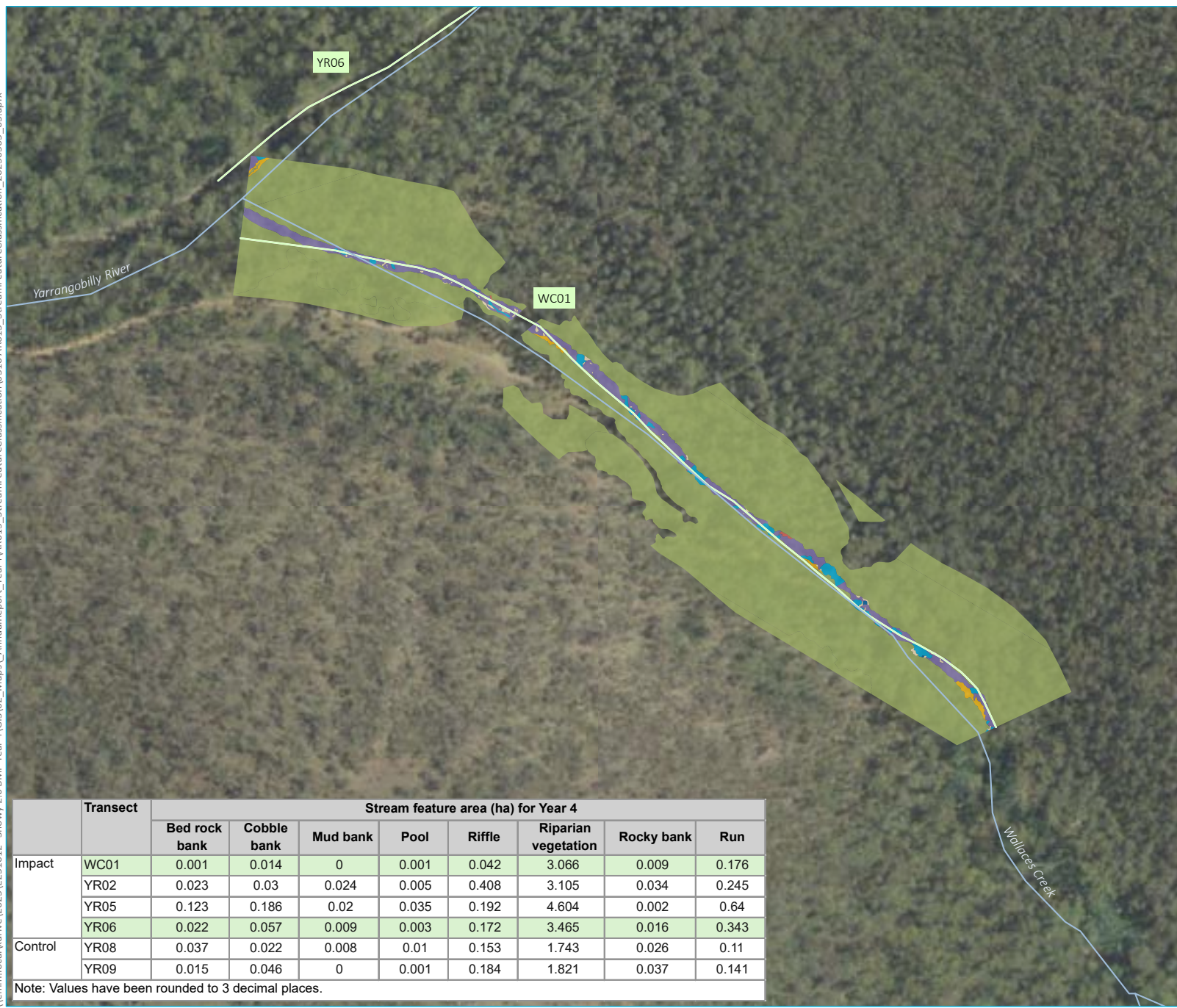
Transect		Stream feature area (ha) for Year 4							
		Bed rock bank	Cobble bank	Mud bank	Pool	Riffle	Riparian vegetation	Rocky bank	Run
Impact	WC01	0.001	0.014	0	0.001	0.042	3.066	0.009	0.176
	YR02	0.023	0.03	0.024	0.005	0.408	3.105	0.034	0.245
	YR05	0.123	0.186	0.02	0.035	0.192	4.604	0.002	0.64
	YR06	0.022	0.057	0.009	0.003	0.172	3.465	0.016	0.343
Control	YR08	0.037	0.022	0.008	0.01	0.153	1.743	0.026	0.11
	YR09	0.015	0.046	0	0.001	0.184	1.821	0.037	0.141

Note: Values have been rounded to 3 decimal places.

Source: EMM (2025); Snowy Hydro (2024); DFSI (2017)



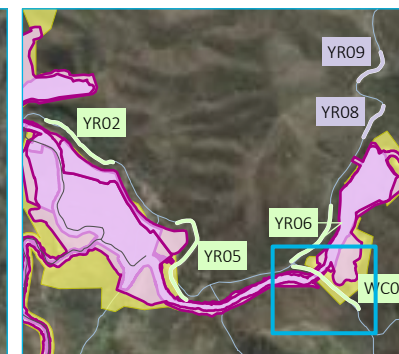
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	Transect	Stream feature area (ha) for Year 4							
		Bed rock bank	Cobble bank	Mud bank	Pool	Riffle	Riparian vegetation	Rocky bank	Run
Impact	WC01	0.001	0.014	0	0.001	0.042	3.066	0.009	0.176
	YR02	0.023	0.03	0.024	0.005	0.408	3.105	0.034	0.245
	YR05	0.123	0.186	0.02	0.035	0.192	4.604	0.002	0.64
	YR06	0.022	0.057	0.009	0.003	0.172	3.465	0.016	0.343
Control	YR08	0.037	0.022	0.008	0.01	0.153	1.743	0.026	0.11
	YR09	0.015	0.046	0	0.001	0.184	1.821	0.037	0.141

Note: Values have been rounded to 3 decimal places.

Source: EMM (2025); Snowy Hydro (2024); DFSI (2017)

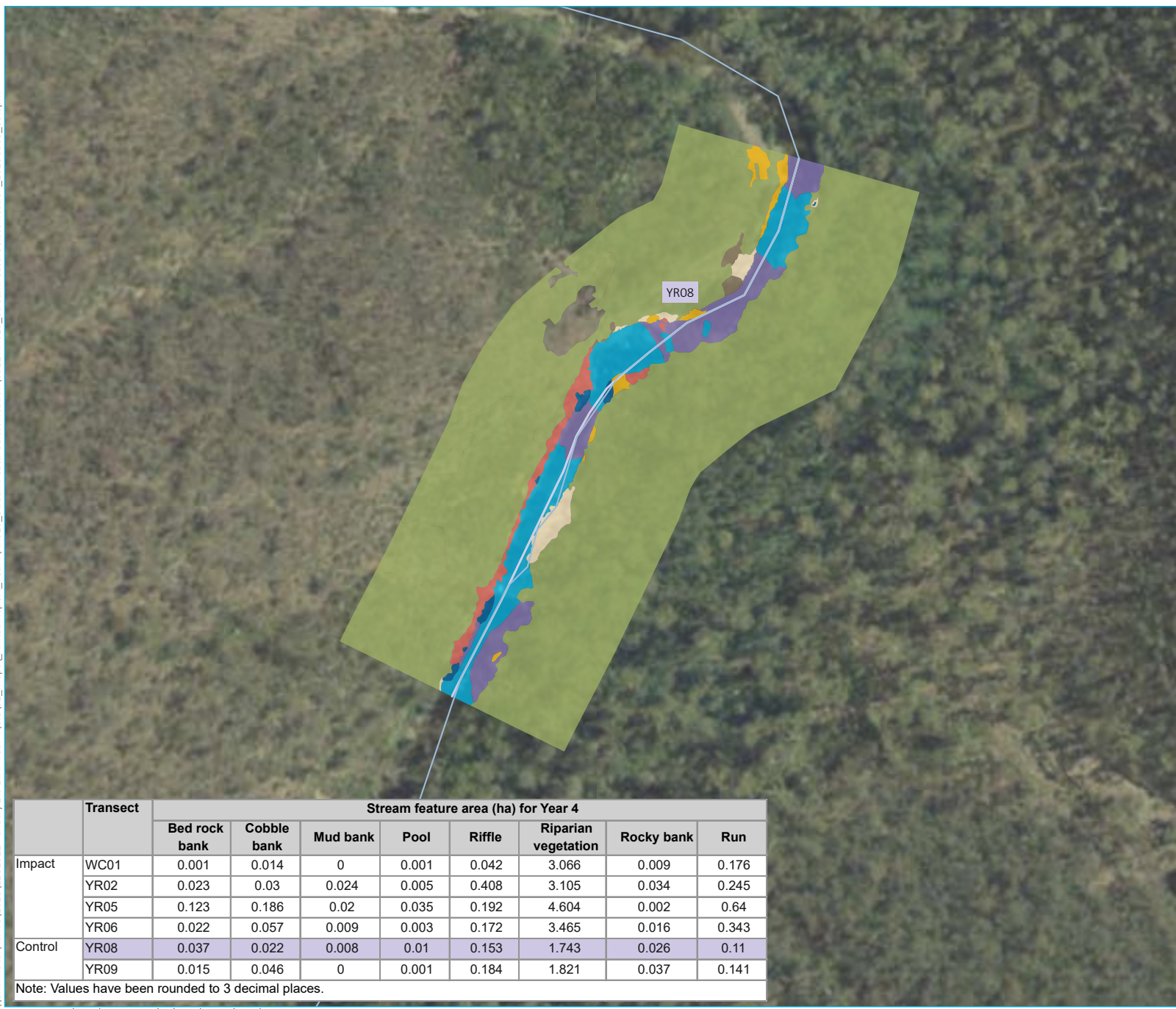


- KEY
- Approved disturbance
 - Approved construction envelope
 - Booroolong frog monitoring location
 - Control
 - Impact
 - Stream feature classification
 - Bedrock bank
 - Cobble bank
 - Riparian vegetation
 - Pool
 - Riffle
 - Run
 - Mud bank
 - Rocky bank
 - Existing environment
 - Named watercourse

Stream feature classification during Year 4 – WC01

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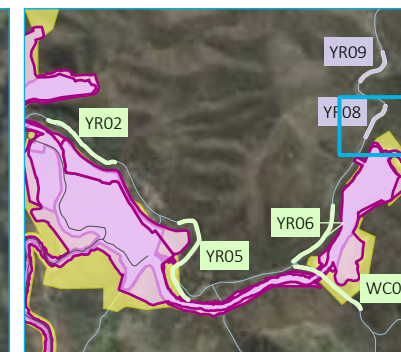




	Transect	Stream feature area (ha) for Year 4							
		Bed rock bank	Cobble bank	Mud bank	Pool	Riffle	Riparian vegetation	Rocky bank	Run
Impact	WC01	0.001	0.014	0	0.001	0.042	3.066	0.009	0.176
	YR02	0.023	0.03	0.024	0.005	0.408	3.105	0.034	0.245
	YR05	0.123	0.186	0.02	0.035	0.192	4.604	0.002	0.64
	YR06	0.022	0.057	0.009	0.003	0.172	3.465	0.016	0.343
Control	YR08	0.037	0.022	0.008	0.01	0.153	1.743	0.026	0.11
	YR09	0.015	0.046	0	0.001	0.184	1.821	0.037	0.141

Note: Values have been rounded to 3 decimal places.

Source: EMM (2025); Snowy Hydro (2024); DFSI (2017)

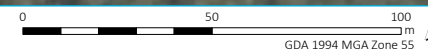


KEY

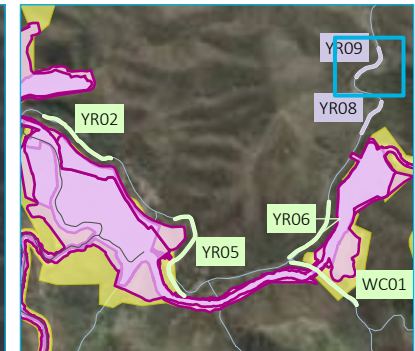
- Approved disturbance
- Approved construction envelope
- Booroolong frog monitoring location
- Control
- Impact
- Stream feature classification
- Bedrock bank
- Cobble bank
- Riparian vegetation
- Pool
- Riffle
- Run
- Mud bank
- Rocky bank
- Existing environment
- Named watercourse

Stream feature classification during Year 4 – YR02

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Annual report
Figure 3.11



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- KEY**
- Approved disturbance
 - Approved construction envelope
 - Booroolong frog monitoring location
 - Control
 - Impact
 - Stream feature classification
 - Bedrock bank
 - Cobble bank
 - Riparian vegetation
 - Pool
 - Riffle
 - Run
 - Mud bank
 - Rocky bank
 - Existing environment
 - Named watercourse

Stream feature classification during Year 4 – YR02

	Transect	Stream feature area (ha) for Year 4							
		Bed rock bank	Cobble bank	Mud bank	Pool	Riffle	Riparian vegetation	Rocky bank	Run
Impact	WC01	0.001	0.014	0	0.001	0.042	3.066	0.009	0.176
	YR02	0.023	0.03	0.024	0.005	0.408	3.105	0.034	0.245
	YR05	0.123	0.186	0.02	0.035	0.192	4.604	0.002	0.64
	YR06	0.022	0.057	0.009	0.003	0.172	3.465	0.016	0.343
Control	YR08	0.037	0.022	0.008	0.01	0.153	1.743	0.026	0.11
	YR09	0.015	0.046	0	0.001	0.184	1.821	0.037	0.141

Note: Values have been rounded to 3 decimal places.

Source: EMM (2025); Snowy Hydro (2024); DFSI (2017)

3.4 Alpine She-oak Skink monitoring

The objective of the Alpine She-oak Skink (Photograph 3.6) monitoring is to determine the occupancy (presence/absence) of the species at potential habitat sites within proximity to the project and document any changes attributable to the Main Works.

3.4.1 Year 4

In Year 4, six monitoring events (in November, December, February, March, April and October) were conducted at eleven active monitoring sites. The survey schedule was adjusted to accommodate higher-priority frog monitoring during January 2024, resulting in the third survey event being rescheduled to April. This adjustment ensured that survey coverage remained robust despite the temporary resource constraints. The Alpine She-oak Skink was recorded at six of the eleven active monitoring sites during Year 4, representing 55% of the sites. These include three impact sites and three control sites.

Six monitoring events took place during Year 4. The first (November) and second (December) monitoring events recorded the greatest number of individuals (seven and eight individuals respectively). The sixth monitoring event recorded no individuals at any of the control or impact sites. Alpine She-oak Skink presence/absence at each monitoring site is summarised in Table 3.13 and presented in Plate 3.24. Further detailed information including monitoring dates is provided in Appendix F.

i Tantangara

Impact sites TG04 and TG10 were decommissioned after the fifth survey event as they had not recorded presence of the target species since they were established. TG04 had not recorded the Skink since January 2023 and TG10 since March 2022. The potential for monitoring outcomes at these sites were limited, due to only being able to record an increase in records and as such the sites were decommissioned. Impact sites TG12 and TG13 were established as a replacement in April 2024 and August 2024 respectively and were surveyed for the first time in the sixth (October) survey event.

The Alpine She-oak Skink was recorded at three impact sites within Tantangara or along Tantangara Road (TG02, TG03 and TG05). Between all impact sites, a total of four individuals were recorded. The species was not recorded from four impact sites TG04 and TG10 (decommissioned April 2024), TG12 (established April 2024), and TG13 (established August 2024). Amongst impact sites, the greatest number of individuals reported in a single monitoring event was one (TG02, TG03 and TG05)

ii Off-site/remote

The Alpine She-oak Skink was recorded at three control sites. Two along Bullocks Hill Trail (TG07 and TG08) and one along Gooandra trail (TG11). Between all control sites, a total of eighteen individuals were recorded. Control sites TG06, TG07, and TG08 were unable to be surveyed during the fifth (April) survey event due to closures of Kosciuszko National Park (Figure 3.13). The species was not recorded at one of the control sites along Port Phillip Trail (TG06). Amongst control sites, the greatest number of individuals reported in a single monitoring event at a control site was seven (at TG11).

iii Limitations

January surveys were unable to be conducted due to logistical issues. An additional survey was conducted in April to account for the missed surveys in January, however, these surveys were outside of the survey period recommended in the BMP (October – March) (EMM, 2020b). Three control sites were unable to be surveyed during Q2 (April) as they were located within closed areas of Kosciuszko National Park. NPWS did not grant access between Thursday 4 April and Friday 4 October 2024. Two sites were decommissioned and replaced with equivalent sites at new locations. These new locations will not be able to trigger adaptive management as they do not have records from baseline/pre-construction.



Photograph 3.6 Alpine She-oak Skink recorded during the Year 3 Q4 monitoring period

Table 3.13 Alpine She-oak Skinks recorded at each monitoring site in Year 4

Site	Monitoring events					
	Q4	Q1		Q2		Q4
	First	Second	Third	Fourth	Fifth	Sixth
Impact						
TG01	NA	NA	NA	NA	NA	NA
TG02	1	0	0	1	0	0
TG03	1	0	0	0	0	0
TG04	0	0	0	0	0	NA
TG05	1	0	0	0	0	0
TG10	0	0	0	0	0	NA
TG12	NA	NA	NA	NA	NA	0
TG13	NA	NA	NA	NA	NA	0
Total (impact)	3	0	0	1	0	0
Control						
TG06	0	0	0	0	NA*	0
TG07	0	0	0	1	NA*	0
TG08	1	1	0	1	NA*	0
TG09	NA	NA	NA	NA	NA	NA
TG11	3	7	2	1	1	0
Total (control)	4	8	2	3	1	0
TOTAL	7	8	2	4	1	0

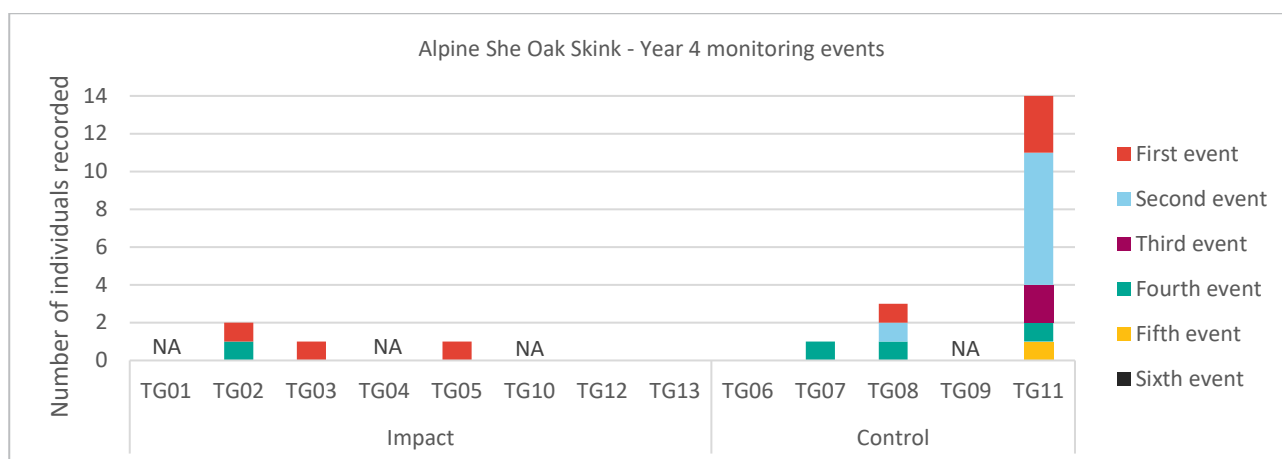
Notes:

TG01 and TG09 were decommissioned in Year 2 (March 2022), and TG10 and TG11 were established as a replacement

TG04 and TG10 were decommissioned in Year 4 (April 2024)

TG12 and TG13 were established in Year 4 (between April and August 2024)

NA* – Sites were not surveyed due to access issues (closure of Kosciuszko National Park)



Notes: TG01 and TG09 were discontinued in Year 2 (March 2022), and TG10 and TG11 were established as a replacement. TG04 and TG10 were discontinued in Year 4 (April 2024), TG12 and TG13 were established as a replacement between the fifth and sixth survey events.

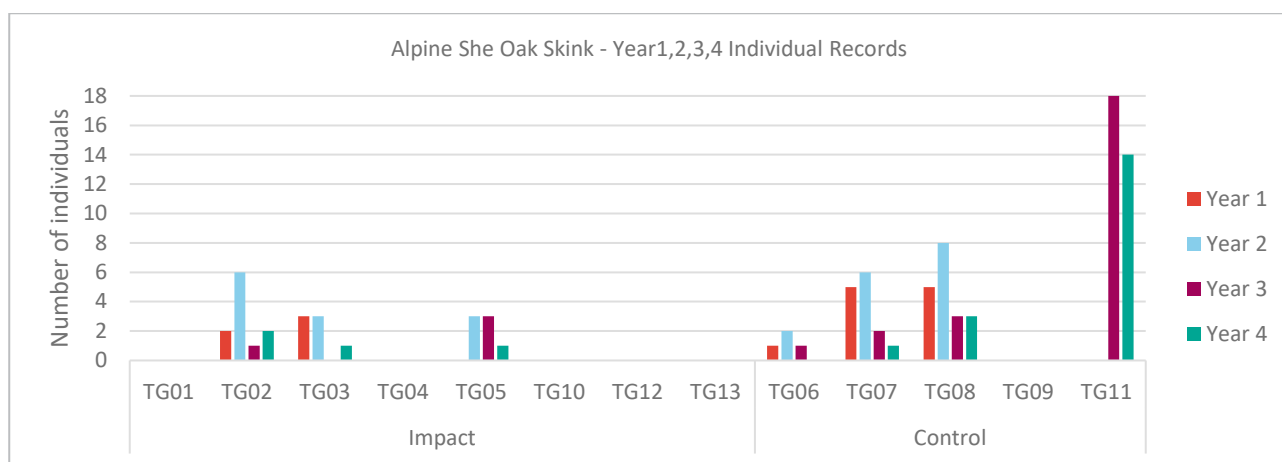
Plate 3.24 Total number of Alpine She-Oak Skink records per site and monitoring period

3.4.2 Comparative analysis- Year 1, Year 2, Year 3 and Year 4

The total number of Alpine She-oak Skinks recorded was 16 in Year 1, 28 in both Years 2 and 3, and 22 in Year 4. Among the impact sites surveyed in Year 1, five individuals were detected within two impact sites (TG02 and TG03). During Year 2, the number of skinks recorded increased to 12, within three impact sites (TG02, TG03 and TG05). During Year 3, the number of skinks recorded was four, within two impact sites (TG02 and TG05). Lastly, during Year 4 the number of skinks recorded at impacts sites was four, found within three impact sites (TG02, TG03 and TG05). The number of individuals recorded at control sites increased over the years, starting from five in Year 1, 12 in Year 2 and 24 in Year 3, before decreasing to eighteen in Year 4. This decline in Year 4 may partially be attributed to closures in Kosciuszko National Park, which prevented surveys at control sites TG06, TG07, and TG08 during the April survey event. Despite this, control sites continued to report a higher number of individuals (eighteen) compared to impact sites (four). The most notable observation was at control site TG11, which consistently reported the highest number of individuals, including a peak of seven individuals during a single monitoring event. In contrast, the maximum count at any impact site was one individual.

All impact sites where the species was recorded during baseline surveys (Year 1) recorded Alpine She-oak presence in Year 2, Year 3, and Year 4, except for TG03 which did not record the species in Year 3. In Year 4 Alpine She-oak Skink was not detected at TG04, TG10, TG12 or TG13, however, these sites were recently decommissioned (TG04 and TG10) or established (TG12 and TG13) and were not surveyed in all six survey events.

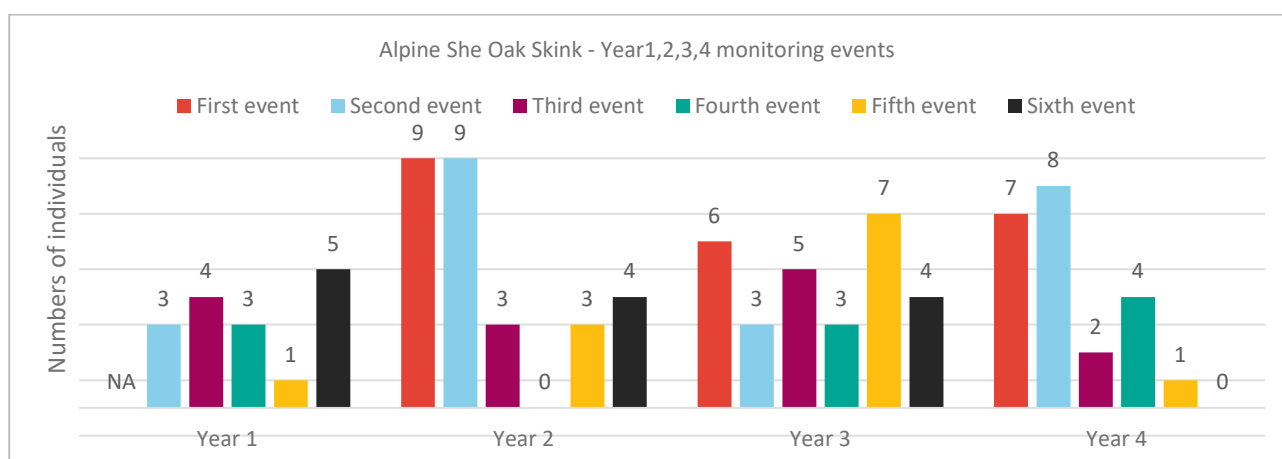
A comparison of Year 4, Year 3 and Year 2 presence compared to Year 1 baseline is presented in Plate 3.25.



Notes: TG01 and TG09 were discontinued in Year 2 (March 2022), and TG10 and TG11 were established as a replacement. TG04 and TG10 were discontinued in Year 4 (by August 2024) and TG12 and TG13 were established as a replacement.

Plate 3.25 Alpine She-Oak Skink records during Year 4, Year 3 and Year 2 compared to baseline (Year 1)

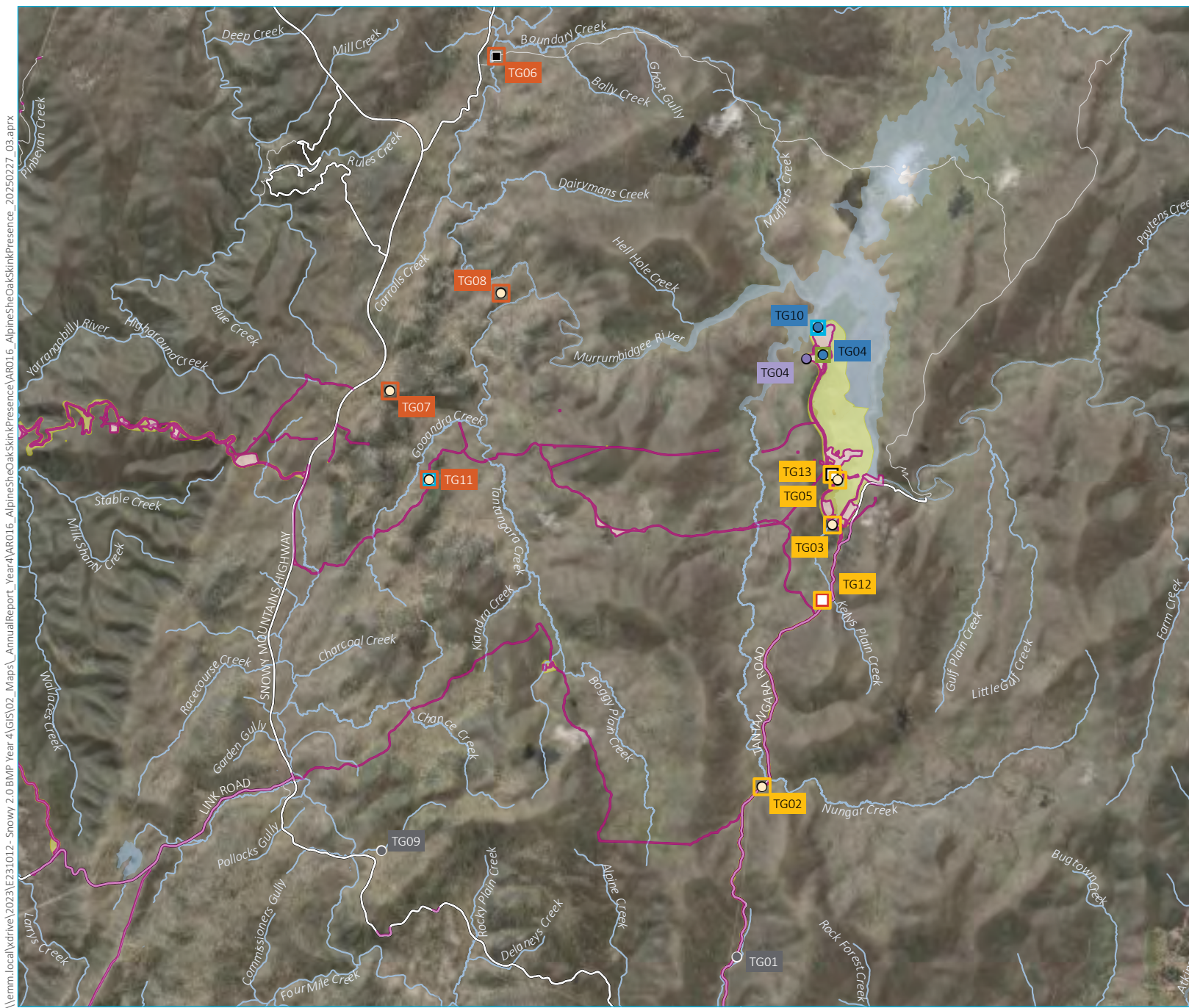
Plate 3.26 shows the comparison between Year 4, Year 3, Year 2 monitoring events compared to Year 1 baseline. No apparent temporal trend was identified comparing the results of different monitoring events across Year 1, Year 2, Year 3 and Year 4.



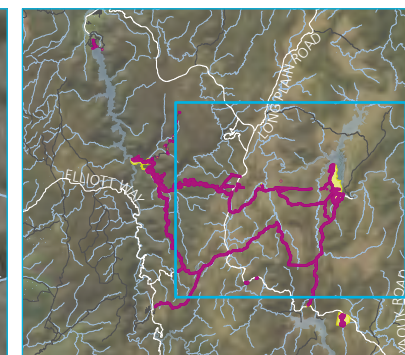
Notes: During Year 1, no first monitoring event was undertaken.

Plate 3.26 Alpine She-Oak Skink records during the six monitoring events of Year 1, Year 2, Year 3 and Year 4

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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



- KEY**
- Approved disturbance
 - Approved construction envelope
 - Alpine She-oak Skink monitoring location
 - Control
 - Impact
 - Decommissioned in March 2022
 - Decommissioned in January 2023
 - Decommissioned in April 2024
 - Presence
 - Absence
 - Established in March 2022
 - Established in January 2023
 - Established in April 2024
 - Established in August 2024
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Alpine She-oak Skink presence/absence during Year 4

3.5 Feral animal monitoring

3.5.1 Occupancy (presence/absence) monitoring

The objective of the feral animal occupancy monitoring is to determine presence/absence of feral animals within proximity to the project for control.

i Year 4

During Year 4, 19 feral animal sites were surveyed during each of the four monitoring events (see Section 3.2). Each site is comprised of two replicates, where 19 monitoring sites results in 38 cameras having potential to record feral species. Feral animals were also indirectly monitored at the small mammal camera locations (opportunistic results are presented in Table 3.15).

Out of the 19 monitoring sites, 63% recorded Red Fox (*Vulpes vulpes*), 47% recorded Wild Dog (*Canis lupus*), 42% recorded Feral Horse (*Equus caballus*), 37% recorded Feral Cat (*Felis catus*) (Photograph 3.7), 37% recorded Sambar Deer, 26% recorded European Rabbit (*Oryctolagus cuniculus*) and 21% of the sites recorded the presence of European Hare (*Lepus europaeus*) (Plate 3.27). Other feral animals recorded included Unknown *Cervid* spp. (11%) and Feral Pig (*Sus scrofa*) (5%) (Plate 3.27). Overall, nine species of feral animals were recorded across 17 monitoring sites, while two monitoring sites recorded no feral animals (Figure 3.14 to Figure 3.20).

Feral animal presence/absence at each monitoring site is summarised in Table 3.14. Presence of feral animals at remote camera sites during Year 4 is presented in Plate 3.27. Further detailed information including monitoring dates and presence/absence at each camera is provided in Appendix G.

a Lobs Hole

There are seven feral camera sites located at Lobs Hole (FC03-FC09) that recorded Feral Cat, European Rabbit, Red Fox, Sambar Deer and Wild Dog. Camera pairs FC08 and FC09 within Lobs Hole recorded no feral animal species. Small mammal cameras at Lobs Hole recorded Feral Cat, Rabbit, Red Fox and Sambar Deer.

b Marica

There are three feral camera sites located at Marica (FC10-FC12) that recorded European Hare, Feral Horse, Red Fox, Sambar Deer and Wild Dog. Small mammal cameras at Marica recorded Feral Cat, Rabbit, Red Fox, Rusa Deer, Sambar Deer and Wild Dog.

c Tantangara

There are eight feral camera sites located at Tantangara (FC13-FC20) that recorded Feral Cat, European Hare, European Rabbit, Feral Horse, Red Fox, Sambar Deer, Wild dogs, Feral Pig and unknown Cervids. Small mammal cameras at Tantangara recorded Feral Horse, Rabbit, Red Fox and Sambar Deer.

d Rock Forest

There is one feral camera sites located at Rock Forest (FC21) that recorded Feral Cat, European Hare, European Rabbit and Red Fox. There are no small mammal cameras at Rock Forest.

e Limitations

Instances of theft in previous years resulting in the loss of some equipment has led to some sites not being surveyed in Year 4. A number of cameras experienced battery depletion and SD cards becoming full, attributed to heightened vehicle activity in the area or false triggers, compromising their functionality and data collection capabilities. Two feral cameras were required to be relocated due to safety concerns because of the cameras being located in areas of high heavy vehicle traffic. This resulted in them being unable to record data in Q4. Additionally, instances of SD card errors or corruption compromised the data collected on two occasions. For further details on the number of cameras that reported issues during Year 4, refer to Appendix A.



Photograph 3.7 Feral Cat (left) and Red Fox (right) recorded on site in Year 4

Table 3.14 Feral animal remote camera presence/absence in Year 4

Site name	Location	Feral Cat				European Hare				European Rabbit				Feral Horse				Red Fox				Deer*				Wild Dog				Feral Pig			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
FC03	LHRR North	NA				NA				NA				NA				NA		1		NA				NA	1	1		NA			
FC04	LHRR North																					1	1	1									
FC05	LHRR Bottom			1														1															
FC06	LHRR Bottom									1		1						1		1													
FC07	LHRR Bottom		1								1	1						1	1	1		1	1	1									
FC08	LHRR Bottom																																
FC09	LHRR Bottom																																
FC10	Marica																		1					1		1	1						
FC11	Marica																				1				1	1							
FC12	Marica					1								1	1	1	1		1														
FC13	Tantangara Road		1	1	1		1				1							1				1	1										
FC14	Tantangara Road														1										1	1		1					
FC15	Tantangara Road					1								1	1	1	1	1			1				1	1	1	1	1				
FC16	Tantangara Road													1	1	1	1		1	1					1	1	1	1					
FC17	Tantangara Dam				1					1		1		1	1		1	1								1							
FC18	Tantangara Dam	1												1	1	1	1					1	1			1		1					
FC19	Tantangara Dam	1		1										1	1	1	1			1													
FC20	Tantangara Dam													1	1	1	1						1					1					
FC21	Rock Forest	1						1			1		1					1															

Notes:

*The deer category includes Sambar, Fallow Deer, as grouped within the BMP.

NA: cameras missing

Cells highlighted in grey represent sites with unsuitable habitat for the Smoky Mouse.

Blank cells represent absence of species or data missing; “1” represents presence of the species.

Table 3.15 Opportunistic (small mammal) remote camera presence/absence in Year 4

Site name		Feral Cat				European Hare				European Rabbit				Feral Horse				Red Fox				Deer*				Wild Dog				Feral Pig			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
SM01-I-RC1	LHRR North	1			1														1	1		1											
SM02-C-RC1	Link Road																																
SM03-I-RC1	LHRR North				1																1												
SM04-C-RC1	Dead-Mans				1																												
SM05-I	LHRR North		1																1		1												
SM06-C	Dead-Mans		1	1																		1											
SM07-I	LHRR North	1			1														1	1		1		1									
SM09-C	Dead-Mans		1	1																													
SM10-I	LHRR North		1	1	1														1	1		1	1										
SM12-C	Dead-Mans				1			1		1	1		1							1													
SM13-C	Dead-Mans				1																	1							1				
SM14-I	LHRR North		1	1																1	1												
SM15-I	LHRR North		1																		1	1											
SM16-I	LHRR North																												1				
SM17-C	LHRR North																																
SM18-I	LHRR North																																
SM19-I	LHRR Bottom		1							1	1								1	1	1		1										
SM20-I	LHRR Bottom	1	1	1														1	1	1	1	1	1	1	1								
SM21-I	Marica	1		1						1																							
SM22-I	Marica	1	1	1	1														1	1	1												
SM23-I	Marica	1		1	1																												
SM24-I	Marica	1		1														1	1		1												
SM25-I	Marica	1	1															1	1		1		1	1							1		
SM26-C	Marica																												1	1			
SM27-I	Marica			1												1	1																
SM28-C	Plateau																																
SM29-C	Plateau									1			1																				
SM30-C	Plateau									1			1																				
SM31-C	Plateau																									1				1			
SM32-C	Plateau									1																							
SM33-C	Plateau																	1															

Site name		Feral Cat				European Hare				European Rabbit				Feral Horse				Red Fox				Deer*				Wild Dog				Feral Pig			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
SM34-I	Tantangara Dam										1		1	1	1	1	1	1	1	1			1										
SM35-I	Plateau															1	1			1													
SM36-I	Tantangara Road										1		1	1	1				1														
SM37-I	Tantangara Road																																
SM38-C	Snowy Mountains Highway																		1														
SM39-C	Tantangara Road																										1		1				
SM40-C	Dead-Mans																																
SM41-C	Link Road																			1													

Notes:

1. I – impact site.
2. C – control site.
3. NA – data missing due to camera moved, stolen, lost data or hardware errors.
4. Blank cells represent absence of species

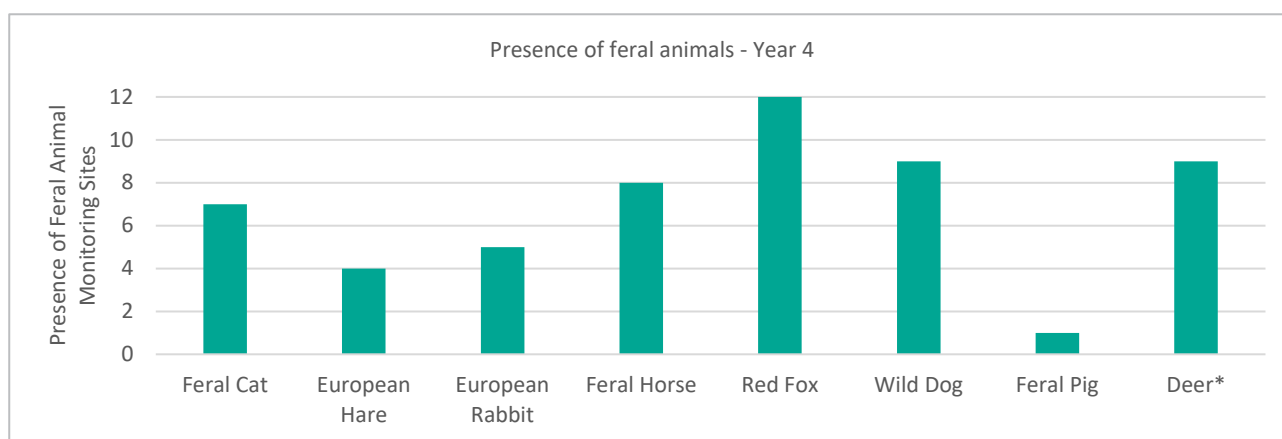


Plate 3.27 Presence of feral animals at feral remote camera sites during Year 4

ii Comparative analysis- Year 1, Year 2 and Year 3 and Year 4

Between Year 1 and Year 4, a slight decline in the percentage of feral species was observed. During Year 1, ten feral species were recorded across 19 monitoring sites, which represents 100% of all monitoring sites surveyed in Year 1. During Year 2, nine species were recorded across 19 monitoring sites, which represents 100% of all monitoring sites surveyed in Year 2. In Year 3, eight feral species were recorded across 16 monitoring sites (84% of all monitoring sites surveyed in Year 3); three sites (FC06, FC08 and FC09) recorded no feral animals in Year 3. In Year 4, nine species of feral animals were recorded across 17 monitoring sites, representing 89% of all monitoring sites surveyed in Year 4; two sites (FC08 and FC09) recorded no feral animals in Year 4.

The percentage of sites recording European Rabbit declined significantly from Year 1 (95%) to Year 4 (26%). Similarly, Feral Cat detections decreased from 84% in Year 1 to 37% in Year 4. Red Fox detections decreased from 84% in Year 1 to 53% in Year 3 to then increase to 63% in Year 4 (Plate 3.28).

The deer species were grouped together in the graphs below for easier interpretation. The full dataset, which includes the results from the feral cameras and the opportunistic data from the small mammal cameras, is presented in Appendix G.

Overall, the four-year monitoring data reveal a mixed trend among feral species, with some populations declining (European Rabbit, European Hare, Feral Cat), others increasing (Sambar Deer, Feral Pig).

A comparison of the percentage of feral animals recorded across all monitoring sites during Year 2, Year 3 and Year 4 compared to Year 1 baseline is presented in Plate 3.28.

