

Falls to Hotham Alpine Crossing: Preliminary Environmental Assessment report



Prepared for: Parks Victoria

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Field team

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Tom Atkin	Environmental engineer/waterway management specialist	Water Technology	Field assessment

This report omits the locations of some threatened fauna species and sensitive fauna habitat features in order to protect these species. These details have been provided to Parks Victoria separately.

Summary

Introduction

Abzeco was commissioned by Parks Victoria (PV) to work in collaboration with Water Technology, Dell Botany, Pathways Bushland and Environment, Atkins Ecological Contracting and the Arthur Rylah Institute for Environmental Research to undertake a preliminary environmental assessment of the proposed development of the Falls to Hotham Alpine Crossing (FHAC).

Background

The proposed project is being undertaken with a view to create one of four iconic walks in Victoria, as outlined in the Falls to Hotham Alpine Crossing Master Plan (FHACMP). The FHAC starts at Falls Creek, following approximately 57 km of largely existing walking tracks of varying widths as well as management vehicle tracks, and is mainly located in the Alpine National Park. The current plans are to widen the existing walking tracks to 900 mm (1200 mm in some places to allow side by side walking) and resurface them with gravel, install new sections of track, and provide additional accommodation opportunities between Falls Creek and Mount Hotham.

The proposed overnight accommodation includes four nodes, each of which will include the following:

- Existing camping areas.
- Hiker camps: 12 elevated three-person camping platforms at each node that are connected via boardwalks, a communal shelter for food preparation and social engagement, a sealed vault toilet system, water collection and storage areas, information boards, and huts for licensed tour operators at the hiker camps.
- Operated huts: weatherproof huts for two to three people per hut, communal toilets, and a communal dining hut with separate kitchen. Separate huts for tour operators and maintenance staff are also proposed.

The four planned overnight nodes are:

- Overnight node 1 - Bogong High Plains:
 - location A, B, C and E hiker camps.
 - location D operated huts.
- Overnight node 2 - Tawonga Huts:
 - location A hiker camp.
 - location B and C operated huts.
- Overnight node 3 - Diamantina River/Red Robin Battery:
 - Diamantina River flats: hiker camp location.
 - Red Robin Battery: operated huts location.
- Overnight node 4 - High Knob:
 - North side Diamantina Spur Walking Track: hiker camp location.
 - South side Diamantina Spur Walking Track: operated huts location.

Just prior to the field assessments, PV regional staff identified three alternative overnight locations requiring assessment that were not included in the FHACMP.

These were:

- Locations F and G operated huts and/or hiker camp locations at overnight node 1, Bogong High Plains.
- Location D operated huts and/or hiker camp location at overnight node 2, Tawonga Huts.

The additional assessment areas also included optional tracks to locations A, B, C and D at overnight node 2, Tawonga Huts.

Scope of assessment

This preliminary environmental assessment identified natural flora, fauna and geomorphological values that may be impacted by the proposed FHAC, and legislative and policy requirements for the project. The findings were used to review the track alignment and overnight node options, and make recommendations to avoid and minimise impacts on environmental values. The report will be used by PV to update the project scope and works area.

Assessment area

The assessment area included the proposed track alignment with a 20 m buffer either side (i.e. a 40 m belt transect). The track was divided into 16 sections for assessment. The buffer to either side of the alignment was included to enable a more comprehensive assessment of surrounding environmental values and options for mitigation.

The indicative track alignment was based on spatial data provided by PV. The indicative location of the overnight nodes was interpreted from illustrated maps provided in the FHACMP.

Separate flora and fauna species lists and geomorphological data were collected in each track section and at each proposed overnight node.

Management history and past environmental impacts

The assessment area and surrounds have a history of impacts on environmental values and management issues, including:

- Construction of Rocky Valley Dam at Falls Creek flooding one of the largest areas of Alpine Bog Communities on the Bogong High Plains, and construction of the Pretty Valley pondage, both used for hydroelectric power generation. Loch Dam at Mount Hotham was constructed to supply water for snowmaking.
- Construction of aqueducts and associated vehicle maintenance tracks across the Bogong High Plains to supply water to Rocky Valley and Pretty Valley dams.
- A history of cattle grazing between the early 1800s and 2005 impacting alpine vegetation through heavy grazing, soil pugging, introduction of weeds, preferential grazing of many herbs that are now rare or threatened, and damage to habitat for threatened flora and fauna species.
- Construction of cattlemen's huts and camping areas which are scattered along the proposed alignment and within surrounding areas.
- Installation of infrastructure for recreation, including accommodation buildings, roads, ski lifts for downhill skiing, ski trails for cross-country skiing, tracks for bush walking,

and more recently mountain bike riding which causes damage and loss of vegetation, soil disturbance and the introduction and spread of weeds.

- Feral horses *Equus caballus*, recreational horse riding and Sambar Deer *Rusa unicolor* which are damaging rare or threatened Alpine Bog Communities and habitat for native flora and fauna by causing pugging, creating wallows, exacerbating erosion, increasing sedimentation of waterways, trampling and overgrazing vegetation, and potentially spreading the Amphibian Chytrid Fungus *Batrachochytrium dendrobatidis* and weeds.

Findings

Project Extent

The length of the proposed route as outlined in the FHACMP was determined to be approximately 61 km. The potential impact area resulting from the proposed widening of the existing track to 900 mm (excluding the existing portion of track) and a construction buffer of 1 m either side of the entire track) equates to:

- 15.1 ha of track (without optional track areas in overnight nodes).
- 0.8 ha in addition, accounting for optional track areas in overnight nodes.

The total combined area of the proposed overnight nodes (without alternate options) is c. 30+ hectares. This includes the entire hatched areas shown at each node in the FHACMP.

The total extent of the project under the proposed FHACMP is around 45 ha, and would exceed this if some sections of track are widened to 1.2 m to facilitate side by side walking.

Flora

A total of 297 plants species, including 252 native species and 45 exotic (introduced) species, were recorded within the assessment area.

Significant flora

Sixty rare or threatened flora species were recorded including:

Proposed FHAC route

- Shining Cudweed *Argyrotégium nitidulum* (*Environment Protection and Biodiversity Conservation Act 1999* [EPBC Act] - Vulnerable).
- Mountain Daisy *Brachyscome foliosa* (*Flora and Fauna Guarantee Act 1988* [FFG Act]).
- Silky Snow-daisy *Celmisia sericophylla* (FFG).
- Fifty-seven species classified as rare or threatened on the Victorian advisory list (including the abovementioned species).

Proposed overnight nodes

- Twenty-five species classified as rare or threatened on the Victorian advisory list.

Long unburnt Snow Gums were recorded along the track alignment and within some overnight nodes.

Habitat for significant flora

Suitable habitat was identified for seven plant species listed under the EPBC Act and/or FFG Act that have been previously recorded within 2.5 km of the assessment area:

- Snow Daphne *Kelleria bogongensis* (EPBC, FFG).

- Thick Eyebright *Euphrasia crassiuscula* subsp. *glandulifera* (EPBC, FFG).
- Bogong Eyebright *Euphrasia eichleri* (EPBC, FFG).
- Wire-head Sedge *Carex cephalotes* (FFG).
- Cushion Rush *Juncus antarcticus* (FFG).
- Rock Poa *Poa saxicola* (FFG).
- Tasmanian Bladderwort *Utricularia monanthos* (FFG).

The timing of the environmental assessment did not coincide with the active growing season for these species, so they may not have been detected and further targeted surveys are therefore required in the right season.

Listed ecological communities

One community listed under the EPBC Act was identified in the assessment area:

- Alpine Sphagnum Bogs and Associated Fens. (EPBC—Endangered), consistent with the Victorian Ecological Vegetation Class (EVC) Alpine Valley Peatland with a bioregional status of Endangered.

Two vegetation communities listed under the FFG Act were identified in the assessment area:

- Alpine Bog Community, consistent with the EPBC listed Alpine Sphagnum Bogs and Associated Fens; and,
- Alpine Snowpatch Community, consistent with Snowpatch Grassland EVC with a Victorian bioregional conservation status of Rare.

Ecological Vegetation Classes (EVCs)

Fourteen ecological vegetation classes (EVCs) were recorded within the assessment area including:

- One EVC with a Victorian bioregional conservation status of Endangered: Alpine Valley Peatland, which is also consistent with the EPBC listed Alpine Sphagnum Bogs and Associated Fens and the FFG Act listed Alpine Bog Community.
- Eight EVCs with a Victorian bioregional conservation status of Rare, including Snowpatch Grassland which is consistent with the Victorian FFG Act listed Alpine Snowpatch Community.
- Three EVCs with a Victorian bioregional conservation status of Least Concern.
- One EVC, Sub-alpine Pond Herbland, which is a recently classified EVC that has not as yet been allocated a Victorian bioregional conservation status.

All fourteen EVCs were recorded along the proposed FHAC route.

Seven EVCs were recorded in the proposed overnight node locations.

Introduced plant species

The weed species recorded within the assessment area include eight noxious weeds (declared under the *Conservation and Land Protection Act 1994* [CaLP Act]), four Weeds of National Significance (WONS) and four additional high threat weeds including:

Two weeds classified as 'Restricted' under the CaLP Act:

- Grey Sallow **Salix cinerea*; and,

- Rusty Sallow **Salix cinerea* subsp. *oleifolia*

Both **Salix* species are also classified as WONS.

Six weeds classified as 'Controlled' under the CaLP Act including:

- Spear Thistle **Cirsium vulgare*;
- Tutsan **Hypericum androsaemum*;
- St John's Wort **Hypericum perforatum* subsp. *perforatum*;
- Sweet Briar **Rosa rubiginosa*:
- Common Blackberry **Rubus anglocandicans*; and,
- Forest Blackberry **Rubus polyanthemos*.

The two **Blackberry* species are also identified WONS.

Four high threat environmental weeds which are highly invasive, can spread rapidly and can cause significant impacts on natural systems including:

- Soft Rush *Juncus effusus* subsp. *effusus*;
- Jointed Rush **Juncus articulatus* subsp. *articulatus*;
- Slender Rush **Juncus tenuis*; and,
- Creeping Buttercup **Ranunculus repens*.

Fauna

Sixty-one fauna species were recorded in the assessment area, comprising 11 mammal, 25 bird, 13 reptile, two frog, two fish and eight invertebrate species. Samples taken of fish in the Mountain Galaxias *Galaxias olidus* complex, caddisflies, stonefly nymphs and mayfly nymphs may reveal additional species pending further clarification of their identification.

Significant fauna

Nine rare or threatened fauna species were recorded within the assessment area including:

Proposed FHAC route

- Broad-toothed Rat *Mastacomys fuscus mordicus* (EPBC – Vulnerable).
- Southern Greater Glider *Petauroides volans* (EPBC – Vulnerable).
- Alpine She-oak Skink *Cyclodomorphys pralealtus* (EPBC – Endangered).
- Guthega Skink *Liopholis guthega* (EPBC – Endangered).
- Platypus *Ornithorhynchus anatinus* (FFG).
- Alpine Water Skink *Eulamprus kosciuskoi* (FFG).
- Alpine Bog Skink *Pseudemoia cryodroma* (FFG).

One species pending FFG Act listing:

- Tussock Skink *Pseudemoia pagenstecheri* (High Country).

Proposed overnight nodes

One species listed under the FFG Act:

- Platypus *Ornithorhynchus anatinus*.

Habitat for significant fauna

Potential habitat was identified in the assessment area for an additional eight threatened fauna species:

- Mountain Pygmy Possum *Burramys parvus* (EPBC, FFG).
- Smoky Mouse *Pseudomys fumeus* (EPBC, FFG).
- Latham's Snipe *Gallinago hardwickii* (EPBC migratory).
- Mountain Skink *Liopholis montana* (deemed eligible, but pending nomination and potential listing under the FFG Act).
- Murray Spiny Crayfish *Euastacus armatus* (EPBC, FFG).
- Alpine Spiny Crayfish *Euastacus crassus* (FFG).
- Alpine Stonefly *Thaumatoperla alpina* (EPBC, FFG).
- Stonefly *Riekoperla intermedia* (FFG).

Detailed targeted surveys are required to assess the presence and extent of populations of rare or threatened fauna in the assessment area using adequate survey effort as outlined in accepted protocols and guidelines.

Geomorphology

Within the assessment area and surrounds, there are the Bogong High Plains South sites of geological or geomorphological national significance: Mount Cope, Mount Jim, Cobungra Gap and Mount Loch, and a site of regional significance; Basalt Hill. These formations are robust features and typically resistant to change. The proposed FHACMP track alignment does not intersect or pass immediately adjacent to any of these discrete features.

Waterways and wetlands

A number of waterways were identified within the assessment area which fall in to four broad classifications:

- Bedrock controlled – these streams experience high energy flows which flush fine sediments, the bed is very close to bedrock and there is little capacity for lateral or vertical change to occur in the waterway.
- Confined (with occasional floodplain pockets) – these streams experience high energy flows which move fine and coarse sediments with little potential for lateral or vertical movement. Floodplain pockets can be subject to inundation and erosion.
- Alpine Bog – located in boggy, densely vegetated environs or can be poorly defined or discontinuous, have wetlands or ponds, and can move freely laterally or vertically depending on depth of bedrock, location of floodplain margin, floating boulders and road crossings, etc.
- Aqueduct – artificially constructed channels which are relatively stable, monitored and maintained.

Flooding risk

The proposed trail alignment intersects both the Kiewa River West Branch and Diamantina River (section 12). Planned overnight node 3 is located on a floodplain pocket of the Diamantina River which may be subject to flooding impacts including:

- Damage to infrastructure proposed to be built at these locations in or over the rivers, or on the floodplain.
- Safety issues resulting from damage to proposed infrastructure caused by floodwaters.

Potential impacts on environmental values

Significant vegetation communities, significant flora, long unburnt Snow Gums, significant fauna habitat, sites of geomorphological significance, and waterways and wetlands in the assessment area have the potential to be impacted by:

- Track widening and construction.
- Ongoing track management and maintenance.
- Construction of overnight nodes.
- Ongoing maintenance and management of overnight nodes.
- Increased numbers of hikers.

Significant vegetation communities

Impacts to significant vegetation communities include:

- Direct loss or reduction in extent through removal.
- Degradation from vegetation trampling, soil disturbance, erosion, weed invasion and sedimentation.
- Altered hydrology.

Significant flora species

Impacts to significant flora species include:

- Direct loss of plants through removal.
- Degradation of habitat caused by trampling, soil disturbance, erosion, weed invasion and sedimentation.
- Fragmentation of plant populations.
- Altered hydrology.

Long unburnt Snow Gums

Damage to the roots and/or canopy of a tree can affect the stability of the tree and affect tree health, and ultimately lead to tree death and fall.

Impacts to Snow Gums include:

- Damage to canopies if construction activities encroach on Tree Protection Zones (TPZs).
- Damage to roots if construction activities encroach on the Structural Root Zones (SRZs).
- Damage to canopies from routine track maintenance.
- Soil compaction from construction and ongoing foot traffic.
- Damage to or removal of trees from firewood collection.

Weeds

Construction of the FHAC and ongoing use and maintenance have the potential to increase weed cover which can degrade native flora and fauna habitat values in the following ways:

- Native vegetation removal and exposed soils provide opportunities for weed invasion.
- Weeds seeds and propagules may be transported during construction to newly disturbed areas on machinery and clothing leading to new weed infestations.
- After construction, weed seeds may be dispersed on walkers' shoes and clothing, and spread across the assessment area and surrounds.
- Weeds may spread via waterways into downstream catchments, causing infestations in the broader landscape.

Significant fauna species

Construction and ongoing maintenance and use impacts of the FHAC on significant fauna species include:

- Habitat loss or fragmentation.
- Habitat degradation.
- Spread of pathogens such as the Amphibian Chytrid Fungus.
- Direct mortality.

Sites of geomorphological significance

The current track alignment is not likely to impact any discrete structures of geological or geomorphological significance.

Vegetation removal or damage may potentially degrade the quality and significance of sites of geomorphological significance if the track alignment or overnight nodes are moved closer to sites of geomorphological significance.

Waterways and wetlands

During construction

Water quality may be impacted during construction from:

- Construction materials and waste being washed into the nearby waterways.
- Construction activities which require the removal and destruction of vegetation cover, contributing to an increased risk of erosion and excessive sediment inputs.

Post construction

During the operation phase of the FHAC, water quality may be impacted through increased sediment inputs from:

- Eroding sections of track.
- Areas where vegetation cover is reduced due to construction or off-track trampling by hikers.
- Concentrated flow paths (concentrated water runoff).

Waterway crossings

The natural flow pattern (both in-channel and floodplain flows) and ecological condition of streams may be altered by construction of water crossings, resulting in:

- A reduction in hydraulic capacity through the structure.
- The raising of water levels (an increased afflux or backwater effect) upstream of the crossing structure, potentially increasing flooding upstream.
- Increased hydraulic forces and hence erosion potential surrounding the crossing structure (both upstream and downstream) through the concentration of flows.
- Disturbance and/or removal of riparian and in-stream vegetation.
- Impeded movement of fish and other aquatic fauna through the crossing structure.
- Reduced sediment transport through the crossing structure.
- Increased sediment and nutrient loads due to altered roadside/trackside drainage arrangements.
- Physical damage (i.e. erosion) to the waterway.

Water runoff and erosion risk

The track, drainage infrastructure, waterway crossings and impervious surfaces (e.g. roofs of buildings at proposed overnight nodes) have the potential to concentrate water runoff and combined with the potential loss of vegetation, particularly on steep slopes, may contribute to erosion.

Legislative implications

Environmental Effects Act 1978

The *Environment Effects Act 1978* (EE Act) requires a referral of works that individually or in combination are capable of significantly affecting the environment.

The delivery of the current FHAC project, as proposed in the Master Plan (without mitigation or minimisation), meets the criteria for referral under the *Environmental Effects Act 1978*] and a referral is recommended to address the following:

- *Potential clearing of 10 ha or more of native vegetation from an area that:*
 - is, or is likely to be, of very high conservation significance (as defined in accordance with Appendix 3 of Victoria's Native Vegetation Management Framework).
- *Matters listed under the Flora and Fauna Guarantee Act 1988:*
 - Listed communities in the assessment area.
 - Potential loss of critical habitat for threatened fauna.
- *Potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the National Parks Act 1975.* This may include impacts on:
 - An EPBC Act listed heritage place (Australian Alps National Parks and Reserves).