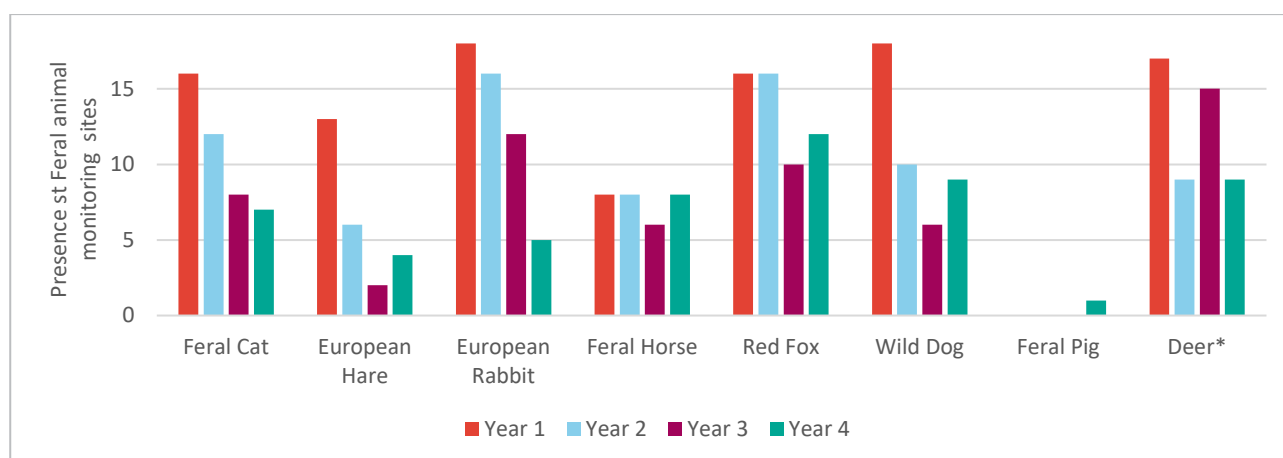


Plate 3.28 Presence of feral animals recorded across all monitoring sites during Year 2, Year 3 and Year 4 compared to baseline (Year 1)

3.5.2 Abundance monitoring

The objective of the feral animal abundance monitoring is to determine feral animal abundance within proximity to the project for control. In Year 4, all seven monitoring transects were surveyed (Lobs Hole Ravine Road Bottom, LHRR North, LHRR South, Marica, Rock Forest, Tintangara Dam and Tintangara Road) across the four monitoring events. During the second monitoring event, Rock Forest, Tintangara Dam and Tintangara Road were cancelled due to unsafe weather conditions (strong to gale force wind up to 80 km/h). During the first monitoring event, Tintangara Dam was partially surveyed due to high heavy vehicle traffic activity along Spoil Road. During the fourth monitoring event, North Ravine Road was partially surveyed due to high heavy vehicle activity. Distance travelled across monitoring events is presented in Table 3.17.

i Year 4

Seven species of feral animals were recorded during Year 4, which include:

- European Hare (*Lepus europaeus*)
- European Rabbit (*Oryctolagus cuniculus*)
- Feral Horse (*Equus caballus*)
- Red Deer (*Cervus elaphus*)
- Red Fox (*Vulpes vulpes*)
- Rusa Deer (*Cervus timorensis*)
- Sambar Deer (*Cervus unicolor*)

During Year 4, the most abundant feral animal per kilometre was European Rabbit, which was most abundant at Rock Forest (9.7 animals/km annual abundance) and Tintangara Dam (5.6 animals/km annual abundance) management zones (Plate 3.29). The second and third most abundant feral animal species recorded during Year 4 were Feral Horse (6 animals/km annual abundance at Tintangara Dam and 4.7 animals/km annual abundance at Marica) and Sambar Deer (1.6 animals/km annual abundance at Lobs Hole Ravine Road North).

During Year 4, the management zone recording the highest abundance per kilometre of feral animals was Rock Forest, which documented an abundance of 8.09 feral animals/km, followed by Tintangara Dam (6.9 feral animals/km) and Marica (1. Rock Forest, Tintangara Dam and Tintangara Road were unable to be surveyed during the Q2 surveys (May 2024) due to dangerous weather conditions at the time of survey.

Feral animal abundance at monitoring sites is summarised in Table 3.16 and shown in Figure 3.14 to Figure 3.21. The Year 4 abundance per km for each management zone is presented in Plate 3.29. Further detailed information including monitoring dates is provided in Appendix G.

a Lobs Hole Ravine Road Bottom

Feral animal abundance was 0.6 animals/km with European Hare, Rabbit, Red Deer, Red Fox and Rusa Deer recorded.

b Lobs Hole Ravine Road North

Feral animal abundance was 0.7 animals/km with Rabbit and Sambar Deer recorded.

c Lobs Hole Ravine Road South

Feral animal abundance was 0.05 animals/km with Rabbit and Sambar Deer recorded.

d Marica

Feral animal abundance was 1.3 animals/km with European Hare, Feral Horse and Rabbit recorded.

e Rock Forest

Feral animal abundance was 8.1 animals/km with only Rabbit recorded.

f Tantangara Dam

Feral animal abundance was 6.9 animals/km with Feral Horse, Rabbit, Rusa Deer and Sambar Deer recorded.

g Tantangara Road

Feral animal abundance was 0.5 animals/km with European Hare, Feral Horse and Rabbit recorded.

h Limitations

Access and weather issues hindered feral spotlighting work, due to high winds and high construction activity on site. This resulted in some transects being shortened to avoid unsafe areas and in Q2, some transects being unable to be surveyed.

Table 3.16 Total number of individuals (and abundance of feral animals per km) recorded within each monitoring location in Year 4

Monitoring event	LHRR Bottom [individuals (abundance)]	LHRR North [individuals (abundance)]	LHRR South [individuals (abundance)]	Marica [individuals (abundance)]	Rock Forest [individuals (abundance)]	Tantangara Dam [individuals (abundance)]	Tantangara Road [individuals (abundance)]
First							
European Hare	0	0	0	1(0.1)	0	0	0
Feral Horse	0	0	0	0	0	33(3.1)	5(0.3)
Rabbit	1(0.1)	5(0.8)	1(0.1)	1(0.1)	19(9.7)	14(1.3)	6(0.4)
Red Deer	1(0.1)	0	0	0	0	0	0
Red Fox	5(0.4)	0	0	0	0	0	0
Sambar	0	0	1(0.1)	0	0	0	0
Second							
European Hare	2(0.2)	0	0	0	NA*	NA*	NA*
Rabbit	11(1.1)	1(0.2)	0	0	NA*	NA*	NA*
Third							
European Hare	0	0	0	0	0	0	2(0.1)
Feral Horse	0	0	0	55(4.7)	0	15(1)	0

Monitoring event	LHRR Bottom [individuals (abundance)]	LHRR North [individuals (abundance)]	LHRR South [individuals (abundance)]	Marica [individuals (abundance)]	Rock Forest [individuals (abundance)]	Tantangara Dam [individuals (abundance)]	Tantangara Road [individuals (abundance)]
Rabbit	4(0.4)	0	0	0	8(5.2)	47(3.2)	3(0.2)
Red Fox	1(0.1)	0	0	0	0	0	0
Rusa Deer	1(0.1)	0	0	0	0	1(0.1)	0
Sambar	0	0	0	0	0	2(0.1)	0
Fourth							
European Hare	0	0	0	0	0	0	3(0.2)
Feral Horse	0	0	0	0	0	81(6)	0
Rabbit	0	2(0.6)	1(0.1)	4(0.3)	14(8.8)	76(5.6)	5(0.3)
Sambar	0	5(1.6)	0	0	0	0	0

Note: NA – Sites were unable to be surveyed due to unsafe weather conditions.

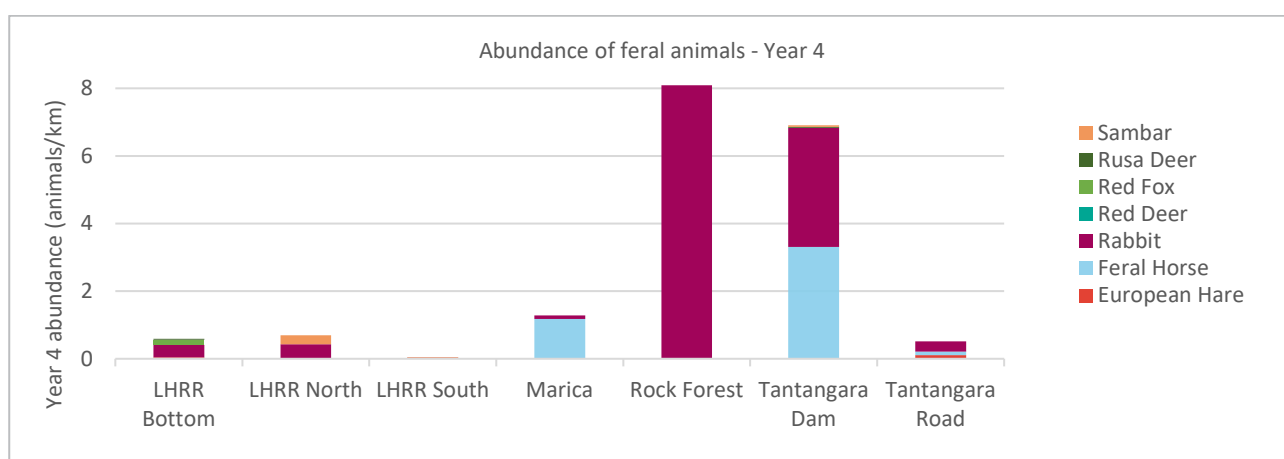


Plate 3.29 Abundance of feral animals observed per km at each location across four monitoring events during Year 4

ii Comparative analysis- Year 1, Year 2, Year 3 and Year 4

During Year 1, Year 2, Year 3 and Year 4, the same eight management zones were surveyed. The distances travelled during the three monitoring years is summarised in Table 3.17.

The overall number of feral animal species recorded increased from five in Year 1 to eight in Year 2, to then return to five species in Year 3 before increasing to seven in Year 4.

Across Years 1, 2, 3 and 4, the greatest annual abundance of feral animals was observed in Year 1 across five out of the seven management zones. The two remaining management zones, Rock Forest recorded a peak in feral animal abundance in Year 2 and Tantangara Dam recorded a peak in feral animal abundance in Year 4.

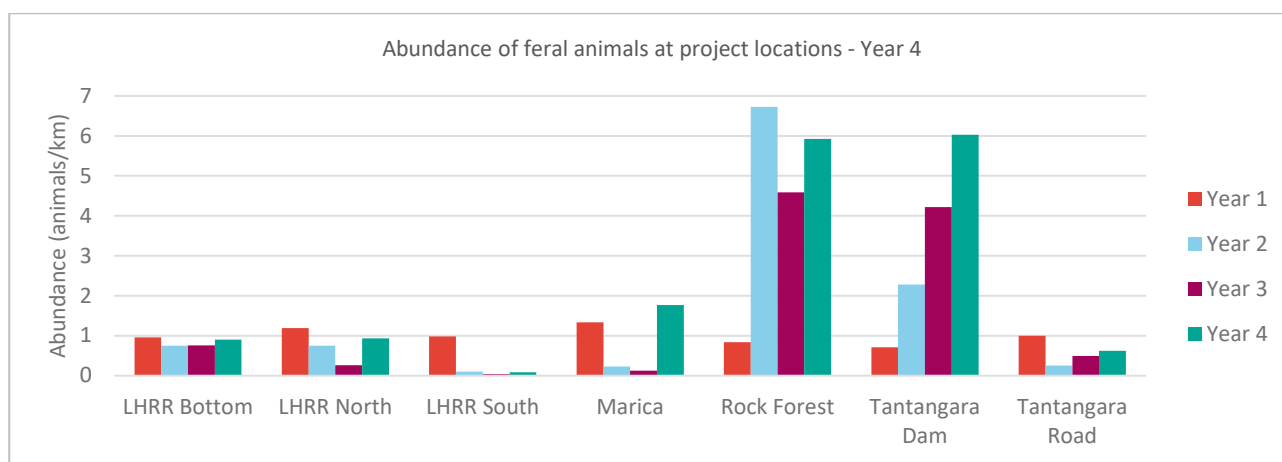


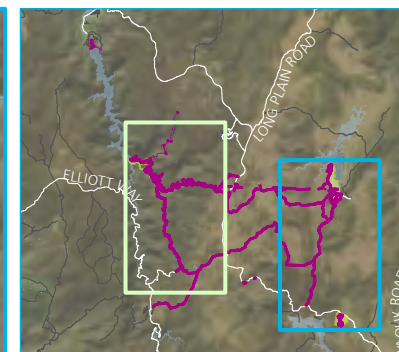
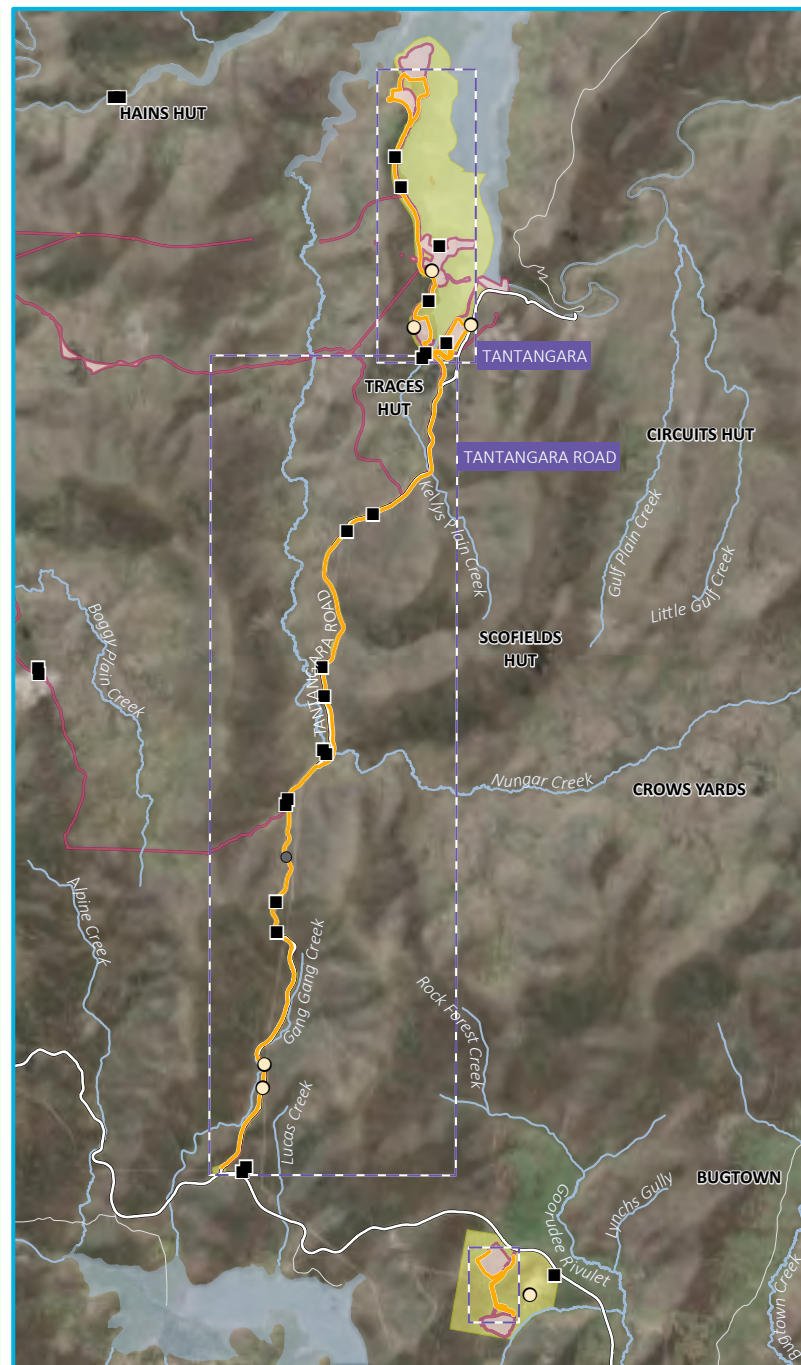
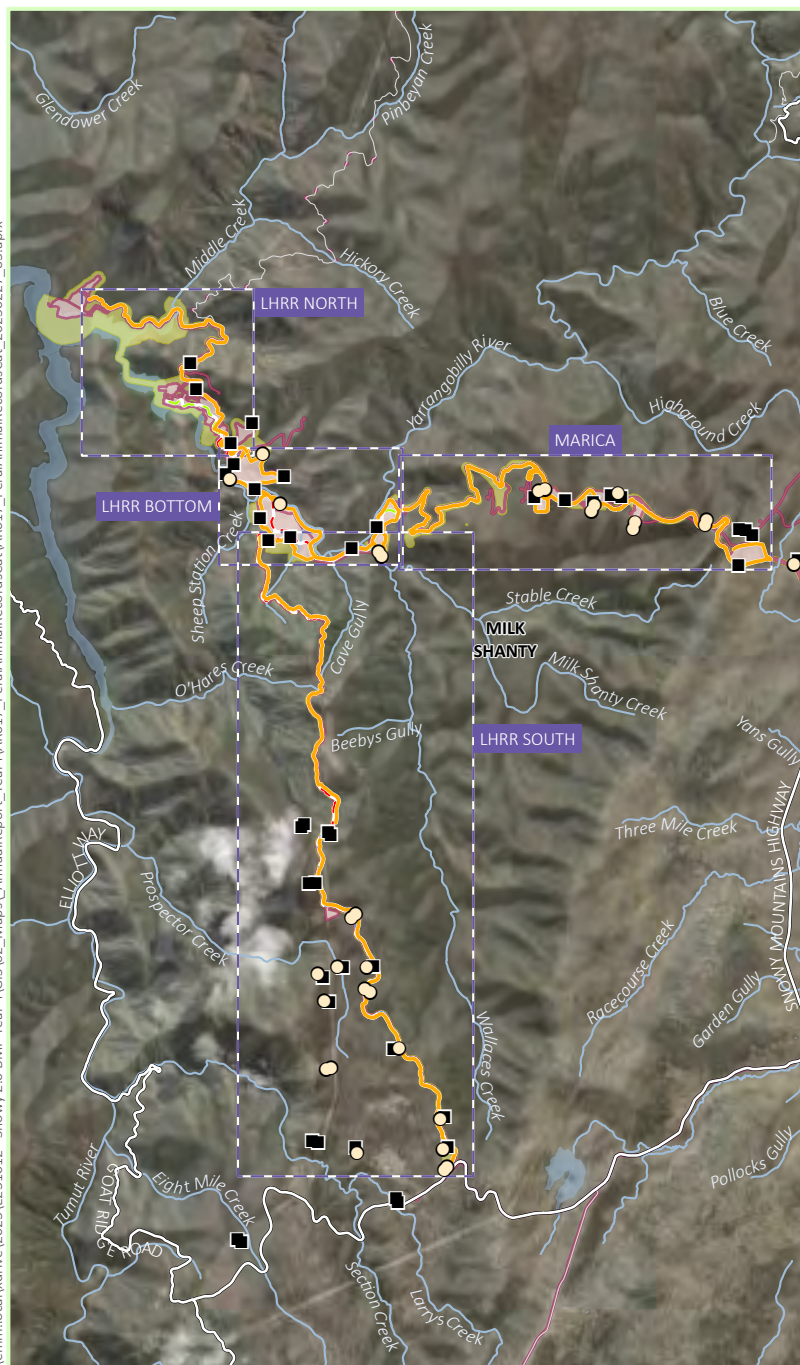
Plate 3.30 Abundance of feral animals per km at project locations

Table 3.17 Distance travelled across monitoring events during Year 1, Year 2, Year 3 and Year 4

Monitoring event	LHRR Bottom	LHRR North	LHRR South	Marica	Rock Forest	Tantangara Dam	Tantangara Road
Year 4							
First	11.7	6.6	13.4	14.3	2.0	10.5	15.9
Second	10.1	6.6	14.4	7.0	NA*	NA*	NA*
Third	11.1	2.2	14.3	11.8	1.5	14.9	15.4
Fourth	11.3	3.2	13.5	14.6	1.6	13.6	15.8
Total	44.2	18.6	55.6	47.7	5.1	39.0	47.1
Year 3							
First	18.0	NA	14.5	15.9	1.0	13.6	15.8
Second	12.5	4.0	28.6	14.6	2.1	9.1	30.5
Third	10.0	5.2	28.9	11.9	2.2	9.9	30.8
Fourth	14.6	9.8	27.3	14.5	1.9	7.0	31.7
Total	55.1	19	99.3	56.9	7.2	39.6	108.8
Year 2							
First	10.0	2.3	14.6	9.0	1.6	5.2	15.7
Second	15.9	6.7	14.5	8.8	1.6	8.3	15.6
Third	15.5	6.5	14.6	11.3	1.1	20.0	15.4
Fourth	6.8	4.4	14.2	14.3	1.2	13.4	15.7
Total	48.1	20.0	57.9	43.4	5.5	46.9	62.4
Year 1							
First	10.3	7.3	14.2	13.6	NA	8.3	15.3
Second	13.4	4.4	14.0	19.3	NA	8.3	16.1
Third	10.3	7.3	14.2	10.4	3.3	7.6	15.5
Fourth	12.3	4.9	14.4	14.6	1.3	9.0	15.6
Total	46.2	23.8	56.8	57.9	4.6	33.2	62.5

Note: NA – site was not surveyed in Q1 and Q2 in Year 1; NA* – Sites were unable to be surveyed due to unsafe weather conditions.

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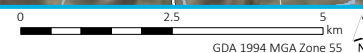
- KEY**
- Approved disturbance
 - Approved construction envelope
 - Feral management zone
 - Spotligting transect
 - Camera record - Feral Cat
 - Presence
 - Absence
 - Spotligting record
 - Feral cat
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

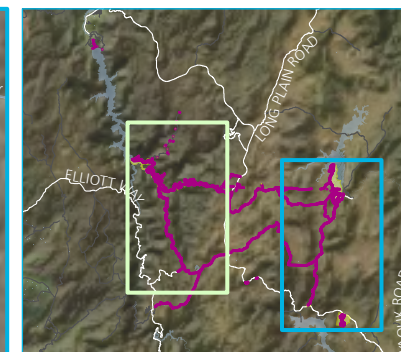
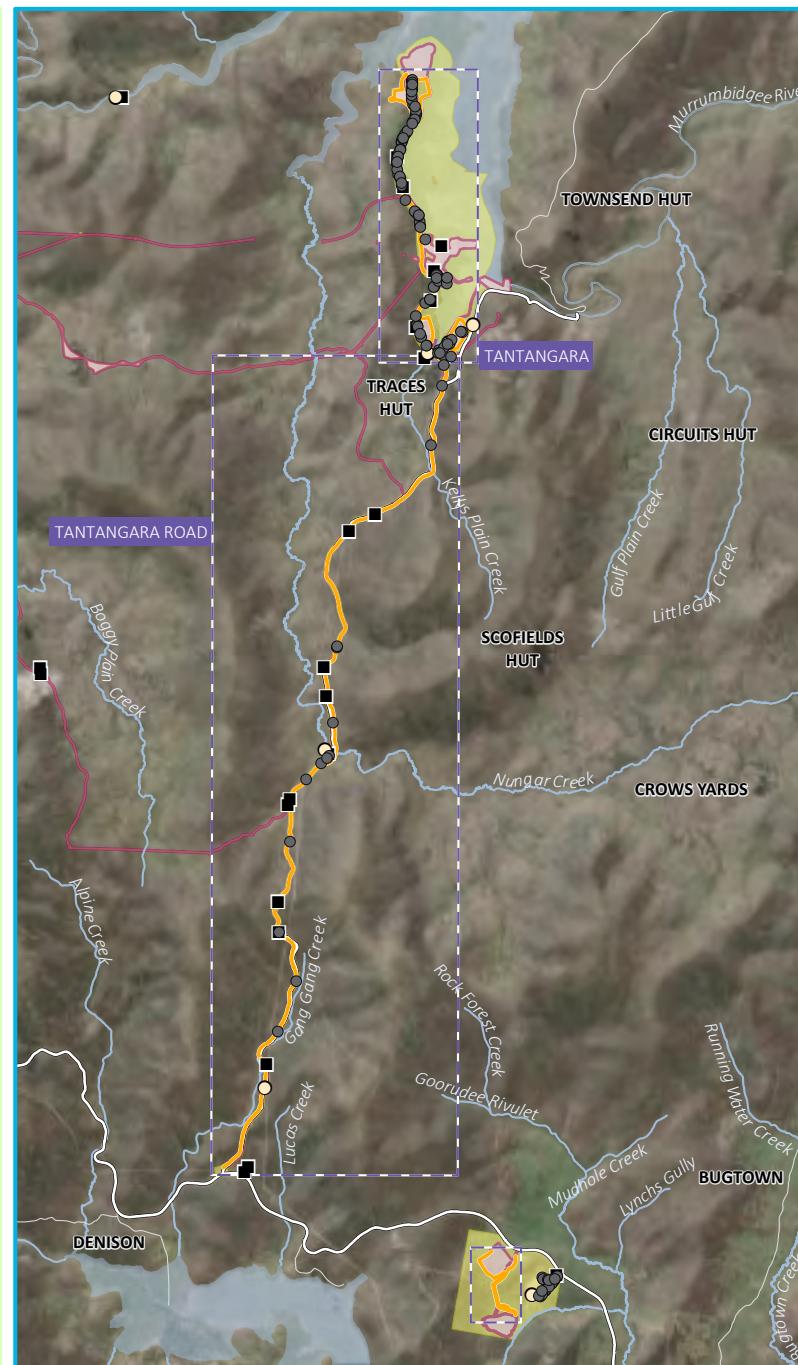
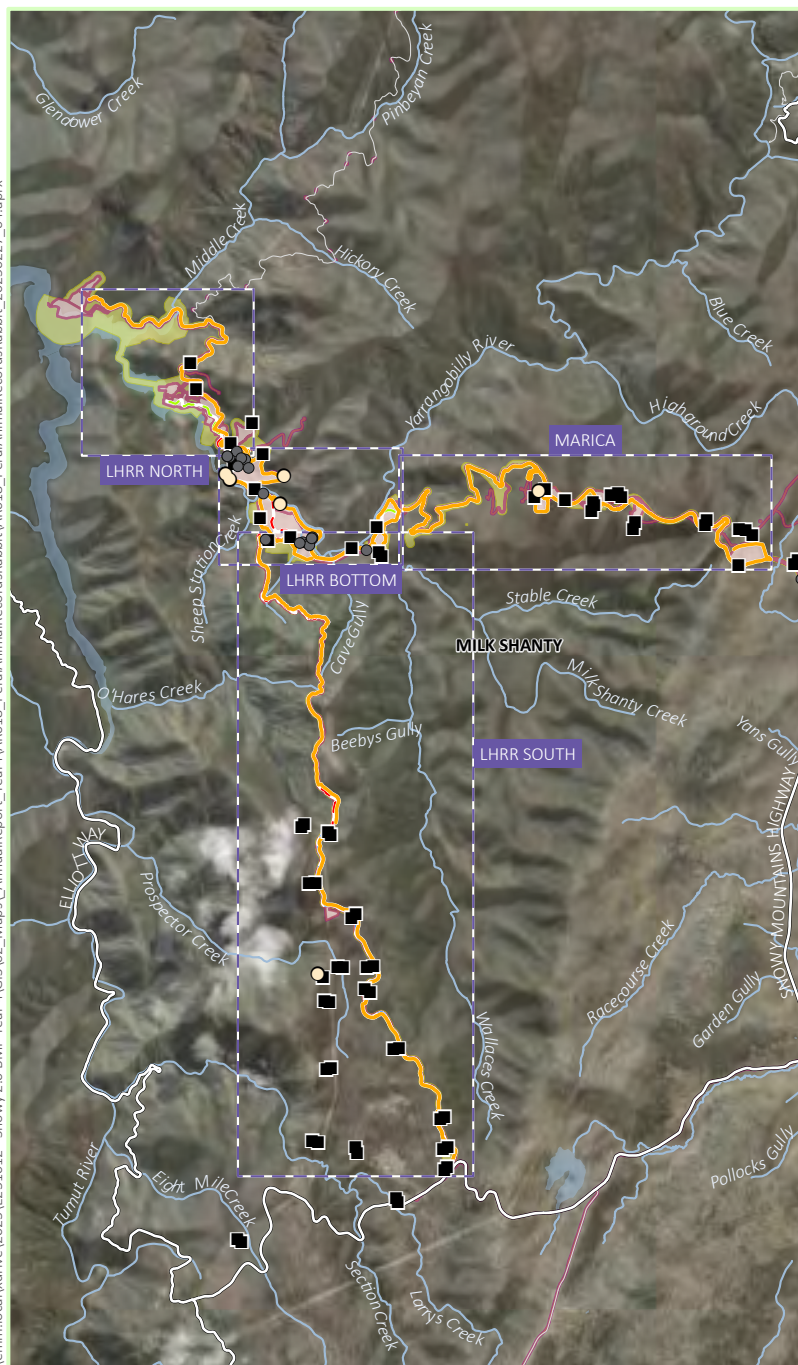
Feral animal records during Year 4 –
Feral Cat

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Biodiversity Management Program
Annual report
Figure 3.14



Source: EMM (2024, 2025); Snowy Hydro (2025); DFSI (2017); ESRI (2025)





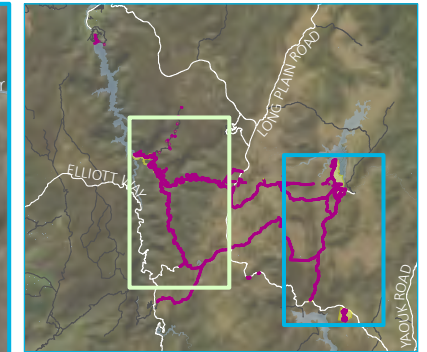
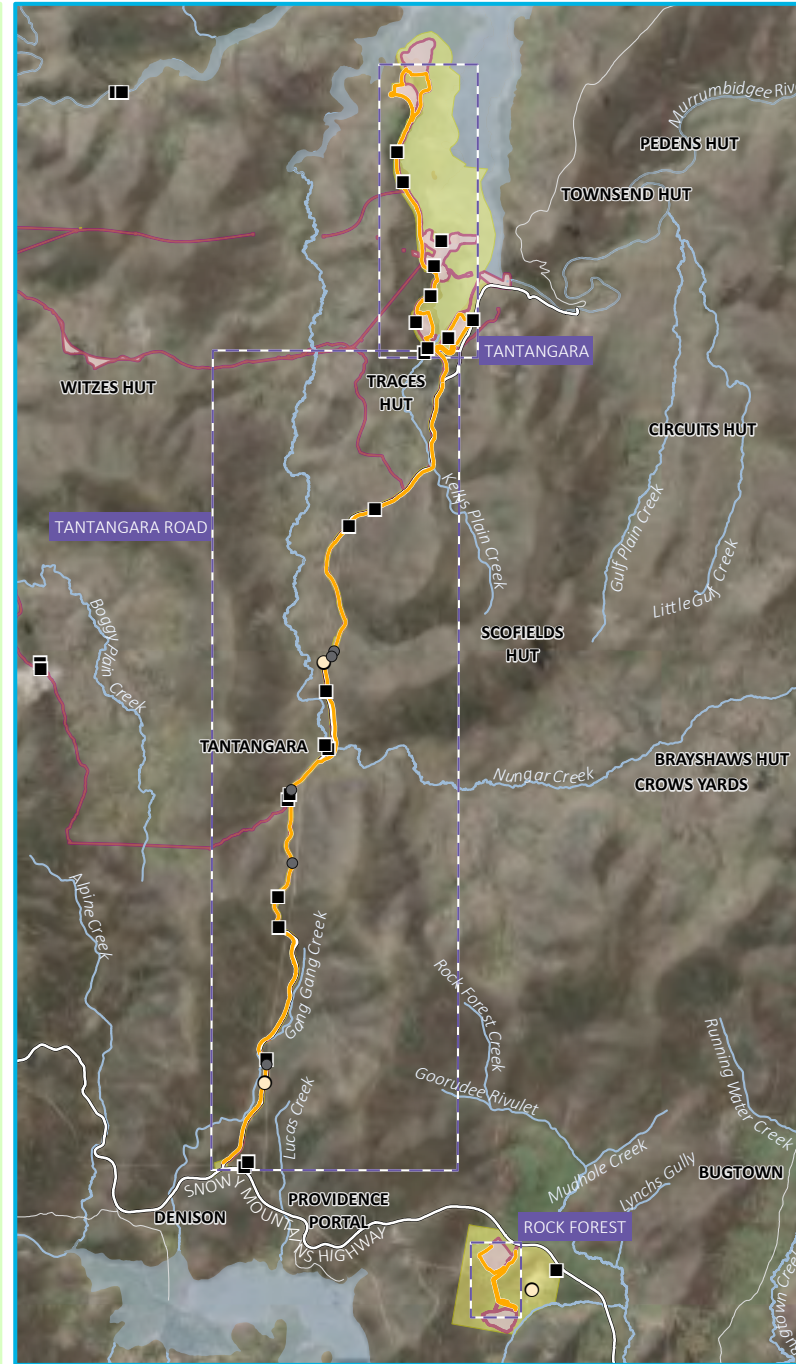
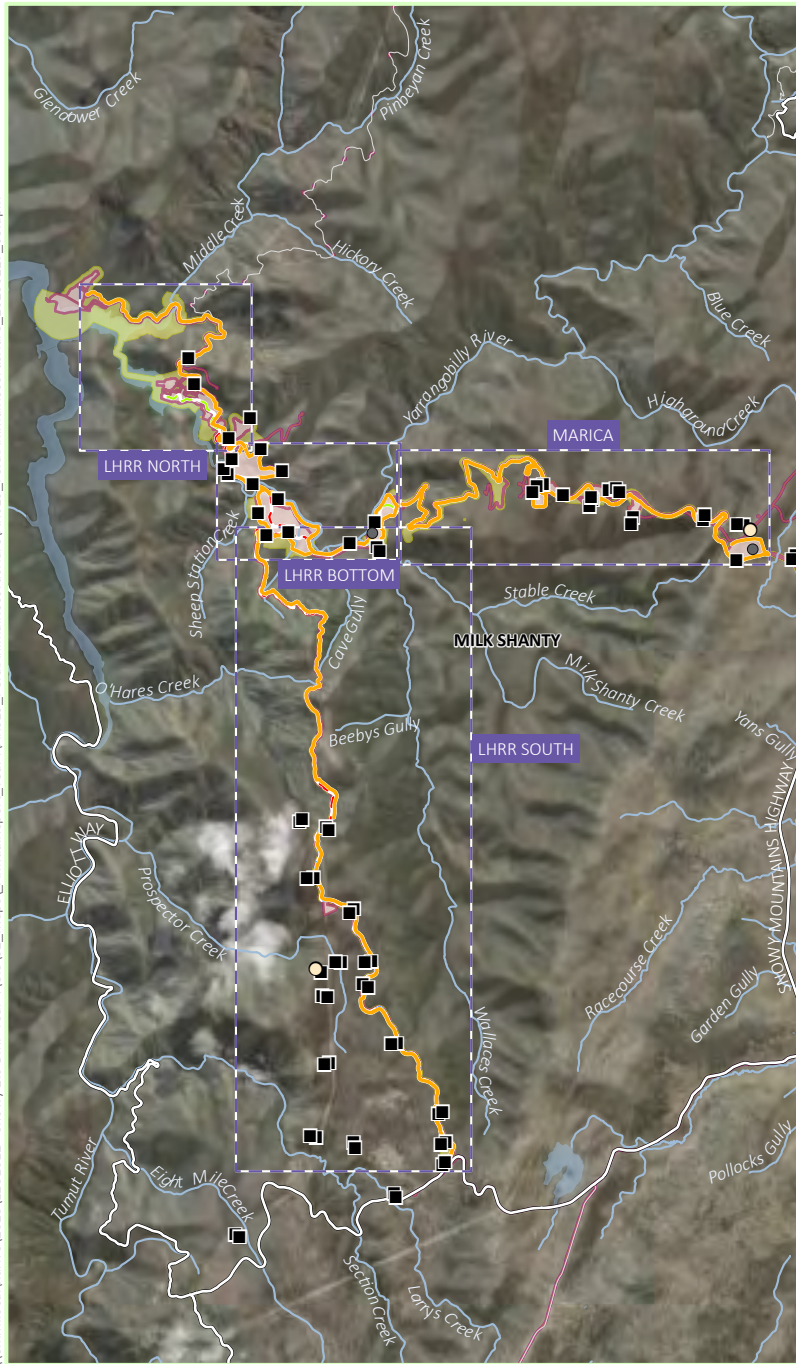
KEY

- Approved disturbance
- Approved construction envelope
- Feral management zone
- Spotlighting transect
- Camera record - European Rabbit
- Presence
- Absence
- Spotlighting record
- European rabbit
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Feral animal records during Year 4 – European Rabbit

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.15





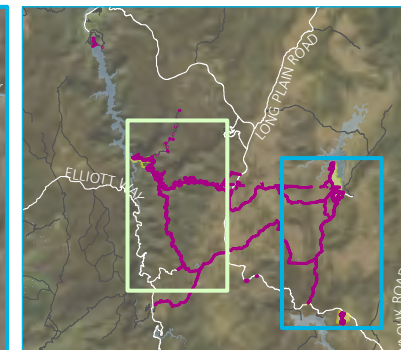
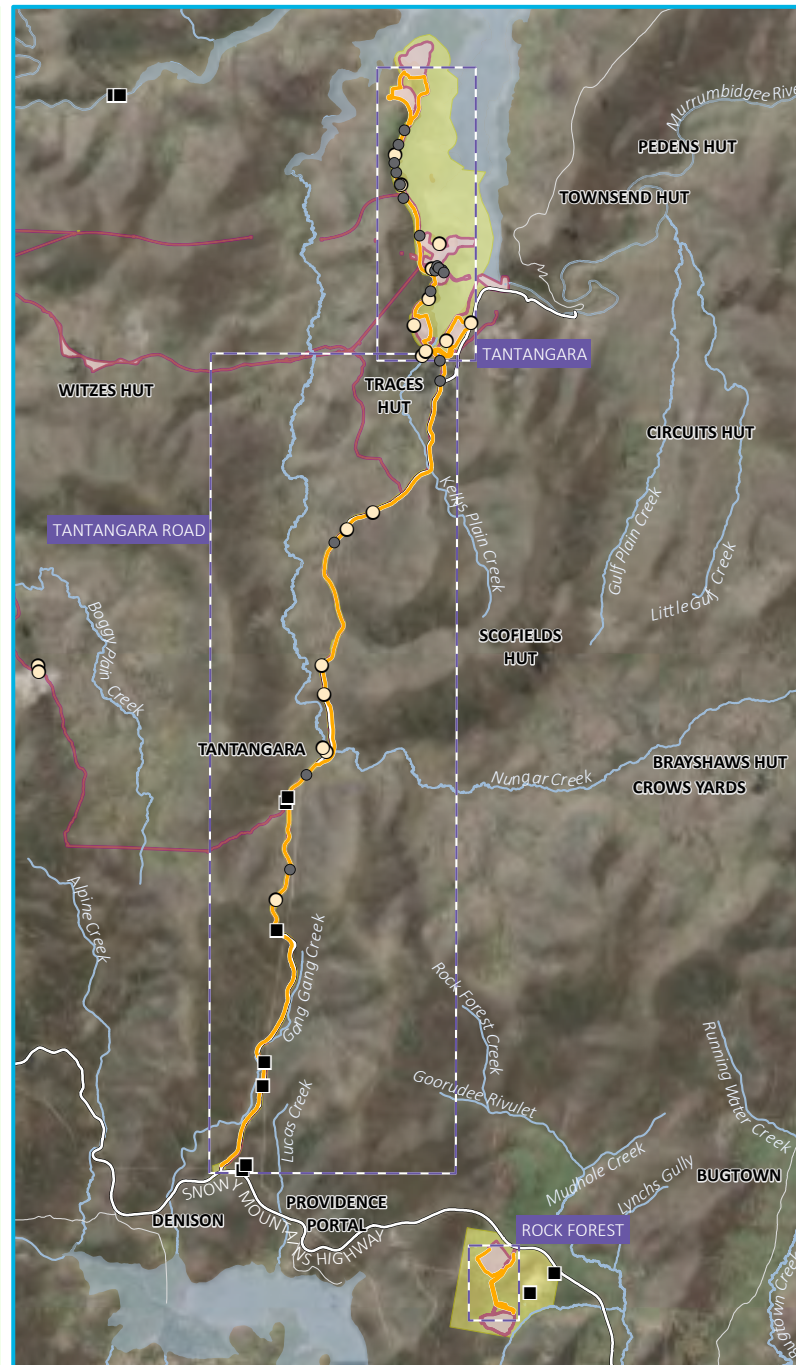
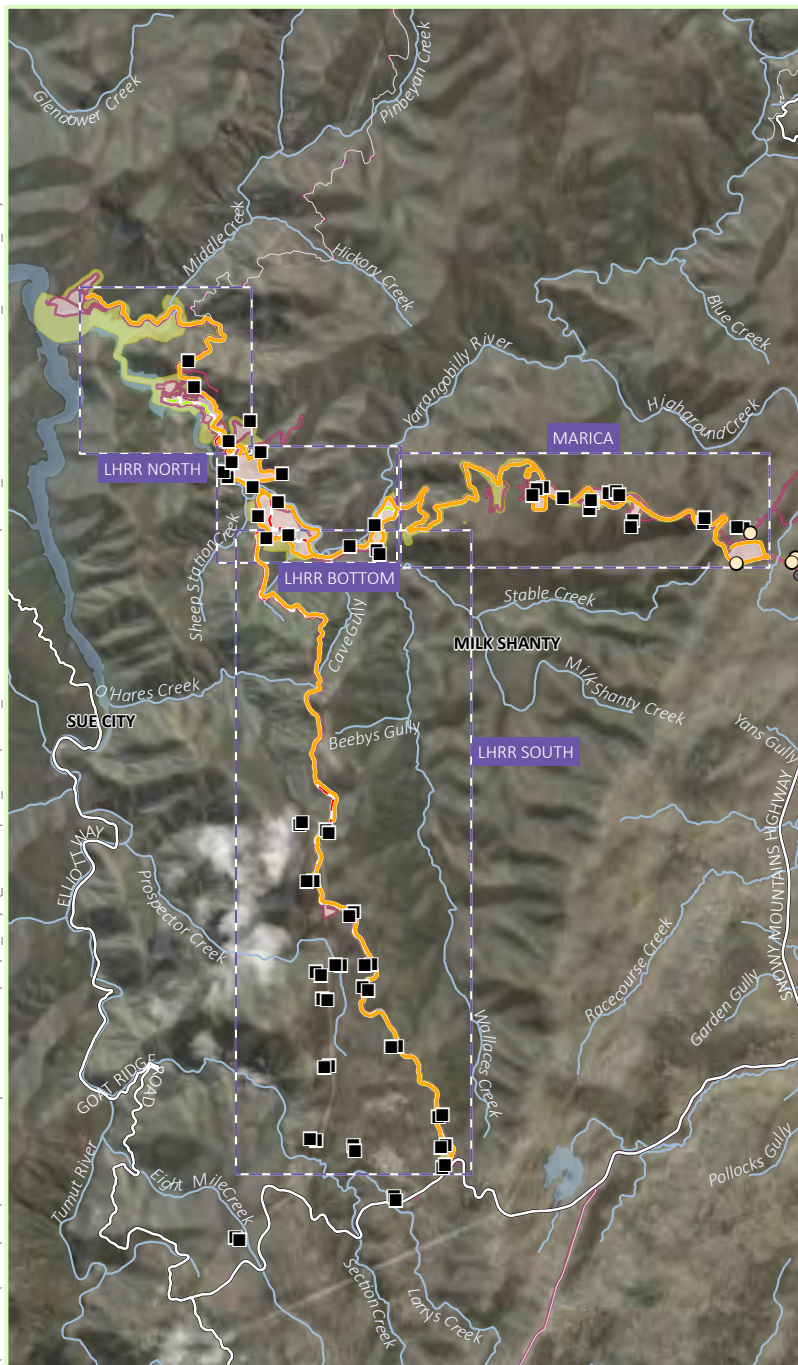
- KEY**
- Approved disturbance
 - Approved construction envelope
 - Feral management zone
 - Spotlighting transect
 - Camera record - European Hare
 - Presence
 - Absence
 - Spotlighting record
 - European Hare
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Feral animal records during Year 4 – European Hare

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.16



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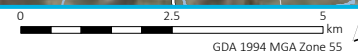


KEY

- Approved disturbance
- Approved construction envelope
- Feral management zone
- Spotlighting transect
- Camera record - Feral Horse
- Presence
- Absence
- Spotlighting record
- Feral Horse
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Feral animal records during Year 4 –
Feral Horse

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.17

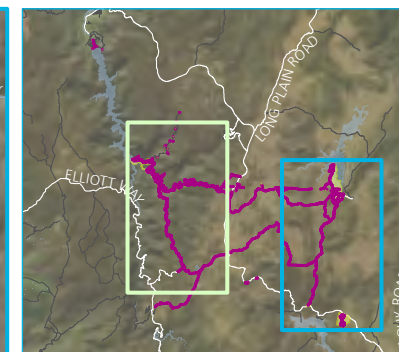


Source: EMM (2024, 2025); Snowy Hydro (2025); DFSI (2017); ESRI (2025)

This map illustrates the Tantara National Park area, highlighting the Tantara Road and various huts. The road is shown as a yellow line with black and white markers, running from the top center towards the bottom. Key locations marked include:

- Huts:** PEDENS HUT, TOWNSEND HUT, WITZES HUT, TRACES HUT, SCOFIELDS HUT, BRAYSHAW'S HUT, CROWS YARDS, and BUGTOWN.
- Geographical Features:** Murrumbidgee River, Gulf Plain Creek, Little Gully Creek, Nungah Creek, Alpine Creek, Gang Gang Creek, Lucas Creek, Rock Forest Creek, Goorudee Rivulet, Muchhole Creek, Lynchs Gully, Running Water Creek, and Snowy Creek.
- Roads:** TANTANGARA ROAD and SNOWY MOUNTAINS HIGHWAY.
- Other Locations:** DENISON, PROVIDENCE PORTAL, and ROCK FOREST.