- Alpine Sphagnum Bogs and Associated Fens (EPBC Act listed community), equivalent to Sub-alpine Valley Peatland (which has a bioregional conservation status of Endangered).
- Sub-alpine Pond Hermland (new record of an EVC with a limited distribution at this location and altitude).
- *Potential extensive or major effects on land stability, acid sulphate soils or highly erodible soils over the short or long term.*

This may include a combination of the following:

- Track widening along narrow ridgelines with steep sides including the Razorback and eastern end of Diamantina Spur increasing the risk of erosion, and track widening on the Bogong High Plains in Sub-alpine Pond Hermland and Alpine Bog Communities which have highly erodible soils.
- Overnight node development on steep slopes that may be prone to major instabilities¹ including at node 1 locations B/E (south side), D, F and G on the Bogong High Plains; location C in overnight node 2 at Tawonga Huts; and overnight node 4 at the High Knob hiker camp location.
- The construction of the hiker camp node on the Diamantina River floodplain at overnight node 3 on the Diamantina River.
- The construction of the hiker camps on the north side of Diamantina Spur, overnight node 4 at High Knob.

Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act is the primary Commonwealth legislation for environmental protection. Under the Act, an action will require approval from the Commonwealth Minister for the Environment if it has, will have, or is likely to significantly impact on Matters of National Environmental Significance (MNES).

Matters of National Environmental Significance (MNES)

The FHAC has the potential to impact on three MNES, including:

- National Heritage Places
- Listed (nationally) threatened species and ecological communities
- Migratory species

Further assessment of potential impacts to these MNES is required once the project scope, walking track alignment and location of overnight nodes has been determined. A referral under the EPBC Act 1999 is likely to be required.

Flora and Fauna Guarantee Act 1988

The FFG Act is the primary Victorian state legislation for the protection and conservation of threatened native plants, animals and ecological communities, and for the management of potentially threatening processes on public land and within waterways in the state

¹ Geotechnical advice is required to assess land stability;

The FFG Act places a Public Authority Duty on Victorian Ministers and Public Authorities to consider the objectives of the Act when performing any functions that may have an impact on biodiversity.

Authorisation is required to remove protected flora, listed communities or habitat for listed species. A total of 95 protected flora species were recorded in the assessment area. A Protected Flora Permit under the FFG Act will be required to remove any of these species.

Fourteen threatened flora and fauna species and two ecological communities listed under the Act were recorded in the assessment area.

Under the *Flora and Fauna Guarantee Amendment Act 2019*, there are expected to be changes to the listing status of flora and fauna species once the assessment process is completed. Critical habitat may also be identified within the assessment area.

As there are likely to be direct and indirect impacts to listed communities and species (vegetation and habitat removal) resulting from the planned works, it is recommended that the project be referred to the Department of Land, Water and Planning (DELWP) for approval once the proposed alignment and locations of overnight nodes are determined.

National Parks Act 1975 and National Parks (Wilderness Act 1992)

The Alpine National Park is designated under Schedule 2 of the *National Parks Act 1975*. It is also covered by Public Land Management Overlays designated under Schedule 6. The National Parks Act is the Victorian legislation for the protection and management of national and other protected parks across the state, including designated remote and natural areas.

Part of the FHAC runs through the Bundara-Cobungra Remote and Natural Area (RNA), and widening or realignment of the track should not occur in this area except where recommended to mitigate existing impacts on threatened communities and species from hikers and horses, which may be permitted in line with the legislation.

Catchment and Land Protection Act 1994

The purpose of the Catchment and Land Protection Act (CaLP) is to protect primary production, Crown land, the environment, and community health from the effects of noxious weeds and pest animals.

Six Controlled and two Restricted CaLP Act listed weeds were recorded in the assessment area. As public land managers, PV is responsible for controlling declared noxious weeds in the National Park. The Mount Hotham Alpine Resort Management Board is responsible for managing weeds on crown land within the Resort on Mount Hotham.

Declared water supply catchment

Many catchments supplying water for domestic, irrigation or other purposes within Victoria are protected under the CaLP Act. The entire Falls – Hotham trail is located within the Upper Kiewa Declared Water Supply Catchment, and approvals for activities conducted under other statutes and statutory planning schemes must be referred to the responsible land management authority (water authority, Catchment Management Authority (CMA) or DELWP) for approval. It is likely that further design details will need to be prepared for both the proposed track and overnight node arrangements prior to seeking approval from relevant authorities.

Water Act 1989

The *Water Act 1989* provides for the authorisation of works and activities around designated waterways. Parks Victoria should consult with the North East CMA to identify which waterways

are designated waterways within the planned FHAC, and requirements for a Works on Waterways permit.

Wildlife Act 1975 and Wildlife Regulations 2002 (Victoria)

The *Wildlife Act 1975* provides for the protection and management of Victorian wildlife, and regulates the conduct of any persons undertaking activities relating to wildlife.

Management Authorisation under the *Wildlife Act* will be required before any actions likely to interfere with protected native fauna are undertaken, including the capture and release of animals from the works areas.

Planning and Environment Act 1987

The *Planning and Environment Act 1987* establishes a framework for planning the use, development and protection of land in Victoria. The removal of native vegetation in Victoria is regulated under the Act through local government planning schemes.

Clause 52.17 Native Vegetation

Under Clause 52.17, a planning application to remove, destroy or lop native vegetation must fulfill requirements under the Guidelines for the removal, destruction or lopping of native vegetation (referred to as 'the Guidelines') unless an exemption applies.

Crown land exemption

Under Clause 52.17, there is a *Crown land exemption* and a *Road safety exemption* from requiring a permit to remove native vegetation by PV or DELWP on Crown land in accordance with the *Procedure for the removal, destruction or lopping of native vegetation on Crown land* ('the Procedure').

As with Clause 52.17, a strategy of avoidance and minimisation must be followed placing a strong emphasis on avoiding and reducing impacts on important biodiversity values outlined in the Procedure.

The removal of vegetation and resultant loss of biodiversity on Crown land by PV is to be counterbalanced by actions to improve native vegetation condition, extent or security.

Counterbalancing actions also include activities beyond improvement of vegetation condition such as improving waterway habitat.

Parks Victoria is exempt from requiring a permit to remove native vegetation for the redevelopment of the FHAC under Clause 52.17 of the Alpine Shire and Alpine Resorts Planning Schemes, but will still need to demonstrate avoidance or minimisation.

Parks Victoria also has existing management obligations in its role as a public land manager to improve vegetation condition, such as the removal of weeds and pest animals, which are currently being undertaken through the delivery of various threat management programs (e.g. feral horse management). Under the Crown land exemption these actions may be considered counterbalancing activities.

Planning zones and overlays

The FHAC is located across three local government areas and covered by a number of zones and overlays. Parks Victoria will need to consult with Alpine Shire Council, East Gippsland Shire Council and the Mount Hotham Resort Management Board to confirm their permit requirements under the relevant zones and overlays.

Recommendations

The following recommendations are provided to assist with the revision of the project scope to mitigate environmental impacts, including avoidance and minimisation of impacts on native vegetation in line with the Procedure.

Track recommendations

Track design and construction

- Qualified, experienced track designers will need to be consulted to develop effective options based on those used elsewhere in similar environs (e.g. parks in alpine areas of Tasmania and New South Wales).
- Ecologists with appropriate alpine experience should be involved in the design process to ensure impacts on biodiversity are minimised.

Track realignment

Realigning the track would require a significant amount of vegetation removal, soil disturbance, waterway and wetland impacts, and may facilitate weed invasion. In some locations it may impact sites of geomorphological significance.

Track realignment works should be limited to that necessary to minimise impacts on natural values, for example:

- Realignment of section 9 at Tawonga Huts to minimise impacts on an Alpine Bog Community.
- Positioning of discrete waterway crossings in more stable/robust locations (e.g. straight section of waterway or bedrock-controlled areas).

Track widening

To minimise vegetation removal and impact on native fauna habitat, it is recommended to:

- Reduce the proposed track width to 600 mm or less.
- Limit widening of existing tracks to where this may protect natural values, for example, for mitigation of areas damaged by off-track walking.
- Use existing vehicle tracks to provide opportunities for side-by-side walking, which would minimise vegetation and fauna habitat removal that might otherwise occur along new or narrower existing sections of track.

Track surface

The existing track has various surface treatments, and different impacts on native vegetation and fauna habitat were observed:

- Rubber matting supports native vegetation growth along its borders and within grid openings, allows water penetration and resulting in little bare ground and few weeds. However, matting may be impacted by fire or eventually deteriorate, and require significant clean up efforts to protect environmental values.
- River pebbles do not support vegetation growth and are easily displaced, creating bare ground and opportunities for weed invasion and increased risk of erosion. They may carry Cinnamon Fungus *Phytophthora cinnamomi* (which is threatening process under the FFG Act). River pebbles, however, are fire resistant and do not deteriorate significantly over time.

- Stepping stones offer permanent stable substrates for wet areas but depending on spacing, may encourage off-track walking which was observed in some places.
- Logs were observed to deteriorate over time in damp areas and are difficult to walk on. This encourages off-track walking. They would also be impacted by fire.
- Steel grid bridges have been installed in the assessment area and surrounds and may be suitable to span sensitive, significant communities and fauna habitat. These would be able to withstand the weight of snow while being permeable enough to allow snowmelt, rain and light to reach vegetation below. They would also be able to withstand low intensity fires.

Track drainage

Drainage impacts need to be minimised to protect native vegetation and fauna habitat:

- The track surface and drainage should be managed along the entire route through the use of drains to protect receiving waterways from sedimentation resulting from erosion.
- Erosion and scouring risk may be minimised with appropriate reinstatement of any vegetation removed during construction along the trail (e.g. sods of native Poa tussock grasses).

General waterway crossing design principles

The proposed trail alignment intersects waterways throughout its length and numerous waterway crossings will be required. Many existing waterway crossings can be retained, while new crossings will need to be determined on a site-by-site basis. The following design principles should be employed to minimise impacts on natural values:

- Crossings should be located on stable sections of stream.
- Possible waterway crossing types include:
 - Low profile ford crossings (typically earthen or rock-lined crossings/stepping stones that do not incorporate a culvert).
 - Bridges (inclusive of raised walkways).
- Appropriate drainage for all track crossings will be required to prevent erosion and sediment generated from construction activities and ongoing use entering waterways and moving downstream.
- Waterways should be protected from hydraulic forces and erosion which may result from constrictions of the floodplain and channel cross-sectional area associated with waterway crossings. This may include for example, rock armouring of stream bed and banks.
- Perching opportunities for predatory birds should be addressed at the design stage to reduce impacts on reptiles and invertebrates.

Flooding risk

Some track and overnight node locations (e.g. near Diamantina River and Kiewa River West Branch) are at risk from flooding. To address potential safety issues they may require:

- Suitable crossings.
- Refuge areas.
- Signage (e.g. depth gauges).

- Barriers (e.g. boom gates) to block access to flooded sections.
- Drown outs.

Ongoing track management recommendations

Ongoing management will be required to minimise track use impacts on native vegetation and fauna habitat. This includes:

- Weed control along the existing track and surrounds.
- Maintenance of track surface integrity.
- Ongoing maintenance to manage erosion of soil around stepping stones.
- Maintenance of track runoff drainage controls.
- Ongoing implementation of the Feral Horse Action Plan 2021.
- Remediation of damage caused by horses and hikers walking off-track.
- Erosion mitigation.

Overnight nodes

Overnight node design and construction

To minimise the extent of native vegetation and fauna habitat removal associated with the construction of overnight nodes, it is suggested that PV:

- Reduce the extent of the proposed overnight nodes.
- Consider using and upgrading existing formal and informal camping locations (e.g. Cope Hut and Tawonga Huts) in areas of degraded vegetation to provide more accommodation opportunities. This could avoid removal of high-quality vegetation and fauna habitat for the establishment of new overnight node locations.
- Employ sensitive building design, construction principles and techniques to minimise work footprints and the amount of construction equipment and material storage required. For example, air lifting in pre-fabricated structures and equipment.
- Avoid where possible or otherwise minimise construction in steep areas to reduce the risk of soil/substrate disturbance and vegetation removal, erosion and soil/substrate instability. Ensure best practise construction techniques are employed to minimise impacts.
- Address runoff control requirements and minimise hillslope erosion and erosion around structures including huts, damping platforms, toilets and water tanks.
- Use existing tracks, where possible, to access overnight nodes, therefore reducing vegetation removal and soil disturbance.
- Clearly define paths between huts to minimise off-track walking impacts on vegetation and fauna habitat.
- Consider track drainage as discussed previously under 'Track recommendations'.

Flooding risk management

Consider flooding risk management requirements as discussed under 'Track recommendations'.

Interpretive signage

Interpretive signage explaining the impacts on flora and fauna habitat from recreational activities such as rock stacking, rock removal to create fire places and fire wood collection, may encourage hikers to not carry out these activities and reduce impacts on native vegetation and fauna.

Ongoing overnight node management

Ongoing management will be required to minimise impacts on native vegetation and fauna habitat. This should include:

- Undertaking weed control in proposed overnight nodes and surrounding areas.
- Continuing to implement the Feral Horse Action Plan 2021.
- Maintaining track surface integrity within overnight nodes and remediate damage caused by horses (overnight node 2 at Tawonga Huts) and hikers walking off-track.
- Remediating informal camping areas (e.g. remove rock stacking and informal fireplaces).
- Maintaining track runoff drainage controls.
- Mitigating erosion.

1 Introduction

The Falls to Hotham Alpine Crossing (FHAC) project is being undertaken by Parks Victoria (PV) to redevelop one of four iconic, long distance walks in Victoria. The objective of the FHAC is to increase access to the Victorian alpine landscape for the wider community (e.g. Image 1).

The FHAC plans to cater for five day/four-night hikes, with accommodation options for families, school groups, walking groups and solo hikers, as well as day trips via a number of access tracks from nearby towns including Harrietville and Mount Beauty, and the Mount Hotham and Falls Creek alpine resorts.

To assess potential impacts on natural values from the proposed track enhancement works and construction of overnight accommodation, PV commissioned Abzeco in collaboration with Water Technology, Dell Botany, Pathways Bushland and Environment, Atkins Ecological Contracting and the Arthur Rylah Institute for Environmental Research to undertake a preliminary environmental assessment.

The assessment identifies natural flora, fauna, geomorphological and hydrological values along the track alignment, within the overnight nodes, and in the nearby surrounds that may be impacted by the proposed FHAC redevelopment as outlined in the *Falls to Hotham Alpine Crossing Master Plan* (FHACMP) (PV 2018).

The findings are used to review the proposed track alignment and overnight node options, and provide recommendations to mitigate impacts on environmental values under the current plan.

This information will be used by PV to refine the design of the track and locations of the accommodation nodes, include appropriate mitigation measures, and update the project scope accordingly.



Image 1. A view of the Victorian Alpine Landscape, the township of Smoko and the Great Alpine Road in the Ovens River Valley to the north-east from the Razorback track to Mount Feathertop on the proposed Falls to Hotham Alpine Crossing (December 2020), (Image credit: Matthew Hatton)

1.1 Project description

Over several years, there have been multiple stages in the development of the FHAC including master planning of the track alignment and overnight nodes. This preliminary environmental assessment follows the indicative proposed track alignment and location of overnight nodes provided in the final FHACMP and spatial data supplied by PV (PV 2018).

1.1.1 Track alignment

The proposed FHAC will start at Falls Creek and follow approximately 57 km of largely existing walking and management vehicle tracks between Falls Creek and Mount Hotham.

Under the FHACMP, the plans are to widen these tracks including the provision of a 600 mm to 900 mm wide walking trail, which widens to 1200 mm in some sections (through less sensitive environs, although with an obvious increase in footprint and resultant ecological impact) to enable hikers to walk two abreast. This would require upgrading most of the existing walking trails.

The proposed enhancement works include trail surfacing with gravel, with scope to recommend other materials and raised sections, and elevated tracks and bridges used in areas where threatened ecological vegetation classes, threatened species, watercourses and other wet areas are identified.

The use of steps will be confined to slopes where significant ecological values are noted on either side. Stone edges, drainage strips and drainage channels have been suggested to manage surface water runoff.

1.1.2 Overnight nodes

Overnight accommodation would include retaining existing huts, buildings, and popular dispersed camping areas near proposed new hiker camps and operated huts.

There are four proposed overnight nodes which would offer varied accommodation options, mainly tent hiker camps and operated huts.

The proposed hiker camp areas would include 12 elevated, three person camping platforms at each node that are connected via boardwalks, a communal shelter for food preparation and social engagement, a sealed vault toilet system, water collection and storage areas, information boards, and huts for licensed tour operators at the hiker camps.

At the operated hut locations, there are plans to provide weather-sealed huts sleeping two to three people for a total of 20 hikers, communal toilets, and a communal dining hut with separate kitchen. Separate huts for tour operators and maintenance staff are also proposed.

The proposed hiker camps and huts would be separated from one another and from the existing dispersed camping areas and huts which would remain unchanged.

One of the objectives of the FHACMP is to select sites where accommodation will be screened from existing camping areas and adjacent huts and tracks.

The four planned overnight nodes are indicated in the FHACMP as candidate areas within which the new facilities would be considered:

- Overnight node 1: Bogong High Plains
 - location A, B, C and E hiker camps
 - location D operated huts

- Overnight node 2: Tawonga Huts
 - location A hiker camp
 - location B and C operated huts
- Overnight node 3: Diamantina River/Red Robin Battery
 - Diamantina River: hiker camp location
 - Red Robin Battery: operated huts location
- Overnight node 4: High Knob
 - North side Diamantina Spur Walking Track: hiker camp location
 - South side Diamantina Spur Walking Track: operated huts location

1.1.3 Alternate overnight node locations

Just prior to the field assessment, PV regional staff identified three overnight locations to be included in the environmental assessment as alternatives to those outlined in the FHACMP.

These included:

- Location F and G operated huts and/or hiker camp locations at overnight node 1, Bogong High Plains.
- Location D operated huts and/or hiker camp location at overnight node 2, Tawonga Huts. The additional assessment areas also included tracks to locations A, B, C and D at Tawonga Huts.

The overnight node locations were selected based on their proximity to areas of natural and cultural interest such as snow gum woodlands, mountain peaks, river valleys and historic huts. The option to use the operated huts throughout the year is also being considered by PV to cater for cross-country skiers and snowshoers.

1.1.4 Scope of the preliminary environmental assessment

The preliminary environmental assessment objectives are to:

- Identify and map significant natural values along the proposed track alignment and within the proposed overnight node locations including:
 - Listed flora and fauna species.
 - Listed ecological communities.
 - Rare or threatened Ecological Vegetation Classes (EVCs).
 - Habitat for listed fauna species.
- Undertake a fluvial geomorphic assessment to identify stream processes, key features, environmental values and threats present within the assessment area that are relevant to the track upgrade and associated works.
- Identify potential threats and impacts to environmental values from the construction and ongoing management of the proposed FHAC trail and overnight nodes.
- Identify potential ongoing threats and impacts on environmental values from increased numbers of hikers accessing the proposed FHAC and overnight nodes.

- Recommend measures or change the scope of proposed works to avoid or mitigate impacts on identified natural values.
- Identify legislative and policy implications of the proposed works.

1.2 Assessment area

The assessment area comprises the track alignment, including a 20 m buffer either side (i.e. a 40 m belt transect) and four accommodation nodes defined by hatched areas shown in the FHACMP. The buffer was included to enable a more thorough assessment of environmental values surrounding the trail alignment as well as options to mitigate impacts from the project.

The track alignment and location of the overnight nodes identified during the field assessment are shown in Appendix 1. Areas that may be impacted beyond the assessment area are also considered, including surrounding fauna habitat and downstream areas that may be subject to hydrological impacts.

1.2.1 Landscape context

The proposed route passes through largely intact native vegetation within the Alpine National Park, and includes a range of vegetation types such as Snow Gum woodland (including long unburnt Snow Gums that are significant areas of vegetation given the recent history of fire in the alps), alpine shrubland, alpine heathland, alpine grassland, Alpine Bog Community (a nationally and state listed threatened community), and montane forest.

Across the Bogong High Plains, the assessment area ranges in elevation from approximately 1600 m to 1800 m above sea level (ASL), and is largely above the treeline. There are sections of Sub-alpine Woodland at the Falls Creek end of Heathy Spur Track where the track descends to the Langford Aqueduct and along Langford West Aqueduct Road, and up past Cope Hut to the Bogong High Plains Road.

The planned track descends to around 1050 m ASL at the Diamantina River into Montane Damp Forest, and then climbs up through Sub-alpine Woodland along Diamantina Spur to treeless alpine vegetation at around 1750 m ASL near High Knob and then to Mount Feathertop. From Mount Feathertop, the proposed alignment backtracks along the Razorback to the Mount Hotham Alpine Resort where it finishes at around 1850 m ASL.

Numerous waterways intersect the proposed FHAC alignment, and intact riparian vegetation and waterways provide potentially suitable habitat for a wide range of flora and fauna species along the route which were identified in the desktop review (Abzeco 2020).

1.2.2 Track sections and location

The proposed track alignment was divided into 16 sections for assessment. The track sections were determined based on track type (walking or vehicle) and location associated with changes in vegetation type (montane or alpine), as these divisions have some different threats and impacts, and therefore require different mitigation strategies. Separate flora and fauna species lists and geomorphological data were collected in each section and at each overnight node.

The majority of the alignment is situated in the Alpine National Park, with a short section in the Mount Hotham Alpine Resort. Different sections of the assessment area fall under different jurisdictions which determines planning requirements. The track sections, overnight nodes and planning jurisdictions are shown in Table 1 and Appendix 1.

Table 1. Falls to Hotham Alpine Crossing track sections, overnight nodes and planning jurisdictions (see Appendix 1 for maps) (November/December 2020)

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
1	Existing track Exists in part, from maintenance hut to start of Heathy Spur Track. New section of track Not included in FHACMP but required to continue from maintenance hut to western end of dam wall.	Between western end of Rocky Valley Storage Dam and Heathy Spur Track		North East	Alpine Shire <ul style="list-style-type: none"> • Public Conservation and Resource Zone (PCRZ) • Bushfire management Overlay (BMO) 	Victorian Alps
2	Existing track (Heathy Spur Track)	Between Rocky Valley Dam and Big River Fire Trail	Eastern end within 100 m of the Bogong RNA	North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
3	Existing track (Big River Fire Trail)	Between Heathy Spur Track and Marum Point Track to the south	Northern end within 100 m of the Bogong RNA	North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
4	Existing track (Australian Alps Walking Track)	Between Marum Point Track and Langford West Aqueduct Road		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO East Gippsland Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
5	Existing track (Langford West Aqueduct Road)	Follows the Langford West Aqueduct Road to the Bogong High Plains Road.		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO East Gippsland Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
5	Overnight node 1, Bogong High Plains	Hiker camps (locations A to C), operated huts locations A and D), alternative locations not included in FHACMP (location F and G).		North East	East Gippsland Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
6	Existing track (Australian Alps Walking Track)	Between the Bogong High Plains Road and a point north of the end of Cope West Aqueduct Road (east of Mount Jim).	South west end of this section is located in the Bundara-Cobungra RNA	North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
7	Existing track (Australian Alps Walking Track)	Between a point north of the end of Cope West Aqueduct Road (east of Mount Jim) and the Fainter Fire Trail.	South-east end of this section is located within the Bundara-Cobungra RNA.	North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
8	Existing track (unnamed)	Between Fainter Fire Trail and Tawonga Huts.		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
8-9	Overnight node 2, Tawonga Huts	Hiker camps (location A), operated huts (locations B and C), alternative option not included in the FHACMP (location D).		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
9	Existing track (unnamed)	Between Tawonga Huts and a point around 0.8 km west of Tawonga Huts.		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
10	New section of track	Around 0.8 km west of Tawonga Huts, to Westons Spur Track.	Southern end of this section is located within the Bundara-Cobungra RNA.	North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
11	Existing track (Westons Spur Track) Additional assessment area not included in the FHACMP. It was considered as an alternative route to section 10.	Between the junction of Pole 333 and Weston Hut.	Eastern part of this section is located within the Bundara-Cobungra RNA.	North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
12	Existing track (unnamed track and West Kiewa Logging Road)	Between Weston Hut and Diamantina Spur Walking Track		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
12	Overnight node 3 – Diamantina Horse Yards and Red Robin Battery	Hiker camp (Diamantina Horse Yards) Operated huts (Red Robin Battery)		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
12a	New section of track	Between West Kiewa Logging Road north of the Diamantina River and the Diamantina Spur Walking Track.		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
12b	New section of track	Between the West Kiewa Logging Road and the Diamantina Spur Walking Track.		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
13	Existing track (Diamantina Spur Walking Track)	Diamantina Spur Walking Track to the Razorback track.		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
13	Overnight node 4, High Knob	Hiker camp and operated huts		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
14	Existing track (Razorback track)	Between the foot and peak of Mount Feathertop.		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO 	Victorian Alps
15	Existing track (Razorback track)	Between the foot of Mount Feathertop and the Great Alpine Road.		North East	Alpine Shire <ul style="list-style-type: none"> • PCRZ • BMO Mount Hotham Alpine Resort Management Board <ul style="list-style-type: none"> • Public Park and Recreation Zone (PPRZ) • Road Zone—Schedule 1 (RZ1) • Bushfire Management Overlay—Schedule 1 (BMO1) • Erosion Management Overlay (EMO) 	Victorian Alps
16	Existing track (unnamed track)	Between the Razorback track and the water		North East CMA and borders the	Mount Hotham Alpine Resort Management Board	Victorian Alps

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
		storage dam next to Mount Loch car park.		East Gippsland CMA	<ul style="list-style-type: none"> • Comprehensive Development Zone—Schedule 2 (CDZ2) • RZ 1 • BMO1 • EMO 	

1.2.3 Existing track condition

The existing track varies from around 40 cm wide along pedestrian-only trails to approximately 3 m wide along maintenance vehicle tracks. Various artificial substrates have been used on the track including rubber matting (Image 2), river pebbles (Image 3), bare earth (Image 4) basalt stepping stones (Images 5-7), gravel (Image 8) and logs (Image 9). Steel bridge waterway crossings have been installed in some places.

Basalt stepping stones and logs have been used to manage wetter sections of the track across the Bogong High Plains in sections 2, 4 and 6-8. However, soil surrounding basalt stepping stones has washed away in some locations, possibly making it difficult for walkers to balance on the now elevated stones. Evidence of off-track walking was observed in these locations (Image 5).

Parallel logs arranged along the contours of slopes appear to fail over time, as the logs effectively support one another and easily go askew if one of them begins to fail. The logs are difficult to walk on due to their rounded profile, they can become very slippery, are susceptible to rotting and slumping, and often end up partially submerged in mud (Image 10 and 11). This has resulted in hikers walking off-track adjacent to the parallel logs. This was evident in seepage areas associated with Damp Grassland and Sub-alpine Woodland EVCs in section 12, particularly where the elevation decreases toward Weston Hut.

In some steep and wet areas of track with no artificial substrate, track edges had become degraded by horses and off-track pedestrian traffic. Trampling has led to vegetation damage and loss resulting in bare ground, soil compaction, and erosion forming deep channels, particularly where the track intersects damp areas such as those supporting Alpine Bog Community and Damp Grassland. This was most obvious in sections 2, 6-9 and 11 (Appendix 1) (Images 12-17).



Image 2. Black matting track surface along a section of existing track, Bogong High Plains (December 2020), (Image credit: Louise Rodda)



Image 3. River pebbles track surface along an existing track, Bogong High Plains (December 2020), (Image credit: Louise Rodda)



Image 4. Bare earth track, Bogong High Plains (December 2020), (Image credit: Louise Rodda)



Image 5. Basalt stepping stones and off-track walking (right side of image) through damp grassland across the Bogong High Plain (December 2020), (Image credit: Louise Rodda)



Image 6. Basalt stepping stones crossing a waterway on the Bogong High Plains (December 2020), (Image credit: Louise Rodda)



Image 7. Close up of basalt stepping stones crossing a drainage line on the Bogong High Plains (December 2020), (Image credit: Louise Rodda)



Image 8. Management vehicle track (crushed rock surface) along Langford Aqueduct (December 2020), (Image credit: Louise Rodda)



Image 9. Parallel logs laid along contour lines used to stabilise part of Westons Spur Track (December 2020), (Image credit: Matthew Hatton)



Image 10. Failed section of log track with pugging along Westons Spur Track (December 2020), (Image credit: Matthew Hatton)



Image 11. Displaced, sunken logs as part of a log crossing on Westons Spur Track (December 2020),
(Image credit: Matthew Hatton)



Image 12. Horse pugging on the track and in a pool next to the track on the Bogong High Plains (December 2020), (Image credit: Louise Rodda)



Image 13. Trampled vegetation across a drainage line on Heathy Spur Track (December 2020) (Image credit: Louise Rodda)



Image 14. Trampled streamside vegetation across narrow linear Alpine Bog Community on the Australian Alps Walking Trail between Big River Fire Trail and Langford Aqueduct (December 2020),
(Image credit: Louise Rodda)



Image 15. Trampled vegetation across a drainage line on Heathy Spur Track (December 2020),
(Image credit: Louise Rodda)



Image 16. Off-track walking by hikers widening the trail on the Bogong High Plains (December 2020),
(Image credit: Louise Rodda)



Image 17. Channelised, compacted track widened by hikers walking off-track to avoid the channelised section on the Bogong High Plains (December 2020),
(Image credit: Louise Rodda)

1.2.4 Access

Access to the FHAC is via various roads, vehicle management tracks and walking tracks along its length (Image 9 and 18, Appendix 1). Vehicle access is possible at several points between Falls Creek and Tawonga Huts including the Bogong High Plains Road (bitumen road), the Langford West Aqueduct Road and the Cope West Aqueduct Road via Pretty Valley Track (both unmade vehicle tracks).

Diamantina Horse Yards (an existing camping area near a proposed overnight accommodation location) and Red Robin Battery are accessible via the West Kiewa Logging Road (an unmade road).

There is no vehicle access between Diamantina Spur and the Mount Hotham Alpine Resort boundary due to the steepness of the terrain.

Within the Mount Hotham Alpine Resort boundary, the planned track alignment crosses the Great Alpine Road (bitumen) and is accessible via various walking tracks.



Image 18. Management vehicle track near Cope Saddle Hut (power supply hut) located on Pretty Valley Track (December 2020), (Image credit: Louise Rodda)

1.2.5 Management history and past environmental impacts

The assessment area has a history of cattle grazing between the early 1800s and 2005 that damaged alpine vegetation and soils which were impacted by heavy grazing, soil pugging and introduction of weeds (DAWE 2021). Impacts also included preferential grazing of many herbs that are now rare or threatened, and damage to habitat for threatened flora and fauna species (DAWE 2021). Associated cattlemen's huts are scattered along the proposed alignment and surrounds including Wallace Hut, Cope Hut, Cope Saddle Hut (SEC Hut), Tawonga Huts, Weston Hut and Blairs Hut.

The Victorian alpine area has long been a destination for recreational activities including downhill and cross-country skiing, bush walking, camping, and more recently mountain bike riding. A number of formal and informal walking tracks and cross-country ski trails connect with the proposed FHAC, and there are existing camping areas within the proposed overnight nodes (Image 19). Off-track walking and camping in non-designated camping areas is currently causing damage to native vegetation and fauna habitats in the assessment area.



Image 19. Existing camping area with elevated camping platform at overnight node 1, Bogong High Plains, near Cope Hut (December 2020), (Image credit: Louise Rodda)

Development in the Mount Hotham and Falls Creek alpine ski resorts and supporting infrastructure at either end of the proposed FHAC includes ski lifts, downhill and cross-country ski runs, work depots, waste water treatment plants, carparks and accommodation. The cross-country ski runs extend into the National Park and along some sections of the proposed FHAC identified by ski poles (Images 2, 3, 4, 6, 7 and 20).



Image 20. Ski poles marking cross country ski runs along the proposed Falls to Hotham Alpine Crossing across the Bogong High Plains (December 2020), (Image credit: Louise Rodda)

There have been major environmental impacts associated with ski resorts and power generation along the proposed FHAC alignment and surrounding areas. This includes the construction of the Kiewa Hydro-Electric Scheme between 1946 and 1961 (Lawrence 2001), which included the construction of Rocky Valley Dam at Falls Creek that resulted in one of the largest areas of Alpine Bog Communities on the Bogong High Plains being flooded. The dam supplies water to the McKay Creek Power Station. The dam is also used for snowmaking and water-based recreation including boating and swimming. Pretty Valley Pondage was also constructed for hydroelectric power generation under the scheme. Loch Dam at Mount Hotham is another constructed dam completed in 2006 that is used for snowmaking (MHARM 2006).

The Kiewa Hydro-Electric scheme included the construction of aqueducts to collect water from the Bogong High Plains to supply the dams (Lawrence 2001). The Langford East and Langford West aqueducts supply Rocky Valley Dam. The Cope West and Cope East aqueducts supply Pretty Valley Pondage.

Several roads and management tracks intersect the proposed FHAC including the Bogong High Plains Road, the Great Alpine Road, Big River Fire Trail between Heathy Spur Track and Marum Point Track, the Fainter Fire Trail to Tawonga Huts, Langford West Aqueduct Road along the Langford Aqueduct, Cope Saddle Track, and the West Kiewa Logging Road between Red Robin Battery and Diamantina Spur.

Feral horses *Equus caballus* and Sambar Deer *Rusa unicolor* are key management issues for environmental values within the assessment area.

Horses

There is now a large body of evidence that clearly identifies feral horses in the Alpine National Park are destroying vegetation structure, impacting and degrading stream morphology and causing extensive damage to the nationally endangered Alpine Sphagnum Bogs and Associated Fens community (Driscoll *et al.* 2019). This evidence differentiates the impacts of horses from those of deer (Driscoll *et al.* 2019).

Pugging and trampling of *Sphagnum* and other plant species in Alpine Sphagnum Bogs and Associated Fens is destroying these communities (Driscoll *et. al.* 2019).

Impacts of horses on in Alpine Bog Communities and other areas of the Alpine National Park include:

Vegetation impacts:

- Grazing and trampling of native vegetation leading to the loss of native flora species diversity and cover abundance;
- Destruction of flora habitat through soil disturbance and pugging;
- Increased opportunities for weed invasion due to loss of native species cover and soil disturbance as well as spread of weeds through dung; and
- Increased soil instability and erosion due to grazing, and trampling which further impacts native vegetation.

Fauna impacts:

- Waterway damage and destruction (pugging, soil disturbance and destruction of vegetation along waterway edges) impacting habitat for terrestrial and amphibious native fauna;
- Increased sedimentation affecting water quality for aquatic fauna;

- Grazing and trampling of vegetation resulting in declining cover and increased bare ground reducing protection for fauna from predators and extreme temperatures;
- Impacts on fauna food sources such as, invertebrates which may be affected habitat loss due to soil disturbance and vegetation destruction causing loss of shelter, and organic material food sources; and
- Spread of disease e.g. Amphibian Chytrid Fungus *Batrachochytrium dendrobatidis* (N. Cleemann pers. comm.).

The impacts of horses even at even low numbers (~0.034 horses/km²) accumulates over time and recovery is slow due to the short growing season, limited by cold temperatures over winter in alpine environments (Driscoll *et al.* 2019). The Alpine Sphagnum Bogs and Associated Fens community may take thousands of years to recover (Claridge 2019). At the same time, native fauna are being displaced and the risk of threatened species becoming extinct is increasing due to ongoing impacts from feral horses (Driscoll *et al.* 2019).

Deer

Deer numbers are reported to be continually increasing in Victoria (Claridge 2016). However, there are few systematic scientific studies documenting evidence of deer impacts (which exclude impacts by other fauna) on environmental values within the state (Claridge 2016; Davis *et. al.* 2016). However, general observations of impacts include tracks being formed through vegetation, areas of bare ground caused by fighting during the rut, overgrazing, browsing, trampled vegetation, thrashing and antler rubbing of stems of woody trees and shrubs, ring barking, spreading weeds on their fur and through scats, soil exposure leading to erosion resulting in sedimentation of waterways and a decline in water quality (Clarke *et al.* 2000; NPWS 2002; Keith and Pellow 2004; Flora and Fauna Guarantee Scientific Advisory Committee 2004 cited in DPIE 2004; Claridge 2016).

Deer eat a wide variety of plants but are known to selectively and heavily browse particular species including Prickly Currant-bush *Coprosma quadrifida*, Hazel Pomaderris *Pomaderris aspera*, Prickly Teatree *Leptospermum continentale*, Prickly Bush-pea *Pultenaea juniperina*, and weeds such as blackberry **Rubus* spp. (particularly blackberry fruits) (Claridge 2016).

Deer are also reported to be widespread in local Alpine Bog Communities, evidenced by many tracks and scats recorded in these systems on the Bogong High Plains, and they create wallows which impact *Sphagnum* species and hydrology (the impacts of which are outlined above) (Claridge 2016). Additionally, deer are known to damage the habitat of threatened fauna species that occur in bogs such as the Alpine Water Skink, Alpine Bog Skink and Alpine Tree Frog, and are also likely vectors of the Amphibian Chytrid Fungus (N. Cleemann pers. comm.). Deer numbers do not appear to be greatly affected by fire in the Victorian Alps, with numbers recovering quickly after initial reductions in numbers (Claridge 2016).

‘Degradation and loss of habitat caused by feral horses *Equus caballus*’ and ‘Reduction in biodiversity of native vegetation by Sambar *Cervus unicolor*’ are both listed potentially threatening processes under the FFG Act. The FFG Act is the primary legislation that applies to the management of threatened and otherwise protected flora and fauna on public land in Victoria, and PV as public land managers have a legislative obligation to manage and mitigate threatening processes.