The map also shows a dashed white line indicating a boundary or route, and a yellow shaded area in the bottom right corner.

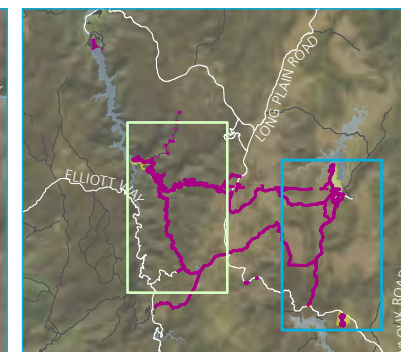
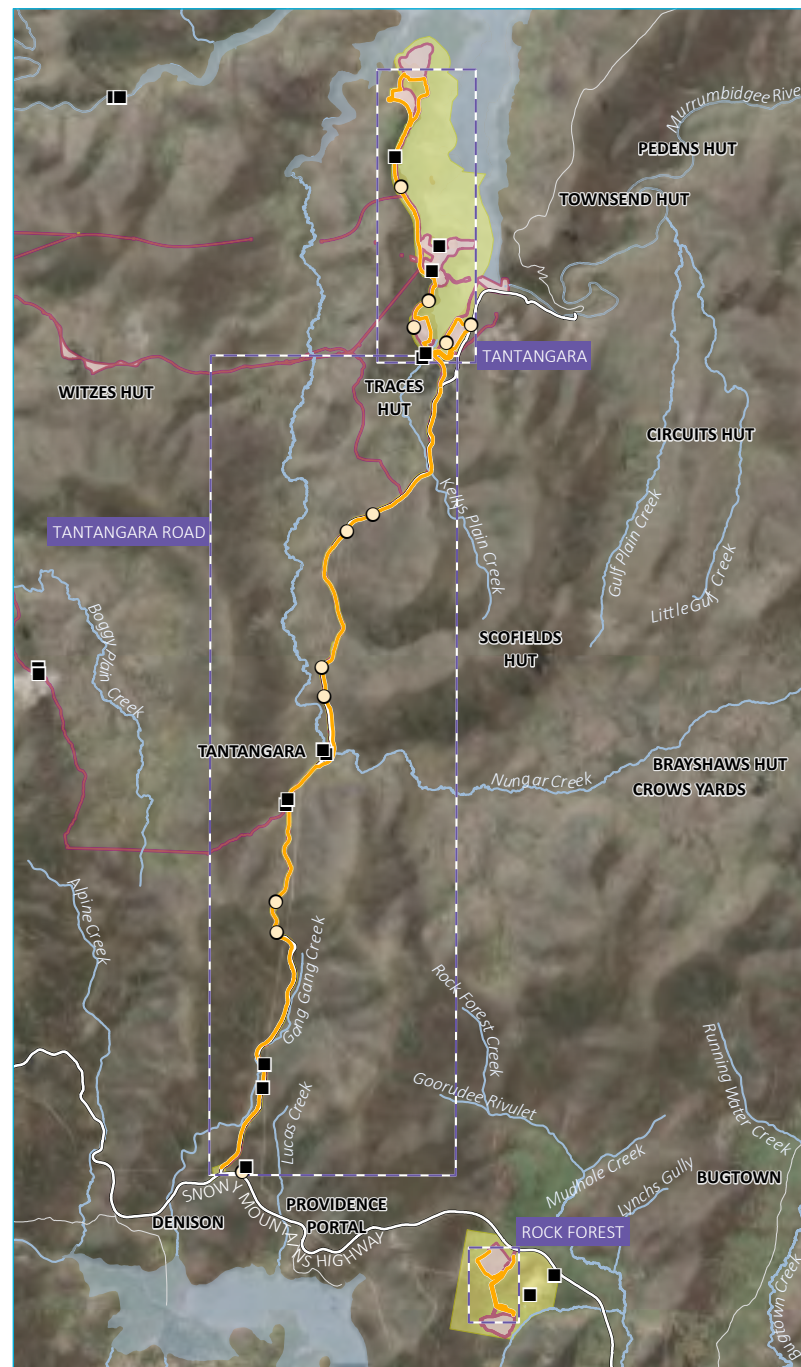
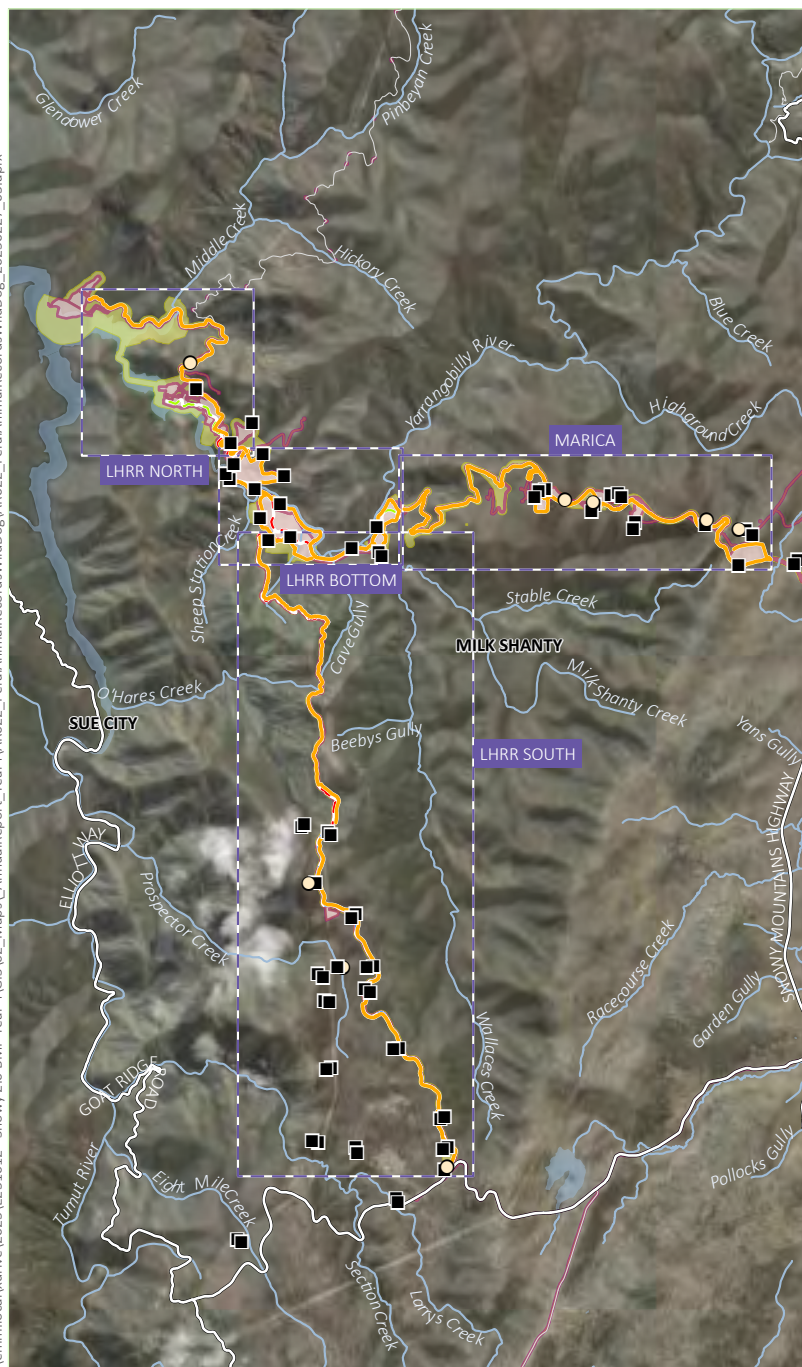


- Approved disturbance
- Approved construction envelope
- Feral management zone
- Spotlighting transect
- Camera record - Red Fox
 - Presence
 - Absence
- Spotlighting record
 - Red Fox
- Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Feral animal records during Year 4 –
Red Fox

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Annual report
Figure 3.18





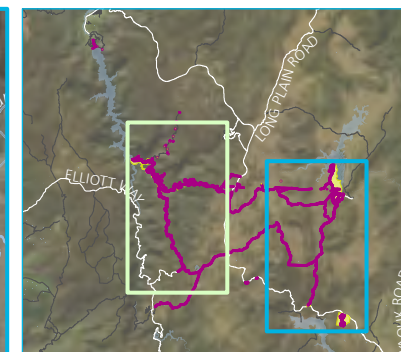
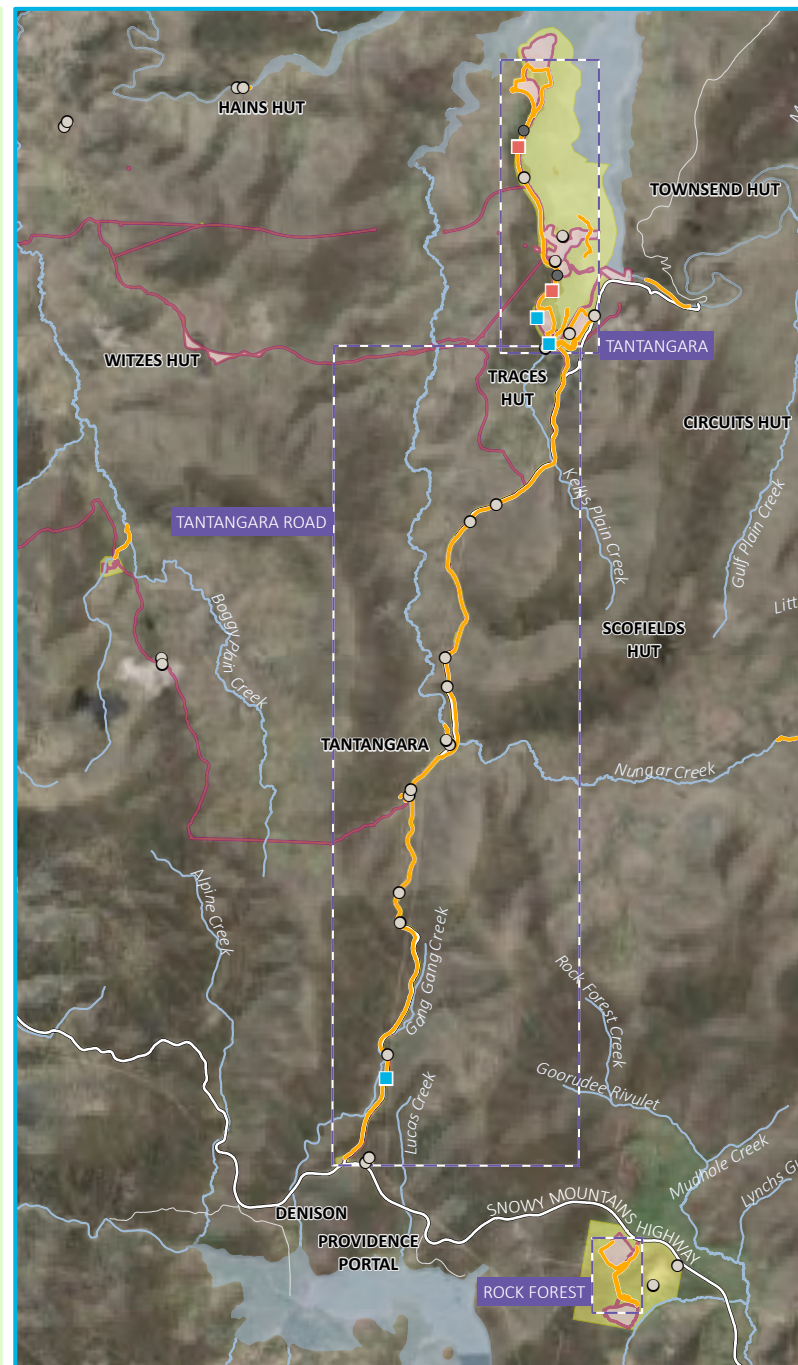
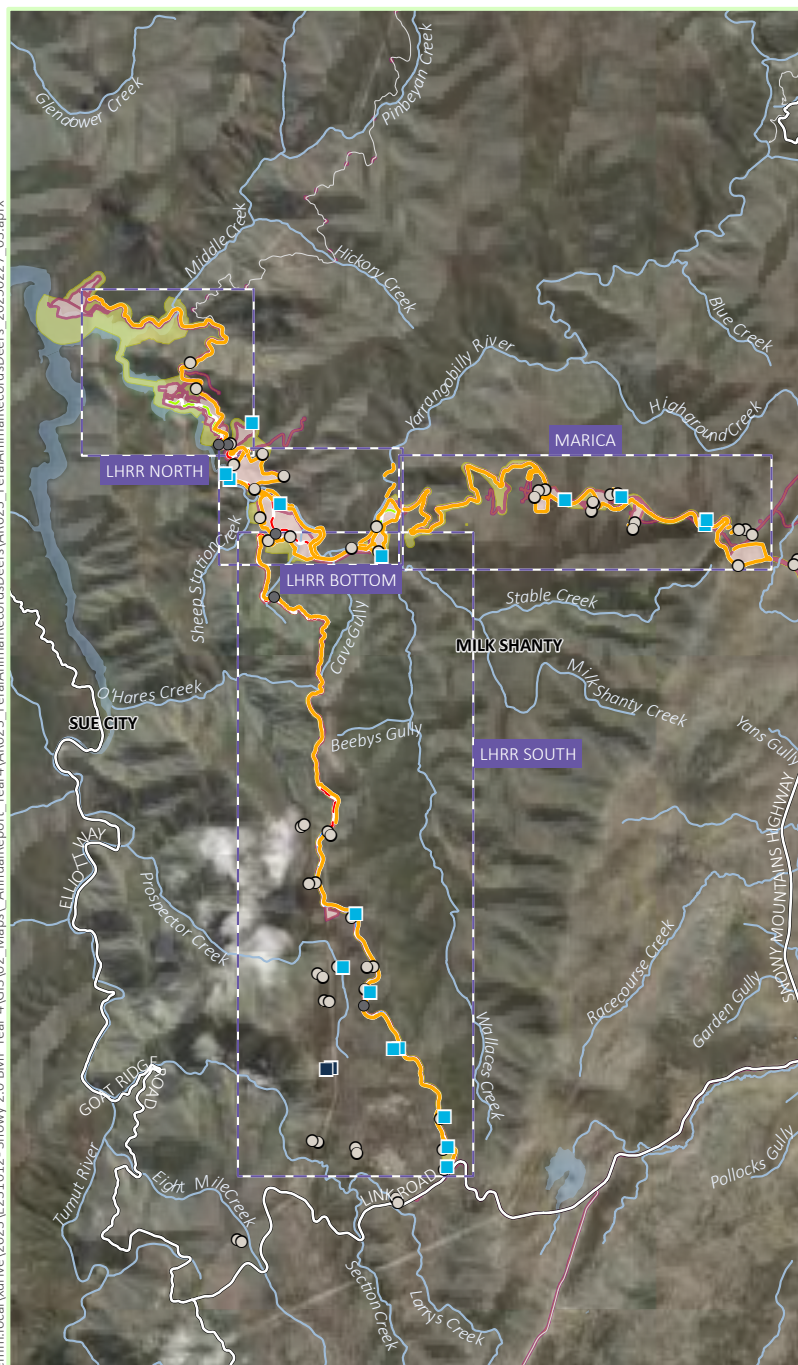
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- Approved disturbance
- Approved construction envelope
- Feral management zone
- Spot lighting transect
- Camera record - Wild Dog
- Presence
- Absence
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Feral animal records during Year 4 – Wild Dog

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Annual report
Figure 3.19



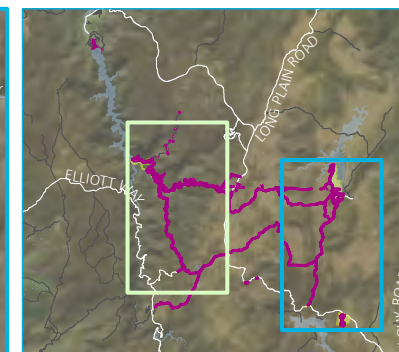
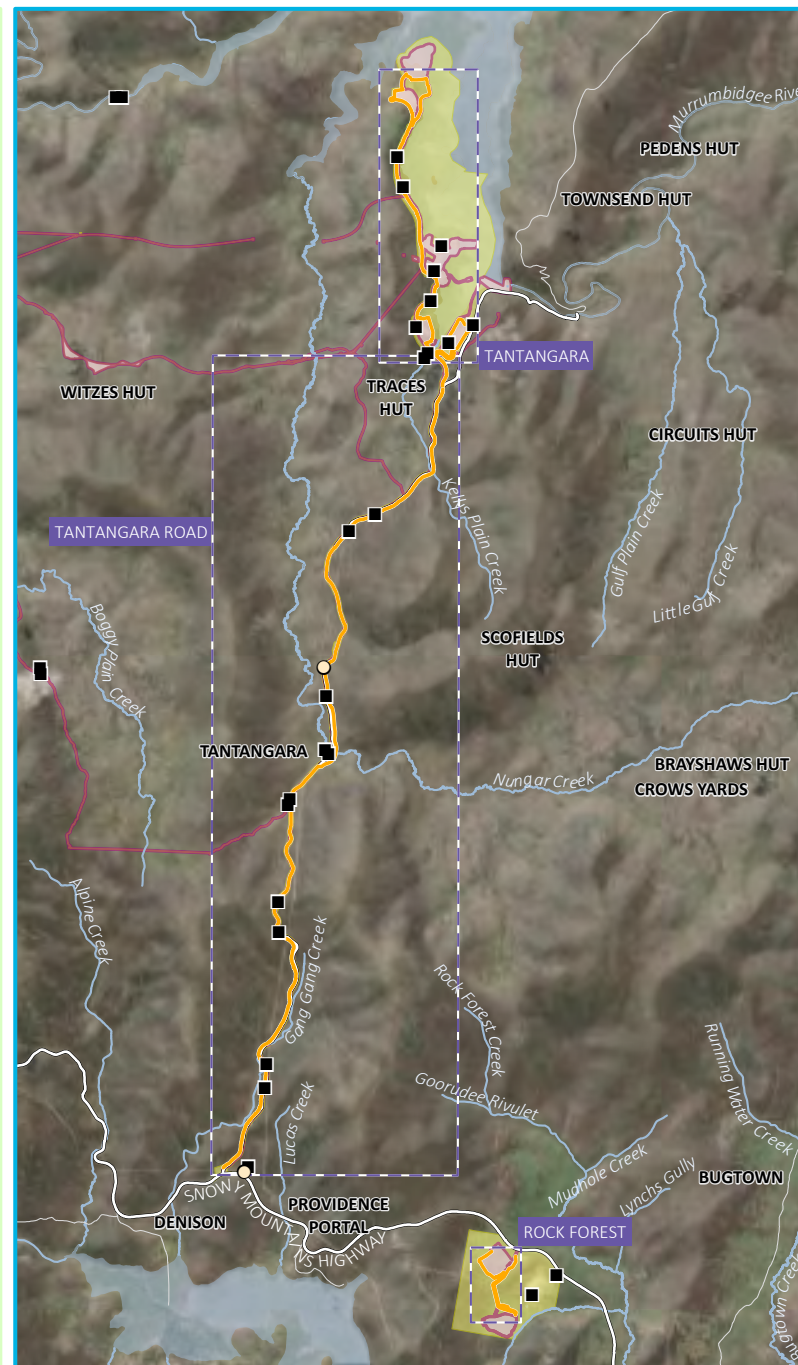
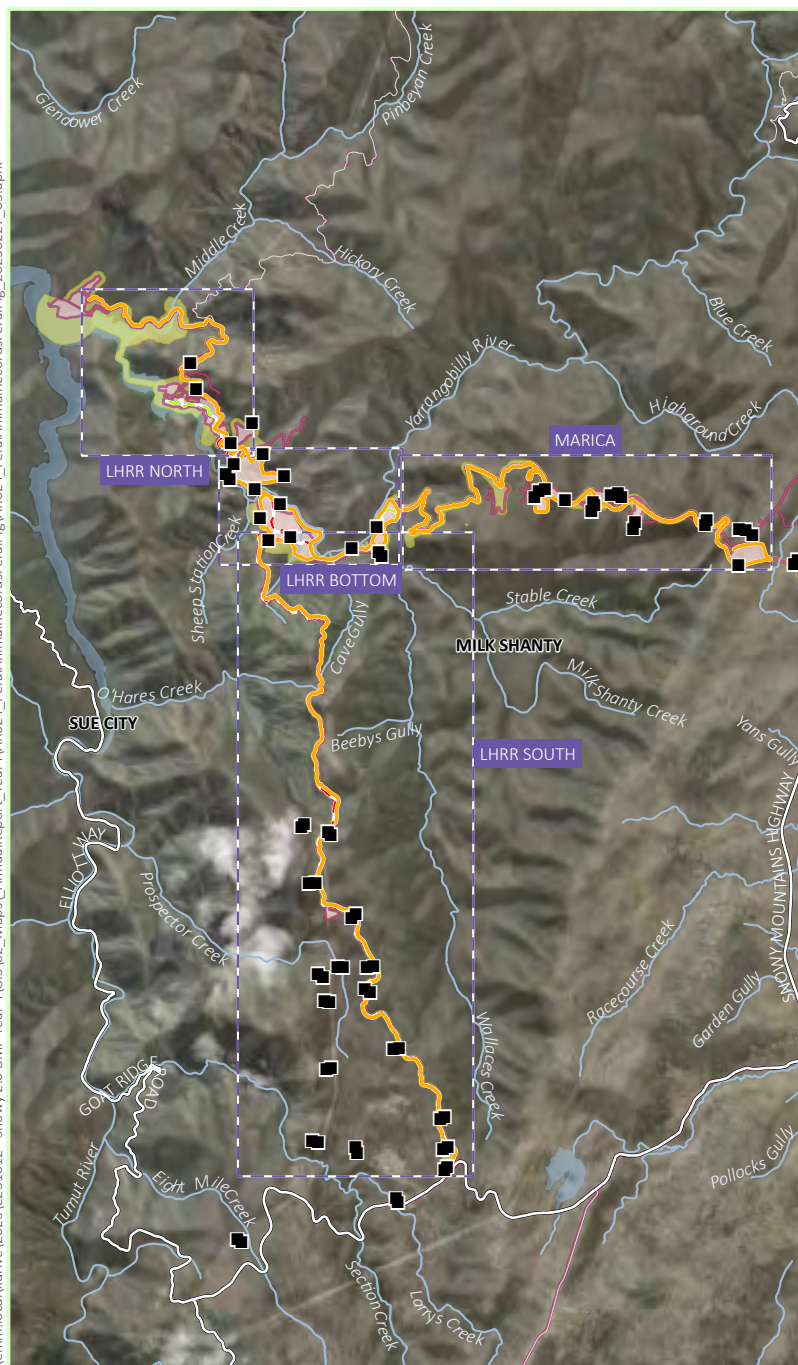


- KEY**
- Approved disturbance
 - Approved construction envelope
 - Feral management zone
 - Spotlighting transect
- Camera record- deer species**
- Samba Deer- presence
 - Red Deer- presence
 - Unknown Cervid sp.- presence
 - Absence
- Spotlighting record**
- Deer
- Existing environment**
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Waterbody

Feral animal records during Year 4- Deer

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Annual report
Figure 3.20

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KEY

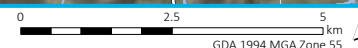
- Approved disturbance
- Approved construction envelope
- Feral management zone
- Spotlighting transect
- Camera record - Feral Pig
- Presence
- Absence
- Existing environment
- Major road
- Minor road
- Named watercourse
- Waterbody

Feral animal records during Year 4 –
Feral Pig

Snowy 2.0
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Annual report
Figure 3.21



Source: EMM (2024, 2025); Snowy Hydro (2025); DFSI (2017); ESRI (2025)



3.6 Weed and pathogen monitoring

3.6.1 Weed presence/absence

The objective of the weed presence/absence monitoring is to determine presence/absence and abundance of priority weeds within proximity of the project (roads and key project infrastructure) for routine control in accordance with the Weed, Pest and Pathogen Management Plan (FGJV, 2020). Flora species identified as priority weeds for the project are listed as per Annexure A of the BMP (Snowy Hydro & FGJV, 2020).

i Year 4

A total of eleven priority weed species were recorded within 50 m of the main project roads, accommodation camps and key construction compounds. Six priority weed species were recorded within 50 m of the threatened flora monitoring locations (Figure 3.22). Overall, eleven priority weeds were recorded in Year 4 in eight management zones.

a Bottom of Lobs Hole

A total of seven priority weed species were recorded in this area, including Spear Thistle, Sweet Vernal Grass, Yorkshire Fog Grass, St John's Wort, Mullein, Blackberry, and Browntop Bent. Notably, St John's Wort, Spear Thistle, and Sweet Vernal Grass were also recorded within 50 m of threatened flora plots. Blackberry and Sweet Vernal Grass both formed dense cover (>50%) in this zone. Additionally, four non-priority weed species were recorded, with Sheep Sorrel, Bentgrass, Redtop Bent, and Flatweed present. Sheep Sorrel was also observed at threatened flora plots.

b Lobs Hole Ravine Road Bottom

Seven priority weed species were also recorded here, including Spear Thistle, Mullein, Blackberry, St John's Wort, Browntop Bent, Yorkshire Fog Grass, and Cocksfoot. Among these, Spear Thistle, Mullein, and St John's Wort were observed at threatened flora plots. Dense weed cover was present, primarily due to Blackberry and St John's Wort. Five non-priority species were present, including Sheep Sorrel, Flatweed, Flaxleaf Fleabane, Bentgrass, and Redtop Bent, with Sheep Sorrel and Bentgrass also detected at threatened flora plots.

c Lobs Hole Ravine Road Top

Fewer species were observed here, with five priority weeds recorded: Spear Thistle, Mullein, Sweet Vernal Grass, St John's Wort, and Yorkshire Fog Grass. All five species were observed at threatened flora plots. Among the non-priority species, Sheep Sorrel, Bentgrass, and Flaxleaf Fleabane were found, with all three also present near threatened flora plots.

d Marica

A total of seven priority weeds were found in Marica, including Spear Thistle, Mullein, St John's Wort, Yorkshire Fog Grass, Sweet Vernal Grass, Browntop Bent, and Ox-eye Daisy. St John's Wort, Mullein, and Spear Thistle were observed near threatened flora plots. This site recorded dense cover of four weed species: Sweet Vernal Grass, Browntop Bent, St John's Wort, and Flatweed (non-priority). In total, five non-priority species were recorded here, including Sheep Sorrel, Flatweed, Flaxleaf Fleabane, Bentgrass, and White Clover, with Sheep Sorrel and Flatweed recorded at threatened flora plots.

e Rock Forest

Six priority weeds were recorded: Spear Thistle, Mullein, St John's Wort, Yorkshire Fog Grass, Sweet Vernal Grass, and Ox-eye Daisy. Spear Thistle, St John's Wort, and Sweet Vernal Grass were associated with threatened flora plots. Among the non-priority species, Sheep Sorrel and Flatweed were present, both observed at threatened flora plots.

f Tantangara Dam

This location had the highest diversity of priority weeds, with ten species recorded: Spear Thistle, Mullein, Sweet Vernal Grass, St John's Wort, Yorkshire Fog Grass, Ox-eye Daisy, Cocksfoot, Browntop Bent, Musk Monkey Flower, and Sweet Briar. Five of these – Spear Thistle, Sweet Vernal Grass, St John's Wort, Mullein, and Yorkshire Fog Grass – were recorded at threatened flora plots. Dense coverage was observed for St John's Wort, Yorkshire Fog Grass, and Sweet Vernal Grass. Non-priority weeds included Sheep Sorrel, Flatweed, Bentgrass, and Flaxleaf Fleabane, with Sheep Sorrel present at threatened flora plots.

g Tantangara Road Bottom

Eight priority weed species were recorded, including Spear Thistle, Mullein, St John's Wort, Sweet Vernal Grass, Yorkshire Fog Grass, Ox-eye Daisy, Cocksfoot, and Browntop Bent. St John's Wort, Spear Thistle, and Sweet Vernal Grass were also recorded near threatened flora plots. Dense weed cover included Sweet Vernal Grass, St John's Wort, and Yorkshire Fog Grass. Four non-priority species were present: Sheep Sorrel, Flatweed, Bentgrass, and Flaxleaf Fleabane, with Sheep Sorrel recorded at threatened flora plots.

h Tantangara Road Top

This site also had eight priority weeds: Spear Thistle, Mullein, St John's Wort, Sweet Vernal Grass, Yorkshire Fog Grass, Ox-eye Daisy, Cocksfoot, and Browntop Bent. St John's Wort, Sweet Vernal Grass, and Spear Thistle were again observed at threatened flora plots. Dense weed coverage was recorded for Sweet Vernal Grass, Yorkshire Fog Grass, and St John's Wort. Among the non-priority species, Sheep Sorrel, Flatweed, Bentgrass, and Flaxleaf Fleabane were recorded, with Sheep Sorrel and Flatweed observed at threatened flora plots.

Priority weed presence/absence within management zones is summarised in Table 3.18. Other weed species, which are not included in Annexure A of the BMP as priority weeds were surveyed in Year 4 and are listed in Table 3.19. Monitoring events and weed records are provided in Appendix H.

Table 3.18 Priority weed species recorded in Year 4

Species name	Common name	Management zone							
		Bottom of Lobs Hole	Lobs Hole Ravine Road Bottom	Lobs Hole Ravine Road Top	Marica	Rock Forest	Tantangara Dam	Tantangara Road Bottom	Tantangara Road Top
<i>Achillea millefolium</i>	Milfoil/Yarrow								
<i>Agrostis capillaris</i>	Browntop Bent	✓	✓		✓		✓		✓
<i>Anthoxanthum odoratum</i>	Sweet Vernal Grass	✓		✓	✓	✓	✓	✓	✓
<i>Barbarea verna</i>	Winter Cress								

Species name	Common name	Management zone								Threatened flora plots*
		Bottom of Lobs Hole	Lobs Hole Ravine Road Bottom	Lobs Hole Ravine Road Top	Marica	Rock Forest	Tantangara Dam	Tantangara Road Bottom	Tantangara Road Top	
<i>Carduus nutans</i>	Nodding Thistle									
<i>Cirsium vulgare</i>	Spear Thistle	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Cotoneaster spp.</i>	Cotoneaster									
<i>Cytisus scoparius</i>	Scotch Broom									
<i>Dactylis glomerata</i>	Cocksfoot		✓	✓			✓	✓	✓	
<i>Echium plantagineum</i>	Patterson's Curse									
<i>Echium vulgare</i>	Vipers Bugloss									
<i>Eragrostis curvula</i>	African Lovegrass									
<i>Genista monspessulana</i>	Cape Broom									
<i>Hieracium aurantiacum</i>	Hawkweed									
<i>Holcus lanatus</i>	Yorkshire Fog Grass	✓			✓	✓	✓	✓	✓	✓
<i>Hypericum perforatum</i>	St John's Wort	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Juncus effusus</i>	Large Rush									
<i>Leucanthemum vulgare</i>	Ox-eye Daisy				✓		✓	✓	✓	✓
<i>Lupinus spp.</i>	Lupins									
<i>Lotus spp.</i>	Bird's-foot Trefoil									
<i>Marrubium vulgare</i>	Horehound									
<i>Mimulus moschatus</i>	Musk Monkey Flower							✓		
<i>Nassella trichotoma</i>	Serrated Tussock									
<i>Onopordium acanthium</i>	Scotch Thistle									
<i>Phleum pratense</i>	Timothy Grass									
<i>Pinus spp.</i>	Pine									
<i>Rosa rubiginosa</i>	Sweet Briar		✓				✓			
<i>Rubus spp.</i>	Blackberry	✓	✓	✓			✓			✓
<i>Salix spp.</i>	Willow									
<i>Ulex nutans</i>	Gorse									
<i>Verbascum spp.</i>	Mullein	✓	✓	✓	✓	✓	✓	✓	✓	

Species name	Common name	Management zone								Threatened flora plots*
		Bottom of Lobs Hole	Lobs Hole Ravine Road Bottom	Lobs Hole Ravine Road Top	Marica	Rock Forest	Tantangara Dam	Tantangara Road Bottom	Tantangara Road Top	
<i>Vinca spp.</i>	Periwinkle									
<i>Xanthium spp.</i>	Bathurst Burr									

Notes: * Weed species was recorded within 50 m of a threatened flora monitoring plot.

Table 3.19 Other weed species recorded (not included in Annexure A) in Year 4

Species name	Common name	Management zone								Threatened flora plots*
		Bottom of Lobs Hole	Lobs Hole Ravine Road Bottom	Lobs Hole Ravine Road Top	Marica	Rock Forest	Tantangara Dam	Tantangara Road Bottom	Tantangara Road Top	
<i>Agrostis gigantea</i>	Redtop Bent	✓	✓							
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	✓	✓		✓			✓	✓	
<i>Hypochaeris radicata</i>	Flatweed	✓			✓	✓	✓	✓	✓	
<i>Rumex acetosella</i>	Sheep Sorrel	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Taraxacum officinale</i>	Dandelion									
<i>Trifolium repens</i>	White Clover					✓				
<i>Triticum aestivum</i>	Common Wheat									
<i>Agrostis spp.</i>	Bentgrass	✓	✓	✓	✓		✓		✓	
<i>Sonchus spp.</i>	Sow thistle									
<i>Lactuca spp.</i>	Lettuce									

Notes: * Weed species was recorded within 50 m of a threatened flora monitoring plot.

ii Comparative analysis- Years 1 - 4

Year 4 weed monitoring recorded slightly higher priority weed species diversity (eleven species) in comparison to Year 3 (ten species), and less priority weed species diversity in comparison to Year 2 (13 species) and Year 1 (16 species). All priority weed species recorded in Year 3 were recorded again in Year 4, with the additional priority weed species of Musk Monkey Flower (*Mimulus moschatus*) recorded within the Tantangara Road Bottom management zone. Musk Monkey Flower (*Mimulus moschatus*) was last recorded on the project within Threatened Flora Plots in Year 2. As all priority weed species recorded in Year 4 have already been identified within management zones in previous monitoring years, no occurrence of any new priority weed species within proximity to project infrastructure was observed.

The following changes in priority weed species presence/absence at monitored management zones have occurred since the Year 3 monitoring event:

- Bottom of Lobs Hole
 - Cocksfoot (*Dactylis glomerata*) not observed
 - Re-establishment of Mullein (*Verbascum spp.*)
- Lobs Hole Ravine Road Bottom
 - Yorkshire Fog (*Holcus lanatus*) not observed
 - Re-establishment of Sweet Briar *Rosa rubiginosa*)
- Lobs Hole Ravine Road Top
 - Browntop Bent (*Agrostis capillaris*) not observed
 - Re-establishment of Mullein (*Verbascum spp.*)
- Marica
 - Re-establishment of Browntop Bent (*Agrostis capillaris*)
 - Re-establishment of Mullein (*Verbascum spp.*)
 - Ox Eye daisy has been recorded outside of the general weed monitoring area at the base of Marica for two years running now. Snowy Hydro Environment Staff has been given the GPS location of this outbreak.
- Rock Forest
 - First record of St. John's Wort (*Hypericum perforatum*) at this management zone
 - First record of Mullein (*Verbascum spp.*) at this management zone
- Tantangara Dam
 - Re-establishment of Mullein (*Verbascum spp.*)
- Tantangara Road Bottom
 - First record of Musk Monkey Flower (*Mimulus moschatus*) at this management zone
 - Re-establishment of Mullein (*Verbascum spp.*)
- Tantangara Road Top
 - Re-establishment of Browntop Bent (*Agrostis capillaris*)
 - Re-establishment of Mullein (*Verbascum spp.*)
- Threatened Flora Plots

- Re-establishment of St John's Wort (*Hypericum perforatum*)
- Re-establishment of Ox-eye Daisy (*Leucanthemum vulgare*)
- Sweet Briar (*Rosa rubiginosa*) not observed
- First record of Blackberry (*Rubus spp.*) at this monitoring location

In Year 1, Year 2, and Year 3 the Tantangara Dam management zone recorded the highest priority weed species diversity of all the management zones, recording 11 different priority weed species in Years 1 and 2, reducing slightly to nine different priority weed species in Year 3. In Year 4, Tantangara Dam remains the management zone with the highest priority weed species diversity, with ten different priority weed species recorded within this management zone.

Priority weed species diversity for management zones; Bottom of Lobs Hole, Lobs Hole Ravine Road Top and Lobs Hole Ravine Road Bottom has remained consistent with results of Year 3, with a net-zero change in priority weed species diversity due to the absence of a previously recorded priority weed species, and the re-establishment of another priority weed species for all three management zones.

Priority weed species diversity has increased by one for the Tantangara Dam management zone, and by two for the Marica, Rock Forest, Tantangara Road Bottom, and Tantangara Road Top management zones since the Year 3 monitoring period.

Mullein (*Verbascum spp.*) was recorded to have re-established at six out of the eight management zones, and the first observation of this species recorded at the Rock Forest management zone.

The presence/absence of Spear Thistle (*Cirsium vulgare*) has not changed since the Year 3 monitoring year and is present at all management zones and threatened species plots. Similarly, no change in presence/absence was observed for Sweet Vernal Grass (*Anthoxanthum odoratum*) which was observed at all management zones (with the exception of Lobs Hole Ravine Road Bottom) and threatened species plots.

IA comparison of Year 1 to Year 4 priority weed species diversity per management zone is presented in Plate 3.31.