To address these requirements, PV have prepared the (*Draft*) *Feral Horse Action Plan 2021* which is being finalised and due for release in late 2021. The aim of the plan is to reduce impacts of feral horses in the Alpine National Park and protect sensitive environmental values (PV 2021a). This is

particularly important now that the Alpine area is also being significantly impacted by bushfires (PV 2021a).

Parks Victoria are also conducting trial deer control programs in the Alpine area to limit environmental damage in the Alpine National Park (PV 2021b). Parks Victoria also undertook ground and aerial shooting following the 2019/2020 bushfires to control deer and other feral animals which pose significant threats to the survival recovery of native plants and animals after fire due to serious habitat impacts caused by grazing, browsing, wallowing and trampling (PV 2021b).

1.2.6 Fire history

Wildfires occurred across some or much of the Bogong High Plains in 2003, 2007, 2015 (DELWP 2020c) and 2020 (N. Cleemann pers. comm.). Sections of the assessment area between the Tawonga Huts and the Razorback were burnt in 2003 and 2007. Along parts of the Razorback within the assessment area there were wildfires in 2003 and 2013. The planned track ends in long unburnt vegetation within the Mount Hotham Alpine Resort boundary (DELWP 2020c).

1.2.7 Climate

Climate data were obtained from weather stations closest to the assessment area, located at Mount Hotham and Falls Creek (BOM 2021).

The proposed FHAC traverses the Victorian Alps which experience high precipitation throughout the year. This largely falls as snow during winter, with occasional brief snow falls at other times of the year. The greatest precipitation occurs from late autumn to early summer. The mean annual rainfall at Falls Creek is 1308 mm, and the mean monthly rainfall ranges from 93 mm to 140 mm. The mean annual rainfall at Mount Hotham is 1453 mm, and the mean monthly rainfall there ranges from 100 to 139 mm.

The Victorian Alps have cool summers and cold winters. The mean monthly temperatures at Falls Creek range from -2.9 to 17.9°C. The mean monthly temperatures at Mount Hotham range from -3.7 to 18°C. The warmest period is in late summer.

Rainfall and temperatures vary across the assessment area, with higher temperatures at lower elevations including the Diamantina River and along the West Kiewa Logging Road.

1.2.8 Geology

The underlying geology varies throughout the assessment area. The section from Falls Creek to the central Bogong High Plains sits on Lower Ordovician gneiss, known as the Omeo Metamorphic Complex (Geoscience 2020). The track then travels over Holocene quaternary fluvial deposits and older tertiary volcanics (Eocene to Oligocene) consisting of extrusive basalts, then lower Devonian intrusive granite, quartz and diorites up to the Westons Spur Track (Geoscience 2020).

On the western edge of the Bogong High Plains, the high plains gneiss is faulted against Upper Ordovician sediments, known as the Kiewa Thrust Fault (AV 2020a). The Kiewa River West Branch follows the fault and has cut down to the mylonite zone which is up to 1.5 km wide (AV 2020a). The West Kiewa Logging Road and beginning of Diamantina Spur Walking Track are located on lower Silurian mylonite (AV 2020a).

The underlying geology of the remainder of the track is Lower Ordovician sandstone, known as the Adaminaby Group which consists of marine sandstone, mudstone, siltstone and minor chert (Geoscience 2020).

There are sites of geomorphological significance within the assessment area including the Bogong High Plains South sites of geological or geomorphological national significance (Mount Cope, Mount Jim, Cobungra Gap and Mount Loch), and a site of regional significance; Basalt Hill (AV 2020a) (further discussed in Section 4.8).

2 Methods

2.1 Desktop review

A desktop review was undertaken to inform and guide the field assessments by identifying the potential locations of threatened species, species habitat, vegetation communities, and geomorphological points of interest and significance. The results are provided a separate report (Abzeco 2020). This information was used to generate digital maps to assist with identifying likely locations of these significant natural values in the field.

The review was undertaken of relevant databases, literature and other resources to search for information on these ecological values, as well as legislation and planning matters applicable to the assessment area and immediate surrounds, including:

- A review of flora and fauna records held in the Victorian Biodiversity Atlas (VBA) from within a 2.5 km buffer for flora and a 5 km buffer for fauna, referred to as a data review area (DRA) (DELWP 2020a)². This information was used to confirm and update the existing desktop analysis of records presented in documentation supplied with the brief.
- A search of ecological communities and flora and fauna species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) recorded within a 2.5 km DRA (flora) and 5 km DRA (fauna) for the FHAC assessment area (in addition to records in the VBA search), using the online EPBC Protected Matters Search Tool (PMST) (DAWE 2020c).
- Ecological Vegetation Class (EVC) mapping/modelling (extant and pre-1750) using the Department of Environment, Land, Water and Planning (DELWP) online tools including NatureKit (DELWP 2020e), the Native Vegetation Information Management System (NVIM) (DELWP 2020d), and associated EVC benchmarks and conservation status (DELWP 2020e).
- A search using VicPlan (Victorian planning schemes online) to identify local government areas and current planning zones and overlays, and provisions that apply to the FHAC assessment area (DELWP 2020f).
- Relevant obligations under legislation, government policies and strategies which need to be considered for the proposed FHAC trail upgrade/construction.
- Review of PV preliminary GIS data and aerial photography along the indicative FHAC track alignment (GIS data was not available for the overnight node locations at this stage).
- Review of the Victorian Resources Online for Sites of Geological and Geomorphological Significance (AV 2020a).
- Review of available historic and georeferenced aerial photography, Digital Elevation Models (LiDAR) and site photographs.

² The VBA does not make all records available at an accurate scale to protect the location of species at risk of illegal collection (referred to as sensitive records), and recent records may not yet be entered into the VBA. Parks Victoria should check with the DELWPs Arthur Rylah Institute, Nick Cleemann, Threatened Fauna Program Leader, prior to undertaking any works to further identify and avoid impacting locations of rare or threatened fauna habitat.

- Review of previous geomorphic investigations, condition assessments and strategic plans (as relevant).
- Review of relevant reports for the FHAC assessment area provided by PV, including:
 - FHACMP;
 - Parks Victoria's visual geographic units and natural values data (provided by PV);
 - Greater Alpine National Parks Management Plan (PV 2016);
 - Falls to Hotham Alpine Crossing Environmental Risk Assessment Final Report (Biosis 2016); and,
 - National Heritage List citation (National Heritage Places) – Australian Alps National Parks and Reserves (DAWE 2020b).

2.2 Field assessments

The proposed track alignment and overnight nodes were surveyed on-foot. Handheld GPS were used to record a track log of the alignment, as the indicative track alignment in the master plan and spatial data provided by PV did not align precisely with the on-ground track in some sections. The accuracy of the mapping was dependent on GPS accuracy and functionality in different sections of the alignment, which generally varied from 0.3-7 m using a combination of differential and hand-held units.

The track log was used to generate figures for the report. It provides a general overview but may not be accurate enough for design purposes, particularly for the overnight nodes, as location and extent have not been finalised.

Flora and fauna data were collected throughout the assessment area using a handheld GPS and electronic tablet with differential GPS (Catalyst DA1 digital antenna, Trimble Inc., California, USA) and ArcGIS Collector software (Esri, California, USA) to capture georeferenced photos, species records and notes. Separate flora and fauna species lists and geomorphological data were collected in each section of the trail and at each overnight node.

2.3 Flora

Flora assessments were undertaken by teams of two botanists from 30 November to 12 December 2020. The following data were collected from the assessment area during the survey:

- An inventory of plant species, including indigenous and exotic (introduced) species.
- Records of locations of long unburnt Snow Gums.
- Coordinates of threatened species and high threat weeds along the alignment.
- Records of locations of EVCs and listed ecological communities.

2.3.1 Listed ecological communities

Ecological communities were determined based on characteristics such as flora composition, vegetation structure, location in the landscape (e.g. altitude and aspect), soil type and microclimate, assessed against listed community descriptions and thresholds where available (DAWE 2020a).

2.3.2 Ecological Vegetation Class determination

Vegetation was assigned an EVC following EVC Benchmarks for the Victorian Alps Bioregion (DELWP 2020e), Victorian Wetland Classification Framework (DELWP 2016), Index of Wetland Condition (DELWP 2020g) and EVC descriptions of Treeless Alpine EVCs (ECAV undated).

EVCs were determined based on defining characteristics, including floristic species composition, vegetation structure (height and density of cover), lifeforms, and ecological characteristics such as soil depth, geology, altitude, aspect, and position in the landscape (e.g. valleys, steep slopes, and lee side of ridges where snow persists late into the season).

2.3.3 Targeted surveys

Targeted flora surveys were undertaken for seven listed species of conservation significance at each of the overnight node locations and in the two new sections of proposed track. Locations of these species were also recorded opportunistically throughout the rest of the assessment area if they were observed. These seven species were considered highly likely to occur within the assessment area (Abzeco 2020):

- Shining Cudweed *Argyrotegium nitidulum* – (EPBC listed as Vulnerable, considered Vulnerable in Victoria).
- Mountain Daisy *Brachyscome foliosa* – (FFG listed, considered Vulnerable in Victoria).
- Silky Snow-daisy *Celmisia sericophylla* – (FFG listed, considered Vulnerable in Victoria).
- Thick Eyebright *Euphrasia crassiuscula* subsp. *glandulifera* – (EPBC listed as Vulnerable, FFG listed, classified as Vulnerable in Victoria).
- Bogong Eyebright *Euphrasia eichleri* – (EPBC listed as Vulnerable, FFG listed, considered Vulnerable in Victoria).
- Cushion Rush *Juncus antarcticus* – (FFG listed, considered Vulnerable in Victoria).
- Buffalo Leek-orchid *Prasophyllum suttonii* s.s. – (FFG listed).

There are no prescribed targeted survey methods for these particular species, so general guidelines for undertaking targeted surveys for threatened plants were followed.

The Commonwealth Government provides draft guidelines for Australia's threatened orchids (DOE 2013). These guidelines recommend undertaking a random meander during orchid flowering periods to detect the target species when large areas need to be covered (DOE 2013). If the species is detected, a thorough search should be undertaken in the location the plants were found using area searches (searching a given area for a set amount of time) and systematic parallel transect searches (transects spaced 10 m apart) (DOE 2013).

The Department of Planning, Industry and Environment (DPIE) provides a guide to 'Surveying threatened plants and their habitats' which states that the three most common methods of undertaking targeted surveys are random meanders, parallel transects and quadrats (Cropper 1993; Keith 2000). The guide states that detection is increased by using the parallel transect method as it systematically covers a predetermined defined area, but is not suitable for every site (DPIE 2020).

The track alignment, overnight node locations and extent, and additional options added to the assessment area during the course of the project are indicative only. As this is a large area without clearly defined boundaries, the random meander method (Cropper 1993) was used to undertake the targeted surveys. Two experienced botanists surveyed the areas on foot, targeting

suitable habitat for the target species. This provided flexibility in the field to consider and review various configurations for the overnight nodes and new sections of track.

During the field assessments, it was found that some locations, such overnight node 1 locations B/E, D, F and G along the Langford Aqueduct, as well as the proposed High Knob operated hut location, were not fully accessible due to steepness and/or the density of vegetation. As a consequence, the surveys able to be undertaken at these sites were relatively limited.

2.4 Fauna

Fauna assessments were undertaken by two zoologists from 23 November to 4 December 2020. Survey methods for threatened species (targeted based on assessments of habitat suitability and pre-existing records) were informed by state and federal survey guidelines or published literature where these were available. All other vertebrate and some notable invertebrate species encountered while undertaking surveys were also recorded.

2.4.1 Broad-toothed Rat

Searches were undertaken for indirect evidence of the Broad-toothed Rat *Mastacomys fuscus mordicus* such as scats, nests and runways (Triggs 1996; Green and Osborne 2012) in areas of suitable habitat, including in damp grassland, woodland and wet heath, particularly along waterways and where there was dense ground vegetation and/or boulders (Walter and Broome 1975; Green and Osborne 2012). Elliott trapping was not possible within the scope of the preliminary assessment, as the time it would have taken for this was used to address other priorities for considering potential impacts to threatened fauna. Trapping surveys require four consecutive nights of survey in each area of suitable habitat during appropriate weather conditions (Chick *et al.* 2018a), and may be required in certain areas where there is a lack of indirect evidence once the trail alignment and location of overnight nodes have been refined.

2.4.2 Sooty Owl and arboreal mammals

The Victorian Biodiversity Atlas contains one record of the Sooty Owl *Tyto tenebricosa* from 1996 on the planned track alignment around Blairs Hut and Diamantina Horse Yards (DELWP 2020a). Biosis (2016) regarded the Sooty Owl as potentially being at risk from the trail redevelopment, although acknowledged the risk may be low. Spotlighting and call-playback was undertaken to further inform this risk. Spotlighting in these areas also targeted arboreal mammals, with a particular focus on the Greater Glider *Petauroides volans* and Yellow-bellied Glider *Petaurus australis*.

Call-playback targeting the Sooty Owl was undertaken for 2 minutes on dusk before spotlighting began at Blairs Hut and Diamantina Horse Yards. The survey involved broadcasting the 'falling bomb'-whistle call of the Sooty Owl, followed by 3 minutes of listening for a response, 2 minutes of repeated call-playback, 2 minutes of listening, and 2 minutes of playing the trilling call (Loyn *et al.* 2011).

Spotlighting was then carried out by two zoologists along a 500 m section of the trail alignment at Diamantina Horse Yards on 29 November 2020 (from 2150-2250 hrs), and another 500 m section at Blairs Hut on the following night (from 2055-2150 hrs). This was done using a 30-watt hand-held spotlight (dimmed with a coloured filter to reduce potential impacts on the vision and natural behavior of nocturnal fauna in accordance with animal ethics requirements), and torch with a brightness of up to 2100 lumens. The surveys were undertaken when there was little wind and it was not raining as recommended by Chick *et al.* (2018b).

Spotlighting was also undertaken opportunistically at the rear (west of) Tawonga Huts on 27 November from 2150-2230 hrs given the taller tree cover there providing potential habitat for nocturnal fauna. The area surveyed followed the edge of the tree line adjacent to a clearing.

2.4.3 Latham's Snipe

Latham's Snipe *Gallinago hardwickii* was surveyed for opportunistically by two observers walking along the edges of tributaries and through boggy ground in the assessment area supporting dense grassy or sedgy vegetation, keeping a lookout for any birds that might be flushed. Areas of potential habitat for the species were also noted.

Undertaking targeted surveys for Latham's Snipe, following the EPBC Act survey guidelines (DotEE 2017) and methods employed in southern Australia by H. Naarding in the 1980s (e.g. detailed in Hansen 2018), were not within the scope of the current assessment due to time constraints. Formal targeted surveys may be required in areas of suitable habitat once the track alignment and location of overnight nodes has been refined.

2.4.4 Guthega Skink

Guthega Skink *Liopholis guthega* colonies are known to occur in the assessment area (Z. Atkins unpubl. data), and were mapped while undertaking assessments of habitat for this and other threatened reptile species. Rocky areas in relatively open Snow Gum woodland, heathland, and tussock grasslands, as well as cuttings and track edges in other areas were visually assessed for lizards or their burrows, and habitat suitability for the species along the trail alignment was noted. Location co-ordinates were recorded for suspected burrows.

2.4.5 Alpine She-oak Skink and Tussock Skink

The Alpine She-oak Skink *Cyclodomorphus praecox* and Tussock Skink *Pseudemoia pagenstecheri* were visually surveyed for while walking the alignment in areas of suitable habitat, recording skinks that were out basking or otherwise active while the sun was out. The location and extent of suitable habitat for these species along the trail alignment was also noted, which included grassland, low or open heathland, and open woodland with a grassy, low or sparsely shrubby understory. Active searching was kept to a minimum to protect habitat and was conducted under the supervision of an expert on the species (Zak Atkins) and in accordance with a research permit.

2.4.6 Alpine Water Skink and Alpine Bog Skink

As the Alpine Water Skink *Eulamprus kosciuskoi* and Alpine Bog Skink *Pseudemoia cryodroma* both live in and near wet or damp environments, although not always together, these species were surveyed for simultaneously. Based on the time available to assess each section of the proposed track alignment, surveys were limited to passive observation and hand catching *Pseudemoia* spp. where closer inspection was needed to confirm species identification. When individuals of *P. cryodroma* or skinks sharing morphological characteristics with the closely related Tussock Skink *P. pagenstecheri* were caught, approximately 2 mm of the tail tip was collected to enable identification through molecular analysis where required, and to inform a broader project on population genetics being undertaken by the Arthur Rylah Institute.

Bogs, fens and wet heaths were surveyed visually in sunny conditions, ensuring the habitat was thoroughly scanned within and on either side of the alignment. Suitable areas of habitat were mapped and noted as potentially supporting these species if they were not observed otherwise, as these species are behaviorally cryptic and can be easily overlooked.

It is also noted that the Alpine Water Skink and Alpine Bog Skink will pass through atypical habitats further away from water (e.g. grassland and heathland between bogs and riparian areas), requiring consideration of potential impacts from the construction which may create potential barriers to movement between areas of core habitat.

2.4.7 Spotted Tree Frog

Surveys for the Spotted Tree Frog *Litoria spenceri* were undertaken in and adjacent to the Diamantina River at Diamantina Horse Yards, and the West Kiewa River at Blairs Hut. This involved two observers listening and searching for frogs and conducting spot counts along the Diamantina River at the Horse Yards, and at the West Kiewa Logging Road bridge crossing the West Kiewa River further downstream. Surveys were undertaken at each of these points for approximately 25 minutes and 10 minutes on the evenings of 29 and 30 November respectively. A more comprehensive survey was undertaken on the West Kiewa River at Blairs Hut on 30 November, largely in accordance with federal survey guidelines (DEWHA 2010). This involved two observers walking in-stream for approximately 350 m (from 2220-2320 hrs) while using head torches to scan the banks, vegetation, emergent rocks and logs for frogs.

Hygiene protocols to reduce the risk of transmitting chytrid fungus followed those outlined in '*Hygiene protocols for the control of diseases in Australian frogs*' (Murray *et al.* 2011), involving brushing and sterilising potentially contaminated (wet) footwear with 70% ethanol between sites.

The average wind speed, relative humidity and air temperature were recorded using a hand-held weather meter (Kestrel 3500, Nielsen-Kellerman, Pennsylvania, USA) at the start of each survey, measured at approximately 1 m off the ground.

2.4.8 Mountain Galaxias species complex

Bait trapping for galaxiids took place in a single stream that crosses the alignment north of Langford West Aqueduct Road (section 4), involving setting eight nylon funnels (45 cm × 23 cm × 23 cm, entrance diameter 40 mm) within a 10 m length of the stream. At least 5 cm at the top of each trap was left exposed above the surface in case air-breathing bycatch (e.g. water skinks) was caught. Each trap was baited with a yellow glow stick, marked on GPS, and tied to nearby vegetation with a cord to prevent it from being carried away in case of high flow. The traps were set at approximately 1900 hrs on 25 November and left overnight for collection at 0815 hrs on the following morning.

Dip netting was also undertaken for galaxiids in a headwater tributary of Tawonga Hut Creek and a bog system on Cope Saddle (sections 9 and 6, on 26 and 27 November respectively). Thirty and 20 minutes were spent dip netting at each site respectively, using a flat-bottomed dip net (bag 35 cm wide × 60 cm deep, mesh size 0.9 mm).

Other tributaries crossing the assessment area were not specifically surveyed for galaxiids, either because they contained a high abundance of trout (with the resulting predation pressure requiring greater survey effort than what was able to be expended to have a reasonable chance of detecting galaxiids), or galaxiids were not observed but still surveyed for opportunistically while dip netting for aquatic invertebrates.

2.4.9 Alpine Stonefly and other threatened aquatic invertebrates

Dip netting and kick netting was undertaken to survey for larvae of the Alpine Stonefly *Thaumatoperla alpina*, a second species of stonefly *Riekoperla intermedia*, and the Alpine Darner (dragonfly) *Austoaeschna flavomaculata*.

Dip netting focused on pools and runs within streams and bogs crossing the trail alignment. Approximately 10 m of stream or pond edge was sampled at each of six sites for between 5 and 40 minutes, taking 10-15 sweeps through the water column and aquatic vegetation where it was present. Kick netting took place at the same sites, sampling riffles by periodically kicking or picking up and wiping cobbles in front of a net with a flat-bottomed hoop, with the base of the hoop pressed firmly against the substrate and bag trailing downstream. Ten kick samples were taken from each site over distances between 10 m and 30 m. The same nets were used for both dip and kick sampling (bag 35 cm wide × 60 cm deep, mesh size 0.9 mm). After 1-3 sweeps, the contents of the net were emptied into a plastic tray containing water from the site, and any invertebrates caught were noted before voucher specimens were taken to further identify taxa of interest.

Water samples were also collected for detecting environmental DNA (eDNA) from the Alpine Stonefly. Suitable microhabitats within targeted stream sections (e.g. cobble-bottomed riffles) were targeted for drawing up and passing a total of 150 ml of water through a 60 ml syringe (i.e. three passes of 50 ml) attached to a 0.22 µm filter unit (Sterivex Millipore, EMD Millipore Corporation, Massachusetts, USA). Three filtered samples were taken at each site surveyed. The samples were kept refrigerated for several days before they were transported to the Centre for Freshwater Ecosystems at La Trobe University in Albury for processing.

2.5 Survey limitations

The seasonality or migratory/transitory habits of some flora and fauna species was a limiting factor due to the timing of the assessment (i.e. some seasonally active species may not have been readily observable when surveys were undertaken). This was variously due to a lack of fertile material required for the identification of plants, dormancy, fauna migration, hibernation, or variation in seasonal activity. For example, this assessment was undertaken in early summer, and late flowering orchids such as *Prasophyllum* species or dicot herbs such as *Euphrasia eichleri* (EPBC listed as Vulnerable) most likely would not have emerged or been flowering at the time of the survey. In addition, some grasses did not have fertile material and were difficult to identify to species level without such material. In this instance, grasses were at least identified to genus. In addition, threatened flora and fauna species may be present in low numbers at certain sites or across the assessment area, so are not always detected during brief surveys.

Some behaviorally cryptic and/or seasonally active fauna species (e.g. the Alpine She-oak Skink *Cyclodomorphus praealtus*) require multiple surveys over an extended period of time to ensure adequate effort for detection. Undertaking repeated surveys over multiple seasons was beyond the scope of this assessment. Where threatened species were not detected in parts of the assessment area but still suspected of occurring there, qualitative determinations of habitat suitability were made.

These limitations are unlikely to affect the major findings of this preliminary assessment in relation to potential impacts from the proposed project on significant flora, vegetation communities, fauna habitats, hydrological features and geomorphological features.

Recommendations have been made to undertake further targeted surveys for threatened flora and fauna species that may not have been recorded during this survey due to it not being the active growing/flowering season for certain plants, or where suitable habitat was identified for fauna species that require multiple surveys over an extended period to detect.

2.6 Conservation status

The conservation status of threatened species was obtained by reference to DELWP's Advisory List of Rare or Threatened Plants in Victoria (DEPI 2014), Advisory List of Threatened Fauna in Victoria (DSE 2013), Advisory list of threatened invertebrate fauna in Victoria (DSE 2009), and listings under the FFG Act (DELWP 2020b) and the EPBC Act (DAWE 2020a).

The FFG Act has recently been amended (FFG Amendment Act 2019). The amendments include the establishment of a single comprehensive list of Victoria's threatened species (the FFG Act Threatened List), and this includes updates to the Victorian conservation status of several species which had not been finalised when the preliminary environmental field assessments were completed. The FFG Act Threatened List replaces the Victorian threatened species advisory lists, and the conservation status of advisory-listed species provided in this preliminary environmental assessment will therefore need to be updated in line with the FFG Act Threatened List in the near future.

2.7 Nomenclature and taxonomy

The use of common names for plants follows the VBA (DELWP 2020a) and online version of Flora of Victoria (VicFlora 2021). Where names differ between these sources, the VBA naming has been adopted as species records are submitted to and managed in this official government database. Fauna names are based on those listed in the VBA or the most recent widely accepted treatment in published literature. Plant and animal names in this report include the common name followed by scientific name (in italics) when first mentioned in the text, and thereafter tend to be referred to by common name only.

Where an asterisk (*) precedes a plant or animal name, it signifies non-native taxa (i.e. those species which have been introduced to Australia). A hash (#) is used to denote Australian native plant or animal species that are not indigenous to the assessment area and may become invasive.

2.8 Geomorphology

Sites of geological and geomorphological significance are present across the alpine region. A review of these sites of significance was undertaken in the desktop assessment (Abzeco 2020) and is summarised in Section 4.7.

The desktop assessment identified discrete sites of geological and geomorphological significance in the form of rock formations. These formations are robust features that are typically resistant to rapid change. The proposed track alignment does not intersect or pass immediately adjacent to any of these discrete features. As such, the sites of geological and geomorphological significance are unlikely to be impacted by the proposed trail, and the geomorphic assessment has focused on other geomorphic features across the landscape that are susceptible to degradation (e.g. waterway crossings).

The geomorphic assessment was undertaken over four days by two Waterway Engineers/Fluvial Geomorphologists during December 2020 and January 2021. As this was a preliminary environmental assessment, the inspection focused on priority areas. The priority areas were identified as the proposed overnight nodes and landforms that were considered to be most susceptible to change, identified through the desktop analysis.

The assessment involved a desktop review of the primary controls on river character and behaviour with consideration of geology, hydrology, topography and aerial photography. This

information was subsequently informed through the targeted field assessment of priority areas that were highlighted during the desktop analysis to identify stream processes, key features, values and threats present within the project area, and their locations. The site assessment was also used to gather photographs and collect information to determine the geomorphic values and risks associated with the proposed works.

2.9 General observations

General observations were recorded throughout the assessment area including existing track and overnight node conditions, and existing disturbance impacts (e.g. from pest plants and animals, informal camping and off-track hiking).

3 Findings

3.1 Project extent

3.1.1 Track

As the spatial data provided by PV for the indicative track alignment did not always spatially align with the existing tracks, the mapping provided in this report was further informed by the track alignment mapped in the field (Table 2).

Table 2. Track section, type and length assessed for the Falls to Hotham Alpine Crossing Environmental Assessment (December 2020)

Track section	Track type	Source	Length (km)
1-9, 12-16	Existing	FHACMP and PV spatial data	52
10	New track (accessible)	FHACMP and PV spatial data	3
12a, 12b	New track (inaccessible, not assessed)	FHACMP and PV spatial data	3
11	Existing	Optional assessment area	3
Part of section 12 to Red Robin Battery, and Part of section 12 on West Kiewa Logging Road parallel with planned new section	Existing (West Kiewa Logging Road)	Optional assessment area	2.4
Track to overnight node 2A from location 2C	Existing (Fainter Fire Trail)	Optional assessment area	Approximately 125 m
Track to overnight node location 2C from Tawonga Huts	New track (accessible)	Optional assessment area	Approximately 250 m
Track to overnight node 2D from track section 9	New track (accessible)	Optional assessment area	Approximately 150 m
Total length as outlined in the FHACMP without optional track areas			58
Total length including optional track areas			61

The average width of the existing track (approximately 30 cm) equates to an area of 1.7 ha under the FHACMP (58 km of track) and 1.8 ha when including the proposed optional track areas (61 km of track).

The majority of the proposed track is 900 mm wide (including in sections of existing track). With the addition of a 2 m construction buffer (1 m either side of the track), the potential impact area is 2.9 m wide.

The potential extent of impacts are:

FHACMP:

- Track: 5.2 ha (58 x 0.9 m) minus 1.7 ha of existing track = **3.5 ha**.
- Track and construction buffer: 16.8 ha (58 km x 2.9 m) minus 1.7 ha of existing track = **15.1 ha**.

FHACMP plus new and optional track areas:

- Track: 5.5 ha minus 1.8 ha of existing track = **3.7 ha**.
- Track and construction buffer: 17.7 ha (61 km x 2.9 m) minus 1.8 ha of existing track = **15.9 ha**.

This does not take into account plans under the current FHACMP to widen yet undetermined lengths of track to 1.2 m.

3.1.2 Overnight nodes

The individual area for each proposed overnight node and total combined area is provided in Table 3. As the number and location of overnight nodes has not been finalised, mapping data is not yet available. The hatched areas indicating the proposed overnight nodes in the FHACMP were used to estimate their location and extent, and potential impacts to vegetation and fauna habitat have been assumed across the entire hatched area for each node included in the FHACMP.

Table 3. Type and areas of overnight nodes assessed for the Falls to Hotham Alpine Crossing Environmental Assessment (December 2020)

Overnight node	Node type	Source	Area (ha)
1A Bogong High Plains	Hiker Camps	FHACMP	1.5
1B/E Bogong High Plains	Hiker Camps	FHACMP	10.6
1C Bogong High Plains	Hiker Camps	FHACMP	2.4
1D Bogong High Plains	Operated Huts	FHACMP	4.9
1F Bogong High Plains	Undesignated	Alternative assessment area	undetermined
1G Bogong High Plains	Undesignated	Alternative assessment area	undetermined
2A Tawonga Huts	Hiker Camps	FHACMP	1.5
2B Tawonga Huts	Operated Huts	FHACMP	2.9
2C Tawonga Huts	Operated Huts	FHACMP	1.4
2D Tawonga Huts	Undesignated	Alternative assessment area	undetermined
3 Diamantina River	Hiker Camps	FHACMP	1.7
3 Red Robin Battery	Operated Huts	FHACMP	0.9
4 High Knob	Hiker Camps	FHACMP	0.97
4 High Knob	Operated Huts	FHACMP	1.1
Total area			30+

3.2 Flora

3.2.1 Floristic values

A total of 297 plant species were recorded in the assessment area, comprising 252 (85%) native species and 45 (15%) exotic species. A list of all flora species is provided in Appendix 2.

3.2.2 Listed ecological communities

EPBC Act-listed communities

The desktop review (Abzeco 2020) identified two EPBC Act listed communities which may occur in the assessment area:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act listed as Critically Endangered); and,
- Alpine Sphagnum Bogs and Associated Fens (EPBC Act listed as Endangered).

The dominant species and structural characteristics which define the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland community were not recorded within the assessment area, and it is also considered unlikely to occur there as it is mostly found at lower altitudes up to 1200 ASL (Beadle 1981).

Alpine Sphagnum Bogs and Associated Fens ecological community was recorded within the assessment area, and details are provided below.

Alpine Sphagnum Bogs and Associated Fens — EPBC Endangered

This community was recorded in the assessment area on the Bogong High Plains in 25 locations either intersecting the track or adjacent to it including:

- Five locations along Heathy Spur Track (section 2).
- Two locations along Big River Fire Trail (section 3).
- Four locations along the Australian Alps Walking Track (between Big River Fire Trail and Langford Aqueduct) (section 4).
- Five locations along Langford Aqueduct (section 5).
- One location on Langford Aqueduct (Cope Hut Track) (section 5).
- Six locations Between Bogong High Plains Road and Tawonga Huts (sections 6-7).
- Two locations at Tawonga Huts (section 9 and overnight node 2).

At Tawonga Huts, this community was recorded south-west of Location A within an additional section of proposed track (not included in the FHACMP) between Tawonga Huts and Location A. This option was discussed with PV staff and given the Alpine Sphagnum Bogs and Associated Fens component, it was no longer considered appropriate and so was not assessed.

The Alpine Sphagnum Bogs and Associated Fens community occurs in permanently wet areas along streams, valley edges and valley floors (Claridge 2016), and has a unique and distinctive suite of species. It is one of the rarest communities in Australia, occupying less than 0.2% of the country (Wahren *et al.* 2001).

Within the assessment area, this community supports rare or threatened flora species such as the Bogong Eyebright *Euphrasia eichleri*, Silky Snow-daisy *Celmisia sericophylla* and Cushion Rush *Juncus antarcticus*.

The community also provides habitat for galaxiid fish and other threatened fauna such as the Alpine Water Skink *Eulamprus kosciuskoii*, Alpine Bog Skink *Pseudemoia cryodroma*, Alpine She-oak Skink *Cyclodomorphus praecox*, Alpine Tree Frog *Litoria verreauxii alpina* and Alpine Spiny Crayfish *Euastacus crassus*. This community provides important sources of water and food for

native animals during dry periods, and performs other important ecological services including sediment trapping, water storage and carbon sequestration (Hope *et al.* 2009).

Alpine Sphagnum Bogs and Associated Fens is listed as an Endangered community under the EPBC Act (DAWE 2020a). It is consistent with the Alpine Bog Community and Fen (Bog Pool) community which is listed under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) (DELWP 2020b). Both the above-mentioned communities are consistent with Alpine Valley Peatland Ecological Vegetation Community (EVC) which has a bioregional conservation status of Endangered in Victoria (DELWP 2020e). These community names are used interchangeably throughout the report.

In Victoria, this community has a small geographic distribution and due to past disturbance (including from cattle grazing, fire and construction of infrastructure such as the Rocky Valley Dam), and now occurs in small fragmented and isolated locations across the Victorian Alps in alpine, subalpine and montane environments (DAWE 2009). Alpine Sphagnum Bogs and Associated Fens are two individual communities with different vegetation types, but are combined as a listed community due to their high level of interdependence (DAWE 2009). Only Alpine Sphagnum Bogs were recorded in the assessment area, and fens were notably absent.

Typically, *Sphagnum* species dominate (>30% ground cover) this community (DAWE 2009). This community can also include vegetation with a minor cover of *Sphagnum* spp., and greater cover of shrubs or species such as Spreading Rope Rush on the margins where *Sphagnum* species have been reduced or lost due to disturbance (DAWE 2009). Most of the Alpine Sphagnum Bogs in the assessment area fit the latter description. There are no condition thresholds that define Alpine Sphagnum Bogs and Associated Fens (DAWE 2009).

The Alpine Sphagnum Bogs and Associated Fens in the assessment area were located along permanently wet areas including streams, drainage lines or permanent ground water expression points (soaks). The impeded drainage leads to incomplete decomposition of organic material and the formation of peat (DAWE 2009). Most were dominated by sedges (*Carex* spp.) and were located in flatter valley locations often referred to as 'valley bogs' (DAWE 2009). They all occurred above 1600 m ASL both above and below the treeline.

Alpine Sphagnum Bogs and Associated Fens are important ecologically as they store carbon, and filter sediments, nutrients and pathogens, maintaining water quality. They also have a high water-holding capacity which may assist in regulating water flow in the surrounding environment (DoE 2015) and managing erosion (DAWE 2009).

This community provides habitat for rare or threatened flora and fauna species, including some endemic species that have a limited distribution confined by climate, geology and hydrology (DoE 2015, DAWE 2009). The community is also very significant due to pollen and charcoal deposits which provide opportunities for analysis of past climatic conditions, assisting with research on climate change and its potential impacts (DAWE 2009).

Victorian FFG Act listed communities

Four FFG Act listed communities were identified as likely to occur in the assessment area in the desktop review (Abzeco 2020). During the field assessment, two of these communities were recorded as being present but no evidence of the remaining two communities was found (Table 4).

Table 4. FFG Act listed vegetation communities recorded in the assessment area or surrounds and determined as being likely to occur there (Abzeco 2020; DELWP 2020b) (September 2020)

Communities listed as threatened under the <i>Flora Fauna Guarantee Act 2019</i> considered likely to occur in or near the assessment area			
Community	Status	Track section	Field assessment results
Alpine Bog Community	Listed	2,3,4,5,7,9	Present
Alpine Snowpatch Community	Listed	14	Present
<i>Caltha introloba</i> Herbland Community	Listed	NA	Not present <i>Caltha introloba</i> dominated open herbland was not recorded in the assessment area
Fen (Bog Pool) Community	Listed	NA	Not present No fens/bog pools fitting the community description were recorded in the assessment area

Alpine Bog Community — FFG Act listed

The Alpine Bog Community was recorded across the Bogong High Plains and is described as being restricted to permanently wet sites such as ground water expression points and drainage lines with gentle to moderate slopes. This community is characterised by *Sphagnum* species which form peat soils ranging from one to several metres deep depending on the substrate. Alpine Bog Communities occur in alpine, subalpine and montane locations, generally above the tree line (~1200 m ASL). As stated above, this community is equivalent to the EPBC Act Listed Endangered Alpine Sphagnum Bogs and Associated Fens community.

Alpine Snowpatch Community — FFG Act listed

The Alpine Snowpatch Community was recorded near Mount Feathertop and is a rare vegetation type that is restricted to steep, sheltered southerly and easterly slopes above 1600 m ASL, where snow cover is persistent into early summer (diurnal) and the growing season is reduced. The community is characterised by a sward structure that is less than 10 cm in height and typically dominated by Mountain Sedge, Alpine Wallaby-grass and Ledge Grass, with herbs such as Slender Snow-daisy. The existing track alignment intersects this community.

Ecological Vegetation Classes (EVCs)

A total of 14 EVCs (and a 'Cleared/Severely Disturbed' vegetation category which has an assigned EVC number 58 [DELWP 2016]) were recorded in the assessment area. They included three EVCs with a bioregional conservation status of Endangered, seven with a bioregional conservation status of Rare, three with a bioregional conservation status of Least Concern and one EVC which does not currently have an allocated status (Table 5).

Descriptions of the EVCs found within the assessment area and representative photos are provided in Table 5.