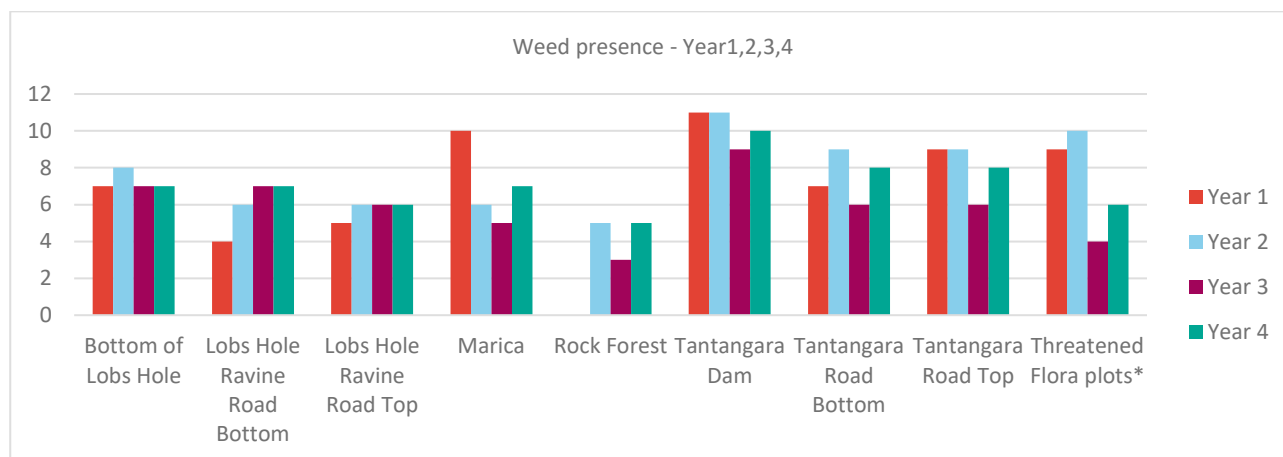
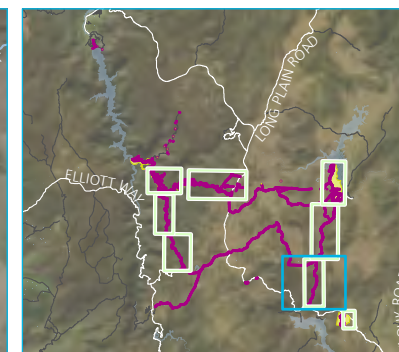


Plate 3.31 Priority weed species diversity recorded during Years 1 to 4 across management zones and *threatened flora plots

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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)

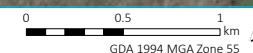


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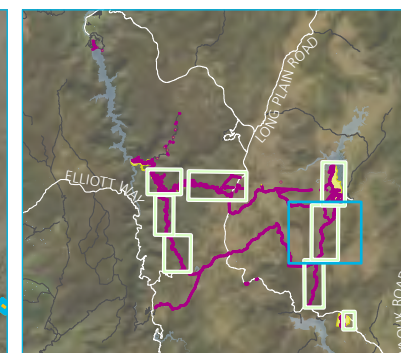
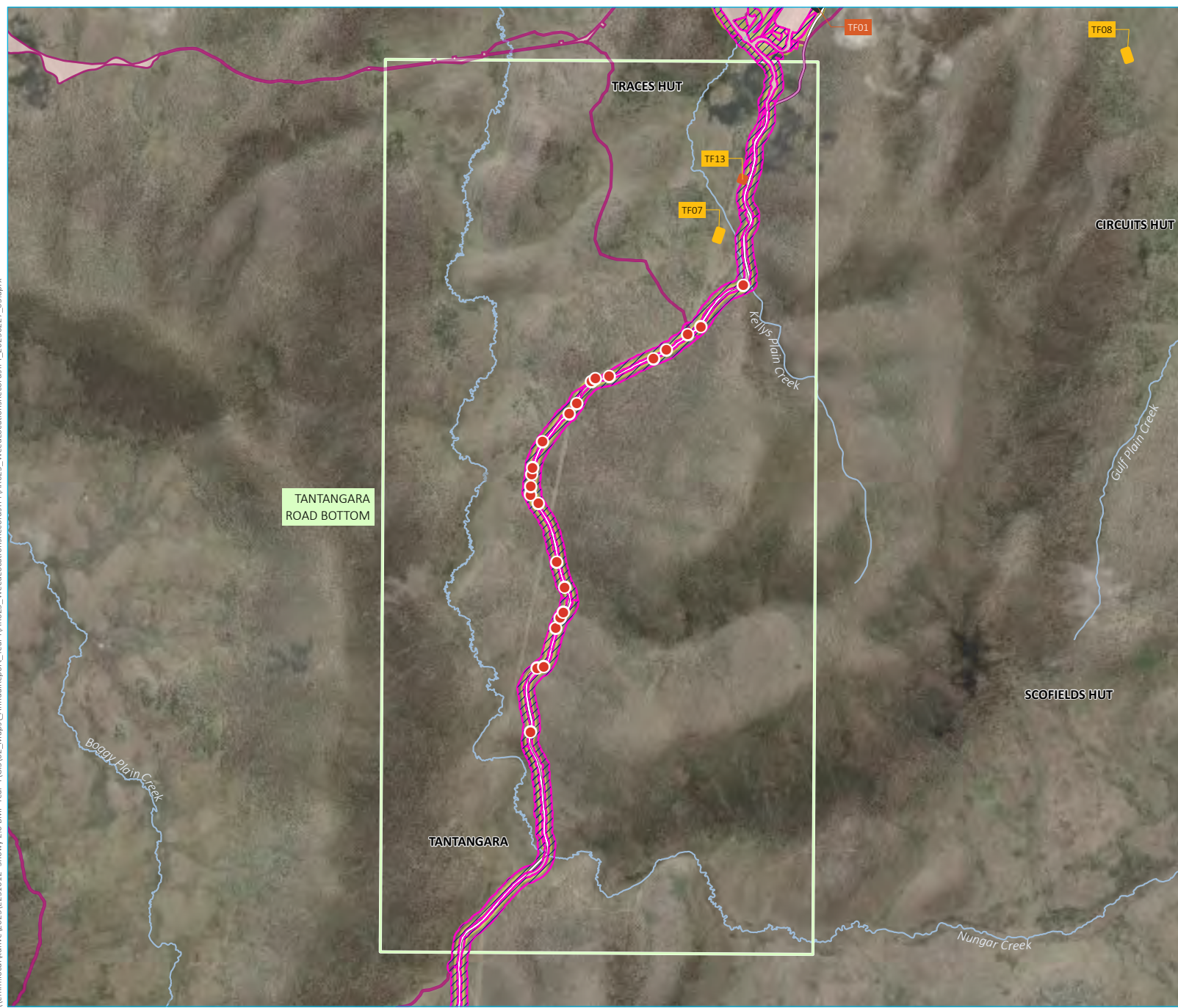
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- Approved construction envelope
- Weed management zone
- Weed record
- Weed record (polygon)
- Control- relocated in December 2022
- Control- dismissed in December 2021
- Control- dismissed in March 2022
- Impact- dismissed in December 2022
- Control- dismissed in December 2022
- Threatened flora monitoring location
- Control
- Impact
- Weed record (point)
- Ox-eye Daisy
- St John's Wort
- Existing environment
- Major road
- Named watercourse
- Waterbody

Weed records during Year 4

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Figure 3.22a



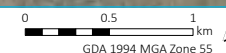
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- KEY**
- Approved disturbance
 - Approved construction envelope
 - Weed management zone
 - Weed record
 - Weed record (polygon)
 - Control- relocated in December 2022
 - Control- dismissed in December 2021
 - Control- dismissed in March 2022
 - Impact- dismissed in December 2022
 - Control- dismissed in December 2022
 - Threatened flora monitoring location
 - Control
 - Impact
 - Weed record (point)
 - Ox-eye Daisy
 - St John's Wort
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

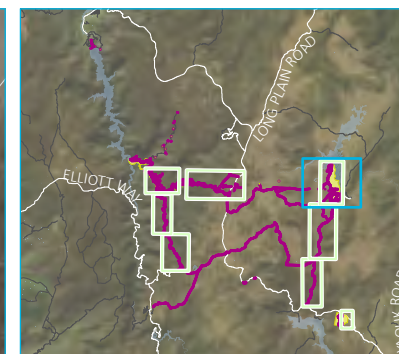
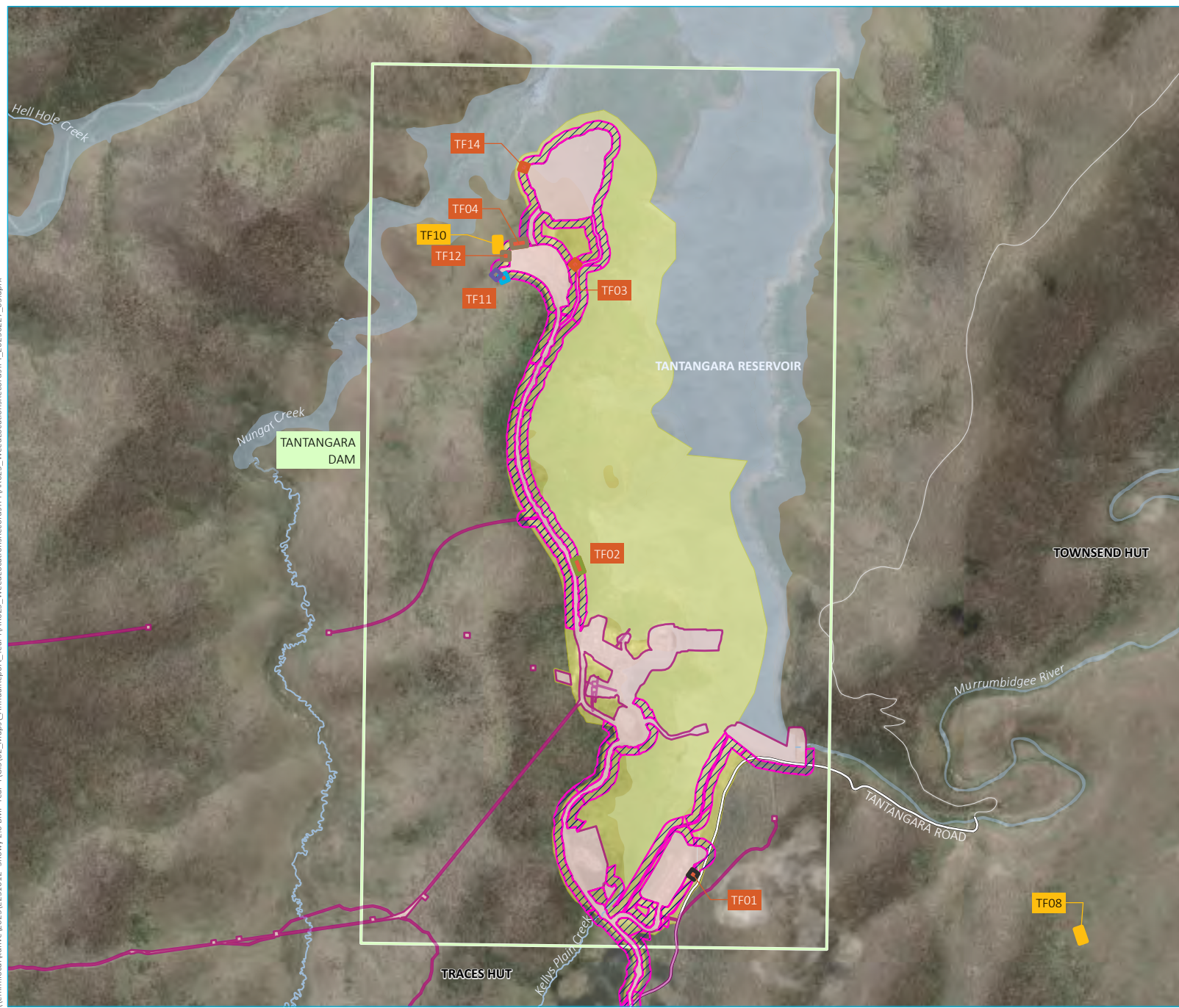
Weed records during Year 4

Snowy 2.0
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Annual report
Figure 3.22b



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)

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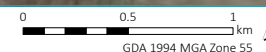
- KEY**
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 - Approved construction envelope
 - Weed management zone
 - Weed record
 - Weed record (polygon)
 - Control- relocated in December 2022
 - Control- dismissed in December 2021
 - Control- dismissed in March 2022
 - Impact- dismissed in December 2022
 - Control- dismissed in December 2022
 - Threatened flora monitoring location
 - Control
 - Impact
 - Weed record (point)
 - Ox-eye Daisy
 - St John's Wort
 - Existing environment
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Weed records during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.22c



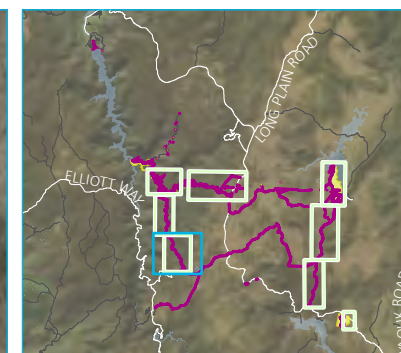
Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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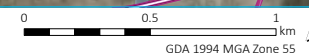
Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



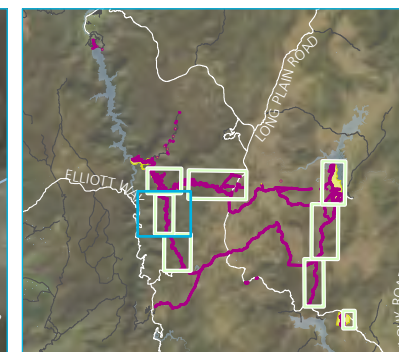
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 - Approved construction envelope
 - Weed management zone
 - Weed record
 - Weed record (polygon)
 - Control- relocated in December 2022
 - Control- dismissed in December 2021
 - Control- dismissed in March 2022
 - Impact- dismissed in December 2022
 - Control- dismissed in December 2022
 - Threatened flora monitoring location**
 - Control
 - Impact
 - Weed record (point)**
 - Ox-eye Daisy
 - St John's Wort
 - Existing environment**
 - Major road
 - Minor road
 - Named watercourse
 - Waterbody

Weed records during Year 4

Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.22d



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KEY

- Approved disturbance
- Approved construction envelope
- Weed management zone
- Weed record
- Weed record (polygon)
- Control- relocated in December 2022
- Control- dismissed in December 2021
- Control- dismissed in March 2022
- Impact- dismissed in December 2022
- Control- dismissed in December 2022

Threatened flora monitoring location

- Control
- Impact

Weed record (point)

- Ox-eye Daisy
- St John's Wort

Existing environment

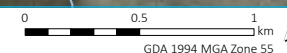
- Major road
- Minor road
- Named watercourse
- Waterbody

Weed records during Year 4

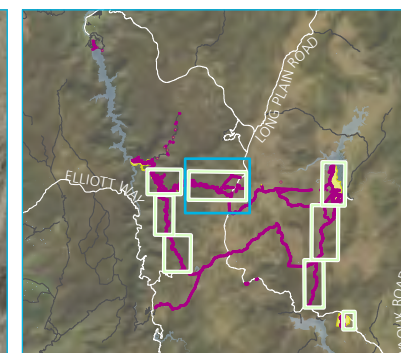
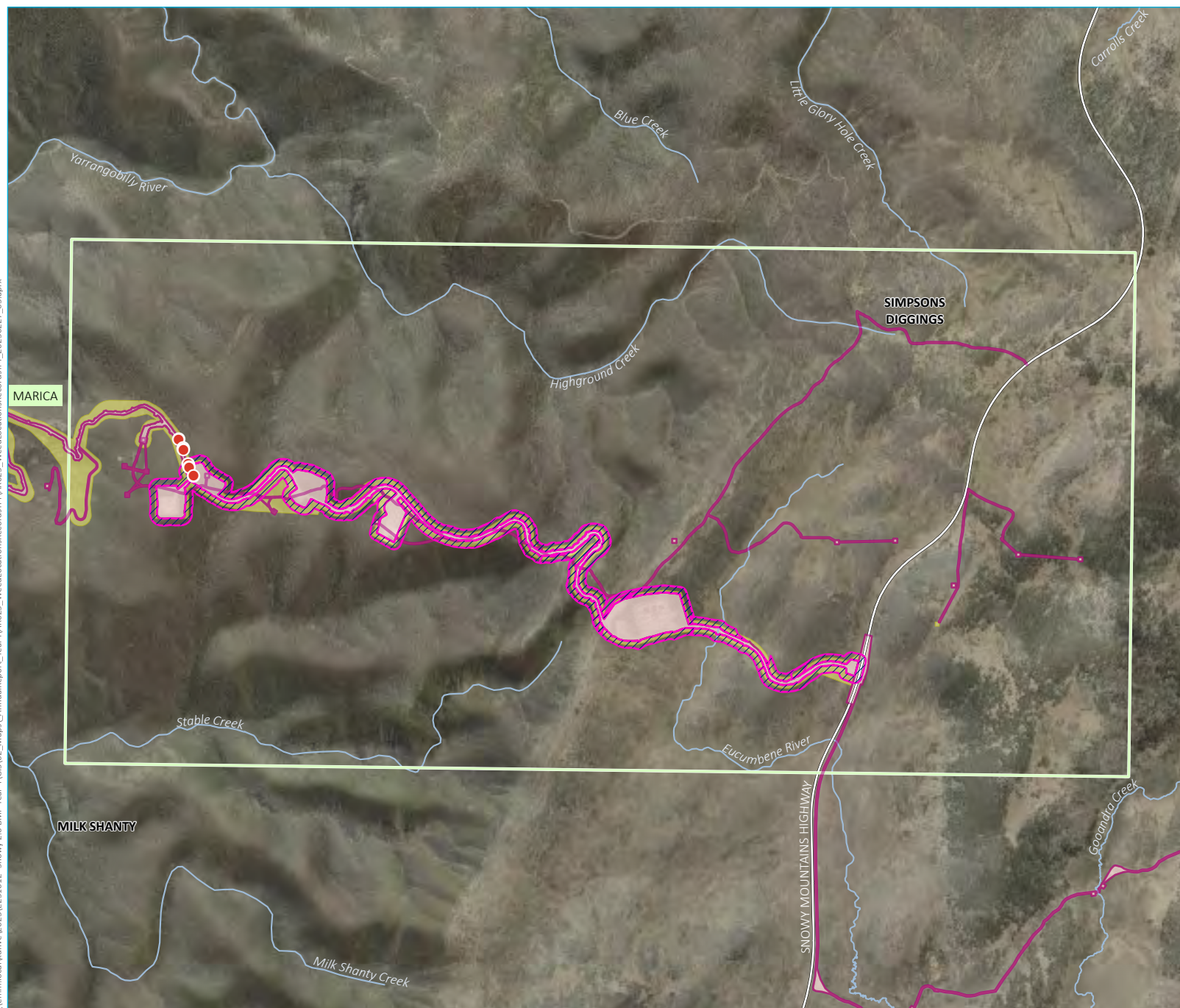
Snowy 2.0
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Annual report
Figure 3.22e



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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KEY

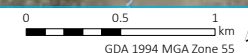
- Approved disturbance
- Approved construction envelope
- Weed management zone
- Weed record
- Weed record (polygon)
- Control- relocated in December 2022
- Control- dismissed in December 2021
- Control- dismissed in March 2022
- Impact- dismissed in December 2022
- Control- dismissed in December 2022
- Threatened flora monitoring location
- Control
- Impact
- Weed record (point)
- Ox-eye Daisy
- St John's Wort
- Existing environment
- Major road
- Named watercourse

Weed records during Year 4

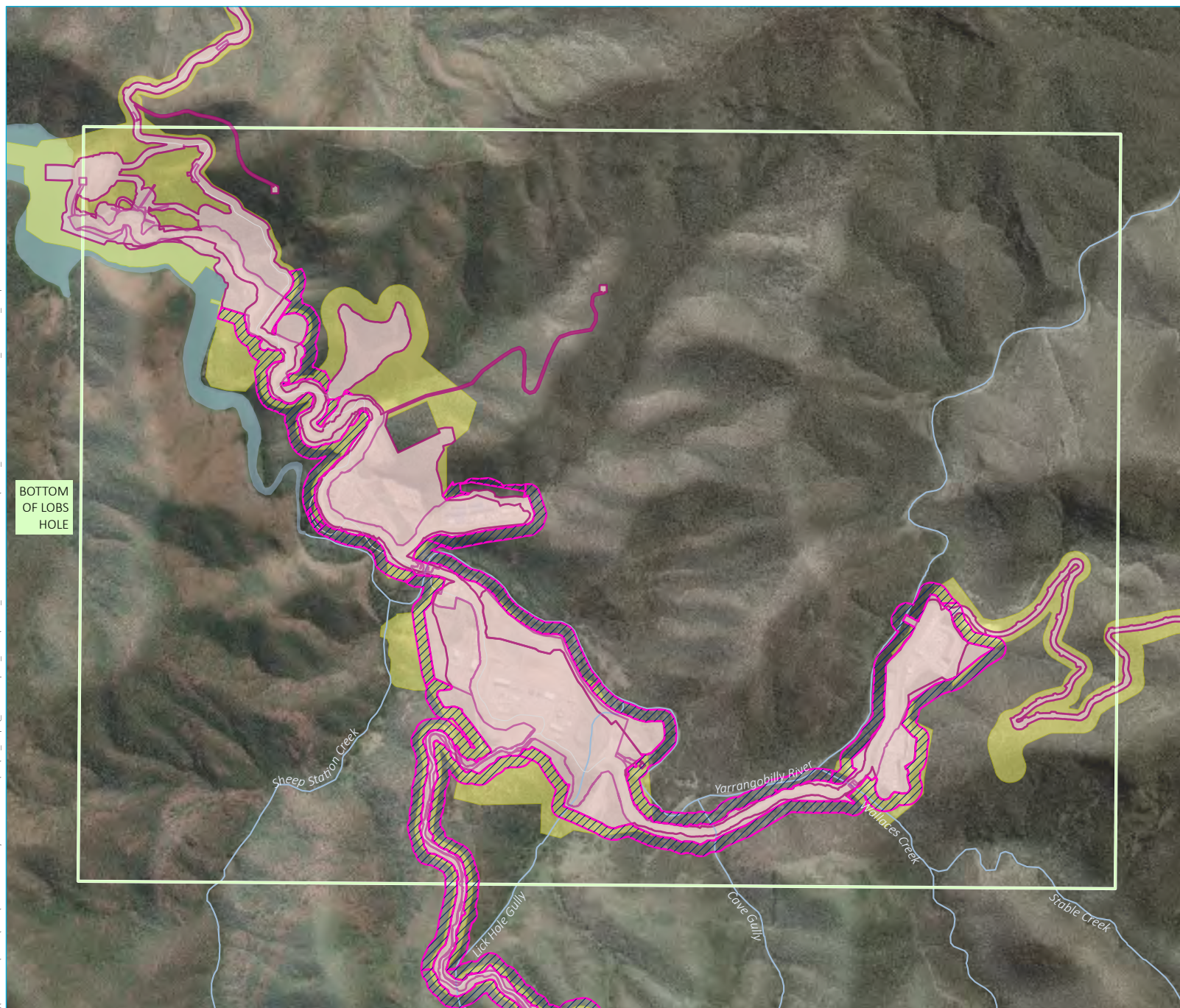
Snowy 2.0
Biodiversity Management Program
Annual report
Figure 3.22f



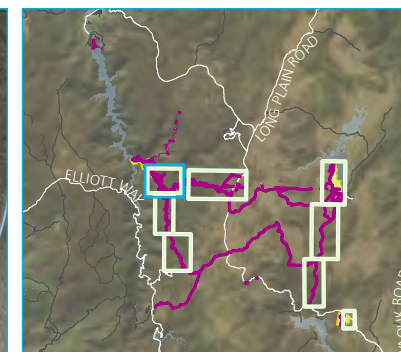
Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



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Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)

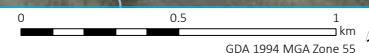


KEY

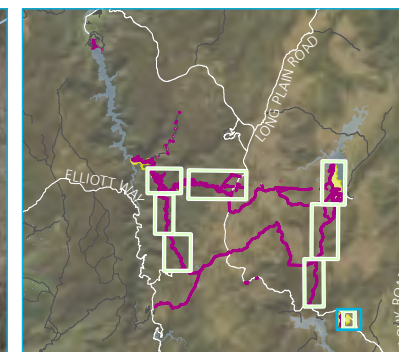
- Approved disturbance
- Approved construction envelope
- Weed management zone
- Weed record
- Weed record (polygon)
- Control- relocated in December 2022
- Control- dismissed in December 2021
- Control- dismissed in March 2022
- Impact- dismissed in December 2022
- Control- dismissed in December 2022
- Threatened flora monitoring location
- Control
- Impact
- Weed record (point)
- Ox-eye Daisy
- St John's Wort
- Existing environment
- Minor road
- Named watercourse
- Waterbody

Weed records during Year 4

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Figure 3.22g



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KEY

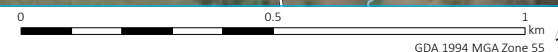
- Approved disturbance
- Approved construction envelope
- Weed management zone
- Weed record
- Weed record (polygon)
- Control- relocated in December 2022
- Control- dismissed in December 2021
- Control- dismissed in March 2022
- Impact- dismissed in December 2022
- Control- dismissed in December 2022
- Threatened flora monitoring location
- Control
- Impact
- Weed record (point)
- Ox-eye Daisy
- St John's Wort
- Existing environment
- Major road
- Named watercourse
- Waterbody

Weed records during Year 4

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Annual report
Figure 3.22h



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



3.6.2 *Phytophthora* presence/absence

The objective of the *Phytophthora* presence/absence monitoring is to monitor pathogens within proximity to project roads and key project infrastructure, specifically *P. cinnamomi* and *P. gregata*, to inform the location and extent of controls.

During Year 4, all 9 BMP *Phytophthora* sampling sites and 23 additional sites (PS01 to PS20 and PMS2 to PMS4) were surveyed. Locations of these 32 sites were as close as possible to the original Year 1 sites, sites established in Year 2, and those relocated in Year 3. In Year 3, clearing works were undertaken by the project which resulted in two sites (PMS1 and PMS5) being discontinued as their location had been buried, and the adjacent four sites (Lobs02, PMS2, PMS3 and PMS4) re-established at updated locations. *Phytophthora* sampling sites are presented in (Figure 3.23).

Laboratory analysis of the collected *Phytophthora* monitoring samples concluded that nil *Phytophthora* species were detected in any of the analysed samples. Pathogen sample sites and results are summarised in Table 3.20.

Table 3.20 *Phytophthora* presence/absence during Year 4 monitoring period

Site	Positive/negative
Lobs Hole R0.5	negative
Lobs Hole R5	negative
Lobs02	negative
Marica 01	negative
Marica Washdown	negative
Marica Washdown 02	negative
PMS1	NA – location buried in Year 3
PMS2	negative
PMS3	negative
PMS4	negative
PMS5	NA – location buried in Year 3
PS01	negative
PS02	negative
PS03	negative
PS04	negative
PS05	negative
PS06	negative
PS07	negative
PS08	negative
PS09	negative
PS10	negative
PS11	negative

Site	Positive/negative
PS12	negative
PS13	negative
PS14	negative
PS15	negative
PS16	negative
PS17	negative
PS18	negative
PS19	negative
PS20	negative
Tantangara Adit 01	negative
Tantangara Road 02	negative
Tantangara Washdown	negative

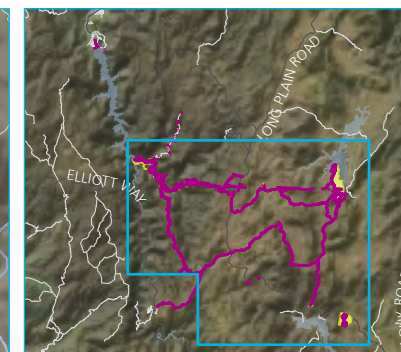
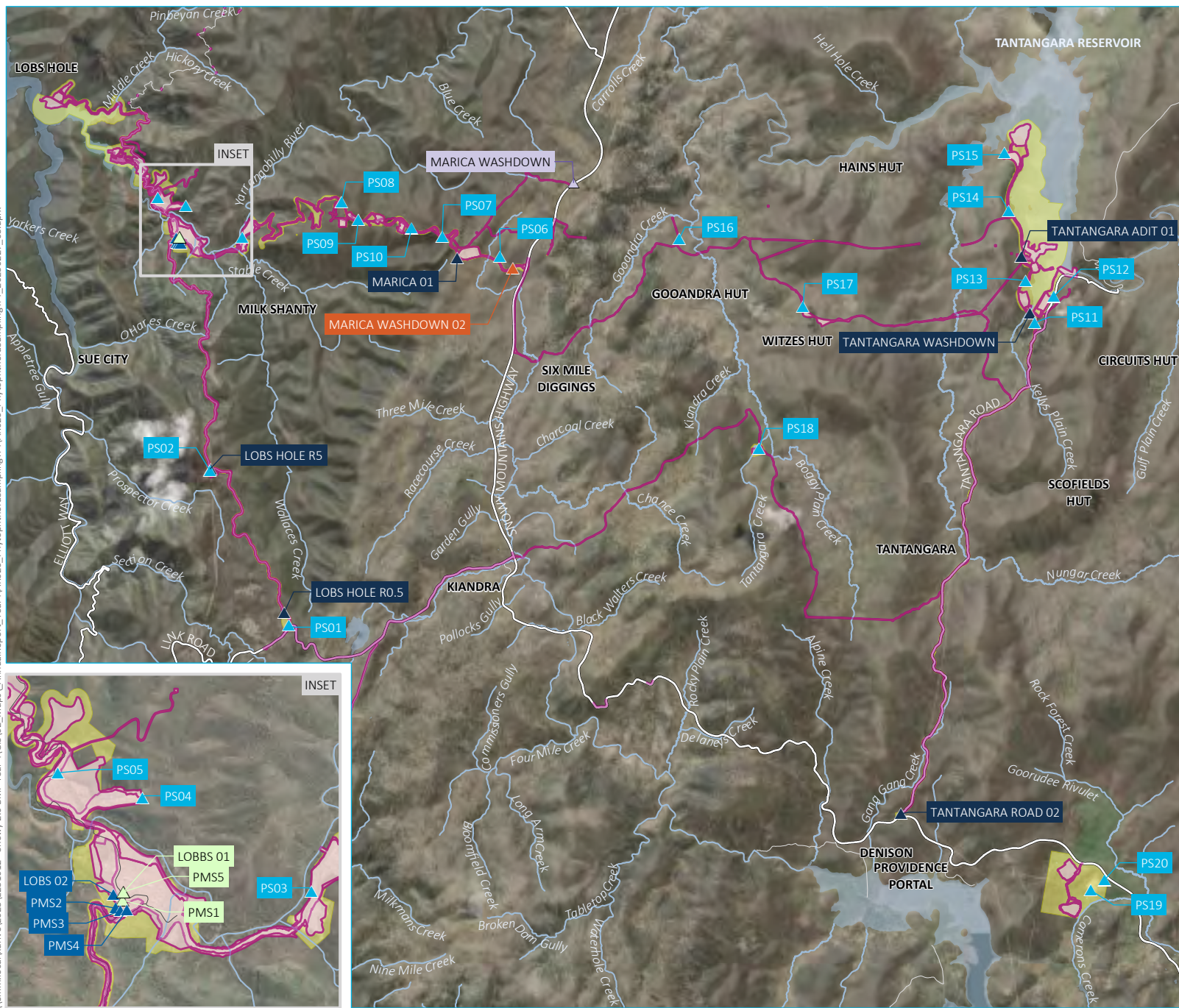
Notes: NA = site dismissed in Year 3

During Year 1, three sites, Lobs01, PMS1 and PMS5, tested positive for *Phytophthora cryptogea/psueudocryptogea*, which is not a species of concern for the BMP. In Year 2, a site adjacent to those that tested positive in Year 1 (Lobs02) was sampled and tested negative. In Year 3, PMS1 and PMS5 were dismissed, but an adjacent site (PMS3) tested positive for *Phytophthora pseudocryptogea/cryptogea*. In Year 3, one site (PS03) located at the eastern end of Lobs Hole tested positive for *Phytophthora cinnamomi* which is a species of concern for the BMP. In Year 4, no sites tested positive for *Phytophthora* species.

i Limitations

Locations of some soil samples were slightly altered due to evolving construction footprint. However, every effort was made to ensure that the soil samples were taken as close as possible to the original locations.

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KEY

- Approved disturbance
- Approved construction envelope
- Indicative weed mapping area

Phytophthora sampling

- ▲ BMP *Phytophthora* sampling
- ▲ Additional risk assessment *Phytophthora* sampling
- ▲ Established in January 2022
- ▲ Dismissed in January 2022
- ▲ Dismissed in January 2023
- ▲ Relocated in January 2023

Existing environment

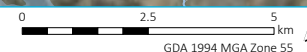
- Major road
- Minor road
- Named watercourse
- Waterbody

Phytophthora sampling sites during Year 4

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Figure 3.23



Source: EMM (2025); Snowy Hydro (2021); DFSI (2017); ESRI (2025)



4 Discussion

4.1 Threatened flora

i Clover Glycine

Monitoring results show a general decline in Clover Glycine across both control and impact sites from Year 1 to Year 4 (Plate 3.3).

Although no impact sites met the first BMP adaptive management trigger (i.e. percentage decline across two consecutive years outside control site variability), site TF04 recorded a consistent absence of individuals in Years 3 and 4, following a sharp decline from 29 individuals in Year 1 to 1 in Year 2. While the Year 3 decline was within the range of control site variability, the continued absence in Year 4 warrants assessment against the second adaptive management trigger, which requires the decline to occur in conjunction with a primary impact. Clover Glycine populations are known to be affected by weed invasion, grazing pressure and altered fire regimes (Institute for Environmental Research, Department of Sustainability and Environment, 2010). Weed mapping within the threatened flora plot locations (see Section 3.6), shows the presence of exotic species that are listed within the BMP as priority weeds (Snowy Hydro & FGJV, 2020). The threatened flora monitoring sites located at the end of Spoil Road, the northern section of Tantangara management zone, presented medium and light cover of Yorkshire Fog Grass (*Holcus lanatus*) and trace cover of five other priority weeds. This area includes four of the threatened flora monitoring plots, such as TF03, TF04, TF11 and TF12. These sites have recorded a significant decline in the total number of individuals of Clover Glycine since Year 1 (79 individuals), in comparison to Year 2 (11 individuals), Year 3 (14 individuals) and Year 4 (9 individuals). TF14, located further away from the currently impacted area, does not present a similar trend (Year 1: 53, Year 2: 12, Year 3: 24 and Year 4: 35).

Two impact sites (TF01 and TF02) were cleared in Year 2 and have not been relocated as Kiandra Leek Orchid and Glover Glycine were unable to be located within the area adjacent to the footprint. Both of these sites exhibited a dense cover of the priority weed Sweet Vernal Grass (*Anthoxanthum odoratum*). Dense coverage of this weed may be the underlying cause of the absence of the species in the area and therefore restricting the re-establishment of the two sites. It is recommended that weed control procedures prioritise the removal of priority weeds in the northern section of Tantangara management zone. Clover Glycine is also known to be at threat from grazing pressures and trampling (Carter & Sutter, 2010). Rabbits and horses were recorded in proximity (Section 3.5) to the threatened flora plot locations, which suggests that grazing pressure and/or trampling may also be contributing to the observed decline in the total number of Clover Glycine individuals.

EMM staff monitoring Clover Glycine for 4 years consecutively, noted an increase in dust from construction works at TF03, TF04, TF11 and TF12, which are located close to the boundary of construction works. While not described in literature as a threat to this species, EMM Botanists who have studied this species since its discovery at this location believe the impacts of dust on this species should be further investigated.

ii Kiandra Leek Orchid

Comparisons of population counts across monitoring years suggest an overall decline in *Kiandra Leek Orchid* abundance from Year 1 to Year 4 (Plate 3.4), at both control and impact sites. Among the impact sites, TF04 is the only impact site that recorded presence of the target species during baseline surveys; this impact site (TF04) has recorded no individuals in the last two monitoring years (Year 1: 1 individual, Year 2: 5 individuals and Years 3 and 4: 0 individuals). Two impact sites (TF11 and TF14) recorded their first sightings in Year 4 (TF11: 1 individual, TF14: 3 individuals) and TF13 recorded its peak in Year 3 with 22 individuals. The remaining two impact sites (TF03 and TF12) recorded no individuals in any of the four monitoring years. Similarly to impact sites, control sites also experienced fluctuations in the number of individuals recorded per site; however, all control sites which recorded the target species during baseline surveys also recorded the species in all monitoring years, including Year 4. TF07,

which did not record the target species during baseline surveys, recorded the species during every monitoring year since Year 2.

As per section 4.2 of the BMP, threatened flora monitoring sites are compared against triggers for adaptive management to determine the health of threatened flora populations located adjacent to the disturbance area (objective). The first part of the BMP adaptive management trigger for Threatened flora monitoring states: *“Percentage decline in the number of plants observed within a single monitoring plot, observed over two consecutive monitoring periods and outside of the standard deviation observed at control sites”* (Snowy Hydro & FGJV, 2020). Despite not showing an actual percentage decline over the last two monitoring periods, one impact site (TF04) recorded no individuals of Kiandra Leek Orchid in Years 3 and 4, thus showing a decline in the number of total individuals from Year 1 (1 individual) and Year 2 (5 individuals) to Year 3 and Year 4 (0 individuals). Considering this trend was not observed among the control sites, TF04 triggers the first part of the adaptive management trigger. The second part of the BMP adaptive management trigger for Threatened flora monitoring states: *“Decline must be observed in conjunction with a primary impact (e.g. increase in weed cover)”* (Snowy Hydro & FGJV, 2020). As mentioned in the Clover Glycine Section 4.1i, TF04 is located within the northern section of Tantangara management zone, which presented medium and light cover of Yorkshire Fog Grass (*Holcus lanatus*) and trace cover of five additional priority weed species. Moreover, this area of the Tantangara management zone has recorded rabbits and horses, which are also considered to be a primary impact to Kiandra Leek Orchid populations promoting the spread of Ox-eye Daisy, causing direct damage and disturbance through trampling, and shifting habitat to more unsuitable shrubby conditions (NSW National Parks and Wildlife Service, 2025; OEH, 2025).

iii Triggers for adaptive management

The triggers for adaptive management for threatened flora are:

- percentage decline in the number of plants observed within a single monitoring plot, observed over two consecutive monitoring periods and outside of the standard deviation observed at control sites
- decline must be observed in conjunction with a primary impact (e.g. increase in weed cover).

Adaptive management for Clover Glycine and Kiandra Leek Orchid has been triggered at TF04. The development of a mitigation plan should address the impact of primary sources, including weeds and feral animals. As mentioned, however, EMM recommends investigating dust levels at the end of Spoil Road near TF03, TF04, TF11 and TF12 to determine if this may be a contributing factor in the decline of threatened flora at this location.

Two impact sites (TF01 and TF02) were not surveyed during December 2023 and January 2024 monitoring events as these sites were cleared as part of the Main Works in Year 2. These sites have not been relocated as Kiandra Leek Orchid and Clover Glycine were unable to be located within the area adjacent to the footprint after targeted searches of the species based on previous records.

4.2 Small terrestrial mammal monitoring

4.2.1 Occupancy (presence/absence) monitoring

i Smoky Mouse

In Year 4, Smoky Mouse was not recorded at any impact sites but was recorded at two control sites (SM09-C and SM12-C). The absence of the target species from all impact sites in both Year 4 and Year 3 requires further investigation to understand whether adaptive management is required at impact sites. According to the BMP (Snowy Hydro & FGJV, 2020), adaptive management is triggered at sites where the species was present during pre-construction surveys but is absent during construction or operation monitoring, provided:

- there are no changes in presence/absence at control sites

- the absence is recorded for greater than one year
- the absence is combined with an observed increase or new occurrence of a primary impact (decline in habitat complexity, weeds, pathogens, or feral herbivores/predators).

Given the significant impact of the 2019-2020 fires on local species and vegetation communities that support these species, comparisons with pre-construction data (pre-2020) are not deemed appropriate. Fires can have substantial direct and indirect impacts on the species (Threatened Species Scientific Committee, 2019), which would make any direct comparisons with pre-fire conditions misleading. Accordingly, Year 1 data will be used to investigate whether adaptive management is required at any impact sites. While Year 1 data provides a more accurate snapshot of the post-fire conditions, it does not allow for a comparison with pre-construction surveys. This limitation has been acknowledged under the Limitations heading in Section Occupancy (presence/absence) monitoring.

During Year 1, the Smoky Mouse was recorded at five impact sites, SM05-I, SM22-I, SM23-I, SM24-I and SM35-I, and two control sites, SM09-C and SM17-C. Since Year 3, absence of the Smoky Mouse was recorded at all impact sites for greater than one year. However, in Year 3, no adaptive management was deemed necessary as the absence was recorded at both impact and control sites. In Year 4, the absence of the target species was recorded again from all impact sites but was recorded as present at two control sites (SM09-C and SM12-C), proving that the species is still present at the same number of control sites as it was during baseline surveys. An investigation of the primary impacts (habitat complexity, weeds, pathogens and feral herbivores/predators) at the five impact sites that recorded presence of the Smoky Mouse during baseline surveys is presented in the following paragraphs.

There are two sets of data that can be used to investigate the first primary impact, habitat complexity: (i) the native vegetation cover, (ii) the habitat structure. The habitat complexity recorded in Year 4 does not show clear declining trends in the average native vegetation cover or the average habitat structure between control and impact sites. The average native vegetation cover recorded in Year 4 at the impact sites is the same or lower than the one recorded at control sites throughout all height intervals, in line with the results recorded in the previous years, so no meaningful changes were observed between control and impact sites' percentage native vegetation cover. Specifically, the native vegetation cover recorded at SM23-I, SM24-I and SM35-I is lower than the average observed at control sites in Year 4. Among these sites, only SM35 shows an average native vegetation cover (all heights combined) lower than previously recorded in Year 1. The average habitat structure recorded in Year 4 at the control sites is lower than the one recorded at impact sites throughout all height intervals, in contrast with the results recorded in the previous years, which showed a smaller difference in the average percentage of habitat structure at control and impact sites in Years 1 and 2. Similarly to Year 4, Year 3 also recorded a greater average in habitat structure percentage at impact sites in comparison with control sites.

When the percentage of native cover is summed to the percentage of habitat structure at control and impact sites, the data shows no major differences between control and impact sites at any of the three height intervals monitored. Specifically, the habitat structure recorded at SM05-I, SM22-I, SM23-I, SM24-I and SM35-I is greater than the average observed at control sites in Year 4. However, among these sites, SM24-I and SM35-I show an average native vegetation cover (all heights combined) lower than previously recorded in Year 1. In conclusion, no clear decline in habitat complexity can be identified by looking at the average percentage values recorded at control and impact sites. Nevertheless, SM24-I and SM35-I showed a decline in habitat complexity in comparison to Year 1 and in comparison to the average control site in Year 4.

There are three sets of data that can be used to investigate the second primary impact, weeds: (i) the exotic vegetation cover, (ii) the presence of weeds of concern and (iii) their density. The average exotic vegetation cover recorded in Year 4 at impact sites is higher than the one recorded at control sites; this gap has been observed throughout all the three monitored height intervals, and across Years 2, 3 and 4. One out of the five impact sites of interest, SM35-I, shows an exotic vegetation cover greater than the average exotic vegetation cover observed at the control and impact sites, while the rest of the impact sites of interest, SM05-I, SM22-I, SM23-I and SM24-I, show an exotic cover lower than the average recorded at control sites. SM35-I is located along the Alpine Creek trail and is thus not included in the weed monitoring survey; therefore, no further data is available regarding the presence of weeds of concern and their density. SM05-I is located along the Lobs Hole Ravine Road, about one kilometre north of the Lobs Hole gate house. In Year 4, this area presented the following weeds of concern, in light density: *Anthoxanthum odoratum*, *Cirsium vulgare*, *Dactylis glomerata*, *Hypericum perforatum*, *Rubus* spp., *Agrostis* spp. In comparison to Year 1, the presence of weeds in this area has increased in terms of number of species recorded and their density, considering that in Year 1 only *Hypericum perforatum* and *Agrostis* spp. were listed as present, in small clusters. SM22-I, SM23-I and SM24-I are located within the Marica management zone. In Year 4, this area presented the following weeds of concern, in trace density: *Hypericum perforatum*, *Agrostis* spp., *Verbascum* spp. and *Cirsium vulgare*. In comparison to Year 1, the presence of weeds in this area has increased in terms of number of species recorded and their density, considering that in Year 1 no species of concern were recorded as present. Overall, an increase in weeds from baseline surveys was observed in Year 4 at all the five impact sites of interest.

There is one set of data that can be used to investigate the third primary impact, pathogens. No *Phytophthora* spp. was recorded in Year 4 at any of the impact sites. The pathogen was not recorded within 2.5 km of any of the impact sites during the entire duration of the monitoring program. No *Phytophthora* monitoring survey was conducted in proximity to SM35-I, as its location did not qualify as a potential sampling site. In conclusion, no *Phytophthora* spp. was recorded in proximity to the five impact sites of interest.

There are two sets of data that can be used to investigate the fourth primary impact, feral herbivores / predators: (i) the results of the feral occupancy monitoring, and (ii) the results of the feral abundance monitoring. The Year 4 results of the feral occupancy monitoring show the presence of Red Fox, Deer, Wild Dog and Feral Cats within the surroundings of SM21-I, SM23-I and SM24-I. Two feral cameras, FC10 and FC11, are located in proximity to SM21-I, SM23-I and SM24-I. These feral cameras (FC10 and FC11) recorded Red Fox, Deer and Wild Dog during Year 4. Feral Cats were recorded across all remote cameras (SM21-I, SM23-I and SM24-I) in Year 4. The remaining two small mammal cameras, SM05-I and SM35-I, are not located in proximity to any feral cameras. Nonetheless, these small mammal cameras recorded Feral Cat (SM05-I only), Feral Horse (SM35-I only), Red Fox (both SM05-I and SM35-I) and Deer (SM05-I only) in Year 4. The Year 4 results of the feral abundance monitoring show the presence of Feral Horse (4.7 individuals/km in Q3), European Hare (0.1 individuals/km in Q1) and Rabbit (0.1 individuals/km in Q1 and 0.3 individuals/km in Q4) along the Marica spotlighting transect, in proximity to where SM21-I, SM23-I and SM24-I are located. The LHRR South spotlighting transect, located in proximity to SM05-I, recorded the presence of Rabbit (0.1 individuals/km in Q1 and Q4) and Sambar Deer (0.1 individuals/km in Q1) in Year 4. No spotlighting transect is located in proximity to SM35-I.

In conclusion, all the small mammal cameras of interest (SM05-I, SM21-I, SM23-I, SM24-I and SM35-I) show presence of feral herbivores/predators. In particular, SM05-I is located in proximity to Rabbit, Feral Cat, Red Fox and Deer records, while SM21-I, SM23-I and SM24-I are located in proximity to Feral Horse, Red Fox, European Hare, Rabbit, Deer, Wild Dog and Feral Cats records, and SM35-I is located in proximity to Feral Horse, Red Fox records. SHL has advised that the area surrounding SM35 was accessed by project staff only during the exploration works and has remained unaffected by direct or indirect project activities since then. Therefore, the absence of the species is unlikely to be attributed to the project. SM35-I is not triggered for adaptive management.

In Year 4, Eastern Pygmy Possum was recorded at nine impact sites (SM03-I, SM14-I, SM15-I, SM16-I, SM18-I, SM21-I, SM23-I, SM24-I and SM25-I) and six control sites (SM02-C, SM06-C, SM09-C, SM17-C, SM26-C and SM40-C). Year 4 had the lowest number of sites with Eastern Pygmy Possum recorded (15 sites) compared to Year 1 (19 sites), Year 2 (18 sites) and Year 3 (20 sites) (Figure 3.3). The negative trend observed in Year 4 may indicate the onset of population decline considering that such trend was not observed at control sites between the monitoring years (Year 1: 6 sites, Year 2: 7 sites, Year 3: 8 sites, Year 4: 6 sites). Accordingly, closer attention will be required in Year 5 to monitor the trend of presence/absence across the sites and assess whether this declining trend is progressing in Year 5.

In Year 4, the Eastern Pygmy Possum was not detected at five impact sites (SM05-I, SM07-I, SM10-I, SM20-I, and SM22-I) that had previously recorded its presence during pre-construction/baseline surveys. Amongst these, one impact site (SM07-I) has recorded the absence of the species for over one year, as the Eastern Pygmy Possum was last recorded at SM07-I in Year 1. In Year 3, both SM07-I and SM18-I were triggered for adaptive management; in Year 4, SM18-I recorded the presence of the species and therefore was no longer triggered for adaptive management.

The absence of the target species from one impact site, SM07-I, since Year 2 (included) was discussed in the Year 2 and Year 3 annual reports (EMM, 2024a; EMM, 2023a). Considering that SM07-I was triggered in Year 2 and Year 3, and the species has again been recorded absent from this location in Year 4, SM07-I remains triggered for adaptive management. An investigation of the primary impacts (habitat complexity, weeds, pathogens and feral herbivores/predators) at the impact site (SM07-I) is required. There are two sets of data that can be used to investigate the first primary impact, habitat complexity, at control and impact sites: (i) the native vegetation cover, (ii) the habitat structure. The native cover and habitat structure in Year 1 was comparable to the one recorded in Year 4 within the first height interval (below 0.5 m) and the native cover and habitat structure were higher in Year 4 in comparison to Year 1 at the other two height intervals (between 0.5–1 m, and between 1–1.5 m) (Table 4.1). Overall, no decline in habitat complexity was recorded at the site in comparison to Year 1. There are three sets of data that can be used to investigate the second primary impact, weeds: (i) the exotic vegetation cover, (ii) the presence of weeds of concern and (iii) their density. The exotic vegetation cover recorded at SM07-I is lower than the average exotic cover recorded at the control sites, and the exotic vegetation cover recorded at SM07-I in Year 4 is lower than the percentage recorded in Year 1 (Table 4.1). During the Year 4 weed monitoring surveys, priority weeds were identified in proximity to the location (SM07-I). These include: Sweet Vernal Grass, Spear Thistle, Cocksfoot, Blackberry and Mullein, which were all recorded at a light density along Lobs Hole Ravine Road top. In comparison to Year 1, Sweet Vernal Grass, Cocksfoot and Mullein are all new weed of concerns that were not recorded during baseline surveys. Therefore, an increase in weeds was recorded in proximity to SM07-I. A change in the third primary impact, pathogens, was not observed. There were no records of *Phytophthora* species at control or impact sites during Year 4. There are two sets of data that can be used to investigate the fourth primary impact, feral herbivores / predators, such as: (i) the results of the feral occupancy monitoring, and (ii) the results of the feral abundance monitoring. No feral cameras are set up in proximity to SM07-I; however, the following species have been recorded at the small mammal camera SM07-I in Year 4: Feral Cat (in Q1 and Q4), Red Fox (in Q2 and Q3) and Sambar Deer (in Q1 and Q3).

During baseline surveys (Year 1 Q1), European Hare and Sambar Deer were recorded at the same small mammal camera location. The results of the feral abundance monitoring conducted along Lobs Hole Ravine Road South show presence of two feral animals in Year 4, Rabbit (0.1 individuals/km in Q1 and in Q4) and Sambar Deer (0.1 individuals/km in Q1). During baseline surveys, a greater density of Rabbit was recorded (0.21 individuals/km in Year 1 Q1); however, no Deer was recorded during Year 1 (from Q1 to Q4). Therefore, an increase in the fourth primary impact, feral predators, has been observed in proximity to SM07-I. SM07-I is still triggered for adaptive management.

Table 4.1 Results of the habitat characteristics monitoring survey at one impact site (SM07-I) compared with the average recorded across the four monitoring years

Item	Year 1			Year 2			Year 3			Year 4		
	<0.5 m	0.5-1 m	1-1.5 m	<0.5 m	0.5-1 m	1-1.5 m	<0.5 m	0.5-1 m	1-1.5 m	<0.5 m	0.5-1 m	1-1.5 m
Native cover												
SM07-I	87%	4%	0%	95%	8%	0%	42%	22%	26%	75%	69%	37%
Average at control sites	74%	15%	2%	90%	18%	4%	78%	16%	9%	70%	30%	15%
Habitat structure												
SM07-I	39%	1%	1%	0%	0%	0%	13%	8%	3%	51%	20%	1%
Average at control sites	18%	0%	0%	27%	1%	0%	8%	1%	0%	7%	0%	0%
Exotic cover												
SM07-I	3%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Average at control sites	18%	1%	0%	9%	0%	0%	8%	1%	0%	15%	0%	0%

In Year 3, Eastern Pygmy Possum was absent for more than one year from SM18 which is located along Lobs Hole Ravine Road, to the east of the construction road. It was discussed in the Year 3 report that this may have been due to construction impacts and warranted further investigation. However, during Year 4 Eastern Pygmy Possum was recorded during Q1.

Habitat suitable for the Eastern Pygmy Possum is found at Lobs Hole and Marica management zones. In Year 4, European Hare, Feral Cat, Feral Horse, Rabbit and Deer were recorded within these management zones. As adjacent camera sites have recorded the Eastern Pygmy Possum and feral species have been recorded within proximity to these sites, reducing predator abundance within the locality has the potential to help increase the number of Eastern Pygmy Possum and other small mammals.

iii Broad-toothed Rat

The Broad-toothed Rat was recorded at 13 sites during Year 4, including three camera impact sites (SM14-I, SM18-I and SM34-I) and ten camera control sites (SM02-C, SM04-C, SM17-C, SM28-C, SM30-C, SM31-C, SM32-C, SM33-C, SM39-C and SM40-C). The target species was recorded present at all available faecal pellet monitoring locations throughout Year 4. Combining the results from these two monitoring surveys, the target species was found to be present in proximity to five extra camera sites (SM27-I, SM34-I, SM36-I, SM37-I and SM38-C). The target species was recorded at all camera sites located within suitable habitat.

All faecal pellet monitoring sites recorded the presence of the target species across the same or higher numbers of monitoring events compared to Year 3, except for sites in which only two monitoring events were conducted due to Kosciuszko National Park closures.

Seven camera locations (SM28-C, SM29-C, SM30-C, SM31-C, SM32-C, SM33-C and SM35-I) and five faecal pellet monitoring sites (all control sites: FP26, FP27, FP31, FP32 and FP33) were unable to be surveyed during Q2 (Autumn) and Q3 (Winter) as they are located within areas of Kosciuszko National Park that were closed for feral animal control activities. This has been noted as a limitation in Section 3.2.1 under the Limitations heading, considering that none of these sites recorded presence or absence of the species. Nonetheless, all monitoring sites that were affected by the closure recorded the presence of the target species in Year 4, except for SM29-C and SM35-I. Moreover, despite the closure, the target species was recorded at more camera locations in Year 4 than Year 3.

In Year 4 monitoring, a total of 13 sites documented the presence of the Broad-toothed Rat, three impact sites (SM14-I, SM18-I and SM34-I) and ten control sites (SM02-C, SM04-C, SM17-C, SM28-C, SM30-C, SM31-C, SM32-C, SM33-C, SM39-C and SM40-C). Notably, in Year 4, three impact sites (SM01-I, SM07-I, and SM36-I) recorded the absence of the Broad-toothed Rat for greater than one year, despite previous detections at these locations. The absence of the target species from these impact sites for greater than one year requires further investigation to understand whether adaptive management is required at impact sites. According to the BMP (Snowy Hydro & FGJV, 2020), adaptive management will be triggered at sites where the absence of the target species is recorded during construction or operational monitoring, where the species was recorded during pre-construction/baseline surveys, so long as:

- there are no changes in presence / absence at control sites
- the absence is recorded for greater than one year
- the absence is combined with an observed increase or new occurrence of a primary impact (decline in habitat complexity, weeds, pathogens, or feral herbivores / predators).

Two camera locations (SM01-I and SM07-I), which have been assessed as not providing suitable habitat, have previously recorded the presence of the Broad-toothed Rat and, in Year 4, have recorded the absence of the species for greater than one year. These camera sites are impact sites. These sites were assessed as not providing suitable habitat due to the lack of records during survey for the Main Works Biodiversity Development Assessment Report (BDAR) (EMM, 2019). Records of the Broad-toothed Rat were primarily concentrated outside of Lobs Hole and Lobs Hole Ravine Road, at Tantangara, Snowy Mountains Highway, Marica, and the Plateau. Records of the species on Lobs Hole Ravine Rd suggest that the species range extends further west into suitable habitat adjacent to the road. Considering that these sites (SM01-I and SM07-I) did not record presence of the species during pre-construction and baseline surveys and occur within non-suitable habitat for the Broad-toothed Rat, adaptive management is not triggered at these sites.

One camera location, SM36-I, which occurs in suitable habitat, recorded absence of the species for greater than one year, where the species was previously recorded. However, one faecal pellet monitoring site, FP18, located in proximity to this camera location (less than 100 m away from SM36-I-RC2) recorded abundant Broad-toothed Rat faecal pellets during Year 4. Accordingly, SM36-I is not triggered for adaptive management.

The 2019/2020 bushfires affected much of KNP and included the location of these sites at Marica. Potential absence of the Broad-toothed Rat at this location during Year 2 may have been due to the bushfire. Habitat structure has changed significantly since previous records of the species and establishment of FP20 for the BMP surveys (Photograph 4.1). FP27 is a control site which was also burnt within the 2019/2020 bushfires, located approximately 2.8 km from FP20. In Year 2 it was recommended that FP20 remain in its current location for the opportunity to record the Broad-toothed Rat re-establishment in what would otherwise be considered previously burnt habitat. Interestingly, Broad-toothed Rat was recorded at FP20 during Year 3 and Year 4, recording the re-establishment of the species in the area post-fire.

A study conducted by Miritis et al. (2023) revealed that fox activity typically peaks shortly after an area is burnt, whereas small mammal activity demonstrates a more gradual increase. In their investigation, which included the sympatric rodent species, the Bush Rat (*Rattus fuscipes*), activity levels were observed to be at their lowest approximately eight months post-fire, steadily rising thereafter and reaching a peak around 18 months post-fire. The ongoing monitoring of the Broad-toothed Rat as part of the BMP will provide valuable insights, facilitating comparisons as the habitat regenerates, to ascertain whether a similar temporal pattern is evident in the region.



Photograph 4.1 Site FP20 before (left) and after (right) the 2019/2020 bushfires

iv Triggers for adaptive management

The triggers for adaptive management for this management action are:

- absence of target species from a site during construction and operational monitoring, where the species was recorded during pre-construction/baseline surveys
- no changes in presence/absence at control sites
- absence recorded for greater than one year
- absence is combined with an observed increase or new occurrence of a primary impact (decline in habitat complexity, weeds, pathogens, or feral herbivores/predators).

Four impact sites (SM05-I, SM22-I, SM23-I, SM24-I) have been triggered for adaptive management as the Smoky Mouse was not observed in Year 4. These sites recorded absence of the Smoky Mouse for greater than one year during construction, where the species was recorded during Year 1. The absence of the species is combined with an observed increase or new occurrence of multiple primary impacts in comparison to baseline surveys, such as a decline in habitat complexity, increase in weeds and feral herbivores/predators. During Year 4, no changes in presence/absence at control sites was recorded in comparison to Year 1.

One impact site (SM07-I) remains triggered for adaptive management as the Eastern Pygmy Possum was not observed in Year 4. Adaptive management for SM18-I is no longer triggered as the species was found present at this site in Year 4.

No adaptive management has been triggered for Broad toothed-Rat (*Mastacomys fuscus*). Camera locations where absence of the species was recorded in Year 4 were not triggered for adaptive management as they recorded presence of the species at faecal pellet monitoring sites located within their proximity (less than 100 m away).

4.2.2 Habitat characteristic monitoring

Overall, no significant degradation in native vegetation cover and habitat structure was observed at impact sites in Year 4. The average cover scores for native vegetation at both impact and control sites increased or slightly decreased, but never by more than 4%, compared to the average percentage recorded in Year 1. The average cover scores for habitat structure at impact sites slightly increased in comparison to the average percentage recorded in Year 1 at impact sites, while, on average, control sites recorded a decline in habitat structure by 10% in comparison to Year 1.

Average covers of exotic vegetation increased at impact sites when compared to Year 1 and when compared to control sites in Year 4, despite displaying a decline in Year 3. The average exotic cover remained highest at the <0.5 m interval, which can diminish suitable habitat for small mammal species. Exotic species tend to dominate, forming monocultures that hinder small mammals' movement throughout an area and diminish available foraging habitat. It is recommended that weed management will be targeted at nine sites (SM01, SM10, SM14, SM15, SM19, SM20, SM27, SM35 and SM36), which showed an exotic vegetation cover greater than Year 1 and greater than the average showed at control sites in Year 4. Seven out of the nine sites recorded no target small mammal species, and all sites recorded the presence of feral animals.

Seven impact sites (SM01, SM18, SM20, SM24, SM25, SM27 and SM35) recorded a decline in both the native vegetation cover and the habitat structure, in comparison to the data recorded at the same sites in Year 1 (data used for the comparison has been summarised in Table 4.2). Among these, four sites (SM18, SM20, SM25 and SM27) recorded a percentage in native vegetation cover and habitat structure lower than the one recorded at the average control site in Year 4 (data used for the comparison has been summarised in Table 4.3). Among the four sites where a degradation in native vegetation cover and habitat structure was observed, two sites (SM20 and SM27) recorded a combined increase in weed cover in comparison to Year 1 (data used for the comparison has been summarised in Table 4.2). Both SM20 and SM27 recorded an exotic cover greater than the one observed at the average control site in Year 4 (data used for this comparison is summarised in Table 4.3). Both sites are considered occupied habitat; SM20 is considered occupied habitat for one of the target species, the Eastern Pygmy Possum, which was recorded present in Year 1 and Year 3; SM27 is considered occupied habitat for the Broad-toothed Rat, which was recorded present in Year 1 and Year 3 at FP20, the faecal pellet monitoring site situated at the same location of SM27-I-RC1. In conclusion, observed degradation in native vegetation cover and habitat structure of occupied habitat was recorded in combination with an increase in weed cover at two impact sites (SM20 and SM27); therefore, these SM20 and SM27 have been triggered for adaptive management.

Table 4.2 **Difference between Year 4 and Year 1 in average cover scores by height class for native vegetation, exotic vegetation and habitat structure at impact sites that recorded a decline in both the native vegetation cover and the habitat structure in comparison to the data recorded at the same sites in Year 1**

Site	<0.5 m			0.5-1 m			1-1.5 m		
	Native (Year 4 – Year 1)	Exotic (Year 4 – Year 1)	Habitat Structure (Year 4 – Year 1)	Native (Year 4 – Year 1)	Exotic (Year 4 – Year 1)	Habitat Structure (Year 4 – Year 1)	Native (Year 4 – Year 1)	Exotic (Year 4 – Year 1)	Habitat Structure (Year 4 – Year 1)
SM01	-8	9	-23	69	5	9	5	0	0
SM18	-6	-51	-5	51	-4	2	12	0	0
SM20	-62	19	-4	-39	37	2	-19	-3	0
SM24	-3	0	-2	30	0	-1	31	0	0
SM25	-5	0	-13	41	0	-2	37	0	0
SM27	24	23	-13	-5	-2	-2	0	0	0
SM35	-60	47	-25	-1	1	-3	0	0	0

Table 4.3 **Average cover scores by height class for native vegetation, exotic vegetation and habitat structure at impact sites that recorded a decline in both the native vegetation cover and the habitat structure in comparison to the data recorded at the same sites in Year 1**

Site	<0.5 m			0.5-1 m			1-1.5 m		
	Native	Exotic	Habitat Structure	Native	Native	Exotic	Habitat Structure	Exotic	Native
SM01	75%	11%	21%	82%	5%	9%	6%	0%	0%
SM18	68%	4%	6%	70%	1%	4%	12%	0%	0%
SM20	30%	52%	5%	21%	50%	3%	3%	0%	0%
SM24	55%	0%	7%	42%	0%	0%	33%	0%	0%
SM25	63%	0%	4%	53%	0%	0%	37%	0%	0%
SM27	105%	39%	0%	3%	0%	0%	0%	0%	0%
SM35	21%	72%	7%	3%	2%	0%	0%	0%	0%
Average at control sites in Year 4	70%	15%	7%	70%	15%	7%	15%	0%	0%

i Triggers for adaptive management

The triggers for adaptive management for this management action are:

- observed degradation in vegetation structure and habitat characteristics of occupied habitat
- observed degradation is combined with an observed increase in weed cover or other project related impacts.

Observed degradation in native vegetation cover and habitat structure of occupied habitat was recorded in combination with an increase in weed cover at two impact sites (SM20 and SM27); therefore, these SM20 and SM27 have been triggered for adaptive management.

4.3 Frog monitoring

4.3.1 Occupancy (presence/absence) monitoring

i Alpine Tree Frog occupancy

The total number of Alpine Tree Frog records increased by 7.5%, from 146 individuals in Year 3 to 157 individuals in Year 4. Impact site TR01 had the highest number of individuals recorded at an impact site to date with 24 individuals being observed in one monitoring event and 43 total sightings. Previously this site had 12 individuals observed in Year 3, 6 individuals recorded during Year 2 and no Alpine Tree Frogs during the first year of monitoring. Similarly, TC02 recorded 17 individuals during Year 4 monitoring with the previous maximum being 7 during Year 3 monitoring.

Year 4 recorded the greatest number of individuals at impact sites (75), an increase of 278% from the previous maximum of 27 in Year 2. Conversely, Year 4 recorded the lowest number of individuals at control sites (82), a decrease from Year 1 results of 57%. The results could indicate natural fluctuations in the two populations. Alternatively, the control results may be because of changes in survey regime compared to previous years. In Year 4, three control sites and one impact site were unable to be surveyed during the prescribed period between December and January and were instead surveyed in February. As discussed in Section 3.3.3, data collected at control sites ER02 and MR01 does not fall within the range defined by the standard deviation of the data collected from Year 1, Year 2, and Year 3. Data collected in Year 5 will be used to assess the trends at ER02 and MR01.

One possible explanation for the high numbers at impact sites is that these sites may have experienced habitat improvements or recovery following previous disturbances, leading to increased breeding success or local recruitment. It is also possible that management interventions or environmental conditions (such as warmer temperatures or changes in precipitation patterns) in the Snowy region have favoured Alpine Tree Frog reproduction and survival at impact sites. Additionally, differences in microhabitat structure or resource availability could have enhanced detectability or occupancy at these sites during Year 4.

Conversely, the reduced numbers at control sites may partly be a consequence of a shift in the survey regime. In Year 4, three control sites and one impact site were not surveyed during the prescribed period (December–January) but instead in February. Since Alpine Tree Frogs are generally more detectable during the designated survey window, the delayed surveys could have resulted in underestimates at control sites. However, this timing issue does not readily account for the dramatic increase observed at impact sites, suggesting that other ecological or management-related factors might be influencing the impact sites differently.

In summary, while survey timing and changes in methodology likely contributed to some of the observed variability, the notable increase at impact sites suggests additional factors—such as habitat recovery, altered breeding dynamics, or favourable microclimatic conditions—may be at play. Further investigation into habitat quality, breeding phenology, and weather patterns in both impact and control areas is recommended to better understand these trends.

ii Booroolong Frog occupancy

Despite the overall decrease in total Booroolong Frog records during Year 2 and Year 3—likely due to extreme weather conditions limiting safe access to survey sites—Year 4 data indicate notable changes. In Year 4, the total number of records increased to 28 individuals, with impact sites recording 23 individuals compared to 20 in Year 1. This represents a 15% increase from Year 1, a dramatic 475% increase from Year 2, and a 156% increase from Year 3. In contrast, control sites have consistently recorded 5 individuals each year, reflecting stable population numbers. This stability suggests that control sites are experiencing minimal external pressures or environmental changes compared to impact sites. These results suggest that, while weather events in previous years may have contributed to lower detection rates, the apparent recovery in numbers at impact sites during Year 4 could indicate positive effects from habitat improvements, effective management interventions, or favourable environmental conditions. However, survey timing remains an important factor, as delays or variations in survey periods (as seen in some previous years) can also influence detectability.

In comparison to Year 1, YR02 recorded a decline from two records to zero records in Year 4. As discussed in Section 3.3.3, although one monitoring event was conducted outside the recommended survey window in Year 4, results still fall within the range defined by the standard deviation of the data from Year 1, Year 2, and Year 3. Therefore, the decline observed at YR02 is not considered to be due to the delayed survey timing. The habitat characteristic monitoring at YR02 showed an increase in cobble bank which is suitable rocky breeding habitat which would indicate a potential improvement in breeding habitat which was not reflected in increased occupancy. Nevertheless, the decline observed at YR02 is comparable to the decline observed at one control site YR08, which recorded four individuals in Year 1 and three individuals in Year 4. In conclusion, no adaptive management is required for YR02.

Year 4 data provides valuable insights into the dynamics of the local Booroolong Frog populations. The increase in numbers at impact sites points to possible recovery or improved conditions, whereas the stability at control sites reinforces the idea that changes are likely related to local management or environmental factors. Nonetheless, given the potential influence of survey timing and extreme weather events on data collection, it is recommended that continued monitoring be undertaken. This will help to confirm whether the trends observed in Year 4 represent a sustained recovery or are simply part of natural fluctuations, thereby informing any necessary adaptive management strategies.

In Year 4, the Booroolong Frog was recorded at WC01 during the first monitoring event, consistent with findings from Year 1, where one individual was also observed. This indicates a persistent but low abundance of the species at this site. The challenges of surveying this location, such as steep banks and high water levels, continue to limit survey efficacy and may contribute to the low detection rates.

iii Trigger for adaptive management

The trigger for adaptive management for this management action is:

- a decline in relative abundance (that upon review by species experts, is also considered as biologically significant) occurs during construction and/or operation at impact sites that does not also occur at the control sites
- a decline in relative abundance is accompanied by a decline in other monitoring parameters.

No decline in relative abundance has occurred at any impact sites for Alpine Tree Frog and Booroolong Frog, therefore adaptive management is not required for this species.

4.3.2 Booroolong Frog habitat characteristic monitoring

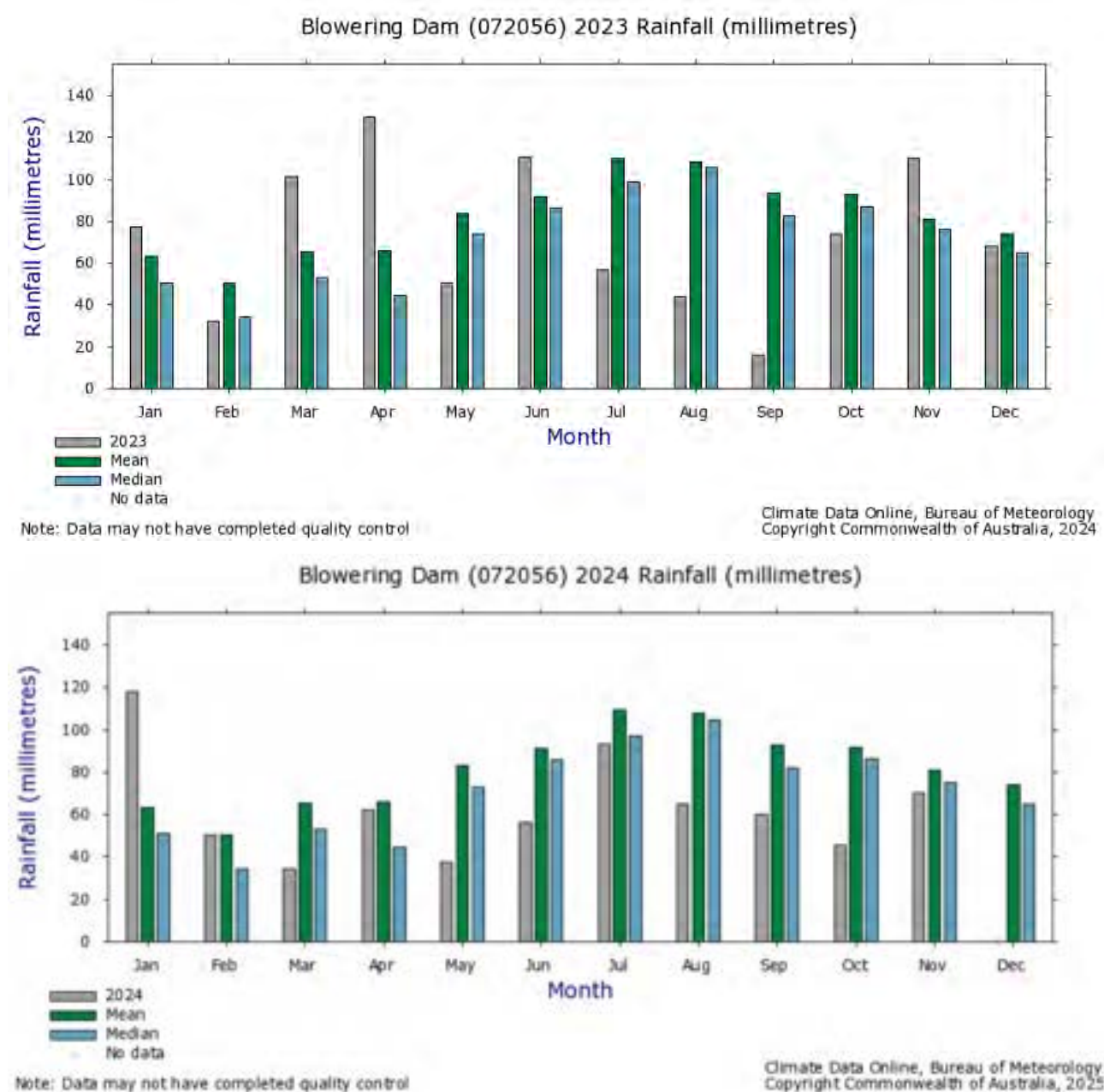
In the month prior to Year 4 data collection (November 2023) the rainfall was 110.1 mm which is 29.3 mm above the average November rainfall (80.8 mm). Despite higher rainfall than average in Year 4 (November 2023), rainfall

was 78.8 mm lower than in Year 3 (November 2022) (Bureau of Meteorology, 2024). Despite the high rainfall observed during monitoring events in Year 4 data collection (see Plate 4.1), these weather events have not substantially altered rocky breeding habitat and pools to indicate a decline in suitable habitat for the species.

In Year 4, the trends are similar to those observed in Year 2 and Year 3, with riparian vegetation steadily increasing across most sites. The increase varies from 2% to 24%. However, impact sites WC01 and YR02 experienced a decrease in riparian vegetation by 11% and 10% respectively.

It was discussed in the Year 2 report that the increase in riparian vegetation may have been partially due to the differences in areas that were surveyed. However, that trend is also observed in Year 3 and Year 4 suggesting that is unlikely to be the difference in survey area contributing to the upward trend of riparian vegetation. Overall, Year 4 saw a total increase of 0.36 ha in riparian vegetation cover.

As observed in previous years, where a reduction in one rocky habitat characteristic occurred, an increase of another habitat took place. At YR06, a decrease of 0.04 ha of cobble bank occurred, however an increase of 0.04 ha of rock bank has occurred also. Rivers are dynamic systems influenced by many factors such as volume and intensity of rainfall, and changing topology, therefore it is likely to see some gradual changes overtime.



Source: BoM (2024)

Plate 4.1 Monthly rainfall measured at Blowering Dam station ID 072056 during 2023 and 2024

i Trigger for adaptive management

The trigger for adaptive management for this management action is:

- observed degradation, change or loss of rocky (breeding) habitat at impact sites that does not also occur at the reference sites.

No substantial changes in rocky habitat have occurred at impact sites; however, small changes have occurred between types of rocky habitat. Additional variables could contribute to the changes in rocky habitat extent such as weather and stream flow. The habitat characteristics should be compared to the frog occupancy monitoring to monitor the effects of these changes on the Booroolong Frog populations within these sites. During Year 4 the small changes to rocky habitat appear to have no negative impact on Booroolong Frog populations based on occupancy data.

4.4 Alpine She-oak Skink monitoring

All impact sites have documented the presence of the Alpine She Oak within the past year, excluding TG04, TG10, TG12 and TG13.

TG04 and TG10 were decommissioned after the fifth survey event, as they had not recorded any individuals since January 2023 and March 2022, respectively. This decision reflects the limited potential for monitoring outcomes at these sites, as consistent non-detection rendered them unlikely to contribute further to assessing the species' response to impact or management activities.

The establishment of new impact sites, TG12 in April 2024 and TG13 in August 2024, represents an adaptive management response to enhance monitoring robustness. These sites were surveyed for the first time during the October monitoring event, but no Alpine She-oak Skink individuals were recorded.

The number of individuals observed varied across monitoring events, with the highest numbers recorded during the November (seven individuals) and December (eight individuals) surveys. These findings align with the species' expected seasonal activity patterns. The absence of detections during the October survey may reflect seasonal declines in detectability or activity.

Over the years, the number of individuals recorded at control sites exhibited an upward trend, increasing from 5 in Year 1 to 12 in Year 2 and 24 in Year 3, before decreasing to 18 in Year 4. This decline in Year 4 may partially be attributed to closures in Kosciuszko National Park, which prevented surveys at control sites TG06, TG07, and TG08 during the April survey event. Despite this, control sites continued to report a higher number of individuals (18) compared to impact sites (four). The most notable observation was at control site TG11, which consistently reported the highest number of individuals, including a peak of seven individuals during a single monitoring event. In contrast, the maximum count at any impact site was one individual.

Weeds are identified in the BMP (EMM, 2020b) as a primary impact on Alpine She-oak Skinks. In Year 4, the weed coverage in the area surrounding impact sites TG10, TG04 and TG02 had a light density, the area surrounding TG12 had a medium density, and the area surrounding TG13, TG05 and TG03 had a dense coverage of weeds. Weed coverage at the impact sites where Alpine She-Oak Skinks were recorded in Year 4 varied from dense to light weed coverage, showing no clear trend between weed coverage and number of skinks at impact sites.

Degradation of habitat by feral herbivores through digging, trampling and browsing is also a threat to the Alpine She-oak Skink (OEH, 2025). Feral animal abundance data showed high numbers of Feral Horse and European Rabbit in the Tantangara Dam area with smaller numbers recorded along Tantangara Road. With no data on feral animal occupancy and abundance or weed coverage in areas surrounding control Alpine She-oak sites it is not possible to compare the influence of these factors between impact and control sites. However, large numbers of horses and rabbits within the Tantangara Dam area are likely impacting the quality of habitat for Alpine She-oak Skink. The Year 4 findings highlight the importance of adaptive management and robust survey design to address site-specific challenges and environmental constraints. The contrast in detections between impact and control sites underscores the need to investigate habitat conditions further and implement targeted management strategies to support population stability at impact sites. Future monitoring efforts should continue to prioritize site accessibility, seasonal timing, and the establishment of new sites to enhance data reliability and representativeness.

4.4.1 Triggers for adaptive management

The triggers for adaptive management for this management actions are:

- absence of target species from a site during construction and operational monitoring, where the species was recorded during pre-construction / baseline surveys
- no changes in presence/absence at control sites
- absence recorded for greater than one year
- absence is combined with an observed increase or new occurrence of a primary impact (weeds).

No Alpine She-oak Skink sites have been triggered for adaptive management in Year 4.

4.5 Feral animal monitoring

4.5.1 Occupancy (presence/absence) and abundance monitoring

Overall, the four-year monitoring data reveal a mixed trend among feral species, with some populations declining (European Hare, Feral Cat), others increasing (Sambar Deer, Feral Pig). Monitoring continues to show that predatory species such as Red Fox, and Wild Dog are present and occur in similar numbers to Year 1 monitoring results. This suggests that the level of predation within the site has not changed significantly. Red Fox detections have fluctuated, decreasing in Year 3 before rebounding in Year 4 (from 10 to 12 sites). Despite these variations, foxes remain one of the most commonly detected predators. Wild Dog numbers also fluctuated, decreasing from 18 sites in Year 1 to 6 sites in Year 3, before slightly increasing again to 9 sites in Year 4. Similarly to Year 3, Red Foxes and Feral Cats have been sighted near Smoky Mouse habitats, highlighting the importance of triggering adaptive measurements to control these predators and to alleviate pressure on potentially recovering populations of Smoky Mouse.

Feral camera trap data shows a steady decline in European Rabbit detections from 67% in Year 1 to 26% in Year 4. However, spotlighting still records high abundance in Rock Forest and Tantangara Dam, suggesting that while the number of sites detecting rabbits has declined, populations may remain high in specific areas. This could indicate local population persistence, habitat preference, or control efforts being more effective in certain regions. Rock Forest, serving as a storage and logistics area, accommodates heavy vehicles for project deliveries, creating suitable habitat with increased open spaces for rabbits to traverse, forage, and breed. To mitigate the impacts caused by high rabbit numbers, it is recommended to exclude European Rabbits from suitable harbors such as access under shipping containers, buildings, and large equipment that remain in place for extended periods. These areas serve as shelters and breeding grounds for rabbits, and reducing such opportunities is likely to aid in controlling their population in the area.

Small mammal camera traps also provide opportunistic data on the presence and absence of feral animals. During Year 4 feral animals were detected on 85% of small mammal cameras with feral cats being the most common, occurring at 51% of small mammal camera sites. Predation by cats and red foxes is listed as a threatening process to all the small mammals being monitored by the NSW Office of Environment and Heritage (OEH, 2025). The high presence of predatory feral animals is likely preventing recovery from fire, increasing mortality through predation and discouraging dispersal. Red foxes are known to selectively target Broad-tooth Rats at Kosciuszko and reduce dispersal. This leads to a reduction in re-colonisation of previously occupied areas and reduced recruitment amongst existing populations (Green, 2002; C O'Brien, 2008). Targeting of feral animals within small mammal habitat is likely a challenging undertaking. Preventing dispersal of predatory feral species from urbanised project areas where control is more achievable, into surrounding small mammal habitat where control of the species is more difficult, will aid in overall protection of small mammal habitat.

Feral Horse detections have gradually declined from 32% in Year 1 to 21% in Year 4 across all feral and small mammal monitoring sites. Spotlighting data indicates that localised populations remain high, particularly in Tantangara Dam and Marica. This suggests that while the overall distribution of Feral Horses may be decreasing, certain areas continue to support significant populations. The recent aerial shooting program targeting Feral Horses in Kosciuszko National Park (Figure 1.1) may be contributing to this trend. However, Sambar Deer detections have increased indicating a growing population. Feral Horse, and hoofed animals such as deer, have the potential to alter habitat structure for threatened species. This could affect some of the threatened species on site such as the Brood-toothed Rat (Section 3.2.1iv) and Alpine She-oak Skink (Section 3.4), for which change in habitat structure is an ongoing threat (Commonwealth TSSC, 2009; Commonwealth TSSC, 2016).

4.5.2 Trigger for adaptive management

The trigger for adaptive management for the feral animal occupancy and feral animal abundance management actions is:

- sighting of feral animals within proximity to known Smoky Mouse habitat or project infrastructure.

As sightings of feral animals have been located within proximity to Smoky Mouse habitat and project infrastructure, adaptive management has been triggered except sites FC08 and FC09. The adaptive management action as outlined in the BMP states that sighting of feral animals triggers control in accordance with the Weed, Pest and Pathogen Management Plan (Appendix F of the BMP). The control is to be arranged by FGJV or Snowy Hydro.

Feral animals were recorded within proximity to project roads and infrastructure within Lobs Hole Ravine Road and Lobs Hole, Marica, Tantangara Dam, Tantangara Road and Rock Forest. It is recommended that control should prioritise feral animals within areas containing Smoky Mouse habitat as a priority.

4.6 Weed presence/absence

In Year 4, three management zones recorded a net zero change in priority weed species diversity, and five management zones recorded an increase in priority weed species diversity. A total of eleven priority weed species were recorded across all management zones within the Year 4 monitoring period, which constitutes an increase of one species observed in comparison to the previous Year 3 results (ten species observed).

Of the eight management zones monitored as part of weed surveys, the Tantangara Dam management zone recorded the highest priority weed species diversity (ten species), followed by Tantangara Road Top (eight species), and Tantangara Road Bottom (eight species). The Tantangara Dam management zone has recorded the highest priority weed species diversity of all management zones every monitoring year since monitoring began (Year 1).

Musk Monkey Flower (*Mimulus moschatus*) was recorded within the Tantangara Road Bottom management zone, constituting the first record of this species within this management zone, and a re-establishment of the species within the project area as it was last recorded in Threatened Flora Plots in Year 1 and Year 2, and Lobs Hole Ravine Road Top in Year 1.

Mullein (*Verbascum spp.*) was recorded at all eight management zones during Year 4 monitoring works, an increase in presence in comparison to Year 3 results in which Mullein was only observed within one management zone (Lobs Hole Ravine Road Bottom). During Year 4 monitoring works, Mullein was observed within the Rock Forest management zone for the first time.