There were many changes of EVC along the trail alignment, and vegetation classes were intersected by the proposed alignment or were in close proximity to the track, often in fine scale mosaics, making it difficult to define one EVC in the narrow, linear assessment area. To manage this, combinations of EVCs were recorded jointly for segments 20 m long or more. For example, if there was Alpine Grassland on one side of the track and Sub-alpine Shrubland on other side of the track which crossed over the track in small pockets, then the vegetation was recorded as Alpine Grassland EVC 1001/Alpine Sub-Alpine Shrubland EVC 42.

Sub-alpine Pond Herbland

Sub-alpine Pond Herbland was recorded in the assessment area (see EVC descriptions below). This community has not been mapped across the state and does not have a DELWP benchmark, but it has been allocated the EVC number of 0913. The community is described in the unpublished report: *Typology for wetlands and related vegetation in Victoria. EVC descriptions: Existing, proposed amendments and new descriptions* (Frood 2003), and included in the Index of Wetland Condition DELWP (2020h). Currently, little is known about this EVCs extent and ecology.

The presence of Sub-alpine Pond Herbland in the assessment area is significant as it does not appear to have been recorded on the Bogong High Plains before, and is only known from extremely small, localised areas in the Victorian Alps near Mt Wellington and Mount Buffalo.

The community is described as consisting of small seasonal ponds within alpine vegetation that may contain herbs or have no vegetation. The ponds typically occur within sub-alpine wet heath, damp heath and/or damp grasslands. Sites are known to occur between 1470-1560 m ASL, while this system sits at a higher elevation within the assessment area. Typical species include Mat Water-milfoil *Myriophyllum pedunculatum*, Alpine Club-rush *Isolepis crassiuscula*, *Agrostis* spp. and Dwarf Buttercup *Ranunculus millanii*. Others including Fen Sedge *Carex gaudichaudiana*, Creeping Raspwort *Gonocapus micranthus* subsp. *micranthus*, Candle Heath *Richea continentis*, *Juncus* spp., *Poa* spp. Star Plantain *Plantago muelleria*, *Rytidosperma* spp., Alpine Baeckea *Baeckea gunniana* and Short Bent-grass *Deyeuxia brachyathera* occur on the verges.

This community does not have a bioregional conservation classification, however, given its limited distribution and impacts from cattle, deer, horses, and weeds, it should be considered an Endangered EVC (D. Frood pers. comm.).

Table 5. Ecological Vegetation Class (EVC) descriptions and bioregional conservation status (November/December 2020)

<p>Alpine Grassland EVC 1001</p> <p><i>Victorian Alps Bioregional Conservation Status: Rare</i></p>
<p>This high-altitude alpine tussock grassland occurs above 1500 m ASL in valleys and saddles which are exposed to cold air drainage, frost and snow, and sheltered from high winds, often between heathlands and shrublands (e.g. on the Bogong High Plains and Howitt Plains). In the assessment area, this EVC was scattered across the Bogong High Plains, as well as along parts of the Razorback track and on Mount Feathertop, and at the western end of Diamantina Spur Walking Track. On the Bogong High Plains, Alpine Grassland was characterised by a dense cover of low tussock grasses interspersed with a variety of herbs. The dominant grasses included Soft Snow-grass <i>Poa hiemata</i>, and Horny Snow-grass <i>Poa fawcettiae</i>. The dominant herbs included <i>Brachyschome</i> spp., <i>Luzula</i> spp., <i>Craspedia</i> spp., <i>Ranunculus</i> spp., Alpine Buttons <i>Leptorhynchos squamatous</i> subsp. <i>alpinus</i>, <i>Celmisia</i> spp. and Showy Violet <i>Viola betonicifolia</i> subsp. <i>betonicifolia</i>. The vegetation was in good condition, with a few scattered weeds confined to areas of disturbance including along the edges of the walking track, maintenance vehicle tracks, and around existing camping areas. The main weeds species were Sheep Sorrel *<i>Acetosella vulgaris</i> and Flatweed *<i>Hypochaeris radicata</i>, as well as Milfoil *<i>Achillea millefolium</i> toward the southern end of the Razorback track.</p>
 <p>Image 21. Alpine Grassland on Heathy Spur Track (December 2020), (Image credit: Louise Rodda)</p>

Alpine Grassy Heathland EVC 1004*Victorian Alps Bioregional Conservation Status: Rare*

Typified by a variably open structure of alpine heath species to 1 m tall, interspersed with tussock grasses and forbs. It generally occurs on slopes above 1400 m ASL where tree growth is limited by frost and exposure. This was the most commonly occurring EVC in the assessment area on the Bogong High Plains, and was also scattered along sections of Diamantina Spur Walking Track and Razorback track where it consisted of low closed tussock grassland interspersed with scattered heath species. The dominant grass species were Soft Snow-grass and Horny Snow-grass, with a mix of herbs present including daisies, Billy Buttons, buttercups, Bidgee-widgee *Acaena novae-zelandiae*, Snow-daisies, Alpine Buttons, Australian Caraway *Oreomyhrris eripoda* and Fleabane *Pappochroma* spp. Heath species included Alpine Rusty Pods *Hovea montana*, Yellow Kunzea *Kunzea muelleri*, Alpine Baeckea *Baeckea gunniana*, Silky Bossiaeae *Bossiaeae sericea*, Leafy Bossiaeae *Bossiaeae foliosa*, Alpine Grevillea *Grevillea australis*, Ozothamnus spp., Alpine Phebalium, *Phebalium squamulosum* subsp *alpinum*, and Alpine Mint-bush *Prostanthera cuneata*. This vegetation was in good condition with few weeds, mainly *Sheep Sorrel and *Flatweed along the path, aqueduct, other vehicle tracks and existing camping areas.



Image 22. Alpine Grassy Heathland on Heathy Spur Track (December 2020), (Image credit: Louise Rodda)

Sub-alpine Shrubland EVC 0042*Victorian Alps Bioregional Conservation Status: Rare*

This EVC ranges from dense to sparse shrubland above 1200 m ASL in locations that experience extreme conditions including long periods of snow cover, shallow soils, and large areas of exposed rock. This EVC occurs under scattered mallee-form eucalypts (typically Snow Gum *Eucalyptus pauciflora*), often with a high abundance and diversity of forbs and graminoids. Patches of Sub-alpine Shrubland were scattered throughout the assessment area across the Bogong High Plains, Diamantina Spur Walking Track and Razorback track. Structure varied from low, closed vegetation up to 1 m high, with and without Snow Gums (e.g. Snow Gums were present in this EVC along parts of the Langford Aqueduct). Common species in this EVC included *Acrothamnus* spp., Alpine Star-bush *Asterolasia trymalioides*, Alpine Baeckea, Silky Bossiaea, Alpine Bottlebrush *Callistemon pityoides*, Yellow Kunzea, Alpine Grevillea, Alpine Orites *Orites lancifolius*, *Ozothamnus* spp. Alpine Phebalium, Alpine Podolobium *Podolobium alpestre*, Alpine Rusty Pods and Alpine Mint-bush. Forbs included daisy bushes, *Veronica* spp., Victorian Buttercup *Ranunculus victoriensis*, *Asperula* spp., and Soft Crane's Bill *Geranium potentilloides*. Along the aqueduct there was a high cover of Royal Grevillea *Grevillea victoriae* in some locations. This vegetation community was in good condition, with few weeds including *Sheep Sorrel and *Flatweed, particularly along the aqueduct.



Image 23. Low (<1m tall) Sub-alpine Shrubland on Heathy Spur Track (December 2020), (Image credit: Louise Rodda)



Image 24. Royal Grevillea *Grevillea victoriae* classified as Rare in Victoria (DSE 2014) in Sub-alpine Shrubland >1m tall along sections of Langford Aqueduct (December 2020), (Image credit: Louise Rodda)



Image 25. Sub-alpine Shrubland on skeletal soils above a track cutting with areas of exposed rock, overnight node 1 location B and E at Cope Hut (December 2020), (Image credit: Louise Rodda)

Sub-alpine Woodland EVC 0043*Victorian Alps Bioregional Conservation Status: Least Concern*

Occurs on a wide range of geologies and aspects above 1200 m ASL, in areas of high rainfall and where snow persists over winter. These environs are typical across the Bogong High Plains, and stands of Sub-alpine Woodland were scattered throughout this part of the assessment area. The community was present along the more elevated western section of Diamantina Spur Walking Track and in discrete sections along the northern portion of the Razorback track. This vegetation primarily consisted of a canopy of Alpine Sally *Eucalyptus pauciflora* subsp. *niphophilla*, although within the High Knob region of Diamantina Spur Walking Track, some of the canopy appears to be Bogong Sally *Eucalyptus pauciflora* subsp. *hedraia*, which is endemic to the local area. The understorey was dominated by a mix of short and tall shrubs and various forbs including Alpine Star-bush, Silky Bossiaeae, Alpine Rusty-pods, Tangled Shrub-violet *Melicytus angustifolius* subsp. *divaricatus*, Alpine Orites, Alpine Podolobium, Alpine Mint-bush, Olearia spp., *Ozothamnus* spp., Alpine Pepper, *Tasmannia xerophila* subsp. *xerophila*, Alpine Phebalium, Alpine Rusty Pods and Alpine Grevillea. Forbs included: *Pimelea* spp., Bidgee-widgee, woodruffs *Asperula* spp., *Brachyscome* spp., *Celmisia* spp., Billy Buttons, Tasman Flax-lily *Dianella tasmanica*, Soft Cranes's-bill, fleabanes, buttercups, Twin-flower Knavel *Scleranthus biflorus*, Prickly Starwort *Stellaria pungens*, Alpine Buttons, and Ledge-grass *Poa hothamensis* var. *hothamensis*. This vegetation community was in good condition, with few weeds including the ubiquitous *Sheep Sorrel and *Flatweed, as well as scattered Sticky Mouse-ear Chickweed **Cerastium glomeratum* s.s., Self-heal **Prunella vulgaris* and White Clover **Trifolium repens*. The occasional Apple **Malus* sp. and Rusty Sallow (Willow) **Salix cinerea* were observed primarily in association with camping and hut locations, and one Sweet Briar **Rosa rubiginosa* was found in close proximity to Weston Hut. Most patches of Sub-alpine Woodland were recently burnt and regenerating well. A few stands of long unburnt woodland were located along Heathy Spur Track, the Langford West Aqueduct Road, and between Cope Hut and the Bogong High Plains Road. Unburnt sections are also present midway along Diamantina Spur Walking Track.



Image 26. Sub-alpine Woodland on Heathy Spur Track (December 2020), (Image credit: Louise Rodda)

Alpine Damp Grassland EVC 1002*Victorian Alps Bioregional Conservation Status: Rare*

Dense tussock grassland typically dominated by Bog Snow-grass, located in high altitude valleys (in and around wet heathland and peatlands) and on plains or plateaus with basalt derived soils above 1600 m ASL. This EVC is subject to seasonal waterlogging. Alpine Damp Grassland occurred in a number of locations across the Bogong High Plains such as Weston Spur track, where it was also present as a mosaic with other vegetation types. Alpine Damp Grassland areas were dominated by Bog Snow-grass, with a variety of forbs such as Victorian Buttercup, Australian Caraway *Oreomyrrhis eripoda*, *Cardamine* spp., Silver Snow-daisy *Celmisia tomentella*, *Plantago* spp., Southern Woodrush *Luzula modesta*, *Brachyscome* spp., Alpine Yam-daisy *Microseris lanceolata*, Alpine Marsh-marigold and Spreading Rope-rush *Empodium minus*. This EVC was generally in good condition, except in some spots on the existing track which had bare areas and were channelised where hikers had walked either side of centre. Common weeds included *Sheep Sorrel and *Flatweed, as well as scattered Sweet Vernal-grass **Anthoxanthum odoratum*, Sticky Mouse-ear Chickweed, White Clover, Dandelion **Taraxacum* spp. and Forget-me-not **Myosotis discolor*.



Image 27. Alpine Damp Grassland in the Bundara-Cobungra Remote and Natural Area north-east of Mount Jim (December 2020), (Image credit: Louise Rodda)

Alpine Valley Peatland EVC 0288*EPBC Act listed as Endangered (Alpine Sphagnum Bogs and Associated Fens)**Victorian FFG Act listed (Aline Bog Community)**Victorian Alps Bioregional Conservation Status: Endangered*

Sedge dominated communities with forbs, mosses, and few shrubs typically <0.5 m tall. On the Bogong High Plains, this EVC occurs in valleys from 1600 to 1700 m ASL, often in old meander channels with deep humic alluvium. Most of these communities are disturbed or modified due to past history of grazing and dam construction.

Watchbed Creek is one of the few remaining examples, as much of this community was flooded and is now beneath Rocky Valley Storage Dam. Common species forming part of this EVC in the assessment area include Spreading Rope-rush, Candle Heath *Richea continentis*, Fen Sedge *Carex gaudichaudiana*, Tall Sedge *Carex appressa*, peat mosses *Sphagnum* spp., Twin-flower Knavel, Alpine Trachymene *Trachymene humilis* subsp. *breviscapa*, Thyme Speedwell *Veronica serpyllifolia*, Southern Woodrush, Silver Snow-daisy, Mountain Woodruff *Asperula gunnii*, Bidgee-widgee, Lilac Bitter-cress *Cardamine lilacina*, Victorian Buttercup, Bog Billy-buttons *Craspedia lamicola*, Ashen Billy-buttons *Craspedia gracilis*, Alpine Club-rush *Isolepis crassiuscula*, Bog Snow-grass *Poa costiniana*, Alpine Rusty-pods and Ace of Spades *Epacris gunnii*. This community was disturbed in places where it was intersected by the walking track, for example, at Watchbed Creek where the creek is diverted through a pipe under the fire trail that intersects the peatland. Smaller peatlands occurred adjacent to and were intersected by the walking track along Heathy Spur Track and Australian Alps Walking Track as it descended to the Langford Aqueduct, and between the Bogong High Plains Road and Tawonga Huts. Threats to the smaller peatlands included disturbance by pest animals resulting in exposed soil and trampled vegetation, and invasion by weeds including *Sheep Sorrel, *Flatweed, and Brown-top Bent **Agrostis capillaris* var *capillaris*.



Image 28. Alpine Valley Peatland along Watchbed Creek, piped under Big River Fire Trail (December 2020), (Image credit: Louise Rodda)

Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic EVC 0211

Victorian Alps Bioregional Conservation Status: Endangered

Alpine Valley Peatland status (see above)

A mosaic of Sub-alpine Wet Heathland and Alpine Valley Peatland (see Alpine Valley Peatland description above). Sub-alpine Wet Heathland is associated with small creeks, drainage lines and ground water expression points (soaks) above 1100 m ASL on organic soils, and is closely related to Alpine Heathland. The structure comprises shrubs up to 2 m tall, with a dominant understory of sedges and grasses, and some forbs present. This community occurred at Langfords Gap along the Langford Aqueduct and around Tawonga Huts. Common flora species included Spreading Rope Rush, *Sphagnum* spp., Fen Sedge, Candle Heath, Bog Snow-grass, Carpet Sedge *Carex jackiana*, Alpine Marsh-marigold *Psychrophila introloba*, Alpine Everlasting *Xerochrysum subundulatum*, Ashen Billy-buttons, Swamp Heath *Epacris paludosa*, Alpine Grevillea, Alpine Baeckea, Alpine Mint-bush and Alpine Phebalium. This vegetation community was being impacted by walking trails at Tawonga Huts and the vehicle track along the Langford Aqueuduct. Impacts included the creation of bare ground and soil compaction from walkers and horses, and invasion by weeds. The main weeds in this community at Tawonga Huts were *Sheep Sorrel and *Flatweed. Additional weeds along the Langford Aqueduct are species listed under the Cleared/Severely Disturbed EVC described below.



Image 29. Sub-alpine Wet-Heathland /Alpine Valley Peatland Mosaic at Overnight Node 2, Tawonga Huts, looking towards locations A (to the right, out of frame) and C (to the left, out of frame) (December 2020), (Image credit: Louise Rodda)



Image 30. Sub-alpine Wet-Heathland/Alpine Valley Peatland Mosaic, proposed overnight Node 2 near Location B at Tawonga Huts (December 2020), (Image credit: Louise Rodda)

Sub-alpine Pond Herbland EVC 913

Victorian Alps Bioregional Conservation Status: No status allocated

Small seasonal herbland pond systems within alpine to subalpine vegetation. This community occurs in mosaic with Sub-alpine Wet Heathland and/or Alpine Damp Grassland. This EVC is very localised in the Victorian Alps and the total area of occurrence is extremely small. Typical vegetation includes small semi-aquatic herbs and sedges, although sometimes plants are absent. In the assessment area, the more common species recorded in this system included Dwarf Buttercup *Ranunculus millanii*, Mat Water-milfoil *Myriophyllum pedunculatum* subsp. *pedunculatum*, Mud Pratia, *Lobelia surrepens*, Alpine Club-rush and Fen Sedge. Species on the pond edges included Bog Snow-grass, Alpine Cotula *Cotula alpina*, Spreading Rope Rush and Bald-seeded Willow-herb *Epilobium curtisiae*. This EVC is located in the Bundara-Cobungra Remote and Natural Area (RNA) along the track in section 7 north-east of Mount Jim on the Bogong High Plains, and was sitting within Alpine Damp Grassland. The vegetation was in good condition, except for areas of bare ground, pugging and trampling along and either side of the walking track. No weeds were recorded.



Image 31. Sub-alpine Pond Herbland in the assessment area on the Bogong High Plains in the Bundara-Cobungra Remote and Natural Area, north east of Mount Jim (December 2020), (Image credit: Louise Rodda)

Alpine Rocky Outcrop Heathland EVC 1013

Victorian Alps Bioregional Conservation Status: NA (used default Sub-alpine Treeless Vegetation EVC 44): Rare. Source (DSE undated):

https://www.environment.vic.gov.au/__data/assets/pdf_file/0012/50511/Bioregional-Conservation-Status-for-each-BioEVC.pdf

Alpine Rocky Outcrop Heathland consists of low (<0.5 m) sparse to dense heathland with scattered forbs and grasses on shallow soils of exposed peaks and ridges, typically in eroded areas where rock is at or near the surface. Common species in this EVC in the assessment area included Alpine Grevillea, Alpine Rusty Pods, Alpine Phebalium, Yellow Kunzea, Soft Snow-grass, Horny Snow-grass, Soft Snow-grass, Bristle Grass *Trisetum spicatum* subsp. *australiense*, Leafy Daisy *Brachyschome rigidula*, Mountain Everlasting *Coronidium monticola* and Alpine Podolepis *Podolepis robusta*. This vegetation was in good condition. It is located in the Bundara-Cobungra RNA along the track section north-east of Mount Jim on the Bogong High Plains, as well as the western end of Weston Spur track, and a small section of the proposed new trail between Tawonga Hut and Weston Spur track. This EVC also occurred in discrete sections along the Razorback track and as a mosaic with Sub-alpine Woodland midway along the Diamantina Spur Walking Track.