No priority weed species that have not been previously recorded were recorded during the Year 4 monitoring works, however several priority weed species present in other management zones have been recorded for the first time in other management zones, including; St. John's Wort (*Hypericum perforatum*) and Mullein (*Verbascum spp.*) within the Rock Forest management zone, Musk Monkey Flower (*Mimulus moschatus*) within the Tantangara Road Bottom management zone, and Blackberry (*Rubus spp.*) within Threatened Flora Plots.

It is recommended that due to high or increasing priority weed species diversity, and the establishment of previously recorded priority weed species in other management zones, the areas for priority weed management are:

- Tantangara Dam
- Tantangara Road Bottom
- Tantangara Road Top
- Rock Forest.

Weed management should be targeted within high traffic areas and roadside bunds. This is where weed seed is likely to accumulate and spread due to potential transport from vehicles. It is recommended that those weeds which have a high occurrence across sites and a high propensity to spread seed be targeted. These species include, but are not limited to, Ox-eye Daisy, St John's Wort, Spear Thistle, Sweet Vernal Grass, and Yorkshire Fog.

It is noted that the Rock Forest site is not outfitted with a wheel-wash or other means of washing/shaking down vehicles of vegetative material or debris prior to leaving/entering site as per the Lobs Hole site. It was also noted that there is no requirement to washdown/ shakedown vehicles that are leaving Marica or entering Tantangara Dam. It is therefore possible, for example, a weed seed-laden vehicle travelling to Tantangara or Rock Forest from Marica or from off-project to introduce weed vegetation into the Tantangara or Rock Forest sites. It is therefore recommended that a review of vehicle washdown/shakedown measures is undertaken at each site to ensure that the risks of the introduction/ spread of weed vegetation and seed to/from project sites is being adequately controlled.

A list of priority weed species found in each management zone in Year 4 can be found in Section 3.6.1.

4.6.1 Trigger for adaptive management

The triggers for adaptive management for this management action are:

- new occurrence of weeds within proximity to project infrastructure
- monitoring results are identifying increases in density of high priority weeds.

No new priority weed species have been recorded within any of the weed management zones, however several priority weed species known to occur in other management zones have been recorded in new management zones for the first time. It recommended that weed control to be undertaken within all management areas, with priority taken for the areas identified above.

4.7 Phytophthora presence/absence

During Year 4, no monitoring sites tested positive for *Phytophthora* species.

4.7.1 Trigger for adaptive management

The triggers for adaptive management for this management action is:

- a soil sample which returns a positive result for Phytophthora species of concern such as *Phytophthora cinnamomi* or *Phytophthora gregata*.

No Phytophthora sites have been triggered for adaptive management in Year 4.

5 Summary of recommendations and triggers for adaptive management

Following the completion of the fourth year of the Main Works BMP, the following recommendations (Table 5.1) are made for consideration by Snowy Hydro, and for the program more broadly, for incorporation into the next year of monitoring (2024/25).

Table 5.1 Triggers for adaptive management and recommendations for project biodiversity management

Monitoring component	Triggers for adaptive management	Recommendation
Threatened Flora monitoring	Adaptive management has been triggered for Clover Glycine and Kiandra Leek Orchid at TF04 - Tantangara.	Initial investigation to document potential causation between decline and project related impacts. EMM recommends that dust be included in the investigations and dust monitoring be established at Spoil Road in Tantangara and a control site established on Circuits trail. Development of a mitigation plan, in consultation with DPIE and DAWE, addressing causes of decline as determined in initial investigation. The mitigation plan is recommends to include the following actions: • Targeted weed suppression to reduce competition from invasive species; • Soil and microhabitat condition assessment to inform future restoration efforts;
Small mammal occupancy monitoring	Four impact sites (Ravine Rd: SM05-I, Marica: SM22-I, SM23-I, SM24-I) have been triggered for adaptive management in Year 4. One impact site (SM07-I – Ravine Road) remains triggered for adaptive management as the Eastern Pygmy Possum in Year 4. No adaptive management has been triggered for Broad toothed-Rat in Year 4.	The adaptive management action as outlined in the BMP states an initial investigation into the absence of the Smoky Mouse and Eastern Pygmy Possum will be required to document potential causation between decline and project related impacts. Development of a mitigation plan, in consultation with NSW DCCEW and Commonwealth DCCEW, addressing causes of decline as determined in initial investigation. This may include targeted weed control, increased monitoring, feral animal control or additional construction related mitigation measures. It is recommended that a formalized trigger-response pathway be documented and integrated into the mitigation plan. If this is ineffective, additional offsets may be required. It is recommended that Feral Cats and European Red Fox be targeted as a priority at the four impact sites that have been triggered for adaptive management. Both species were present across all triggered sites except SM23-I where only one of the two species was detected. It is recommended that faecal pellet search results be presented as the number of each age class that occurred at a site rather than the total number of all pellets and the dominant age class.

Monitoring component	Triggers for adaptive management	Recommendation
Small mammal habitat characteristic monitoring	Observed degradation in native vegetation cover and habitat structure of occupied habitat was recorded in combination with an increase in weed cover at two impact sites (SM20 – Lobs Hole and SM27 - Marica). SM20 and SM27 have been triggered for adaptive management.	Initial investigation to document potential causation between decline and project related impacts is required for the observed degradation at SM20 and SM27. Development of a mitigation plan, in consultation with NSW DCCEEW and Commonwealth DCCEEW, addressing causes of decline as determined in initial investigation. This may include targeted weed control or additional construction related mitigation measures. If this is ineffective, presence/absence monitoring will be used to determine if any impacts to small terrestrial mammals will occur. It is recommended that weed management will be targeted at nine sites (Ravine Rd: SM01, SM10, SM14, SM15. Lobs Hole: SM19, SM20. Marica: SM27. Alpine Creek Trail: SM35. Tantangara: SM36.), which showed an exotic vegetation cover greater than Year 1 and greater than the average showed at control sites in Year 4. It is recommended that floristic surveys be undertaken to identify plant species in the monitoring area. This will provide an understanding of the food and habitat value provided for small mammals. This will also help identify which priority weeds are present to inform control methods. It is recommended that photopoint monitoring be established at each impact site to provide a visual record of vegetation and habitat changes over time. Fixed photo points should be recorded with consistent GPS coordinates, camera height, and direction. Photographs should be taken seasonally or in conjunction with key project milestones to track weed invasion, vegetation degradation, and habitat recovery.
Alpine Tree Frog occupancy monitoring	Not triggered	It is recommended that the survey periods for this species be altered from December to January as outlined in the BMP (EMM, 2020b) to September to December as per the NSW Survey Guide for Threatened Frogs (DPIE, 2020). This will provide a larger window for survey opportunity and ensure species is able to be surveyed during optimal conditions.
Booroolong Frog occupancy monitoring	Not triggered	It is recommended that the survey periods for this species be expanded from November to mid-December as outlined in the BMP (EMM, 2020b) to October to December as per the NSW Survey Guide for Threatened Frogs (DPIE, 2020). This will provide a larger window for survey opportunity and ensure species is able to be surveyed during optimal conditions.
Booroolong Frog habitat characteristic monitoring	Not triggered	It is recommended that previous mapping be overlaid with current mapping to understand the transition between habitat characteristics. This will improve understanding of how the habitat characteristics are changing in specific areas and how to better manage important habitat characteristics. It is also recommended that SHL liaise with National Parks and Wildlife Service to undertake targeted blackberry (<i>Rubus</i> spp.) control along survey transects, as infestations are impacting habitat quality and access. Given the proximity to the target species' breeding habitat, manual removal is preferred, with the cut-and-paint method as a low-impact alternative where necessary. Herbicide use and heavy machinery should be avoided to protect sensitive areas.
Alpine She-oak Skink occupancy monitoring	Not triggered	N/A

Monitoring component	Triggers for adaptive management	Recommendation
Feral animal occupancy monitoring Feral animal abundance monitoring	Feral animal occupancy and abundance monitoring: Pest control in accordance with the Weed, Pest and Pathogen Management Plan (FGJV 2020) has been triggered to all Feral animal remote camera monitoring sites except sites FC08 – Lobs Hole and FC09 – Lobs Hole.	The adaptive management action as outlined in the BMP states that sighting of feral animals triggers the Weed, Pest and Pathogen Management Plan (Appendix F of the BMP). The adaptive management is to be arranged by FGJV or Snowy Hydro. Priority areas for control include Lobs Hole Ravine Road and Marica with regards to proximity to Smoky Mouse habitat. Tantangara Dam and Rock Forest should also be prioritised with particular attention to the European Rabbit and feral horse, of which the latter are known threats to the Smoky Mouse, Eastern Pygmy-possum and Broad-toothed Rat habitat. It is recommended that the occupancy and abundance of feral species be monitored in the Year 5 monitoring period to assess occupancy and abundance changes across the site and compared to threatened species monitoring results, not just in relation to Smoky Mouse habitat. Additional recommendations to enhance feral animal management include the implementation of targeted control measures prior to and during breeding seasons of key feral species such as Red Fox, Feral Cat and European Rabbit. Strategic timing of control efforts may reduce recruitment success and improve long-term effectiveness of control programs. It is also recommended that feral animal control activities be coordinated with regional programs run by agencies such as the National Parks and Wildlife Service (NPWS) or Local Land Services. Aligning control actions with broader landscape-scale initiatives may improve outcomes and reduce reinvasion risk.
Weed presence / absence monitoring	Not triggered	To help prevent the potential triggers of adaptive management actions it is recommended that due to weed diversity, the areas for priority management include: • Tantangara Dam • Tantangara Road Bottom • Tantangara Road Top • Rock Forest. Weed management should also target high traffic areas and roadside bunds. This is where weed seed is likely to accumulate and spread due to potential transport from vehicles. It is recommended that those weeds with a high occurrence across sites and with high propensity to spread seed be targeted. These species include, but are not limited to, Ox-eye Daisy, St John's Wort, Spear Thistle, Sweet Vernal Grass, and Yorkshire Fog Grass.
<i>Phytophthora</i> spp. presence / absence monitoring	Not triggered	No recommendations required.

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Appendix A

Summary of Year 4 monitoring results and recommendations

Summary of Year 4 monitoring components, adaptive management triggers, and baseline and construction conditions							
Monitoring component	Trigger for adaptive management	Summary of conditions and adaptive management triggers relevant to Y4 adaptive management triggers	Y4 Q1 – Construction condition	Q2 – Construction condition	Q3 – Construction condition	Q4 – Construction condition	Review of adaptive management triggers
Threatened flora monitoring	•Percentage decline in the number of plants observed within a single monitoring plot, observed over two consecutive monitoring periods and outside of the standard deviation observed at control sites. •Decline must be observed in conjunction with a primary impact (e.g. increase in weed cover).	•During Year 3, a total of 38 individuals of Clover Glycine (<i>Glycine latrobeana</i>) were recorded at two impact sites (TF03 and TF14) and 100 individuals across five control sites (TF06, TF07, TF08, TF09 and TF10). •Two individuals of Kiandra Leek Orchid (<i>Prasophyllum retroflexum</i>) were recorded at one impact site (TF13) and 17 individuals at three control sites (TF06, TF07 and TF09) during Year 3. - No threatened flora species were recorded at three impact sites (TF04, TF11 and TF12) and one control site (TF05). - One impact site (TF04) reported a decline in the number of Clover Glycine individuals recorded over two consecutive monitoring periods. The observed decline at this impact site falls within the range of variation observed at control sites, as indicated by the standard deviation. No adaptive management was required for threatened flora plots in Year 3. - During Year 3, it was recommended plots TF01 and TF02 be discontinued, and new sites established as replacements.	•During Year 4 a total of 44 individuals of Clover Glycine were recorded at two impact sites (TF03 and TF14) and 154 individuals across four control sites (TF07, TF08, TF09 and TF10). - Twelve individuals of Kiandra Leek Orchid were recorded at three impact sites (TF11, TF13 and TF14) and 34 individuals at three control sites (TF06, TF07 and TF09) during Year 4. - No threatened flora species were recorded at two impact sites (TF04 and TF12) and one control site (TF05). - During Year 4, the following actions were taken regarding the logistics of the threatened flora plots: •TF01 and TF02 were cleared in Year 2 and have not been relocated as Kiandra Leek Orchid and Glover Glycine were unable to be located within the area adjacent to the footprint.	- According to the BMP, threatened flora monitoring is to be conducted bi-annually between December and January (dependent on flowering). - Therefore, no threatened flora monitoring was conducted during Q2 (March to May).	- According to the BMP, threatened flora monitoring is to be conducted bi-annually between December and January. - Therefore, no threatened flora monitoring was conducted during Q3 (June to August).	- According to the BMP, threatened flora monitoring is to be conducted bi-annually between December and January. - Therefore, no threatened flora monitoring was conducted during Q4 (September to November).	Adaptive management has been triggered for Clover Glycine and Kiandra Leek Orchid at TF04.
Small mammal presence/absence monitoring	•Absence of target species from a site during construction and operational monitoring, where the species was recorded during pre construction/baseline surveys. •No changes in presence/absence at control sites. •Absence recorded for greater than one year. •Absence is combined with an observed increase or new occurrence of a primary impact (decline in habitat complexity, weeds, pathogens, or feral herbivores/predators).	•During baseline survey (Year 1 Q1), the Smoky Mouse (<i>Pseudomys fumeus</i>) was recorded at one impact site (SM05 I) and no control sites. - The Eastern Pygmy Possum (<i>Cercartetus nanus</i>) was recorded at seven impact sites (SM03 I, SM10 I, SM14 I, SM16 I, SM18 I, SM20 I, SM21 I) and seven control sites (SM02 C, SM04 C, SM06 C, SM08 C, SM09 C, SM11 C, SM17 C). - The Broad toothed Rat (<i>Mastacomys fuscus</i>) was recorded at three control sites (SM28 C, SM30 C, SM33 C) and no impact sites. - No monitoring sites recorded Broad toothed Rat scats. •During Year 2, adaptive management was triggered for the Smoky Mouse and Eastern Pygmy Possum. Specific sites which required prioritisation included SM05, SM24 and SM35 for the Smoky Mouse and SM05, SM07, SM10, SM18, SM20 and SM22 for the Eastern Pygmy Possum. •During Year 3, adaptive management was not triggered for the Smoky Mouse as the species was not recorded at either the impact or control sites. Two impact sites (SM07 and SM18) remain triggered for adaptive management as the Eastern Pygmy Possum was not observed in Year 3 at these locations. Additional sites where absence of the species was recorded in Year 3 were not triggered for adaptive management as they did not record presence in Year 1 (baseline surveys). - No adaptive management has been triggered for Broad-toothed Rat. Sites where absence of the species was recorded in Year 3 were not triggered for adaptive management as they did not record presence in Year 1 (baseline surveys).	•The Smoky Mouse was not recorded at any impact or control sites. - Nine impact sites (SM05-I, SM10-I, SM14-I, SM18-I, SM21-I, SM22-I, SM23-I, SM24-I, SM35 I) recorded absence of the Smoky Mouse, which was previously recorded in these sites. - All the impact sites that previously recorded Smoky Mouse presence did not record the species for greater than one year. Three control sites (SM09-C, SM12-C, SM17-C) that previously recorded Smoky Mouse presence recorded the absence of the species for greater than one year. The absence of Smoky Mouse at all sites has been discussed with SHL in a progress meeting. •The Eastern Pygmy Possum was recorded at nine impact sites (SM03-I, SM15-I, SM16-I, SM18-I, SM21-I, SM23-I, SM24-I, SM25-I and SM26-I) and five control sites (SM02-C, SM06-C, SM09-C, SM17-C and SM40-C). - Nine impact sites (SM01 I, SM05 I, SM07 I, SM10 I, SM14 I, SM19 I, SM20 I, SM22-I and SM35 I) recorded absence of the Eastern Pygmy Possum, which was previously recorded in these sites. - Amongst these, four impact sites (SM01 I, SM07 I, SM19 I and SM35 I) that previously recorded Eastern Pygmy Possum presence did not record the species for greater than one year. One control site (SM29 C) that previously recorded Eastern Pygmy Possum presence recorded the absence of the species for greater than one year. •The Broad toothed Rat was recorded at nine control sites (SM02-C, SM04-C, SM17-C, SM28-C, SM30-C, SM31-C, SM32-C, SM33-C and SM39-C) and one impact sites (SM18-I). - In Year 4 Q1, four impact sites (SM01 I, SM07 I, SM34-I and SM36 I) recorded absence of the Broad toothed Rat, which was previously recorded in these sites. - Amongst these, two impact sites (SM07-I and SM36-I) that previously recorded Broad toothed Rat presence recorded absence of the species for greater than one year. One control site (SM38 C) that previously recorded Broad toothed Rat presence recorded the absence of the species for greater than one year. •Broad-toothed Rat faecal pellet search was undertaken in February. All sites recorded presence of the species. Two impact sites (FP17 and FP18) and one control site (FP33) recorded abundant (fresh) Broad-toothed Rat faecal pellets. One impact site (FP19) recorded uncommon (intermediate) faecal pellets and one impact site (FP20) recorded rare (old) faecal pellets. Two control sites (FP24 and FP26) recorded common (intermediate), and one control site (FP31) recorded common (old) faecal pellets. Two control sites (FP27 and FP30) recorded rare (intermediate), and one control site (FP32) recorded abundant (old) faecal pellets. •Two cameras (SM37 I RC1 and SM37 I RC2) are still missing since Year 3 Q1; therefore, no data was collected at these locations for Q1. –Nine camera locations (SM01-I-RC1, SM04 C RC2, SM19-I-RC2, SM26-C-RC2, SM30-C-RC1, SM31-C-RC1, SM32-C-RC1, SM34-I-RC2, SM38-C-RC1) did not capture a full 30 days of Q1 data. This is likely due to false triggers or high levels of activity prior to, or early in the 30-day period. Four camera locations (SM06-C-RC2, SM27-I-RC1, SM36 I RC1, SM39-C-RC1) had no data in Q1. This may be due to large amounts of false triggers or hardware errors. Sites will be checked for excess vegetation and hardware will be examined. •MegaDetector and EcoAssist, software used to filter photos, are now being used. They filter out false triggers, vehicles and people leaving only photos of animals. Automatic ID is not being employed and ecologists are still providing the ID of animals. A confidence threshold of 0.50 is being used, which means the model will have to be at least 50% sure the object is either a person, vehicle or animal. It is possible some animals are missed; however, a spot-check is undertaken to check the results.	•The Smoky Mouse was recorded at no impact sites and one control site (SM09-C). - Nine impact sites (SM05-I, SM10-I, SM14-I, SM18-I, SM21-I, SM22-I, SM23-I, SM24-I, SM35 I) recorded absence of the Smoky Mouse, which was previously recorded in these sites. - All the impact sites that previously recorded Smoky Mouse presence did not record the species for greater than one year. Two control sites (SM12-C, SM17-C) that previously recorded Smoky Mouse presence recorded the absence of the species for greater than one year. •The Eastern Pygmy Possum was recorded at three impact sites (SM03-I, SM14-I and SM21-I) and three control sites (SM06-C, SM09-C and SM17-C). - Fifteen impact sites (SM01-I, SM05-I, SM07-I, SM10-I, SM15-I, SM16-I, SM18-I, SM19-I, SM20 I, SM22-I, SM23-I, SM24-I, SM25-I, SM26-I and SM35-I) recorded absence of the Eastern Pygmy Possum, which was previously recorded in these sites. - Amongst these, four impact sites (SM01 I, SM07 I, SM19 I and SM35 I) that previously recorded Eastern Pygmy Possum presence did not record the species for greater than one year. One control site (SM29 C) that previously recorded Eastern Pygmy Possum presence recorded the absence of the species for greater than one year. •The Broad toothed Rat was recorded at one impact site (SM34-I) and four control sites (SM32-C, SM33-C, SM17-C, SM39-C). - In Year 4 Q3, four impact sites (SM01 I, SM07 I, SM18-I and SM36 I) recorded absence of the Broad toothed Rat, which was previously recorded in these sites. - Amongst these, two impact sites (SM07-I and SM36-I) that previously recorded Broad toothed Rat presence recorded absence of the species for greater than one year. SM36-I showed presence of the target species during faecal pellet searches. Thus, only SM07-I is triggered for adaptive management. One control site (SM38 C) that previously recorded Broad toothed Rat presence recorded the absence of the species for greater than one year. •Broad-toothed Rat faecal pellet search was undertaken across July and August. All sites recorded presence of the species except for one impact site (FP20). Two impact sites (FP17 and FP18) and two control sites (FP24 and FP30) recorded abundant (fresh) Broad-toothed Rat faecal pellets. One impact site (FP19) recorded common (fresh) faecal pellets. Control sites FP26, FP27, FP31, FP32 and FP33 were unable to be surveyed as they are located within closed areas of Kosciuszko National Park and NPWS did not grant access. •Two cameras (SM37 I RC1 and SM37 I RC2) are still missing since Year 3 Q1; therefore, no data was collected at these locations for Q3. –Fourteen cameras (SM28-C-RC1, SM28 C RC2, SM29-C-RC1, SM29-C-RC2, SM30-C-RC1, SM30-C-RC2, SM31-C-RC1, SM31-C-RC2, SM32-C-RC1, SM32-RC2, SM33-C-RC1, SM33-C-RC2, SM35-I-RC1, SM35-I-RC2) were unable to be surveyed as they are located within closed areas of Kosciuszko National Park and NPWS did not grant access. –Three camera locations (SM03-I-RC2, SM15-I-RC2 and SM19-I-RC2) had no data in Q3. Two camera locations (SM02-C-RC1 and SM12-C-RC2) recorded less than 30 days of Q3 data. This may be due to large amounts of false triggers or hardware errors. Sites will be checked for excess vegetation and hardware will be examined. –All the remaining camera locations captured a full 30 days of Q3 data. •MegaDetector and EcoAssist were used to filter out false triggers, vehicles and people leaving only photos of animals (confidence level: 0.50). To monitor the accuracy of the filtering process, a 2-hour spot-check review of the filtered images, conducted by an ecologist, was incorporated into the methodology. Out of 2,162 images reviewed, 12 errors were identified, resulting in an accuracy rate of 99.44%, which is considered acceptable.	•The Smoky Mouse was recorded at no impact sites and one control site (SM09-C and SM12-C). - Nine impact sites (SM05-I, SM10-I, SM14-I, SM18-I, SM21-I, SM22-I, SM23-I, SM24-I, SM35-I) recorded absence of the Smoky Mouse, which was previously recorded in these sites. - All the impact sites that previously recorded Smoky Mouse presence did not record the species for greater than one year. One control site (SM17-C) that previously recorded Smoky Mouse presence recorded the absence of the species for greater than one year. •The Eastern Pygmy Possum was recorded at no impact sites and no control sites. - Seventeen impact sites (SM01-I, SM03-I, SM05-I, SM07-I, SM10-I, SM14-I, SM15-I, SM16-I, SM19-I, SM20-I, SM21-I, SM22-I, SM23-I, SM24-I, SM25-I, SM26-I and SM35-I) recorded absence of the Eastern Pygmy Possum, which was previously recorded in these sites. - Amongst these, five impact sites (SM01 I, SM05-I, SM07 I, SM19 I and SM35 I) that previously recorded Eastern Pygmy Possum presence did not record the species for greater than one year. Two control sites (SM29-C and SM41-C) that previously recorded Eastern Pygmy Possum presence recorded the absence of the species for greater than one year. •The Broad-toothed Rat was recorded at two impact sites (SM14-I and SM34-I) and five control sites (SM28-C, SM30-C, SM32-C, SM39-C and SM40-C). - In Year 4 Q4, four impact sites (SM01-I, SM07-I, SM18-I and SM36-I) recorded absence of the Broad-toothed Rat, which was previously recorded in these sites. - Amongst these, two impact sites (SM07-I and SM36-I) that previously recorded Broad toothed Rat presence recorded absence of the species for greater than one year. SM36-I showed presence of the target species during faecal pellet searches in Q4. Thus, only SM07-I is triggered for adaptive management. - One control site (SM38 C) that previously recorded Broad toothed Rat presence recorded the absence of the species for greater than one year. However, SM38 C showed presence of the target species during faecal pellet searches in Q4. •Broad-toothed Rat faecal pellet search was undertaken in October. All sites recorded presence of the species except for one impact site (FP20). One control site (FP26) recorded abundant (fresh) Broad-toothed Rat faecal pellets. Two control sites (FP27 and FP32 recorded abundant (intermediate) Broad-toothed Rat faecal pellets. Two impact sites (FP17 and FP19) and one control site (FP24) recorded abundant (old) Broad-toothed Rat faecal pellets. One impact site (FP18) recorded common (intermediate) Broad-toothed Rat faecal pellets. One control site (FP33) recorded common (old) Broad-toothed Rat faecal pellets. Two control sites (FP30 and FP31) recorded uncommon (old) Broad-toothed Rat faecal pellets. •Two cameras (SM37 I RC1 and SM37 I RC2) are still missing since Year 3 Q1; therefore, no data was collected at these locations for Q4. –Four cameras (SM30-C-RC1, SM32-C-RC1, SM33-C-RC1 and SM33-C-RC2) had no data in Q4 as they are located within closed areas of Kosciuszko National Park and did not receive maintenance during Q3, which caused SD cards to become full prior to Q4. Two camera location (SM28-C-RC1 and SM30-C-RC2) recorded less than 30 days of Q4 data for the same reasons. –Four camera locations (SM03-I-RC1, SM16-I-RC1, SM17-C-RC1 and SM36-I-RC2) had no data in Q4. One camera location (SM36-I-RC1) recorded less than 30 days of Q4 data. This may be due to large amounts of false triggers or hardware errors. Sites will be checked for excess vegetation and hardware will be examined. –All the remaining camera locations captured a full 30 days of Q4 data.	Five impact sites (SM05-I, SM22-I, SM23-I, SM24-I and SM35-I) have been triggered for adaptive management in Year 4. One impact site (SM07-I) remains triggered for adaptive management as the Eastern Pygmy Possum in Year 4. No adaptive management has been triggered for Broad toothed-Rat in Year 4.	
Small mammal habitat characteristic monitoring	•Observed degradation in vegetation structure and habitat characteristics of occupied habitat. •Observed degradation is combined with an observed increase in weed cover or other project related impacts.	•During baseline surveys in Year 1, the average percentage of native cover at impact sites ranged from 0% to 99%, compared to that of exotic which ranged from 0% to 66%. •The average percentage of native cover at control sites ranged from 0% to 95%, compared to that of exotic cover which ranged from 0% to 79%. •Two control sites (SM08 and SM11) were unable to be established due to inaccessibility along Dead Man’s Fire Trail and were replaced during Year 2 (with SM40 and SM41). - During Year 3, three impact sites (SM18, SM35 and SM36) have been triggered for adaptive management due observed degradation in vegetation structure and habitat characteristics and due to the absence of the target species.	•Vegetation structure remained comparable between impact and control sites. •The average percentage of native cover at impact sites ranged from 22% to 70%, compared to that of exotic which ranged from 1% to 17%. The average percentage of habitat structure cover at impact sites ranged from 1% to 19%. •The average percentage of native cover at control sites ranged from 15% to 70%, compared to that of exotic cover which ranged from 0% to 15%. The average percentage of habitat structure cover at control sites ranged from 0% to 7%. •By comparing Year 4 data with baseline data, three major differences were observed at impact sites. First, an increase (19%) in the average native cover between 1.1.5 m, which was 3% in Year 1, 9% in Year 2, 16% in Year 3 and 22% in Year 4. This may account for regeneration of canopy species after the 2019/2020 bushfires. Second, an increase (35%) in the average native cover between 0.5-1 m, which was 17% in Year 1, 19% in Year 2, 18% in Year 3 and 52% in Year 4. This may also be a result of post-fire canopy regeneration. Third, an increase (3%) in the average exotic cover below 0.5 m, which was 14% in Year 1, 19% in Year 2 and 12% in Year 3 and 17% in Year4. Control sites had a reduction (-2.5%) in average exotic cover across the same period. These small changes are likely attributable to natural fluctuations or environmental conditions. •Overall, no significant degradation in vegetation structure and habitat characteristics of occupied habitat was observed.	According to the BMP, small mammal habitat characteristic monitoring is to be conducted once a year. Therefore, small mammal habitat characteristic monitoring was not undertaken during Q2.	According to the BMP, small mammal habitat characteristic monitoring is to be conducted once a year. Therefore, small mammal habitat characteristic monitoring was not undertaken during Q3.	According to the BMP, small mammal habitat characteristic monitoring is to be conducted once a year. Therefore, small mammal habitat characteristic monitoring was not undertaken during Q4.	Observed degradation in native vegetation cover and habitat structure of occupied habitat was recorded in combination with an increase in weed cover at two impact sites (SM20 and SM27). SM20 and SM27 have been triggered for adaptive management.
Alpine Tree Frog occupancy monitoring	•A decline in relative abundance (which upon review by species experts, is also considered as biologically significant) occurs during construction and/or operation at impact sites that does not occur at the control sites. •Decline in relative abundance is accompanied by a decline in other monitoring parameters.	•During baseline surveys in Year 1, 16 sightings of the Alpine Tree Frog (<i>Litoria verreauxii alpina</i>) were recorded at three of four impact sites (TC02, NC01, KP001) and 144 sightings at all four control sites (TC03, ER02, MR01, NC03). No Alpine Tree Frogs were recorded at TR01. •During Year 2, 27 individuals of the Alpine Tree Frog were recorded at all four impact sites and 159 individuals were recorded within all four control sites. •During Year 3, all transects were surveyed. Overall, 21 Alpine Tree Frogs were recorded across three impact sites (TR01, TC02 and NC01). At the control sites, 125 Alpine Tree Frogs were recorded across all four sites. No Alpine Tree Frogs were recorded at one impact site (KP001).	•During Year 4 Q1, all transects were surveyed. Some repeats were conducted in February 2024. Overall, 75 Alpine Tree Frogs were recorded across all four impact sites (TR01, TC02, NC01 and KP001). At the control sites, 82 Alpine Tree Frogs were recorded across all four control sites (TC03, ER02, MR01, NC03). •Declines in relative abundance observed at two impact sites (KP001 and NC01) between Year 1 and Year 3 did not continue. Year 4 abundance increased beyond Year 1 levels at both sites. •There was no decline in abundance at any of the four impact sites between Year 1 and Year 4. - Three of the four control sites showed a decline in relevant abundance between Year 1 and Year 4, The percentage decline between Year 1 and Year 4 populations at control sites are: –ER02: 91% –MR01: 78% –NC03: 37% •There was no decline in abundance at any of the four impact sites between Year 3 and Year 4. - Three of the four control sites showed a decline in relevant abundance between Year 3 and Year 4, the percentage decline between Year 3 and Year 4 populations at control sites are: –TC03: 21% –ER02: 90% –MR01: 67%	According to the BMP, frog abundance monitoring is to be conducted bi-annually during the breeding season (December to January for Alpine Tree Frog). Therefore, Alpine Tree Frog monitoring was not undertaken during Q2.	According to the BMP, frog abundance monitoring is to be conducted bi-annually during the breeding season (December to January for Alpine Tree Frog). Therefore, Alpine Tree Frog monitoring was not undertaken during Q3.	According to the BMP, frog abundance monitoring is to be conducted bi-annually during the breeding season (December to January for Alpine Tree Frog). Therefore, Alpine Tree Frog monitoring was not undertaken during Q4.	Adaptive management has not been triggered.

Monitoring component	Trigger for adaptive management	Summary of conditions and adaptive management triggers relevant to Y4 adaptive management triggers	Y4 Q1 – Construction condition	Q2 – Construction condition	Q3 – Construction condition	Q4 – Construction condition	Review of adaptive management triggers
Booroolong Frog occupancy monitoring	•A decline in relative abundance (which upon review by species experts, is also considered as biologically significant) occurs during construction and/or operation at impact sites that does not occur at the control sites. •Decline in relative abundance is accompanied by a decline in other monitoring parameters.	•During Year 1 baseline surveys, twenty sightings of the Booroolong Frog (<i>Litoria booroolongensis</i>) were recorded at all four impact sites (WC01, YR02, YR05, YR06) and five sightings at the two control sites (YR08, YR09). •During Year 2, four sightings of the Booroolong Frog were recorded at one impact site (YR05) and four sightings were recorded at the two control sites (YR08, YR09). This survey was completed under many limitations, and it was recommended that a third year of data is captured to inform any potential adaptive management. •During Year 3, nine sightings of the Booroolong Frog were recorded across three impact sites (YR02, YR05 and YR06). Five Booroolong Frogs were recorded at one control site (YR08). No Booroolong Frogs were recorded at one impact site (WC01). One control transect (YR09) was not surveyed to due unsafe conditions	•All six Booroolong Frog monitoring sites were surveyed. In total, 23 Booroolong Frogs were recorded across three impact sites (WC01, YR05 and YR06). No Booroolong Frogs were recorded at one impact site (YR02). Five Booroolong Frogs were recorded across the two control sites (YR08 and YR09). •A decline in relative abundance in respect to Year 1 data occurred at one out of four impact sites (YR02), whilst one control site (YR08) showed a decline. The percentage decline between Year 1 and Year 4 populations at impact sites is: –YR02: 100% The percentage decline between Year 1 and Year 4 populations at control sites is: –YR08 25% •A decline in relative abundance in respect to Year 3 data occurred at one out of four impact sites (YR02). The percentage decline between Year 3 and Year 4 populations at impact sites is: –YR02: 100% The percentage decline between Year 3 and Year 4 populations at impact sites is: –YR08: 25% There is the potential that these declines are biologically significant.	According to the BMP, frog abundance monitoring is to be conducted bi-annually during the breeding season (November to mid-December for Booroolong Frog). Therefore, Booroolong Frog monitoring was not required to be undertaken during Q2.	According to the BMP, frog abundance monitoring is to be conducted bi-annually during the breeding season (November to mid-December for Booroolong Frog). Therefore, Booroolong Frog monitoring was not required to be undertaken during Q3.	According to the BMP, frog abundance monitoring is to be conducted bi-annually during the breeding season (November to mid-December for Booroolong Frog). Therefore, Booroolong Frog monitoring was not required to be undertaken during Q4.	Adaptive management has not been triggered.
Booroolong Frog habitat characteristics monitoring	Observed degradation, change or loss of rocky (breeding) habitat at impact sites that does not also occur at the reference sites.	Booroolong Frog habitat characteristic monitoring for Year 3 was undertaken in December 2022. All four impact transects (WC01, YR02, YR05 and YR06) and two control transects (YR08 and YR09) were surveyed. Results from the survey showed that: •The average bed rock cover was 0.03 ha at impact transects and control transects. •The average cobble bank cover was 0.06 ha at impact transects and 0.03 ha at control transects. •The average mud bank cover was 0.01 ha at impact transects and 0.003 ha at control transects. •The average pool cover was 0.003 ha at impact transects and 0 ha at control transects. •The average riffle cover was 0.06 ha at impact transects and 0.04 ha at control transects. •The average riparian vegetation cover was 3.56 ha at impact transects and 1.61 ha at control transects. •The average rocky bank cover was 0.03 ha at impact transects and 0.04 ha at control transects. •The average run cover was 0.58 ha at impact transects and 0.27 ha at control transects. •The average cover of ‘other’ features (such as access tracks, cleared land or other vegetation) was 0.5 ha at impact transects and 0.24 ha at control transects. The total area mapped was 23.83 ha. The average extent of bed rock bank, riffles and rocky banks within impact sites are within the standard deviation observed at the control sites during Year 3. However, the average extent for cobble banks and runs are outside the standard deviation observed at control sites. The majority of ‘rocky’ habitat parameters have not changed when compared to control sites.	Booroolong Frog habitat characteristic monitoring for Year 4 was undertaken in December 2022. All four impact transects (WC01, YR02, YR05 and YR06) and two control transects (YR08 and YR09) were surveyed. Results from the survey showed that: •The average bed rock cover was 0.042 ha at impact transects and 0.026 ha at control transects. •The average cobble bank cover was 0.071 ha at impact transects and 0.033 ha at control transects. •The average mud bank cover was 0.018 ha at impact transects and 0.005 ha at control transects. •The average pool cover was 0.012 ha at impact transects and 0.005 ha at control transects. •The average riffle cover was 0.235 ha at impact transects and 0.169 ha at control transects. •The average riparian vegetation cover was 3.326 ha at impact transects and 1.462 ha at control transects. •The average rocky bank cover was 0.015 ha at impact transects and 0.031 ha at control transects. •The average run cover was 0.316 ha at impact transects and 0.126 ha at control transects. •The average cover of ‘other’ features (such as access tracks, cleared land or other vegetation) was 0.794 ha at impact transects and 0.407 ha at control transects. The total area mapped was 23.83 ha. The average extent of bed rock bank, cobble bank, mud bank, riffles, riparian vegetation, rocky banks and run within impact sites are outside of the standard deviation observed at the control sites during Year 4. All ‘rocky’ habitat parameters have changed when compared to control sites.	According to the BMP, frog habitat characteristic monitoring is to be conducted once a year during the breeding season (November to mid-December for Booroolong Frog). Therefore, Booroolong Frog habitat characteristic monitoring was not required to be undertaken during Q2.	According to the BMP, frog habitat characteristic monitoring is to be conducted once a year during the breeding season (November to mid-December for Booroolong Frog). Therefore, Booroolong Frog habitat characteristic monitoring was not required to be undertaken during Q3.	According to the BMP, frog habitat characteristic monitoring is to be conducted once a year during the breeding season (November to mid-December for Booroolong Frog). Therefore, Booroolong Frog habitat characteristic monitoring was not required to be undertaken during Q4.	Adaptive management has not been triggered.
Alpine She-oak Skink occupancy monitoring	•Absence of target species from a site during construction and operational monitoring, where the species was recorded during pre construction/baseline surveys. •No changes in presence/absence at control sites. •Absence recorded for greater than one year. •Absence is combined with an observed increase or new occurrence of a primary impact (weeds or feral animals).	During Year 1 baseline surveys, two Alpine She oak Skinks (<i>Cyclodomorphus praealtus</i>) were recorded at a single impact site (TG02) and five Alpine She oak Skinks were recorded at three control sites (TG06, TG07, TG08). No Alpine She oak Skinks were recorded at four impact sites (TG01, TG03, TG05) and one control site (TG09). During Year 2, no adaptive management was triggered, however it was raised that if no Alpine She oak Skinks were recorded at TG05 up to December 2022 (Year 3), adaptive management would be triggered (EMM 2023). Impact site TG04 has not recorded any individuals since its establishment, in October 2021. TG04 was relocated in January 2023 in potential suitable habitat, due to having never recorded species presence. During Year 3, no adaptive management was triggered.	January surveys were not undertaken due to competing priorities during the survey period and were rescheduled to April to ensure a robust dataset and will be reported on in the Year 4 Q2 report. Three Alpine She-oak Skinks were found across three impact sites (TG02, TG03 and TG05). 14 Alpine She-oaks were recorded across two control sites (TG08 and TG11). •Control site TG07 has not recorded any individuals for greater than a year. Most recent sighting at this site was November 2022. No adaptive management required as this is a control site. •Impact site TG10 has no records since its establishment in March 2022. No adaptive management required as there have been no previous records in baseline surveys. •Impact site TG04 has no records since its relocation in January 2023. No adaptive management required as there have been no previous records in baseline surveys. Tantangara Dam management zone (where most impact sites are located) recorded the highest number of priority weeds (ten species) (see Table 1.11). Additionally, Tantangara Dam has also shown a substantially higher abundance of feral animals in comparison to other project areas (see Table 1.10). These are both primary impacts on the Alpine She-oak Skink and are one aspect that are considered for adaptive management triggers.	One Alpine She-oak Skink was recorded at one impact site (TG02). Four individuals were recorded across three control sites (TG07, TG08 and TG11). Three control sites (TG06, TG07 and TG08) were unable to be accessed for April surveys due to National Parks and Wildlife Services conducting aerial shooting. Two sites were decommissioned after the 2024 April surveys. TG10 has not recorded any individuals since it was established in March 2022. Similarly, TG04 has had no records since it was relocated January 2023. Two sites will be established in Year 4. TG12 (impact site) was established in habitat adjacent to Tantangara public road in April 2024. TG13 (impact site) will be established within Tantangara construction area before October 2024 surveys commence. Both sites will commence next survey effort (October 2024). TG12 and TG13 will be located within the same habitat as the decommissioned sites (TG10 and TG04a) and are intended to replace these two sites.	According to the BMP, Alpine She-oak Skink presence/absence monitoring surveys will be undertaken between October and March. Therefore, Alpine She-oak Skink presence/absence monitoring was not required to be undertaken during Q3.	No Alpine She-oak Skinks (<i>Cyclodomorphus praealtus</i>) were recorded across all control and impact sites in October. Surveys commenced at sites TG12 and TG13 for the first time since they were established.	Adaptive management has not been triggered.
Feral animal occupancy monitoring	Sighting of feral animals within proximity to known Smoky Mouse habitat or project infrastructure.	Sighting of feral animals trigger control in accordance with the Weed, Pest and Pathogen Management Plan. Feral animal control to be undertaken within areas with feral records. During Year 3 Q4 seven feral animal species were recorded across 32 sites (55% of monitored sites) comprising: •Feral Cat was recorded at eight sites. •European Hare was recorded at one site. •European Rabbit was recorded at nine sites. •Feral Horse was recorded at ten sites. •Red Fox was recorded at twelve sites. •Sambar Deer was recorded at five sites. •Wild Dog was recorded at five sites. As sightings of feral animals had been located within proximity to Smoky Mouse habitat and project infrastructure, adaptive management had been triggered in Year 3.	Eight feral animal species were recorded across 11 sites (59% monitored sites) comprising the following: •Feral Cat was recorded at three sites. •European Hare was recorded at two sites. •European Rabbit was recorded at two sites. •Feral Horse was recorded at seven sites. •Red Fox was recorded at five sites. •Sambar Deer was recorded at one site. •Wild Dog was recorded at three sites. •Feral Pig was recorded at one site. Five cameras (FC03A, FC03B, FC04A, FC08B, FC19B) were missing prior to Q1 of Year 4 and have not been replaced; therefore, no data was collected at these locations for Q1. One camera (FC21A) was reinstalled in February 2024; therefore, no data was collected at the locations for Q1. Eight camera locations (FC05B, FC06B, FC08A, FC09A, FC09B, FC13A, FC13B and FC16B) collected no Q1 data.	Seven feral animal species were recorded across 16 sites (55% monitored sites) comprising the following: •Feral Cat was recorded at two sites. •European Hare was recorded at one site. •European Rabbit was recorded at three sites. •Feral Horse was recorded at eight sites. •Red Fox was recorded at five sites. •Sambar Deer was recorded at five sites. •Wild Dog was recorded at eight sites. One camera (FC04A) was missing prior to Q2 of Year 4 and has not been replaced; therefore, no data was collected at this location for Q2. One camera (FC19B) was reinstalled in May 2024; therefore, no data was collected at the locations for Q2. Three camera locations (FC05A, FC13B, FC15B) collected no Q2 data. •MegaDetector and EcoAssist were used to filter out false triggers, vehicles and people leaving only photos of animals (confidence level: 0.50). Automatic ID is not being employed and ecologists are still providing the ID of animal.	Seven feral animal species were recorded across 15 sites (64% monitored sites) comprising the following: •Feral Cat was recorded at three sites. •European Hare was recorded at one site. •European Rabbit was recorded at two sites. •Feral Horse was recorded at six sites. •Red Fox was recorded at six sites. •Sambar Deer was recorded at four sites. •Wild Dog was recorded at five sites. One camera (FC04A) is still missing and has not been replaced; therefore, no data was collected at this location for Q3. Two cameras (FC03A and FC03B) were removed from Lobs Hole Ravine Road North in August as this area is now a significant ADT haul road including controlled one-way traffic conditions. The camera locations adjacent to this road posed some safety concerns pertaining to ADT and LV/ personnel separation. We will review the feral camera locations and seek to re-install the two cameras in Q4. •MegaDetector and EcoAssist were used to filter out false triggers, vehicles and people leaving only photos of animals (confidence level: 0.50). To monitor the accuracy of the filtering process, a 2-hour spot-check review of the filtered images, conducted by an ecologist, was incorporated into the methodology. Out of 2,162 images reviewed, 12 errors were identified, resulting in an accuracy rate of 99.44%, which is considered acceptable.	Six feral animal species were recorded across 12 sites (62% monitored sites) comprising the following: •Feral Cat was recorded at two sites. •European Rabbit was recorded at two sites. •Feral Horse was recorded at seven sites. •Red Fox was recorded at one site. •Sambar Deer was recorded at two sites. •Wild Dog was recorded at five sites. One camera (FC04A) is still missing and has not been replaced; therefore, no data was collected at this location for Q4. Two cameras (FC03A and FC03B) were re-installed in Q4; therefore, no data was collected at the locations for Q4. Two camera locations (FC05B, FC09B) collected no Q4 data due to high traffic at the locations. One camera location (FC10A) collected no Q4 data due to hardware errors. •MegaDetector and EcoAssist were used to filter out false triggers, vehicles and people leaving only photos of animals (confidence level: 0.50).	Adaptive management has been triggered. Pest control in accordance with the Weed, Pest and Pathogen Management Plan (FGIV 2020) has been triggered to all Feral animal remote camera monitoring sites except sites FC08 and FC09.
Feral animal abundance monitoring	Sighting of feral animals within proximity to known Smoky Mouse habitat or project infrastructure.	During Year 3 (Q4), spotlighting was completed at all management zones. Lobs Hole Ravine Road North and Tantangara Dam were only partially surveyed because of construction works limiting access. •Five feral animal species were recorded across the Main Works project area: –54 individuals of Rabbit –38 individuals of Feral Horse –1 individual of Red Fox –1 individual of Fallow Deer –1 individual of Sambar Deer •Average abundance for each road/key infrastructure area: –Lobs Hole Ravine Road Bottom = 0.62 animals/km (Rabbit) –Lobs Hole Ravine Road North = 0.20 animals/km (Rabbit and Red Fox) –Lobs Hole Ravine Road South = 0.04 animals/km (Sambar Deer) –Marica = 0.14 animals/km (Rabbit) –Rock Forest = 9.74 animals/km (Rabbit) –Tantangara Dam = 6.86 animals/km (Rabbit, Feral Horse, and Fallow Deer) –Tantangara Road = 0.47 animals/km (Rabbit and Feral Horse). As sightings of feral animals had been located within proximity to Smoky Mouse habitat and project infrastructure, adaptive management had been triggered in Year 3 (Q4).	Spotlighting surveys were completed at Lobs Hole, Marica, Rock Forest, Tantangara Dam and Tantangara Road. •Six feral animals were recorded across the Main Works project area: –47 individuals of Rabbit –1 individual of European Hare –38 individuals of Feral Horse –5 individuals of Red Fox. –1 individual of Sambar Deer –1 individual of Red Deer. •Average abundance for each road/key infrastructure area: –Lobs Hole Ravine Road Bottom = 0.60 animals/km (Rabbit, Red Fox, and Red Deer) –Lobs Hole Ravine Road North = 0.75 animals/km (Rabbit) –Lobs Hole Ravine Road South = 0.15 animals/km (Rabbit and Sambar Deer) –Marica = 0.14 animals/km (Rabbit and European Hare) –Rock Forest = 9.75 animals/km (Rabbit) –Tantangara Dam = 4.47 animals/km (Rabbit and Feral Horse) Tantangara Road = 0.69 animals/km (Rabbit and Feral Horse).	Spotlighting surveys were completed at Marica and Lobs Hole management zone. However, work at Rock Forest, Tantangara Road and Tantangara Dam was cancelled due to unsafe weather conditions (strong to gale force wind up to 80 km/h). •Two feral animals were recorded across the Main Works project area: –12 individuals of Rabbit –2 individuals of European Hare. •Average abundance for each road/key infrastructure area: –Lobs Hole Ravine Road Bottom = 1.28 animals/km (Rabbit and European Hare) –Lobs Hole Ravine Road North = 0.15 animals/km (Rabbit). •Lobs Hole Ravine Road South and Marica recorded no feral animals.	Spotlighting surveys were completed at Lobs Hole, Marica, Rock Forest, Tantangara Dam and Tantangara Road. •Six feral animals were recorded across the Main Works project area: –62 individuals of Rabbit –2 individuals of European Hare –70 individuals of Feral Horse –1 individual of Red Fox. –2 individuals of Rusa Deer –2 individuals of Sambar Deer •Average abundance for each road/key infrastructure area: –Lobs Hole Ravine Road Bottom = 0.54 animals/km (Rabbit, Red Fox, and Rusa Deer) –Marica = 4.67 animals/km (Horse) –Rock Forest = 5.23 animals/km (Rabbit) –Tantangara Dam = 4.37 animals/km (Rabbit, Feral Horse, Rusa Deer and Sambar Deer) –Tantangara Road = 0.33 animals/km (Rabbit and European Hare). •Lobs Hole Ravine Road North and Lobs Hole Ravine Road South recorded no feral animals.	Spotlighting surveys were completed at Lobs Hole, Marica, Rock Forest, Tantangara Dam and Tantangara Road. •Four feral animals were recorded across the Main Works project area: –102 individuals of Rabbit –3 individuals of European Hare –81 individuals of Feral Horse –5 individuals of Sambar Deer •Average abundance for each road/key infrastructure area: –Lobs Hole Ravine Road North = 2.21 animals/km (Rabbit and Sambar Deer) –Lobs Hole Ravine Road South = 0.07 animals/km (Rabbit) –Marica = 0.27 animals/km (Rabbit) –Rock Forest = 8.83 animals/km (Rabbit) –Tantangara Dam = 11.58 animals/km (Rabbit and Feral Horse) –Tantangara Road = 0.51 animals/km (Rabbit and European Hare). •Lobs Hole Ravine Road Bottom recorded no feral animals.	Adaptive management has been triggered. Pest control in accordance with the Weed, Pest and Pathogen Management Plan (FGIV 2020) has been triggered to all Feral animal remote camera monitoring sites except sites FC08 and FC09.
Weed presence / absence monitoring	•New occurrence of weeds within proximity to project infrastructure. •Monitoring results are identifying increases in density of high priority weeds.	In Year 1, 16 priority weed species were recorded within 50 m of the main project roads, accommodation camps and key construction compounds and within 50 m of the threatened flora monitoring locations: •Milfoil/Yarrow (<i>Achillea millefolium</i>) •Browntop Bent (<i>Agrostis capillaris</i>) •Sweet Vernal Grass (<i>Anthoxanthum odoratum</i>) •Spear Thistle (<i>Cirsium vulgare</i>) •Cocksfoot (<i>Dactylis glomerata</i>) •Patterson’s Grass (<i>Echium plantagineum</i>) •Vipers Bugloss (<i>Echium vulgare</i>) •Yorkshire Fog Grass (<i>Holcus lanatus</i>) •St John’s Wort (<i>Hypericum perforatum</i>) •Ox eye Daisy (<i>Leucanthemum vulgare</i>) •Bird’s foot Trefoil (<i>Lotus spp.</i>) •Musk Monkey Flower (<i>Mimulus moschatatus</i>) •Scotch Thistle (<i>Onopordium acanthium</i>) •Sweet Briar (<i>Rosa rubiginosa</i>) •Blackberry (<i>Rubus spp.</i>) •Mullein (<i>Verbascum spp.</i>). In Year 2, no new priority weed species were recorded. However, among the weed species recorded in Year 2, seven species not considered as priority weed species were recorded: •Redtop Bent (<i>Agrostis gigantea</i>) •Flaxleaf Fleabane (<i>Conyza bonariensis</i>) •Flatweed (<i>Hypochaeris radicata</i>) •Sheep Sorrel (<i>Rumex acetosella</i>) •White Clover (<i>Trifolium repens</i>) •Bentgrass (<i>Agrostis spp.</i>) Five Priority weed species were found at ‘dense’ cover (>50%), Blackberry (<i>Rubus Spp.</i>), St John’s Wort (<i>Hypericum perforatum</i>), Sweet Vernal Grass (<i>Anthoxanthum odoratum</i>), Browntop Bent (<i>Agrostis capillaris</i>) and Yorkshire Fog Grass (<i>Holcus lanatus</i>). Dense cover of weeds was recorded across six management zones, Bottom of Lobs Hole, Lobs Hole Ravine Road bottom, Marica, Tantangara Dam, Tantangara Road bottom and Tantangara Road top. When compared to Year 3 data, there is an increase in the number of species at dense cover from four to five and in increase of sites with dense cover of priority weeds from five to six.	No new priority weed species were recorded. Eleven priority weed species were recorded within 50 m of the main project roads, accommodation camps and key construction compounds and within 50 m of the threatened flora monitoring locations: •Browntop Bent (<i>Agrostis capillaris</i>) •Sweet Vernal Grass (<i>Anthoxanthum odoratum</i>) •Spear Thistle (<i>Cirsium vulgare</i>) •Cocksfoot (<i>Dactylis glomerata</i>) •Yorkshire Fog Grass (<i>Holcus lanatus</i>) •St John’s Wort (<i>Hypericum perforatum</i>) •Ox eye Daisy (<i>Leucanthemum vulgare</i>) •Musk Monkey Flower (<i>Mimulus moschatatus</i>) •Sweet Briar (<i>Rosa rubiginosa</i>) •Blackberry (<i>Rubus spp.</i>) •Mullein (<i>Verbascum spp.</i>). Tantangara Dam (ten species), Tantangara Road Top (eight species) and Tantangara Road Bottom (eight species) recorded the greatest numbers of priority weed species. Six species not considered as priority weed species were also recorded: •Redtop Bent (<i>Agrostis gigantea</i>) •Flaxleaf Fleabane (<i>Conyza bonariensis</i>) •Flatweed (<i>Hypochaeris radicata</i>) •Sheep Sorrel (<i>Rumex acetosella</i>) •White Clover (<i>Trifolium repens</i>) •Bentgrass (<i>Agrostis spp.</i>) Five Priority weed species were found at ‘dense’ cover (>50%), Blackberry (<i>Rubus Spp.</i>), St John’s Wort (<i>Hypericum perforatum</i>), Sweet Vernal Grass (<i>Anthoxanthum odoratum</i>), Browntop Bent (<i>Agrostis capillaris</i>) and Yorkshire Fog Grass (<i>Holcus lanatus</i>). Dense cover of weeds was recorded across six management zones, Bottom of Lobs Hole, Lobs Hole Ravine Road bottom, Marica, Tantangara Dam, Tantangara Road bottom and Tantangara Road top. When compared to Year 3 data, there is an increase in the number of species at dense cover from four to five and in increase of sites with dense cover of priority weeds from five to six.	According to the BMP, weed monitoring is to be conducted yearly, in early Summer. Therefore, weed presence/absence monitoring was not undertaken during Q2.	According to the BMP, weed monitoring is to be conducted yearly, in early Summer. Therefore, weed presence/absence monitoring was not undertaken during Q3.	According to the BMP, weed monitoring is to be conducted yearly, in early Summer. Therefore, weed presence/absence monitoring was not undertaken during Q4.	Adaptive management has not been triggered.

Monitoring component	Trigger for adaptive management	Summary of conditions and adaptive management triggers relevant to Y4 adaptive management triggers	Y4 Q1 – Construction condition	Q2 – Construction condition	Q3 – Construction condition	Q4 – Construction condition	Review of adaptive management triggers
Phytophthora presence/absence monitoring	A soil sample returns a positive result for Phytophthora species of concern such as Phytophthora cinnamomi or Phytophthora gregata.	•Of the eight samples taken during baseline surveys (conducted during Q2 of Year 1), Phytophthora spp. was detected in one soil sample from Lobs Hole (Lobs01). No dieback was observed during surveys. Further tests confirmed the species to be Phytophthora cryptogea/psueudocryptogea. Additional soil sampling was required within the suspected infection area to document the extent. The original location (Lobs01) was resampled (PMS5), and an additional four sites surrounding the infected area (PMS1, PMS2, PMS3 and PMS4). Phytophthora cryptogea/psueudocryptogea was detected in PMS1 and PMS5, confirming presence within the bottoms of Lobs Hole. Given the results of the additional testing, soil samples were taken from an additional 20 locations across the Snowy 2.0 project area. The additional 20 samples tested negative for Phytophthora spp. •All samples taken in Year 2 were negative. No additional testing was required. •During Year 3, all the original sampling sites and 23 additional sites were sampled in January 2023 and tested for Phytophthora spp. presence. The results of the analysis showed that: –Phytophthora pseudocryptogea/cryptogea was detected at one sample site (PMS3) –Phytophthora cinnamomi was detected at one sample site (PS03). •Adaptive management has been triggered: No additional areas within proximity have been tested at PS03, however two sites have been tested within close proximity to PMS3 (PMS2 and PMS4) during the January testing. These sites tested negative to Phytophthora spp. detection.	During December 2023, 21 sites were sampled in and tested for Phytophthora spp. presence. All the sites surveyed in December 2023 recorded absence of the genus. No Phytophthora spp. was found at the five sites (Marica01 (PS), PS06, PS08, PS09 and PS10) surveyed in January 2024. The remaining sites will be surveyed in Q2.	During April 2024, 11 sites were sampled and tested for Phytophthora spp. presence. All the sites surveyed in April 2024 recorded absence of the genus.	According to the BMP, Phytophthora presence/absence monitoring is to be conducted once per year during the construction phase. Therefore, weed presence/absence monitoring was not undertaken during Q3.	According to the BMP, Phytophthora presence/absence monitoring is to be conducted once per year during the construction phase. Therefore, weed presence/absence monitoring was not undertaken during Q4.	Adaptive management has not been triggered.

Appendix B

Site locations summary

B.1 Monitoring site locations

Table B.1 Monitoring site locations

Location	Site	GPS coordinates	Threatened flora		Small mammals		Alpine She-oak Skink	Frogs			Feral animals	Pathogens
			Monitoring plots	Habitat characteristic transects	Motion camera	Faecal pellet search	Tile grid	Alpine Tree Frog transects	Booroolong Frog transects	Booroolong drone survey	Motion camera	Soil sampling
Circuits Trail	NC03	E653086 N6029900						✓				
	TF05 (relocated - old location)	E653562 N6030119	-									
	TF05 (relocated in December 2022)	E652628 N6034864	✓									
	TF08	E652134 N6036239	✓									
	TF09	E652604 N6034294	✓									
Dead-Mans	SM04 C RC1	E627513 N6028084		✓	✓						✓	
	SM04 C RC2	E627488 N6028175		✓	✓						✓	
	SM06 C RC1	E627084 N6029494		✓	✓						✓	
	SM06 C RC2	E627005 N6029469		✓	✓						✓	
	SM09 C RC1	E627054 N6030585		✓	✓						✓	
	SM09 C RC2	E626973 N6030598		✓	✓						✓	
	SM12 C RC1	E626863 N6031047		✓	✓						✓	
	SM12 C RC2	E626949 N6030991		✓	✓						✓	
	SM13 C RC1	E627190 N6031165		✓	✓						✓	
	SM13 C RC2	E627280 N6031156		✓	✓						✓	
	SM40 C RC1	E626870 N6028263		✓	✓						✓	
	SM40 C RC2	E626771 N6028286		✓	✓						✓	
	LHRR Bottom	FC05 A	E625172 N6040255									✓
FC05 B		E625522 N6039454									✓	
FC06 A (relocated - old location)		E626304 N6039273									-	
FC06 A (relocated in January 2023)		E626275 N6039278									✓	
FC06 B (relocated - old location)		E625818 N6039058									-	
FC06 B (relocated in January 2023)		E625843 N6039152									✓	
FC07 A		E625910 N6038584									✓	

Location	Site	GPS coordinates	Threatened flora		Small mammals		Alpine She-oak Skink	Frogs			Feral animals	Pathogens	
			Monitoring plots	Habitat characteristic transects	Motion camera	Faecal pellet search	Tile grid	Alpine Tree Frog transects	Booroolong Frog transects	Booroolong drone survey	Motion camera	Soil sampling	
	FC07 B (relocated - old location)	E626243 N6038815										-	
	FC07 B (relocated in May 2023)	E626297 N6038780										✓	
	FC08 A	E626410 N6038267										✓	
	FC08 B (relocated - old location)	E626044 N6038209										✓	
	FC08 B (relocated March 2024)	E626027 N6038189											
	FC09 A	E627425 N6038082										✓	
	FC09 B (relocated - old location)	E627839 N6038435										-	
	FC09 B (relocated in May 2023)	E627880 N6038450										✓	
	Lobs01 (dismissed in Year3)	E626169 N6038412											-
	Lobs02 (established in Year3)	E626078 N6038392											-
	PMS1 (dismissed in Year3)	E626160 N6038341											✓
	PMS2 (relocated in Year 3)	E626097 N6038269											✓
	PMS3 (relocated in Year 3)	E626140 N6038244											✓
	PMS4 (relocated in Year 3)	E626199 N6038253											✓
	PMS5 (dismissed in Year3)	E626166 N6038409											-
	PS03	E627852 N6038421											✓
	PS04	E626340 N6039260											✓
	PS05	E625578 N6039489											✓
	SM19 I RC1	E625424 N6039246		✓		✓							✓
	SM19 I RC2	E625396 N6039202		✓		✓							✓
	SM20 I RC1	E627814 N6038071		✓		✓							✓
	SM20 I RC2	E627887 N6038000		✓		✓							✓
	WC01	E627781 N6038027								✓		✓	
	YR02	E626236 N6038909								✓		✓	
	YR05	E626886 N6038200								✓		✓	
	YR06	E627711 N6038318								✓		✓	

Location	Site	GPS coordinates	Threatened flora		Small mammals		Alpine She-oak Skink	Frogs			Feral animals	Pathogens
			Monitoring plots	Habitat characteristic transects	Motion camera	Faecal pellet search	Tile grid	Alpine Tree Frog transects	Booroolong Frog transects	Booroolong drone survey	Motion camera	Soil sampling
LHRR North	YR08	E628062 N6039040							✓	✓		
	YR09	E628064 N6039368							✓	✓		
	FC03 A (relocated – old location)	E624757 N6041147									-	
	FC03 A (relocated October 2024)	E626719 N6038162									✓	
	FC03 B (relocated – old location)	E624854 N6040718									-	
	FC03 B (relocated October 2024)	E625231 N6039747									✓	
	FC04 A (missing – old location)	E625424 N6039813									-	
	FC04 B	E625779 N6040158									✓	
	Lobbs hole R0.5	E628985 N6028294										✓
	Lobs Hole, R5	E626999 N6032166										✓
	PS01	E629107 N6027958										✓
	PS02	E626985 N6032115										✓
	SM01 I RC1	E629002 N6027853		✓	✓						✓	
	SM01 I RC2	E628957 N6027805		✓	✓						✓	
	SM03 I RC1	E629013 N6028188		✓	✓						✓	
	SM03 I RC2	E628934 N6028144		✓	✓						✓	
	SM05 I RC1	E628889 N6028648		✓	✓						✓	
	SM05 I RC2	E628957 N6028685		✓	✓						✓	
	SM07 I RC1	E628205 N6029818		✓	✓						✓	
	SM07 I RC2	E628113 N6029804		✓	✓						✓	
	SM10 I RC1	E627642 N6030795		✓	✓						✓	
	SM10 I RC2	E627729 N6030742		✓	✓						✓	
	SM14 I RC1	E627783 N6031169		✓	✓						✓	
	SM14 I RC2	E627675 N6031155		✓	✓						✓	
	SM15 I RC1	E627492 N6032042		✓	✓						✓	
SM15 I RC2	E627422 N6031971		✓	✓						✓		
SM16 I RC1	E626828 N6032555		✓	✓						✓		

Location	Site	GPS coordinates	Threatened flora	Small mammals		Alpine She-oak Skink		Frogs			Feral animals	Pathogens
			Monitoring plots	Habitat characteristic transects	Motion camera	Faecal pellet search	Tile grid	Alpine Tree Frog transects	Booroolong Frog transects	Booroolong drone survey	Motion camera	Soil sampling
	SM16 I RC2	E626716 N6032542		✓	✓						✓	
	SM17 C RC1	E626639 N6033514		✓	✓						✓	
	SM17 C RC2	E626591 N6033477		✓	✓						✓	
	SM18 I RC1	E627032 N6033393		✓	✓						✓	
	SM18 I RC2	E627079 N6033341		✓	✓						✓	
Link Road	SM02 C RC1	E628187 N6027266		✓	✓						✓	
	SM02 C RC2	E628156 N6027339		✓	✓						✓	
	SM41 C RC1	E625604 N6026619		✓	✓						✓	
	SM41 C RC2	E625533 N6026657		✓	✓						✓	
Marica	FC10 A	E630446 N6038925									✓	
	FC10 B	E630950 N6038880									✓	
	FC11 A	E631414 N6038842									✓	
	FC11 B	E631880 N6038926									✓	
	FC12 A	E634047 N6038305									✓	
	FC12 B (relocated - old location)	E633816 N6037796									-	
	FC12 B (relocated in May 2023)	E633976 N6038088									✓	
	Marica Washdown (dismissed in Year2)	E636787 N6039884										-
	Marica Washdown02 (established in Year2)	E635151 N6037569										
	Marica01 (microsited in Year 3)	E633655 N6037849										✓
	PS06	E634797 N6037898										✓
	PS07	E633241 N6038437										✓
	PS08	E630531 N6039358										✓
	PS09	E630983 N6038878										✓
	PS10	E632420 N6038653										✓
	SM21 I RC1	E630622 N6039053		✓	✓						✓	
	SM21 I RC2	E630517 N6039030		✓	✓						✓	
	SM22 I RC1	E631437 N6038798		✓	✓						✓	

Location	Site	GPS coordinates	Threatened flora	Small mammals		Alpine She-oak Skink		Frogs			Feral animals	Pathogens
			Monitoring plots	Habitat characteristic transects	Motion camera	Faecal pellet search	Tile grid	Alpine Tree Frog transects	Booroolong Frog transects	Booroolong drone survey	Motion camera	Soil sampling
	SM22 I RC2	E631388 N6038695		✓	✓						✓	
	SM23 I RC1	E631707 N6038968		✓	✓						✓	
	SM23 I RC2	E631825 N6038988		✓	✓						✓	
	SM24 I RC1	E632106 N6038509		✓	✓						✓	
	SM24 I RC2	E632076 N6038398		✓	✓						✓	
	SM25 I RC1	E633267 N6038464		✓	✓						✓	
	SM25 I RC2	E633291 N6038553		✓	✓						✓	
	SM26 I RC1	E633937 N6038389		✓	✓						✓	
	SM26 I RC2	E633825 N6038391		✓	✓						✓	
	SM27 I RC1	E634736 N6037814		✓	✓	✓ FP20					✓	
	SM27 I RC2	E634796 N6037889		✓	✓						✓	
Plateau	PS16	E639636 N6038371										✓
	PS17	E642962 N6036535										✓
	PS18	E641780 N6032723										✓
	SM28 C RC1	E637149 N6039490		✓	✓						✓	
	SM28 C RC2	E637048 N6039567		✓	✓	✓ FP27					✓	
	SM29 C RC1	E639235 N6040472		✓	✓						✓	
	SM29 C RC2	E639130 N6040449		✓	✓						✓	
	SM30 C RC1	E641243 N6042194		✓	✓	✓ FP32					✓	
	SM30 C RC2	E641108 N6042164		✓	✓						✓	
	SM31 C RC1	E641023 N6040021		✓	✓						✓	
	SM31 C RC2	E640974 N6039933		✓	✓	✓ FP31					✓	
	SM32 C RC1	E643931 N6040579		✓	✓	✓ FP26					✓	
	SM32 C RC2	E643829 N6040582		✓	✓						✓	
	SM33 C RC1	E641583 N6048457		✓	✓	✓ FP33					✓	
	SM33 C RC2	E641675 N6048502		✓	✓						✓	
	SM35 I RC1	E642590 N6031051		✓	✓						✓	
	SM35 I RC2	E642579 N6031152		✓	✓						✓	
	TC02	E641967 N6033078						✓				

Location	Site	GPS coordinates	Threatened flora		Small mammals		Alpine She-oak Skink	Frogs			Feral animals	Pathogens
			Monitoring plots	Habitat characteristic transects	Motion camera	Faecal pellet search	Tile grid	Alpine Tree Frog transects	Booroolong Frog transects	Booroolong drone survey	Motion camera	Soil sampling
	TC03	E641113 N6042194						✓				
	TG06	E640403 N6048376					✓					
	TG07	E637664 N6039759					✓					
	TG08	E640520 N6042278					✓					
	TG11 (established in Year2)	E638672 N6037478					✓					
Rock Forest	FC21 A	E650261 N6021525									✓	
	FC21 B	E649945 N6021155									✓	
	PS19	E650712 N6020805										✓
	PS20	E651092 N6021074										✓
Snowy Mountains Highway	ER02	E636682 N6027218						✓				
	SM38 C RC1	E639865 N6025701		✓	✓	✓ FP30					✓	
	SM38 C RC2	E639926 N6025774		✓	✓						✓	
	TF06	E637158 N6027887	✓									
	TG09 (dismissed in Year 2)	E637448 N6027921										
Tantangara Dam	FC17 A (relocated - old location)	E649735 N6036813									-	
	FC17 A (relocated in Year 3)	E649657 N6036805									✓	
	FC17 B (relocated - old location)	E649325 N6036515									-	
	FC17 B (relocated in May 2023)	E649359 N6036549									✓	
	FC18 A (relocated - old location)	E648789 N6036772									-	
	FC18 A (relocated in January 2023)	E648791 N6036831									✓	
	FC18 B	E649036 N6037217									✓	
	FC19 A (relocated - old location)	E649088 N6037712									-	
	FC19 A (relocated in January 2023)	E649171 N6037744									✓	
	FC19 B (relocated - old location)	E649211 N6038123									-	
	FC19 B (relocated in January 2023 – old location)	E649083 N6038232									-	

Location	Site	GPS coordinates	Threatened flora		Small mammals		Alpine She-oak Skink	Frogs			Feral animals	Pathogens	
			Monitoring plots	Habitat characteristic transects	Motion camera	Faecal pellet search	Tile grid	Alpine Tree Frog transects	Booroolong Frog transects	Booroolong drone survey	Motion camera	Soil sampling	
	FC19 B (relocated in May 2024)	E649056 N6038220									✓		
	FC20 A (relocated - old location)	E648577 N6039095									-		
	FC20 A (relocated in August 2023)	E648543 N6039165									✓		
	FC20 B	E648480 N6039651									✓		
	KPC01	E649204 N6036660						✓					
	MR01	E650944 N6037180						✓					
	TR01	E649460 N6037893						✓					
	PS11	E649248 N6036091										✓	
	PS12	E649732 N6036815										✓	
	PS13	E648960 N6037255										✓	
	PS14	E648517 N6039121										✓	
	PS15	E648386 N6040640										✓	
	SM34 I RC1	E649008 N6036345		✓	✓	✓ FP19					✓		
	SM34 I RC2	E648968 N6036254		✓	✓						✓		
	Tantangara Adit 01	E648848 N6037892											✓
	Tantangara Washdown	E649087 N6036362											✓
	TF01 (dismissed in December 2021)	E649623 N6036633	-										
	TF02 (dismissed in December 2022)	E648880 N6038633	-										
	TF03	E648860 N6040585	✓										
	TF04 (relocated - old location)	E648496 N6040723	-										
	TF04 (relocated in December 2022)	E648491 N6040753	✓										
	TF10	E648323 N6040726	✓										
	TF11 (relocated - old location)	E648348 N6040518	-										
	TF11 (relocated in December 2022)	E648397 N6040498	✓										
	TF12 (relocated - old location)	E648410 N6040641	-										

Location	Site	GPS coordinates	Threatened flora	Small mammals		Alpine She-oak Skink		Frogs			Feral animals	Pathogens
			Monitoring plots	Habitat characteristic transects	Motion camera	Faecal pellet search	Tile grid	Alpine Tree Frog transects	Booroolong Frog transects	Booroolong drone survey	Motion camera	Soil sampling
	TF12 (relocated in December 2022)	E648378 N6040643	✓									
	TF14	E648527 N6041215	✓									
	TG03	E649050 N6036311					✓					
	TG04 (dismissed April 2024 – old location)	E648807 N6040689					-					
	TG05	E649190 N6037463					✓					
	TG10 (dismissed April 2024 – old location)	E648681 N6041395					-					
	TG13 (established August 2024)	E649039 N6037611					✓					
Tantangara Road	FC13 A	E646294 N6024195									✓	
	FC13 B	E646308 N6024598									✓	
	FC14 A	E646533 N6026805									✓	
	FC14 B (Year 1 location)	E646510 N6027314										
	FC14 B (Year 2 location)	E646762 N6026426									-	
	FC14 B (relocated in April 2023)	E646507 N6027276									✓	
	FC15 A	E647297 N6030683									✓	
	FC15 B	E647266 N6031168									✓	
	FC16 A	E648102 N6033700									✓	
	FC16 B	E648503 N6033965									✓	
	NC01	E647317 N6029902						✓				
	SM36 I RC1 (relocated – old location)	E647364 N6029737		-	-	-					-	
	SM36 I RC1 (relocated in June 2023)	E647261 N6029666		✓	✓	✓ FP18					✓	
	SM36 I RC2 (relocated – old location)	E647294 N6029806		-	-						-	
	SM36 I RC2 (relocated in June 2023)	E647212 N6029744		✓	✓						✓	
	SM37 I RC1 (dismissed May 2024– old location) FP17 still conducted in this location	E646622 N6028813		-	-	✓FP17					-	

Location	Site	GPS coordinates	Threatened flora	Small mammals		Alpine She-oak Skink		Frogs			Feral animals	Pathogens
			Monitoring plots	Habitat characteristic transects	Motion camera	Faecal pellet search	Tile grid	Alpine Tree Frog transects	Booroolong Frog transects	Booroolong drone survey	Motion camera	Soil sampling
	SM37 I RC2 (dismissed May 2024– old location)	E646539 N6028870		-	-						-	
	SM39 C RC1	E645970 N6022761		✓	✓	✓ FP24					✓	
	SM39 C RC2	E646038 N6022838		✓	✓						✓	
	Tantangara Road 02	E645605 N6022864										✓
	TF07	E648824 N6034781	✓									
	TF13	E649017 N6035235	✓									
	TG01	E646591 N6025193					✓					
	TG02	E647238 N6029571					✓					
	TG12 (established August 2024)	E648786 N6034372										

Appendix C

Threatened flora monitoring periods and records

C.1 Monitoring periods

Table C.1 **Threatened flora monitoring periods summary - Year 4**

Monitoring Period	Monitoring event	Monitoring dates
Quarter 1	First	6 December 2023 – 10 December 2023
	Second	10 January 2024 – 12 January 2024

C.2 Records

Table C.2 **Threatened flora monitoring periods summary - Year 4**

Monitoring site	Scientific name	Common name	Number of individuals	Easting	Northing
TF03	<i>Glycine latrobeana</i>	Clover Glycine	2	648844	6040586
			2	648854	6040595
			2	648843	6040585
			3	648854	6040594
TF06	<i>Prasophyllum retroflexum</i>	Kiandra Leek Orchid	3	637181	6027870
			4	637188	6027871
			4	637145	6027862
			1	637119	6027867
			1	637116	6027887
			2	637138	6027889
			3	637145	6027890
			1	637152	6027906
			4	637142	6027900
			2	637160	6027915
TF07	<i>Glycine latrobeana</i>	Clover Glycine	1	648830	6034828
			1	648828	6034802
			2	648830	6034826
			2	648830	6034799
	<i>Prasophyllum retroflexum</i>	Kiandra Leek Orchid	1	648831	6034732
TF08	<i>Glycine latrobeana</i>	Clover Glycine	1	652133	6036206
			1	652160	6036206
			1	652107	6036251
			5	652127	6036209
			5	652145	6036205

Monitoring site	Scientific name	Common name	Number of individuals	Easting	Northing
TF09	<i>Glycine latrobeana</i>	Clover Glycine	12	652172	6036199
			3	652128	6036219
			4	652128	6036216
			3	652132	6036207
			1	652156	6036204
			2	652151	6036205
			5	652171	6036198
			1	652580	6034315
			1	652582	6034294
			14	652570	6034308
			1	652585	6034300
			5	652600	6034282
			1	652602	6034290
			4	652597	6034290
			2	652590	6034317
			5	652595	6034284
			2	652596	6034291
			2	652585	6034287
			2	652581	6034292
			8	652572	6034293
	<i>Prasophyllum retroflexum</i>	Kiandra Leek Orchid	2	652577	6034316
			1	652571	6034314
			2	652578	6034313
			1	652585	6034311
			1	652589	6034307
			2	652592	6034322
			2	652620	6034312
			1	652596	6034291
			1	652579	6034316
			1	652575	6034321
			2	652585	6034300
			1	652609	6034308

Monitoring site	Scientific name	Common name	Number of individuals	Easting	Northing
TF10	<i>Glycine latrobeana</i>	Clover Glycine	2	648348	6040686
			1	648348	6040705
			3	648348	6040733
			2	648346	6040738
			1	648332	6040758
			1	648327	6040745
			2	648323	6040740
			2	648331	6040726
			2	648302	6040675
			6	648301	6040746
			2	648311	6040677
			9	648340	6040731
			1	648321	6040716
			1	648320	6040737
			2	648327	6040746
			5	648326	6040754
			1	648330	6040757
			2	648347	6040732
			2	648344	6040741
			1	648348	6040710
TF11	<i>Prasophyllum retroflexum</i>	Kiandra Leek Orchid	1	648474	6040726
TF13	<i>Prasophyllum retroflexum</i>	Kiandra Leek Orchid	3	648614	6034085
			2	648630	6034072
			2	648623	6034110
			1	648619	6034071
TF14	<i>Glycine latrobeana</i>	Clover Glycine	2	648506	6041204
			4	648548	6041214
			10	648550	6041218
			13	648549	6041214
			1	648547	6041206
			5	648503	6041202
	<i>Prasophyllum retroflexum</i>	Kiandra Leek Orchid	3	648625	6034105

C.3 Photo points

Table C.3 Threatened flora photo points — Year 4

Monitoring site	Monitoring event
	First: December 2023 Second: January 2024
TF03	
TF04	

Monitoring event	
Monitoring site	First: December 2023 Second: January 2024

TF05

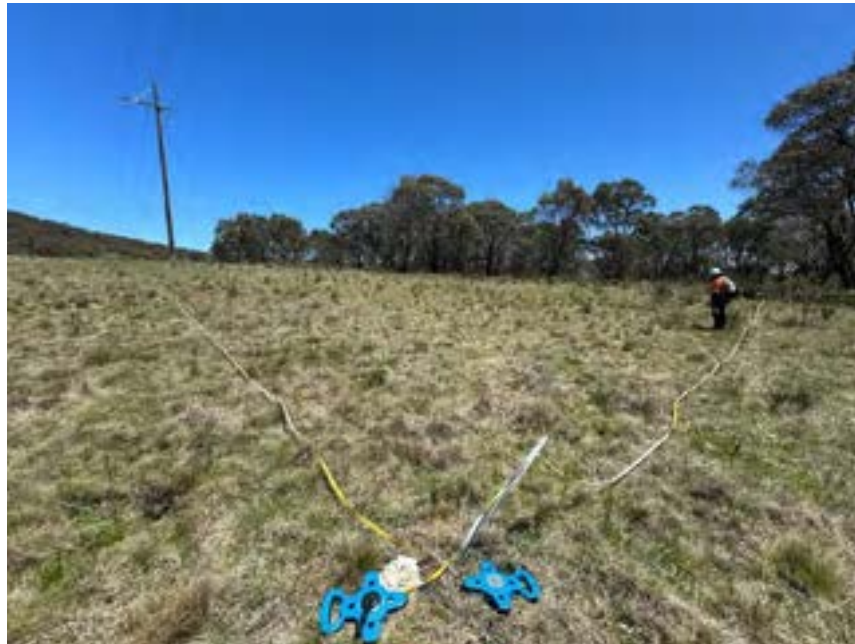


TF06



Monitoring event	
Monitoring site	First: December 2023
	Second: January 2024

TF07



TF08



Monitoring event	
Monitoring site	First: December 2023 Second: January 2024

TF09



TF10



Monitoring event	
Monitoring site	First: December 2023
	Second: January 2024

TF11



TF12



Monitoring event	
Monitoring site	First: December 2023 Second: January 2024

TF14



Appendix D

Small terrestrial mammal monitoring periods and records

D.1 Occupancy

D.1.1 Monitoring periods

Table D.1 Small mammal occupancy monitoring periods summary - Year 4

Monitoring period	Monitoring event	Monitoring dates
Q1 (Construction)	First	1 December 2023–29 February 2024
Q2 (Construction)	Second	1 March 2024–31 May 2024
Q3 (Construction)	Third	1 June 2024–31 August 2024
Q4 (Construction)	Fourth	1 September 2024–30 November 2024

D.1.2 Remote camera records

Table D.2 Small terrestrial mammal remote camera records - Year 4

Camera ID	Smoky Mouse				Eastern Pygmy Possum				Broad-toothed Rat			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
SM01-I-RC1												
SM01-I-RC2												
SM02-C-RC1					1							
SM02-C-RC2									1	1		
SM03-I-RC1												
SM03-I-RC2			NA		1	1	NA				NA	
SM04-C-RC1									1	1		
SM04-C-RC2												
SM05-I-RC1												
SM05-I-RC2												
SM06-C-RC1					1	1						
SM06-C-RC2	NA				NA	1			NA			
SM07-I-RC1												
SM07-I-RC2												
SM09-C-RC1			1		1	1						
SM09-C-RC2		1		1	1	1						
SM10-I-RC1												
SM10-I-RC2												
SM12-C-RC1				1								
SM12-C-RC2												

Camera ID	Smoky Mouse				Eastern Pygmy Possum				Broad-toothed Rat			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
SM13-C-RC1												
SM13-C-RC2												
SM14-I-RC1												1
SM14-I-RC2						1						
SM15-I-RC1					1							
SM15-I-RC2			NA		1		NA				NA	
SM16-I-RC1		NA		NA		NA		NA		NA		NA
SM16-I-RC2					1							
SM17-C-RC1				NA	1	1		NA				NA
SM17-C-RC2					1	1			1	1		
SM18-I-RC1					1				1			
SM18-I-RC2								1				
SM19-I-RC1												
SM19-I-RC2			NA				NA				NA	
SM20-I-RC1												
SM20-I-RC2												
SM21-I-RC1					1	1						
SM21-I-RC2					1							
SM22-I-RC1												
SM22-I-RC2												
SM23-I-RC1					1							
SM23-I-RC2		NA				NA				NA		
SM24-I-RC1												
SM24-I-RC2					1							
SM25-I-RC1					1							
SM25-I-RC2												
SM26-C-RC1												
SM26-C-RC2					1							
SM27-I-RC1	NA				NA				NA			
SM27-I-RC2												
SM28-C-RC1		X	X			X	X		1	X	X	1
SM28-C-RC2		X	X			X	X			X	X	

Camera ID	Smoky Mouse				Eastern Pygmy Possum				Broad-toothed Rat			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
SM29-C-RC1		X	X			X	X			X	X	
SM29-C-RC2		X	X			X	X			X	X	
SM30-C-RC1		X	X	X*		X	X	X*		X	X	X*
SM30-C-RC2		X	X			X	X		1	X	X	1
SM31-C-RC1		X	X			X	X		1	X	X	
SM31-C-RC2		X	X			X	X		1	X	X	
SM32-C-RC1		X	X	X*		X	X	X*	1	X	X	X*
SM32-C-RC2		X	X			X	X		1	X	X	1
SM33-C-RC1		X	X	X*		X	X	X*	1	X	X	X*
SM33-C-RC2		X	X	X*		X	X	X*	1	X	X	X*
SM34-I-RC1												1
SM34-I-RC2										1	1	1
SM35-I-RC1		X	X			X	X			X	X	
SM35-I-RC2		X	X			X	X			X	X	
SM36-I-RC1	NA				NA				NA			
SM36-I-RC2				NA				NA				NA
SM37-I-RC1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SM37-I-RC2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SM38-C-RC1												
SM38-C-RC2												
SM39-C-RC1	NA				NA				NA	1		
SM39-C-RC2									1	1	1	1
SM40-C-RC1												1
SM40-C-RC2					1							
SM41-C-RC1												
SM41-C-RC2												

1. I – impact site; C – control site.

3. Highlighted cells represent sites with unsuitable habitat for that species.

4. Blank cells represent absence of species.

5. NA – data missing due to camera moved, stolen, lost data or hardware errors.

6. X – located within closed areas of Kosciuszko National Park and NPWS did not grant access.

7. X* – no data due to maintenance not being performed in the closed areas of Kosciuszko National Park.

D.2 Habitat characteristic

D.2.1 Monitoring Period

Table D.3 Small mammal habitat characteristics monitoring period summary - Year 4

Monitoring period	Monitoring dates
Quarter 1	6 November 2023 – 8 November 2023 28 November 2024 – 2 December 2023

D.2.2 Records

Table D.4 Average percentage cover (native, exotic, and habitat structure) at three height intervals (<0.5 m, 0.5-1 m, 1-1.5 m) - Year 4

Site type	Site	<0.5 m			0.5-1 m			1-1.5 m		
		Native	Exotic	Habitat Structure	Native	Exotic	Habitat Structure	Native	Exotic	Habitat Structure
Control	SM02	57%	2%	20%	56%	0%	0%	65%	0%	0%
	SM04	71%	6%	15%	33%	0%	0%	12%	0%	0%
	SM06	53%	7%	14%	26%	1%	3%	20%	0%	0%
	SM08	0%	0%	0%	0%	0%	0%	0%	0%	0%
	SM09	90%	1%	3%	30%	0%	0%	10%	0%	0%
	SM12	79%	2%	4%	57%	0%	1%	38%	0%	0%
	SM13	63%	19%	8%	25%	5%	0%	12%	2%	0%
	SM17	68%	0%	4%	90%	0%	0%	28%	0%	0%
	SM26	97%	0%	1%	26%	0%	0%	7%	0%	0%
	SM28	78%	21%	0%	0%	1%	0%	0%	0%	0%
	SM29	69%	23%	8%	17%	0%	0%	0%	0%	0%
	SM30	93%	7%	0%	5%	0%	0%	0%	0%	0%
	SM31	64%	32%	3%	1%	0%	0%	0%	0%	0%
	SM32	42%	54%	0%	53%	0%	0%	0%	0%	0%
	SM33	69%	31%	0%	10%	0%	0%	0%	0%	0%
	SM38	69%	22%	2%	12%	0%	0%	0%	0%	0%
	SM39	56%	41%	2%	24%	0%	0%	13%	0%	0%
	SM40	78%	4%	9%	14%	0%	1%	10%	0%	0%
	SM41	55%	1%	40%	67%	0%	3%	50%	0%	1%

Site type	Site	<0.5 m			0.5-1 m			1-1.5 m		
		Native	Exotic	Habitat Structure	Native	Exotic	Habitat Structure	Native	Exotic	Habitat Structure
Impact	SM01	75%	11%	21%	82%	5%	9%	6%	0%	0%
	SM03	54%	1%	44%	81%	0%	27%	38%	0%	2%
	SM05	74%	0%	54%	73%	0%	18%	20%	0%	2%
	SM07	75%	0%	51%	69%	0%	20%	37%	0%	1%
	SM10	67%	4%	64%	56%	14%	13%	76%	2%	2%
	SM14	59%	4%	37%	58%	5%	8%	25%	0%	0%
	SM15	90%	20%	22%	68%	1%	5%	22%	0%	1%
	SM16	85%	0%	14%	70%	0%	6%	34%	0%	0%
	SM18	68%	4%	6%	70%	1%	4%	12%	0%	0%
	SM19	49%	91%	12%	35%	52%	20%	21%	20%	3%
	SM20	30%	52%	5%	21%	50%	3%	3%	0%	0%
	SM21	82%	3%	6%	38%	0%	0%	13%	0%	0%
	SM22	71%	4%	7%	35%	1%	0%	34%	0%	0%
	SM23	52%	1%	7%	54%	0%	1%	49%	0%	0%
	SM24	55%	0%	7%	42%	0%	0%	33%	0%	0%
	SM25	63%	0%	4%	53%	0%	0%	37%	0%	0%
	SM27	105%	39%	0%	3%	0%	0%	0%	0%	0%
	SM34	96%	20%	20%	61%	6%	5%	0%	0%	0%
	SM35	21%	72%	7%	3%	2%	0%	0%	0%	0%
	SM36	100%	10%	1%	59%	6%	0%	0%	0%	0%
	SM37	98%	21%	2%	56%	1%	1%	2%	0%	0%

Appendix E

Frog monitoring periods and records

E.1 Monitoring periods

Table E.1 Frog occupancy monitoring period summary — Year 4

Monitoring period	Monitoring event	Monitoring dates
Alpine Tree Frog		
Quarter 1	First	12 January 2024 – 15 January 2024*
	Second	21 January 2024 – 24 January 2024*
Booroolong Frog		
Quarter 1	First	5 December 2023 – 6 December 2023**
	Second	22 January 2024 – 24 January 2024

Notes:

*Due to poor weather four sites were instead monitored 9 February 2024 – 10 February 2024.