Image 32. Alpine Rocky Outcrop Heathland (on Basalt outcrop) on the Bogong High Plains, in the Bundara-Cobungra Remote and Natural Area, north-east of Mount Jim (December 2020), (Image credit: Louise Rodda)

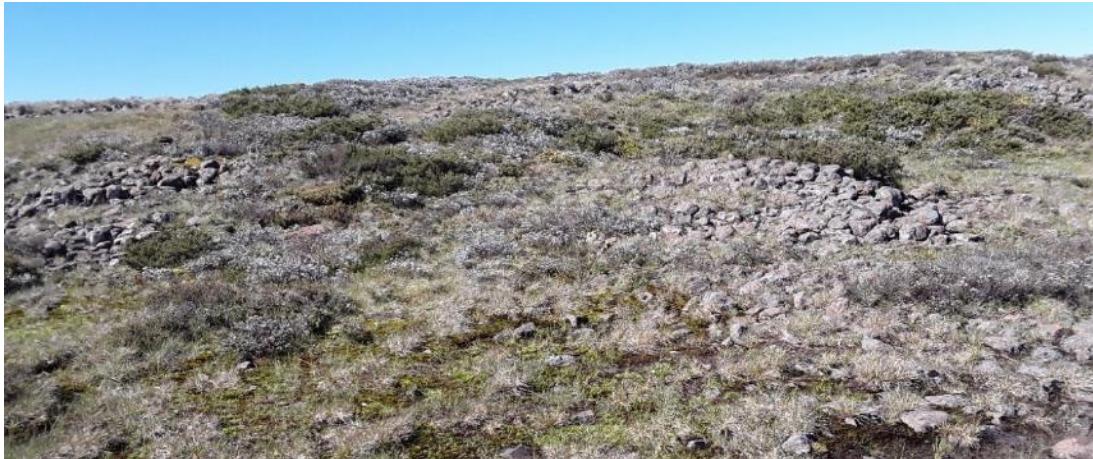


Image 33. Alpine Rocky Outcrop Heathland (on Basalt outcrop) on the Bogong High Plains, in the Bundara-Cobungra Remote and Natural Area, north east of Mount Jim (December 2020), (Image credit: Louise Rodda)



Image 34. Alpine Rocky Outcrop Heathland (on basalt outcrop) on the Bogong High Plains, between Tawonga Huts and Weston Spur track (December 2020), (Image credit: Matthew Hatton)

Alpine Dwarf Heathland EVC 0170

Victorian Alps Bioregional Conservation Status: NA (used default Sub-alpine Treeless Vegetation EVC 44): Rare. Source (DSE undated):

https://www.environment.vic.gov.au/__data/assets/pdf_file/0012/50511/Bioregional-Conservation-Status-for-each-BioEVC.pdf

A very low open heathland generally to 0.2 m high. Occurs on exposed ridges and peaks above 1700 m ASL experiencing strong winds, frosts and high temperatures in summer. Located on rocky pavements with minimal soil development. Shrubs are generally wind-pruned. One of the rarest plant communities in the state and subject to damage by horses, cattle (historic grazing) and bushwalkers. The common species in this vegetation community within the assessment area included Ace of Spades, Yellow Kunzea, Alpine Grevillea, Soft Snow-grass, Carpet Heath *Pentachondra pumila*, Silver Ewartia *Ewartia nubigena*, White Purslane *Montia australis* and Alpine Stackhousia *Stackhousia pulvinaris*. The vegetation was in good condition, with very low weed cover other than scattered *Sheep Sorrel and *Flatweed. This community was located in the Bundara-Cobungra RNA along the track in section 7 north-east of Mount Jim on the Bogong High Plains, at the western end of Weston Spur track where it merges with Alpine Grassland, and along a large section of the proposed track between Tawonga Huts and Weston Spur track where an exposed ridgeline supports a mosaic of Alpine Dwarf Heathland with Alpine Grassland and Rocky Outcrop Heathland. Small areas of Alpine Dwarf Heathland were also present in the Hotham Heights trail area south of the Great Alpine Road.



Image 35. Alpine Dwarf Heathland, Australian Alps Walking Track, Bogong High Plains (December 2020), (Image credit: Louise Rodda)



Image 36. Alpine Dwarf Heathland along the west section of Weston Spur track, Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Montane Damp Forest EVC 38

Victorian Alps Bioregional Conservation Status: Least Concern

Montane Damp Forest generally occurs on well-developed colluvial soils on a variety of aspects from approximately 700-1500 m ASL. This community is typically characterised by a canopy of Mountain Gum *Eucalyptus dalrympeana* subsp. *dalrympeana* and Alpine Ash *Eucalyptus delegatensis* to ~ 30 m tall, over a dense shrub layer including species such as Silver Wattle *Acacia dealbata*, Mountain Hickory Wattle *Acacia obliquinervia*, Tree Lomatia *Lomatia fraseri*, Dusty Daisy-bush *Olearia phlogopappa* subsp. *flavescens*, Tall Oxylobium *Oxylobium arborescens* and Sticky Everlasting *Ozothamnus thrysoideus*. The ground layer includes a variety of herbs, grasses and ferns, such as Tasman Flax-lily *Dianella tasmanica*, Slender Tussock-grass *Poa tenera*, Weeping Grass *Microlaena stipoides* var. *stipoides*, Sword Tussock-grass *Poa ensiformis*, Mother Shield-fern *Polystichum proliferum*, Austral Bracken *Pteridium esculentum* subsp. *esculentum*, Fishbone Waterfern *Blechnum nudum*, Mountain Fireweed *Senecio gunnii* and Common Trigger-plant *Stylium armeria*. This vegetation type was in good condition, with low weed cover in most areas, although it supported a variety of exotic species, particularly along road edges and near camping areas. Exotic weed species included *Sweet Vernal-grass, *Yorkshire Fog, St John's Wort **Hypericum perforatum* subsp. *veronense*, Apple, Creeping Buttercup **Ranunculus repens*, Blackberry **Rubus polyanthemos* and *Rusty Sallow. Montane Damp Forest occurs in one long reach between around Weston Hut and the western end of Diamantina Spur Walking Track below approximately 1500 m ASL. The community extends throughout the Diamantina Horse Yard area, as well as the Red Robin Battery section of the assessment area.



Image 37. Montane Damp Heathland on the western face of Diamantina Spur Walking Track (December 2020) (Image credit: Matthew Hatton)



Image 38. Montane Damp Heathland bordering the Diamantina River near Diamantina Horse Yards (December 2020), (Image credit: Matthew Hatton)



Image 39. Montane Damp Forest at the Red Robin Battery site (December 2020), (Image credit: Matthew Hatton)

Montane Riparian Thicket EVC 0041

Victorian Alps Bioregional Conservation Status: Least Concern

Occurs as a closed shrubland to approximately 8 m tall in montane and sub-alpine areas, often within Montane Damp Forest along drainage lines, streams with gentle gradients and in soaks at the heads of gullies on south-facing aspects. Soils are waterlogged colluviums or alluviums rich in organic matter. The characteristic canopy species is Mountain Tea-tree *Leptospermum grandifolium*, although the much larger Myrtle Beech *Nothofagus cunninghamii* may also be present. The understorey consists of a variety of shade-tolerant species, with ferns typically dominant over a sparser cover of sedges, grasses and other herbs. Montane Riparian Thicket was identified in one location only, where the West Kiewa River crosses West Kiewa Logging Road near Red Robin Battery. Vegetation was in good condition and characterised by mature Mountain Tea-tree and young Ferny Panax *Polyscias sambucifolia* subsp. 2 over dense Hard Water-fern *Blechnum wattsii* and Fishbone Water-fern. Weed cover was low, except for the road/track verge which supported a variety of common weeds typical of regularly disturbed areas such as *Sweet Vernal-grass, *Yorkshire Fog and *Flatweed.



Image 40. Montane Riparian Thicket at the junction of the West Kiewa River and West Kiewa Logging Road near the Red Robin Battery area (December 2020), (Image credit: Matthew Hatton)

Snowpatch Grassland EVC 1012

Victorian FFG Act listed (Alpine Snowpatch Community)

Victorian Alps Bioregional Conservation Status: NA (used default Sub-alpine Treeless Vegetation EVC 44): Rare. Source (DSE undated):

https://www.environment.vic.gov.au/__data/assets/pdf_file/0012/50511/Bioregional-Conservation-Status-for-each-BioEVC.pdf

Snowpatch Grassland occurs in alpine areas above 1600 m ASL, and is restricted to the sheltered slopes on southerly or easterly (lee) aspects where snow cover persists beyond the general thaw into early summer, thereby reducing the growing season. The community is characterised by a sward structure that is less than 10 cm high, typically dominated by Mountain Sedge *Carex hebes*, Alpine Wallaby-grass *Rytidosperma nudiflorum* and Ledge Grass *Poa hothamensis*. Other common components include Slender Snow-daisy, Victorian Snow-daisy, Alpine Woodruff *Asperula pusilla*, Tufted Knawel *Scleranthus diander*, Prickly Starwort *Stellaria pungens* and Showy Violet *Viola betonicifolia* subsp. *betonicifolia*. Snowpatch Grassland was in good condition, with very low weed cover apart from scattered *Sheep Sorrel and *Flatweed. Within the assessment area, this community is entirely restricted to the upper section of Mount Feathertop, more specifically, the southern face.



Image 41. Snowpatch Grassland, Mount Feathertop (December 2020) (Image credit: Matthew Hatton)



Image 42. Snowpatch Grassland on the south face of Mount Feathertop (December 2020) (Image credit: Matthew Hatton)

Cleared/Severely Disturbed (allocated EVC number 58) (DELWP 2014)

Victorian Alps Bioregional Conservation Status: No status

Vegetation that has been modified due to disturbance impacts. In the assessment area, this includes vehicle roads and tracks, car parks, huts, camping platforms, walking tracks, rock walling, bridging and aqueducts. Impacts include soil compaction, vegetation removal and a high cover of weeds. The more common weed species were *Sheep Sorrel, Brown-top Bent **Agrostis capillaris* *Flatweed, **Taraxacum* spp. White Clover **Trifolium repens*, Sweet Vernal-grass **Anthoxanthum odoratum*, Creeping Fescue **Festuca rubra*, Yorkshire Fog **Holcus lanatus*, Soft Rush **Juncus effusus* (particularly along Langford Aqueduct), Timothy Grass **Phleum pratense*, Squirrel-tail Fescue **Vulpia bromoides*, Grey Sallow **Salix cinerea* (Particularly along Heathy Spur Track), and *Milfoil (associated with roadsides and carparking at the start of the Razorback track).



Image 43. Cope Aqueduct bridge crossing and Cope Saddle Track near Cope Hut (December 2020), (Image credit: Matthew Hatton)



Image 44. Langford West Aqueduct Road and Langford Aqueduct (December 2020), (Image credit: Matthew Hatton)

Trail alignment — Ecological vegetation classes (EVCs)

A summary of the EVCs recorded in each track section, including their conservation status and corresponding listed communities, is provided in Table 6.

Table 6. List of EVCs and their bioregional conservation status recorded in sections of the proposed FHAC trail alignment

Legend:

R = recorded

EVC = Ecological Vegetation Class

BCS = Victorian Bioregional Conservation Status

EPBC = Listed under the *Environment Protection and Biodiversity Conservation Act 1999*

FFG = Listed under the *Flora and Fauna Guarantee Act 1988*

EVC	BCS	Status	Track sections															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Alpine Damp Grassland	Rare							R	R			R	R		R			
Alpine Dwarf Heathland	Rare							R	R			R	R		R			R
Alpine Grassland	Rare			R	R	R	R	R	R	R	R	R	R		R	R	R	R
Alpine Grassy Heathland	Rare			R	R	R	R	R	R	R	R	R	R		R	R	R	R
Alpine Rocky Outcrop Heathland	Rare							R				R	R		R			
Alpine Valley Peatland	Endangered	EPBC FFG		R	R	R	R	R										
Cleared/ Severely Disturbed	No status		R	R		R	R		R	R			R			R	R	
Montane Damp Forest	Least Concern												R	R				
Montane Riparian Thicket	Least Concern													R				
Snowpatch Grassland	Rare	FFG														R		
Sub-alpine Pond Hermland	No status								R				R					
Sub-alpine Shrubland	Rare			R	R	R	R			R	R			R	R	R		
Sub-alpine Wet Heathland/	Endangered	EPBC FFG					R				R							

EVC	BCS	Status	Track sections															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Alpine Valley Peatland Mosaic																		
Sub-alpine Woodland	Least Concern			R		R	R			R	R	R	R		R		R	R

Overnight nodes — Ecological vegetation classes (EVCs)

Seven EVCs in total were recorded at the proposed overnight node locations. A summary and images of individual EVCs at each proposed overnight node are provided in Table 7.

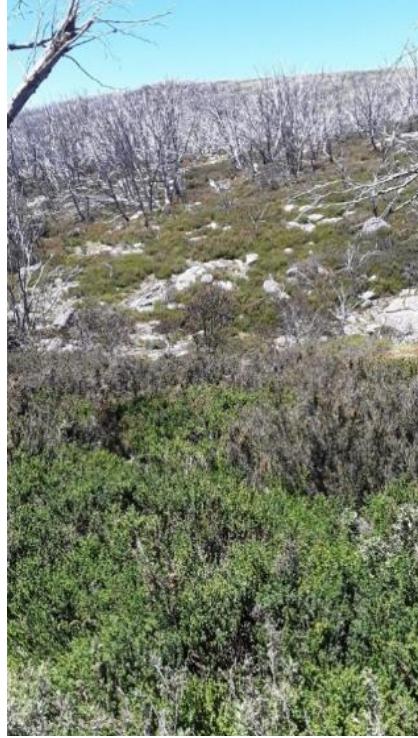
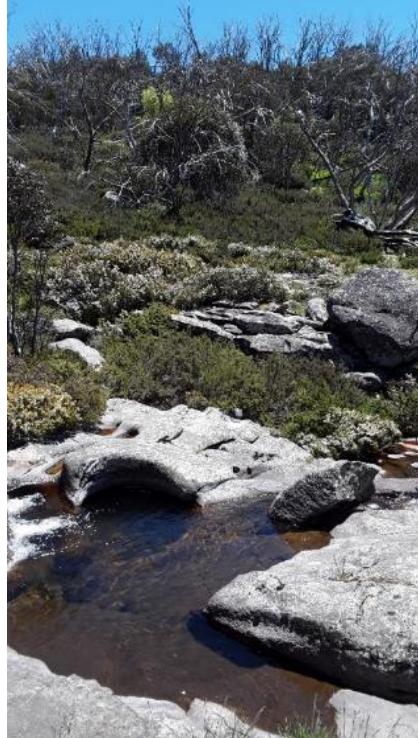
Table 7. Ecological Vegetation Classes (EVCs) recorded in the overnight nodes, December 2020

Overnight node	EVC		
1A Bogong High Plains –hiker camps (area extended east)	Alpine Grassland/Alpine Grassy Heathland fringed by Sub-alpine burnt Woodland	 <p>Image 45. Proposed overnight node 1A (December 2020), (Image credit: Louise Rodda)</p>	 <p>Image 46. Proposed overnight node 1A (December 2020), (Image credit: Louise Rodda)</p>

Overnight node	EVC		
1B/E Bogong High Plains —hiker camps/ operated huts	Sub-alpine Woodland (burnt)/Sub-alpine Shrubland	 Image 47. Proposed overnight node 1B/E (December 2020), (Image credit: Louise Rodda)	 Image 48. Proposed overnight node 1B/E (December 2020), (Image credit: Louise Rodda)

Overnight node	EVC		
1D Bogong High Plains – operated huts	Sub-alpine Woodland (burnt)	 Image 49. Proposed overnight node 1D (December 2020), (Image credit: Louise Rodda)	 Image 50. Proposed overnight node 1D (December 2020), (Image credit: Louise Rodda)
1F – Bogong High Plains, alternative option – hiker camps/ operated huts	Sub-alpine Woodland (burnt)/Sub-alpine Shrubland/Alpine Grassy Heathland (adjoins long unburnt Snow Gums)	 Image 51. Proposed overnight node 1F (December 2020), (Image credit: Louise Rodda)	 Image 52. Proposed overnight node 1F (December 2020), (Image credit: Louise Rodda)

Overnight node	EVC		
1G – Bogong High Plains alternative option – hiker camps/operated huts	Sub-alpine Woodland (burnt)/Sub-alpine Shrubland	 <p data-bbox="759 720 1349 783">Image 53. Proposed overnight node 1G (December 2020), (Image credit: Louise Rodda)</p>	 <p data-bbox="1448 720 2039 783">Image 54. Proposed overnight node 1G (December 2020), (Image credit: Louise Rodda)</p>
2A Tawonga Huts – hiker camps	Alpine Grassy Heathland/Sub-alpine Shrubland fringed by Sub-alpine Woodland (burnt)	 <p data-bbox="759 1260 1349 1323">Image 55. Proposed overnight node 2A (December 2020), (Image credit: Louise Rodda)</p>	 <p data-bbox="1448 1260 2039 1323">Image 56. Proposed overnight node 2A (December 2020), (Image credit: Louise Rodda)</p>

Overnight node	EVC		
<p>Proposed location of new track between 2A and 2C via 'swimming hole' (Image 58)</p>	<p>Sub-alpine Shrubland fringed by Sub-alpine Woodland (burnt)</p>	 <p>Image 57. Proposed track location between overnight node 2A and 2C looking towards 2A from 2C (December 2020), (Image credit: Louise Rodda)</p>	 <p>Image 58. Proposed track location between overnight node 2A and 2C looking towards 2C from the 'swimming hole' in foreground (December 2020), (Image credit: Louise Rodda)</p>

Overnight node	EVC		
2B Tawonga Huts – operated huts	Sub-alpine Shrubland/Sub-alpine Woodland (burnt), abuts Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic	 <p data-bbox="750 652 1343 715">Image 59. Proposed overnight node 2B (December 2020), (Image credit: Louise Rodda)</p>	 <p data-bbox="1462 652 2055 715">Image 60. Proposed overnight node 2B (December 2020), (Image credit: Louise Rodda)</p>
2B Tawonga Huts – extension option	Alpine Grassland fringed by Sub-alpine Woodland, abuts Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic	 <p data-bbox="765 1223 1336 1287">Image 61. Proposed overnight node 2B extension (December 2020), (Image credit: Louise Rodda)</p>	 <p data-bbox="1477 1223 2048 1287">Image 62. Proposed overnight node 2B extension (December 2020), (Image credit: Louise Rodda)</p>

Overnight node	EVC		
Track from Tawonga Huts to 2B	Alpine Damp Grassland and Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic, Sub-alpine Woodland (burnt), and Alpine Grassland/Cleared/Severely Disturbed, abuts Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic	 <p>Image 63. Track from Tawonga Huts to proposed overnight node 2B (December 2020), (Image credit: Louise Rodda)</p>	 <p>Image 64. Track to Tawonga Huts from to proposed overnight node 2B (December 2020), (Image credit: Louise Rodda)</p>