**Due to poor weather two sites were instead monitored 8 February 2024.

E.2 Records

Table E.2 Frog Records — Year 4

Scientific name	Common name	Monitoring site	Count of individuals	Easting	Northing
<i>Litoria verreauxii alpina</i>	Alpine Tree Frog	ER02	3	636638	6027672
			1	636832	6027279
		KPC01	2	649123	6036474
			2	649105	6036459
			2	649261	6036864
		MR01	3	651195	6036959
			1	651102	6037014
			1	651013	6037118
			1	650933	6037142
			1	650734	6037334
			1	650734	6037322
		NC01	2	647392	6029745
			2	647275	6029932
			1	647260	6029990
			2	647216	6030014
			1	647274	6029934
			1	647220	6030029

Scientific name	Common name	Monitoring site	Count of individuals	Easting	Northing
		NC03	1	652780	6029795
			4	652781	6029798
			4	652805	6029820
			3	652824	6029829
			1	652875	6029799
			1	652933	6029795
			1	652932	6029796
			1	652979	6029804
			1	653109	6029824
			1	653190	6029873
			1	653221	6029968
			1	653235	6029982
			3	653261	6029991
			2	653286	6030067
			2	652860	6029819
			1	652912	6029807
			1	652941	6029795
			1	652945	6029792
			1	653001	6029816
			1	653010	6029806
			1	653058	6029824
		TC02	5	642021	6033183
			3	641973	6033257
			2	641975	6033267
			7	642017	6033210
		TC03	10	640861	6041982
			1	640947	6042088
			1	640995	6042118
			1	641148	6042155
			1	641275	6042338
			1	641305	6042338
			2	641299	6042289
			7	641187	6042108

Scientific name	Common name	Monitoring site	Count of individuals	Easting	Northing
		TR01	1	641263	6042298
			3	641347	6042318
			6	640847	6041980
			1	641098	6042158
			2	641350	6042304
			1	649602	6038083
			4	649646	6037844
			10	649575	6037839
			1	649561	6037987
			3	649601	6038064
			1	649602	6038052
			4	649625	6037830
			2	649591	6038076
			3	649588	6038064
			1	649709	6037936
			2	649666	6037866
			5	649631	6037843
			4	649562	6037856
			2	649528	6037871
<i>Litoria booroolongensis</i>	Booroolong Frog	WC01	1	627570	6038145
		YR05	1	626821	6038014
			1	626832	6038008
			1	626831	6038013
			1	626832	6038016
			1	626830	6038019
			5	626827	6038034
			1	626827	6038034
			1	626824	6038040
			1	626819	6038064
			2	626833	6038010
			2	626831	6038031
			1	626883	6038188
			1	626963	6038276

Scientific name	Common name	Monitoring site	Count of individuals	Easting	Northing
		YR06	1	627783	6038404
			1	627583	6038188
			1	627770	6038373
		YR08	1	628028	6039006
			1	628078	6039079
			1	628113	6039112
		YR09	1	627998	6039323
			1	627958	6039274

Appendix F

Alpine She-oak Skink monitoring periods and records

F.1 Monitoring periods

Table F.1 Alpine She-oak Skink monitoring periods summary - Year 4

Monitoring period	Monitoring event	Monitoring dates
Q1 (Construction)	First	7–30 November 2023
Q1 (Construction)	Second	6–10 December 2023
Q1 (Construction)	Third	3–24 February 2024
Q2 (Construction)	Fourth	26–27 March 2024
Q2 (Construction)	Fifth	23–24 April 2024
Q4 (Construction)	Sixth	10–22 October 2024

F.2 Records

Table F.2 Alpine She-oak Skink records - Year 4

Monitoring site	Count of individuals	Easting	Northing	Monitoring event
TG02	1	647237	6029570	First
	1	647237	6029570	Fourth
TG03	1	649043	6036309	First
TG05	1	649189	6037462	First
TG07	1	637663	6039758	Fourth
TG08	1	640520	6042277	First
	1	640520	6042277	Second
	1	640520	6042277	Fourth
TG11	3	638672	6037477	First
	7	638672	6037477	Second
	2	638672	6037477	Third
	1	638672	6037477	Fourth
	1	638672	6037477	Fifth

Appendix G

Feral animal monitoring periods and records

G.1 Occupancy

G.1.1 Monitoring periods

Table G.1 Feral animal occupancy monitoring periods summary - Year 4

Monitoring period	Monitoring event	Monitoring dates*
Q1 (Construction)	First	1 December 2023–29 February 2024
Q2 (Construction)	Second	1 March 2024–31 May 2024
Q3 (Construction)	Third	1 June 2024–31 August 2024
Q4 (Construction)	Fourth	1 September 2024–30 November 2024

Notes: *Dates are based on the 30-day period of camera data processed and tagged.

G.1.2 Remote cameras data

Table G.2 Feral animal remote camera presence/absence

Site name	Feral Cat				European Hare				European Rabbit				Feral Horse				Red Fox				Wild Dog				Feral Pig				Deer*			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
FC03 A	NA			NA	NA			NA	NA			NA	NA			NA	NA		1	NA	NA	1	1	NA	NA			NA	NA			NA
FC03 B	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA
FC04 A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FC04 B																														1	1	1
FC05 A			1															1														
FC05 B	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA
FC06 A		NA				NA			1	NA	1			NA			1	NA	1			NA			NA				NA			
FC06 B	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
FC07 A																		1														
FC07 B		1								1	1						1	1	1									1	1	1		
FC08 A	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
FC08 B	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
FC09 A	NA				NA				NA				NA				NA				NA				NA				NA			
FC09 B	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA
FC10 A				NA				NA					NA							NA				NA				NA				NA
FC10 B																		1				1	1									1
FC11 A																						1	1									
FC11 B																														1		
FC12 A					1								1	1	1																	
FC12 B													1	1	1	1			1													
FC13 A	NA	1	1		NA	1			NA	1			NA				NA	1			NA				NA				NA	1	1	
FC13 B	NA	NA		1	NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA		
FC14 A																					1	1			1							
FC14 B			NA				NA				NA			1	NA				NA			1	NA				NA				NA	
FC15 A													1	1	1	1						1			1							
FC15 B		NA			1	NA				NA			1	NA	1	1	1	NA		1	1	NA	1	1	1	1	NA				NA	
FC16 A													1	1	1			1	1		1	1	1	1								
FC16 B	NA				NA				NA				NA	1	1	1	NA				NA	1			NA				NA			
FC17 A				1					1				1	1		1						1										

Site name	Feral Cat				European Hare				European Rabbit				Feral Horse				Red Fox				Wild Dog				Feral Pig				Deer*			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
FC17 B									1			1	1	1		1	1					1										
FC18 A	1												1	1	1	1						1		1					1			
FC18 B													1	1	1							1									1	
FC19 A	1		1										1	1	1	1			1													
FC19 B	NA	NA			NA	NA			NA	NA			NA	NA	1	1	NA	NA			NA	NA			NA	NA			NA	NA		
FC20 A													1	1	1	1								1								
FC20 B													1	1	1	1															1	
FC21 A	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
FC21 B	1						1			1		1					1															
SM01-I-RC1				1															1	1			1						1			
SM01-I-RC2	1	NA				NA				NA				NA				NA				NA				NA			NA			
SM02-C-RC1																																
SM02-C-RC2																																
SM03-I-RC1																													1			
SM03-I-RC2			NA	1			NA				NA				NA				NA			NA				NA				NA		
SM04-C-RC1				1																												
SM04-C-RC2																																
SM05-I-RC1		1																	1													
SM05-I-RC2																													1			
SM06-C-RC1		1																														
SM06-C-RC2	NA	1	1		NA				NA				NA				NA				NA				NA				NA	1		
SM07-I-RC1	1			1														1	1												1	
SM07-I-RC2																		1										1		1		
SM09-C-RC1																																
SM09-C-RC2		1	1																													
SM10-I-RC1		1																														
SM10-I-RC2		1	1	1														1	1									1	1			
SM12-C-RC1				1			1		1	1		1							1													
SM12-C-RC2																																
SM13-C-RC1				1																												
SM13-C-RC2																						1							1			
SM14-I-RC1																				1												

Site name	Feral Cat				European Hare				European Rabbit				Feral Horse				Red Fox				Wild Dog				Feral Pig				Deer*			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
SM14-I-RC2		1	1																1	1												
SM15-I-RC1		1																		1								1				
SM15-I-RC2		1	NA				NA				NA				NA				NA				NA				NA			NA		
SM16-I-RC1		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		
SM16-I-RC2																							1									
SM17-C-RC1				NA				NA				NA				NA			NA				NA				NA				NA	
SM17-C-RC2																																
SM18-I-RC1																																
SM18-I-RC2																																
SM19-I-RC1		1							1	1								1	1	1									1			
SM19-I-RC2			NA				NA			1	NA				NA				NA	1			NA				NA		1	NA		
SM20-I-RC1	1	1																1	1	1	1											
SM20-I-RC2		1	1															1	1	1	1							1	1	1	1	
SM21-I-RC1			1																													
SM21-I-RC2	1								1																							
SM22-I-RC1	1			1														1														
SM22-I-RC2	1	1	1	1															1	1												
SM23-I-RC1																																
SM23-I-RC2	1	NA	1	1		NA				NA				NA				NA				NA				NA			NA			
SM24-I-RC1			1															1	1		1											
SM24-I-RC2	1																			1												
SM25-I-RC1	1																														1	
SM25-I-RC2		1																1	1		1										1	
SM26-C-RC1																																
SM26-C-RC2																																
SM27-I-RC1	NA		1		NA				NA				NA			1	NA				NA				NA				NA			
SM27-I-RC2															1																	
SM28-C-RC1		NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA		NA	NA		
SM28-C-RC2		NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA		NA	NA		
SM29-C-RC1		NA	NA			NA	NA		1	NA	NA			NA	NA			NA	NA			NA	NA			NA	NA		NA	NA		
SM29-C-RC2		NA	NA			NA	NA		1	NA	NA	1		NA	NA			NA	NA			NA	NA			NA	NA		NA	NA		
SM30-C-RC1		NA	NA	NA		NA	NA	NA	1	NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA

Site name	Feral Cat			European Hare				European Rabbit				Feral Horse				Red Fox				Wild Dog				Feral Pig				Deer*					
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
SM30-C-RC2		NA	NA			NA	NA		1	NA	NA	1		NA	NA			NA	NA			NA	NA			NA	NA			NA	NA		
SM31-C-RC1		NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA		
SM31-C-RC2		NA	NA			NA	NA			NA	NA			NA	NA			NA	NA		1	NA	NA	1		NA	NA			NA	NA		
SM32-C-RC1		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA	
SM32-C-RC2		NA	NA			NA	NA		1	NA	NA			NA	NA			NA	NA			NA	NA			NA	NA			NA	NA		
SM33-C-RC1		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA	
SM33-C-RC2		NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA	1	NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	NA	NA	
SM34-I-RC1											1			1	1	1	1	1	1	1											1		
SM34-I-RC2													1				1																
SM35-I-RC1		NA	NA			NA	NA			NA	NA			NA	NA	1		NA	NA			NA	NA			NA	NA			NA	NA		
SM35-I-RC2		NA	NA			NA	NA			NA	NA			NA	NA	1	1	NA	NA	1		NA	NA			NA	NA			NA	NA		
SM36-I-RC1	NA				NA				NA				NA	1			NA		1		NA				NA				NA				
SM36-I-RC2				NA				NA			1	NA	1	1	1	NA				NA				NA				NA				NA	
SM37-I-RC1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
SM37-I-RC2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
SM38-C-RC1																																	
SM38-C-RC2																																	
SM39-C-RC1	NA				NA				NA				NA				NA				NA			1	NA				1	NA			
SM39-C-RC2																																	
SM40-C-RC1																																	
SM40-C-RC2																																	
SM41-C-RC1																																	
SM41-C-RC2																																	

- Notes:
- I – impact site.
 - C – control site.
 - NA – data missing due to camera moved, stolen, lost data or hardware errors.
 - Blank cells represent absence of species.

G.2 Abundance

G.2.1 Monitoring Periods

Table G.3 Feral animal abundance monitoring periods summary — Year 4

Monitoring period	Monitoring event	Monitoring dates
Q1 (Construction)	First	11–12 February 2024
Q2 (Construction)	Second	29 May 2024
Q3 (Construction)	Third	12–13 June 2024
Q4 (Construction)	Fourth	27–28 September 2024

G.2.2 Abundance data

Table G.4 Feral animal abundance (animals/km) – Year 4

Feral animal total and abundance	LHRR Bottom [individuals (abundance)]	LHRR North [individuals (abundance)]	LHRR South [individuals (abundance)]	Marica [individuals (abundance)]	Rock Forest [individuals (abundance)]	Tantangara Dam [individuals (abundance)]	Tantangara Road [individuals (abundance)]
First monitoring event (Q1)							
Distance (km)	11.7	6.6	13.4	14.3	1.9	10.5	15.9
Feral Cat	0	0	0	0	0	0	0
European Hare	0	0	0	1 (0.1)	0	0	0
Rabbit	1 (0.1)	5 (0.8)	1 (0.1)	1 (0.1)	19 (9.8)	14 (1.3)	6 (0.4)
Feral Horse	0	0	0	0	0	33 (3.1)	5 (0.3)
Red Fox	5 (0.4)	0	0	0	0	0	0
Wild Dog	0	0	0	0	0	0	0
Red Deer	1 (0.1)	0	0	0	0	0	0
Rusa Deer	0	0	0	0	0	0	0
Sambar	0	0	1 (0.1)	0	0	0	0
Second monitoring event (Q2)							
Distance (km)	10.14	6.62	14.37	7.03	NA	NA	NA
Feral Cat	0	0	0	0	NA	NA	NA
European Hare	2 (0.2)	0	0	0	NA	NA	NA
Rabbit	11 (1.1)	1 (0.2)	0	0	NA	NA	NA
Feral Horse	0	0	0	0	NA	NA	NA
Red Fox	0	0	0	0	NA	NA	NA
Wild Dog	0	0	0	0	NA	NA	NA
Red Deer	0	0	0	0	NA	NA	NA
Rusa Deer	0	0	0	0	NA	NA	NA
Sambar	0	0	0	0	NA	NA	NA
Third monitoring event (Q3)							
Distance (km)	11.07	2.20	14.28	11.79	1.53	14.87	15.36
Feral Cat	0	0	0	0	0	0	0
European Hare	0	0	0	0	0	0	2 (0.1)
Rabbit	4 (0.4)	0	0	0	8 (5.2)	47 (3.2)	3 (0.2)
Feral Horse	0	0	0	55 (4.7)	0	15 (1)	0
Red Fox	1 (0.1)	0	0	0	0	0	0
Wild Dog	0	0	0	0	0	0	0

Feral animal total and abundance	LHRR Bottom [individuals (abundance)]	LHRR North [individuals (abundance)]	LHRR South [individuals (abundance)]	Marica [individuals (abundance)]	Rock Forest [individuals (abundance)]	Tantangara Dam [individuals (abundance)]	Tantangara Road [individuals (abundance)]
Red Deer	0	0	0	0	0	0	0
Rusa Deer	1 (0.1)	0	0	0	0	1 (0.1)	0
Sambar	0	0	0	0	0	2 (0.1)	0
Fourth monitoring event (Q4)							
Distance (km)	11.32	3.16	13.54	14.56	1.59	13.55	15.79
Feral Cat	0	0	0	0	0	0	0
European Hare	0	0	0	0	0	0	3 (0.2)
Rabbit	0	2 (0.6)	1 (0.1)	4 (0.3)	14 (8.8)	76 (5.6)	5 (0.3)
Feral Horse	0	0	0	0	0	81 (6)	0
Red Fox	0	0	0	0	0	0	0
Wild Dog	0	0	0	0	0	0	0
Red Deer	0	0	0	0	0	0	0
Rusa Deer	0	0	0	0	0	0	0
Sambar	0	5 (1.6)	0	0	0	0	0

Note: NA sites were unable to be surveyed due to severe weather conditions at the time of survey.

Appendix H

Weed and pathogen monitoring periods and records

H.1 Weeds

H.1.1 Monitoring periods

Table H.1 Weed monitoring periods summary — Year 4

Monitoring period	Monitoring dates
Quarter 1	6–10 December 2023
	8–12 January 2024

H.1.2 Weed records

Table H.2 Weed records (polygons) — Year 4

Weed management zone	Estimated cover				Area (ha)	Easting	Northing
	Dense	Medium	Light	Trace			
Bottom of Lobs Hole		<i>Hypericum perforatum</i> , <i>Rubus spp.</i>			626117.72	6039362.93	626117.72
	<i>Rubus spp.</i>				625394.92	6039214.57	625394.92
	<i>Hypericum perforatum</i>			<i>Verbascum virgatum</i> , <i>Rubus spp.</i> , <i>Agrostis capillaris</i> , <i>Rumex acetosella</i> , <i>Cirsium vulgare</i> , <i>Conyza bonariensis</i> , <i>Hypochaeris radicata</i>	625872.75	6038792.43	625872.75
		<i>Hypericum perforatum</i> , <i>Rubus spp.</i>		<i>Conyza bonariensis</i> , <i>Agrostis spp.</i> , <i>Cirsium vulgare</i>	626280.62	6038849.55	626280.62
			<i>Hypericum perforatum</i>	<i>Hypochaeris radicata</i> , <i>Cirsium vulgare</i> , <i>Verbascum thapsus</i> , <i>Rubus spp.</i> , <i>Holcus lanatus</i> , <i>Rumex acetosella</i> , <i>Agrostis capillaris</i> , <i>Agrostis gigantea</i> , <i>Anthoxanthum odoratum</i>	625632.78	6039094.06	625632.78
			<i>Hypericum perforatum</i> , <i>Hypochaeris radicata</i> , <i>Conyza bonariensis</i> , <i>Agrostis spp.</i>	<i>Rumex acetosella</i> , <i>Cirsium vulgare</i> , <i>Verbascum Thapsus</i> , <i>Rubus spp.</i> , <i>Festuca spp.</i> , <i>Conyza bonariensis</i> , <i>Agrostis spp.</i>	625321.34	6039824.52	625321.34
				<i>Hypericum perforatum</i> , <i>Conyza bonariensis</i> , <i>Verbascum spp.</i> , <i>Hypochaeris radicata</i> , <i>Cirsium vulgare</i>	626204.38	6039201.90	626204.38

Weed management zone	Estimated cover				Area (ha)	Easting	Northing
	Dense	Medium	Light	Trace			
			<i>Rubus spp.</i> , <i>Agrostis spp.</i>	<i>Hypericum perforatum</i> , <i>Conyza bonariensis</i> , <i>Cirsium vulgare</i> , <i>Verbascum virgatum</i> , <i>Verbascum Thapsus</i> , <i>Rumex acetosella</i> , <i>Hypochaeris radicata</i>	627270.58	6038204.79	627270.58
	<i>Rubus spp.</i>		<i>Holcus lanatus</i>	<i>Hypericum perforatum</i> , <i>Cirsium vulgare</i>	627866.85	6038569.37	627866.85
Lobs Hole Ravine Road bottom		<i>Hypericum perforatum</i> , <i>Rubus spp.</i>		<i>Cirsium vulgare</i> , <i>Rumex acetosella</i> , <i>Agrostis spp.</i> , <i>Verbascum virgatum</i> , <i>Dactylis glomerata</i>	37.24	625961.96	6037957.52
	<i>Rubus spp.</i> , <i>Hypericum perforatum</i>			<i>Verbascum virgatum</i> , <i>Agrostis spp.</i> , <i>Rumex acetosella</i> , <i>Cirsium vulgare</i> , <i>Rosa rubiginosa</i>	18.74	626289.56	6037150.22
		<i>Rubus spp.</i> , <i>Hypericum perforatum</i>	<i>Cirsium vulgare</i> , Trace: <i>Verbascum spp.</i> , <i>Agrostis spp.</i> , <i>Conyza bonariensis</i>		29.41	626895.03	6036507.68
	<i>Rubus spp.</i>			<i>Rumex acetosella</i> , <i>Conyza bonariensis</i> , <i>Verbascum spp.</i> , <i>Agrostis spp.</i>	5.01	627137.13	6033626.86
	<i>Rubus spp.</i>			<i>Rumex acetosella</i> , <i>Agrostis gigantea</i> , <i>Agrostis capillaris</i> , <i>Dactylis glomerata</i>	47.50	626908.21	6034821.74
Lobs Hole Ravine Road top			<i>Anthoxanthum odoratum</i> , <i>Cirsium vulgare</i> , <i>Dactylis glomerata</i> , <i>Hypericum perforatum</i> , <i>Rubus spp.</i> , <i>Rumex acetosella</i> , <i>Agrostis spp.</i>		98.44	628192.41	6030021.15

Weed management zone	Estimated cover				Area (ha)	Easting	Northing
	Dense	Medium	Light	Trace			
Marica			<i>Hypericum perforatum, Agrostis spp., Verbascum spp., Cirsium vulgare, Dactylis glomerata</i>	<i>Rubus spp.</i>	37.05	627008.36	6032575.80
			<i>Anthoxanthum odoratum, Holcus lanatus, Rumex acetosella</i>	<i>Cirsium vulgare</i>	15.45	635180.69	6037589.40
				<i>Hypochaeris radicata, Anthoxanthum odoratum, Verbascum spp.</i>	4.09	634128.02	6038130.69
				<i>Holcus lanatus, Rumex acetosella, Verbascum spp.</i>	6.15	633918.56	6037834.84
				<i>Hypericum perforatum, Cirsium vulgare, Agrostis spp., Verbascum spp., Rumex acetosella</i>	111.45	631982.56	6038725.65
				<i>Hypericum perforatum, Leucanthemum vulgare</i>	1.34	630666.01	6039118.74
				<i>Rumex acetosella, Hypochaeris radicata</i>	8.02	634550.26	6037825.63
				<i>Hypochaeris radicata, Hypericum perforatum, Conyza bonariensis, Rumex acetosella</i>	14.32	633476.78	6038271.40
	<i>Agrostis capillaris</i>	<i>Rumex acetosella, Hypochaeris radicata, Polygonum plebeium</i>	<i>Anthoxanthum odoratum</i>		3.16	633639.68	6037839.35
	<i>Hypochaeris radicata, Anthoxanthum odoratum</i>				0.60	635071.38	6037589.51

Weed management zone	Estimated cover				Area (ha)	Easting	Northing
	Dense	Medium	Light	Trace			
Rock Forest		<i>Anthoxanthum odoratum</i>	<i>Rumex acetosella</i> , <i>Holcus lanatus</i> , <i>Trifolium repens</i>	<i>Cirsium vulgare</i> , <i>Hypochaeris radicata</i> , <i>Hypericum perforatum</i> , <i>Verbascum thapsus</i>	32.36	650850.90	6020951.04
Tantangara Dam	<i>Anthoxanthum odoratum</i>			<i>Hypochaeris radicata</i> , <i>Holcus lanatus</i> , <i>Dactylis glomerata</i> , <i>Cirsium vulgare</i> , <i>Rumex acetosella</i> , <i>Leucanthemum vulgare</i> , <i>Hypericum perforatum</i>	11.66	649443.82	6036527.40
			<i>Anthoxanthum odoratum</i> , <i>Holcus lanatus</i> , <i>Agrostis capillaris</i>	<i>Verbascum virgatum</i>	6.21	650191.71	6037343.11
	<i>Anthoxanthum odoratum</i> , <i>Rumex acetosella</i>	<i>Leucanthemum vulgare</i>	<i>Cirsium vulgare</i>	<i>Rubus spp.</i> , <i>Hypochaeris radicata</i> , <i>Holcus lanatus</i>	2.81	649136.58	6037506.79
	<i>Anthoxanthum odoratum</i>	<i>Rubus spp.</i> , <i>Rumex acetosella</i>	<i>Cirsium vulgare</i> , <i>Hypochaeris radicata</i> , <i>Holcus lanatus</i>	<i>Leucanthemum vulgare</i>	2.45	648868.22	6037022.14
	<i>Anthoxanthum odoratum</i>	<i>Rumex acetosella</i>	<i>Cirsium vulgare</i> , <i>Hypochaeris radicata</i> , <i>Holcus lanatus</i>	<i>Leucanthemum vulgare</i>	7.43	649021.17	6037269.46
	<i>Anthoxanthum odoratum</i>		<i>Rumex acetosella</i>	<i>Cirsium vulgare</i> , <i>Leucanthemum vulgare</i> , <i>Hypochaeris radicata</i> , <i>Holcus lanatus</i>	18.34	648868.20	6036763.09
		<i>Holcus lanatus</i>	<i>Leucanthemum vulgare</i> , <i>Cirsium vulgare</i> , <i>Rumex acetosella</i> , <i>Anthoxanthum odoratum</i>		2.77	649325.09	6037602.76
			<i>Holcus lanatus</i> , <i>Agrostis capillaris</i> , <i>Rumex acetosella</i>	<i>Hypochaeris radicata</i> , <i>Cirsium vulgare</i> , <i>Dactylis glomerata</i> , <i>Hypericum perforatum</i>	7.92	649635.74	6036716.22

Weed management zone	Estimated cover				Area (ha)	Easting	Northing
	Dense	Medium	Light	Trace			
			<i>Holcus lanatus</i> , <i>Agrostis capillaris</i> , <i>Rumex acetosella</i>	<i>Hypochaeris radicata</i> , <i>Cirsium vulgare</i> , <i>Dactylis glomerata</i> , <i>Rubus</i> spp., <i>Hypericum perforatum</i>	7.28	649749.37	6037274.44
		<i>Holcus lanatus</i> , <i>Anthoxanthum odoratum</i>		<i>Cirsium vulgare</i> , <i>Rumex acetosella</i> , <i>Hypericum perforatum</i> , <i>Rosa rubiginosa</i> , <i>Verbascum thapsus</i> , <i>Rubus</i> spp.	6.41	648871.23	6040415.04
		<i>Rubus</i> spp., <i>Holcus lanatus</i>	<i>Anthoxanthum odoratum</i>	<i>Rumex acetosella</i> , <i>Hypericum perforatum</i> , <i>Cirsium vulgare</i> , <i>Leucanthemum vulgare</i> , <i>Hypochaeris radicata</i>	5.63	648490.88	6039486.24
		<i>Rubus</i> spp., <i>Rosa rubiginosa</i> , <i>Holcus lanatus</i> , <i>Hypericum perforatum</i>	<i>Anthoxanthum odoratum</i>	<i>Cirsium vulgare</i> , <i>Leucanthemum vulgare</i>	6.07	648571.47	6039794.63
		<i>Holcus lanatus</i>	<i>Hypericum perforatum</i>	<i>Rosa rubiginosa</i> , <i>Rubus</i> spp., <i>Rumex acetosella</i> , <i>Anthoxanthum odoratum</i> , <i>Cirsium vulgare</i>	7.46	648712.37	6040094.73
	<i>Anthoxanthum odoratum</i>		<i>Holcus lanatus</i>	<i>Rumex acetosella</i> , <i>Hypericum perforatum</i> , <i>Cirsium vulgare</i> , <i>Leucanthemum vulgare</i> , <i>Hypochaeris radicata</i> , <i>Rubus</i> spp.	23.51	648728.22	6038786.92
Tantangara Rd Bottom		<i>Leucanthemum vulgare</i> , <i>Anthoxanthum odoratum</i>		<i>Cirsium vulgare</i> , <i>Rumex acetosella</i> , <i>Verbascum thapsus</i> , <i>Dactylis glomerata</i> , <i>Holcus lanatus</i> , <i>Hypochaeris radicata</i>	30.08	648916.66	6034418.53
	<i>Anthoxanthum odoratum</i>		<i>Holcus lanatus</i> , <i>Rumex acetosella</i> , <i>Cirsium vulgare</i>		24.81	649279.34	6036576.37

Weed management zone	Estimated cover				Area (ha)	Easting	Northing
	Dense	Medium	Light	Trace			
	<i>Anthoxanthum odoratum</i>	<i>Rumex acetosella</i>		<i>Cirsium vulgare, Dactylis glomerata, Holcus lanatus, Leucanthemum vulgare, Hypochaeris radicata, Verbascum thapsus</i>	8.00	649247.51	6036045.22
			<i>Dactylis glomerata, Holcus lanatus, Anthoxanthum odoratum</i>	<i>Cirsium vulgare, Leucanthemum vulgare, Hypochaeris radicata, Verbascum thapsus</i>	12.65	649131.77	6035360.43
			<i>Anthoxanthum odoratum, Leucanthemum vulgare</i>	<i>Rumex acetosella, Verbascum thapsus, Hypericum perforatum, Hypochaeris radicata, Cirsium vulgare, Holcus lanatus</i>	1.96	649104.57	6035582.20
			<i>Holcus lanatus, Anthoxanthum odoratum, Rumex acetosella</i>	<i>Leucanthemum vulgare, Hypochaeris radicata, Dactylis glomerata, Hypericum perforatum, Mimulus moschatus, Verbascum thapsus, Conyza bonariensis</i>	47.24	647708.88	6033024.70
		<i>Anthoxanthum odoratum, Holcus lanatus, Hypericum perforatum</i>			4.21	647346.81	6030259.13
Tantangara Road Top			<i>Anthoxanthum odoratum</i>	<i>Hypochaeris radicata, Leucanthemum vulgare, Hypericum perforatum, Cirsium vulgare, Dactylis glomerata, Verbascum thapsus, Rumex acetosella</i>	101.51	647012.81	6029311.28

Weed management zone	Estimated cover				Area (ha)	Easting	Northing
	Dense	Medium	Light	Trace			
			<i>Leucanthemum vulgare</i> , <i>Holcus lanatus</i>	<i>Hypochaeris radicata</i> , <i>Hypericum perforatum</i> , <i>Cirsium vulgare</i> , <i>Dactylis glomerata</i> , <i>Agrostis capillaris</i> , <i>Anthoxanthum odoratum</i>	1.09	646537.59	6026798.30
			<i>Anthoxanthum odoratum</i> ,	<i>Hypochaeris radicata</i> , <i>Leucanthemum vulgare</i> , <i>Hypericum perforatum</i> , <i>Cirsium vulgare</i> , <i>Dactylis glomerata</i> , <i>Verbascum thapsus</i> , <i>Rumex acetosella</i>	2.65	646521.09	6026739.52
			<i>Anthoxanthum odoratum</i>	<i>Hypochaeris radicata</i> , <i>Hypericum perforatum</i> , <i>Rumex acetosella</i> , <i>Leucanthemum vulgare</i> , <i>Conyza bonariensis</i>	0.77	646663.84	6026682.43
			<i>Anthoxanthum odoratum</i> , <i>Agrostis capillaris</i>	<i>Hypericum perforatum</i> , <i>Hypochaeris radicata</i> , <i>Leucanthemum vulgare</i> , <i>Conyza bonariensis</i> , <i>Dactylis glomerata</i> , <i>Rumex acetosella</i> , <i>Holcus lanatus</i> , <i>Cirsium vulgare</i>	18.39	646760.78	6026125.93
		<i>Anthoxanthum odoratum</i>	<i>Holcus lanatus</i> , <i>Agrostis capillaris</i>	<i>Leucanthemum vulgare</i> , <i>Hypericum perforatum</i> , <i>Hypochaeris radicata</i>	6.71	646624.67	6025343.09
		<i>Anthoxanthum odoratum</i>	<i>Leucanthemum vulgare</i> , <i>Agrostis capillaris</i>	<i>Cirsium vulgare</i> , <i>Hypericum perforatum</i> , <i>Dactylis glomerata</i>	5.05	646421.70	6025007.63
			<i>Agrostis capillaris</i> , <i>Anthoxanthum odoratum</i>	<i>Holcus lanatus</i> , <i>Leucanthemum vulgare</i> , <i>Hypochaeris radicata</i> , <i>Dactylis glomerata</i> , <i>Hypericum perforatum</i> , <i>Verbascum thapsus</i> , <i>Cirsium vulgare</i>	36.35	646100.71	6023873.65

Weed management zone	Estimated cover				Area (ha)	Easting	Northing
	Dense	Medium	Light	Trace			
	<i>Anthoxanthum odoratum</i> , <i>Holcus lanatus</i>			<i>Leucanthemum vulgare</i> , <i>Agrostis capillaris</i> , <i>Hypochaeris radicata</i> , <i>Cirsium vulgare</i> , <i>Rumex acetosella</i>	1.65	645597.67	6022836.34
Threatened Flora Plots			<i>Holcus lanatus</i>	<i>Rubus spp.</i> , <i>Hypericum perforatum</i> , <i>Anthoxanthum odoratum</i> , <i>Rumex acetosella</i> , <i>Cirsium vulgare</i> , <i>Leucanthemum vulgare</i>	59.31	648789.68	6040976.52

Table H.3 Weed records (points) Year 4

Weed management zone	Estimated cover				Count	Easting	Northing
	Dense	Medium	Light	Trace			
Marica				<i>Leucanthemum vulgare</i>	1	630615.23	6039256.89
				<i>Leucanthemum vulgare</i>	2	630647.79	6039194.15
				<i>Leucanthemum vulgare</i>	2	630649.80	6039182.90
			<i>Hypericum perforatum</i> , <i>Leucanthemum vulgare</i>		2	630674.84	6039109.29
				<i>Leucanthemum vulgare</i>	60	630684.46	6039079.91
				<i>Leucanthemum vulgare</i> , <i>Hypericum perforatum</i>	20	630678.11	6039097.45
				<i>Leucanthemum vulgare</i>	2	630683.86	6039078.07
				<i>Leucanthemum vulgare</i>	2	630690.80	6039054.55
				<i>Leucanthemum vulgare</i>	2	630721.73	6038994.93

Weed management zone	Estimated cover				Count	Easting	Northing
	Dense	Medium	Light	Trace			
Tantangara Road bottom		<i>Leucanthemum vulgare</i>			15	647300.33	6030751.90
		<i>Leucanthemum vulgare</i>			50	647353.94	6031268.77
		<i>Leucanthemum vulgare</i>			50	647407.34	6031280.88
		<i>Leucanthemum vulgare</i>			50	647504.84	6031595.85
		<i>Leucanthemum vulgare</i>			10	647540.59	6031677.93
		<i>Leucanthemum vulgare</i>			10	647566.08	6031722.36
		<i>Leucanthemum vulgare</i>			10	647576.38	6031924.04
				<i>Leucanthemum vulgare</i>	1	647512.62	6032131.12
				<i>Leucanthemum vulgare</i>	1	647362.54	6032607.51
			<i>Leucanthemum vulgare</i>		20	647299.41	6032673.37
			<i>Leucanthemum vulgare</i>		10	647302.02	6032743.19
				<i>Leucanthemum vulgare</i>	5	647310.36	6032841.01
				<i>Leucanthemum vulgare</i>	5	647316.75	6032894.69
				<i>Leucanthemum vulgare</i>	5	647397.04	6033107.23
		<i>Leucanthemum vulgare</i>			5	647612.47	6033331.45
			<i>Leucanthemum vulgare</i>		20	647674.44	6033415.59
			<i>Leucanthemum vulgare</i>		20	647794.35	6033594.89
			<i>Leucanthemum vulgare</i>		10	647825.10	6033618.16
				<i>Leucanthemum vulgare</i>	5	647937.60	6033634.91
			<i>Leucanthemum vulgare</i>		20	648296.61	6033779.38

Weed management zone	Estimated cover				Count	Easting	Northing
	Dense	Medium	Light	Trace			
			Leucanthemum vulgare		10	648400.51	6033849.63
			Leucanthemum vulgare		10	648573.71	6033974.80
		Leucanthemum vulgare			30	648680.00	6034037.33
	Leucanthemum vulgare				100	649023.47	6034371.91

H.2 Pathogens

H.2.1 Monitoring Periods

Table H.4 Pathogen monitoring periods summary Year 4

Monitoring period	Monitoring dates
Quarter 1	6–10 December 2023
Quarter 2	22–24 April 2024

H.2.2 Records

Table H.5 *Phytophthora* testing records

Monitoring site	Positive/negative	Phytophthora species	Easting	Northing
Lobs 02	Negative	-	626120	6038401
Lobs Hole R0.5	Negative	-	628995	6028300
Lobs Hole R5	Negative	-	626989	6032170
Marica Washdown02	Negative	-	635152	6037565
Marica01	Negative	-	633642	6037855
PMS2	Negative	-	626106	6038270
PMS3	Negative	-	626149	6038245
PMS4	Negative	-	626208	6038248
PS01	Negative	-	629109	6027956
PS02	Negative	-	626988	6032118
PS03	Negative	-	627856	6038413
PS04	Negative	-	626334	6039263
PS05	Negative	-	625578	6039483
PS06	Negative	-	634811	6037880
PS07	Negative	-	633242	6038430
PS08	Negative	-	630555	6039344
PS09	Negative	-	630990	6038885
PS10	Negative	-	632422	6038653
PS11	Negative	-	649215	6036114
PS12	Negative	-	649729	6036816
PS13	Negative	-	648972	6037253
PS14	Negative	-	648507	6039139
PS15	Negative	-	648403	6040707

Monitoring site	Positive/negative	Phytophthora species	Easting	Northing
PS16	Negative	-	639641	6038376
PS17	Negative	-	642967	6036540
PS18	Negative	-	641781	6032731
PS19	Negative	-	650724	6020789
PS20	Negative	-	651091	6021076
Tantangara Adit 01	Negative	-	648853	6037900
Tantangara Road 02	Negative	-	645605	6022890
Tantangara Washdown	Negative	-	649139	6036308

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