Overnight node	EVC		
<p>2C Tawonga Huts – operated huts</p>	<p>Sub-alpine Woodland</p>		

Image 65. Proposed overnight node 2C (December 2020) (Image credit: Louise Rodda)

Image 66. Proposed overnight node 2C (December 2020), (Image credit: Louise Rodda)

Overnight node	EVC		
Track from Tawonga Huts to 2C	Alpine Damp Grassland/Cleared/Severely Disturbed, and Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic and Sub-alpine Shrubland	 <p data-bbox="833 1056 1260 1183"> Image 67. Track from Tawonga Huts to proposed overnight node 2C (December 2020), (Image credit: Louise Rodda) </p>	 <p data-bbox="1529 1056 1956 1183"> Image 68. Track from Tawonga Huts to proposed overnight node 2C (December 2020), (Image credit: Louise Rodda) </p>

Overnight node	EVC		
2D Tawonga Huts – alternative option – hiker camps/operated huts	Sub-alpine Woodland/Alpine Grassland/Cleared/ Severely Disturbed	 <p data-bbox="752 668 1349 731">Image 69. Proposed overnight node 2D (December 2020), (Image credit: Louise Rodda)</p>	 <p data-bbox="1439 668 2059 731">Image 70. Proposed overnight node 2D (December 2020), (Image credit: Louise Rodda)</p>

Overnight node	EVC		
Track to 2D (continuation from track to 2B)	Alpine Grassland/Alpine Grassy Heathland		<p>Image 71. Proposed track to overnight node 2D (December 2020), (Image credit: Louise Rodda)</p>

Overnight node	EVC		
3 Diamantina Horse Yards – hiker camps	Montane Damp Forest	 <p>Image 72. Proposed overnight node 3 Diamantina River Flats near Diamantina Horse Yards (December 2020), (Image credit: Matthew Hatton)</p>	 <p>Image 73. Proposed overnight node 3 Diamantina River Flats near Diamantina Horse Yards (December 2020), (Image credit: Matthew Hatton)</p>

Overnight node	EVC		
3 Red Robin Battery—operated huts	Montane Damp Forest		

Image 74. Proposed overnight node 3 at Red Robin Battery (December 2020), (Image credit: Matthew Hatton)

Image 75. Proposed overnight node 3 at Red Robin Battery (December 2020), (Image credit: Matthew Hatton)

Overnight node	EVC		
4 High Knob – hiker camps	Sub-alpine Woodland/Alpine Grassland		
	Sub-alpine Woodland (fringed by long unburnt Snow Gums)		<p>Image 76. Proposed overnight node 4 at High Knob (December 2020), (Image credit: Matthew Hatton)</p> <p>Image 77. Proposed overnight node 4 at High Knob (December 2020), (Image credit: Matthew Hatton)</p> <p>Image 78. Proposed overnight node 4 at High Knob (December 2020), (Image credit: Matthew Hatton)</p>

3.2.3 Significant flora species

A total of 60 rare or threatened flora species were recorded within the proposed track alignment, including:

- One EPBC Act listed species (Shining Cudweed);
- Two FFG Act listed species (Silky Snow-daisy and Mountain Daisy); and
- Fifty-seven species classified as rare or threatened in Victoria (Appendix 2, Table 8).

Twenty-five Victorian rare or threatened species were recorded within the proposed overnight node areas (Appendix 2, Table 9).

Greater numbers of rare or threatened species were recorded in general across the Bogong High Plains. The highest number of rare or threatened species (30) was recorded in section 6 of the track in the Bundara-Cobungra RNA (Table 8).

The highest number of rare or threatened species (11) recorded within the proposed overnight nodes were at node 1A Cope Hut (Table 9).

The EPBC Act and FFG Act listed species recorded in the assessment area and their locations are described below.

Shining Cudweed *Argyrotegium nitidulum* (EPBC listed — Vulnerable, Victorian advisory list classified — Rare).

Shining Cudweed was relatively common in localised areas, with multiple plants recorded along four track sections (1-3 and 6) on the Bogong High Plains (Table 8, Image 79 and 80). No plants of this species were recorded in the proposed overnight nodes.



Image 79. Shining Cudweed *Argyrotegium nitidulum*, Heathy Spur Track (December 2020),
(Image credit: Louise Rodda)



Image 80. Shining Cudweed *Argyrotegium nitidulum*, Australian Alps Walking Track in the Bundara-Cobungra RNA (December 2020),
(Image credit: Louise Rodda)

Silky Snow-daisy *Celmisia sericophylla* (FFG Act listed, Victorian advisory list classified — Vulnerable)

Silky Snow-daisy was recorded at one location hanging over the Langford Aqueduct and as such, is not considered to be part of a remnant population but a recently established occurrence (Table 8, Image 81).



Image 81. Silky Snow-daisy *Celmisia sericophylla*, Langford Aqueduct (December 2020), (Image credit: Louise Rodda)

Mountain Daisy *Brachyscome foliosa* (FFG Act listed, Victorian advisory list classified — Vulnerable)

Hundreds of plants of Mountain Daisy were located along the track alignment and immediate surrounds across the high plains in the Bundara-Cobungra RNA in one track section (section 6), and it was also recorded in moderate numbers in section 14 (Table 8, Image 82). This species was not recorded at any of the proposed overnight nodes.



Image 82. Mountain Daisy *Brachyscome foliosa*, Bundara-Cobungra RNA (December 2020) (Image credit: Louise Rodda)

Table 8. Rare or threatened flora species recorded along the proposed track alignment within the Falls to Hotham Alpine Crossing assessment area (November/December 2020)**Legend:**

R = recorded

EPBC Act = Environment Protection and Biodiversity Conservation Act 1999

FFG Act = Flora and Fauna Guarantee Act 1988

Advisory list = Advisory list of rare or threatened plants in Victoria - 2014

No.	Scientific name	Common name	EPBC Act	FFG Act	Advisory list (DEPI 2014)	Track section																		
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
1	<i>Acacia alpina</i>	Alpine Wattle			Rare													R		R				
2	<i>Acacia dallachiana</i>	Catkin Wattle			Rare													R						
3	<i>Aciphylla glacialis</i>	Snow Aciphyll			Rare						R	R	R				R		R					
4	<i>Acrothamnus montanus</i>	Snow Beard-heath			Rare				R	R	R	R	R	R	R	R				R				
5	<i>Alchemilla xanthochlora</i>	Lady's Mantle			Rare											R	R							
6	<i>Argyroxiphium nitidulum</i>	Shining Cudweed	Vulnerable		Rare		R	R	R			R												
7	<i>Boronia algida</i>	Alpine Boronia			Rare													R		R				
8	<i>Brachyscome foliosa</i>	Mountain Daisy		Listed	Vulnerable							R								R				
9	<i>Brachyscome tadgellii</i>	Tadgell's Daisy			Rare						R	R	R		R	R		R	R		R			
10	<i>Cardamine lilacina</i> s.s.	Lilac Bitter-cress			Vulnerable		R	R	R		R	R												
11	<i>Carex canescens</i>	Short Sedge			Rare		R	R																
12	<i>Carex jackiana</i>	Carpet Sedge			Rare						R													
13	<i>Celmisia costiniana</i>	Carpet Snow-daisy			Rare		R	R	R	R						R								
14	<i>Celmisia latifolia</i>	Victorian Snow-daisy			Rare												R		R	R				
15	<i>Celmisia sericophylla</i>	Silky Snow-daisy	Listed		Vulnerable					R														
16	<i>Celmisia tomentella</i>	Silver Snow-daisy			Rare		R	R	R	R	R	R	R											
17	<i>Coronidium waddelliae</i>	Snowy Everlasting			Rare													R						
18	<i>Craspedia adenophora</i>	Sticky Billy-buttons			Rare			R																
19	<i>Craspedia aurantia</i> s.l.	Orange/Green Billy-buttons			All infraspecific taxa included in Advisory List		R	R	R	R	R					R								
20	<i>Craspedia aurantia</i> var. <i>aurantia</i>	Orange Billy-buttons			Rare											R		R	R	R				
21	<i>Craspedia aurantia</i> var. <i>jamesii</i>	Green Billy-buttons			Rare													R						
22	<i>Craspedia lamicola</i>	Bog Billy-buttons			Vulnerable		R	R	R			R					R		R	R				
23	<i>Craspedia maxgrayi</i> s.s.	Woolly Billy-buttons			Vulnerable		R	R	R								R		R					
24	<i>Epacris celata</i>	Cryptic Heath			Rare		R	R	R		R	R	R											
25	<i>Epilobium curtisiae</i>	Bald-seeded Willow-herb			Rare		R				R	R												
26	<i>Eucalyptus pauciflora</i> subsp. <i>hedraia</i>	Bogong Sally			Rare																			
27	<i>Euchiton umbricola</i>	Cliff Cudweed			Rare												R			R				
28	<i>Euphrasia crassiuscula</i> subsp. <i>crassiuscula</i>	Thick Eyebright			Rare					R						R		R	R					
29	<i>Euphrasia crassiuscula</i> subsp. <i>eglandulosa</i>	Thick Eyebright			Rare														R	R	R			
30	<i>Ewartia nubigena</i>	Silver Ewartia			Rare							R				R		R		R	R	R		
31	<i>Leptorhynchus squamatus</i> subsp. <i>alpinus</i>	Alpine Buttons			Rare				R	R	R		R				R		R	R	R	R		
32	<i>Leucochrysum alpinum</i>	Alpine Sunray			Rare												R	R		R				
33	<i>Luzula acutifolia</i> subsp. <i>acutifolia</i>	Sharp-leaf Woodrush			Rare												R		R		R			
34	<i>Luzula alpestris</i>	Tussock Woodrush			Rare					R	R					R	R							
35	<i>Olearia brevipedunculata</i>	Rusty Daisy-bush			Rare				R	R	R	R	R	R	R	R	R	R	R	R	R			
36	<i>Olearia frostii</i>	Bogong Daisy-bush			Rare		R	R	R	R							R		R	R	R			
37	<i>Olearia phlogopappa</i> subsp. <i>flavescens</i>	Dusty Daisy-bush			Rare		R	R	R								R	R						
38	<i>Oreomyrrhis pulviniflora</i>	Cushion Caraway			Endangered							R												
39	<i>Ozothamnus alpinus</i>	Alpine Everlasting			Rare		R	R	R		R				R			R			R			
40	<i>Pappochroma nitidum</i>	Sticky Fleabane			Rare															R				
41	<i>Pentachondra pumila</i>	Carpet Heath			Rare			R			R	R			R	R								
42	<i>Phebalium squamulosum</i> subsp. <i>alpinum</i>	Alpine Phebalium			Rare		R	R	R	R	R	R				R			R		R	R		
43	<i>Pimelea axiflora</i> subsp. <i>alpina</i>	Alpine Bootlace Bush			Rare		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R		
44	<i>Pimelea ligustrina</i> subsp. <i>ciliata</i>	Fringed Rice-flower			Rare		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R		

No.	Scientific name	Common name	EPBC Act	FFG Act	Advisory list (DEPI 2014)	Track section															
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
45	<i>Poa hothamensis</i> var. <i>parviflora</i>	Soft Ledge-grass			Rare					R											
46	<i>Podolepis laciniata</i>	High-plain Podolepis			Rare		R	R		R	R										
47	<i>Poranthera oreophila</i>	Mountain Poranthera			Rare		R	R	R		R										
48	<i>Psychrophila introloba</i>	Alpine Marsh-marigold			Rare						R	R									
49	<i>Ranunculus eichlerianus</i>	Eichler's Buttercup			Rare					R	R	R						R			
50	<i>Ranunculus gunnianus</i>	Gunn's Alpine Buttercup			Rare		R			R											
51	<i>Ranunculus millanii</i>	Dwarf Buttercup			Rare		R			R		R									
52	<i>Ranunculus muelleri</i>	Felted Buttercup			Vulnerable						R										
53	<i>Ranunculus victoriensis</i>	Victorian Buttercup			Rare	R	R	R	R	R	R	R		R	R		R				
54	<i>Rytidosperma alpicola</i>	Crag Wallaby-grass			Rare														R		
55	<i>Rytidosperma nivicola</i>	Snow Wallaby-grass			Rare										R						
56	<i>Scleranthus diander</i>	Tufted Knavel			Rare										R		R		R		
57	<i>Scleranthus singuliflorus</i>	Mossy Knavel			Rare			R	R	R	R	R									
58	<i>Senecio pinnatifolius</i> var. <i>alpinus</i>	Snowfield Groundsel			Rare	R	R	R	R	R	R	R									
59	<i>Stackhousia pulvinaris</i>	Alpine Stackhousia			Rare		R	R		R	R		R	R		R	R				
60	<i>Trachymene humilis</i> subsp. <i>breviscapa</i>	Alpine Trachymene			Rare		R	R	R	R	R	R									
Total number of species recorded						10	26	24	21	20	30	23	5	2	10	21	5	8	15	12	3

Table 9. Rare and threatened flora species recorded at proposed overnight nodes within the Falls to Hotham Alpine Crossing assessment area (November/December 2020)**Legend:****R** = recordedEPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*FFG Act = *Flora and Fauna Guarantee Act 1988*

Advisory list = Advisory list of rare or threatened plants in Victoria 2014

No.	Scientific name	Common name	EPBC Act	FFG Act	Victorian Advisory List (DEPI 2014)	Overnight nodes/tracks																
						1A	1 B/E	1C	1D	1F	1G	2A	2B	2C	2D	Track between Tawonga Huts and 'swimming hole' on the creek via 2C	Track between 'swimming hole' on the creek and 2A	Track to 2D	3 Hiker Camps	3 Operated Huts	4 Hiker Camps	4 Operated Huts
1	<i>Acacia dallachiana</i>	Catkin Wattle			Rare														R	R		
2	<i>Acrothamnus montanus</i>	Snow Beard-heath			Rare	R	R									R			R			
3	<i>Brachyscome tadgellii</i>	Tadgell's Daisy			Rare											R						
4	<i>Cardamine lilacina</i> s.s.	Lilac Bitter-cress			Vulnerable		R						R									
5	<i>Carex jackiana</i>	Carpet Sedge			Rare							R										
6	<i>Celmisia costiniana</i>	Carpet Snow-daisy			Rare	R	R	R	R	R			R		R		R					
7	<i>Celmisia latifolia</i>	Victorian Snow-daisy			Rare																R	R
8	<i>Celmisia tomentella</i>	Silver Snow-daisy			Rare	R	R		R							R	R					
9	<i>Coronidium waddelliae</i>	Snowy Everlasting			Rare															R		
10	<i>Craspedia aurantia</i> var. <i>aurantia</i>	Orange Billy-buttons			Rare	R																
11	<i>Leptorhynchos squamatus</i> subsp. <i>alpinus</i>	Alpine Buttons			Rare	R	R	R														
12	<i>Olearia brevipedunculata</i>	Rusty Daisy-bush			Rare	R			R	R	R	R	R	R	R	R		R			R	R
13	<i>Olearia frostii</i>	Bogong Daisy-bush			Rare	R	R	R					R		R	R						
14	<i>Olearia phlogopappa</i> subsp. <i>flavescens</i>	Dusty Daisy-bush			Rare		R		R	R			R		R			R				
15	<i>Phebalium squamulosum</i> subsp. <i>alpinum</i>	Alpine Phebalium			Rare	R	R	R	R	R	R	R	R	R	R	R	R					
16	<i>Pimelea axiflora</i> subsp. <i>alpina</i>	Alpine Bootlace Bush			Rare		R	R	R	R	R		R									
17	<i>Pimelea ligustrina</i> subsp. <i>ciliata</i>	Fringed Rice-flower			Rare	R		R	R	R		R		R	R							
18	<i>Poa hothamensis</i> var. <i>parviflora</i>	Soft Ledge-grass			Rare						R											
19	<i>Poranthera oreophila</i>	Mountain Poranthera			Rare		R	R														
20	<i>Ranunculus eichlerianus</i>	Eichler's Buttercup			Rare							R	R		R						R	R
21	<i>Ranunculus victoriensis</i>	Victorian Buttercup			Rare	R	R	R	R	R												
22	<i>Scleranthus diander</i>	Tufted Knawel			Rare																R	R
23	<i>Scleranthus singuliflorus</i>	Mossy Knawel			Rare			R														
24	<i>Senecio pinnatifolius</i> var. <i>alpinus</i>	Snowfield Groundsel			Rare				R													
25	<i>Trachymene humilis</i> subsp. <i>breviscapa</i>	Alpine Trachymene			Rare	R						R		R								
Total number of species recorded						11	10	8	9	7	7	4	7	5	3	8	4	2	2	2	4	4

A further seven species previously recorded within 2.5 km of the assessment area (Abzeco 2020) were not recorded during the field assessments but are considered highly likely to occur within the assessment area (Appendix 3) based on the identification of suitable habitat:

- Snow Daphne *Kelleria bogongensis* (EPBC Act listed — Vulnerable, Victorian FFG Act listed, Victorian advisory list classified — Endangered)
- Rock Poa *Poa saxicola* (Victorian FFG Act listed, Victorian advisory list classified — Vulnerable)
- Tasmanian Bladderwort *Utricularia monanthos* (Victorian FFG Act listed, Victorian advisory list classified — Vulnerable)
- Wire-head Sedge *Carex cephalotes* (Victorian FFG Act listed, Victorian advisory list classified — Vulnerable)
- Thick Eyebright *Euphrasia crassiuscula* subsp. *glandulifera* (EPBC Act listed — Vulnerable, Victorian FFG Act listed, Victorian advisory list classified — Vulnerable)
- Bogong Eyebright *Euphrasia eichleri* (EPBC Act listed — Vulnerable, Victorian FFG Act listed, Victorian advisory list classified — Vulnerable)
- Cushion Rush *Juncus antarcticus* (FFG Act listed — Victorian FFG Act listed, Victorian advisory list classified — Vulnerable)

A description of these species and recommendations for additional surveys during the active growing season in suitable habitat are provided in Appendix 3.

3.2.4 Long unburnt Snow Gums

Long unburnt Snow Gums were recorded in the four track sections: 2, 4, 5 and 14 and at overnight nodes 1F (Bogong High Plains) and 4 (High Knob—operated huts).

3.2.5 Introduced species

A list of weed species for each section of track and each proposed overnight node is provided in Appendix 4. Eight declared noxious weeds were recorded in the assessment area including two weeds classified as Restricted in the region under the CaLP Act (Grey Sallow **Salix cinerea* and Rusty Sallow **Salix cinerea* subsp. *oleifolia*) which are also Weeds of National Significance (WONS). Six weeds are classified as Controlled in the region under the CaLP Act including Spear Thistle **Cirsium vulgare*, Tutsan **Hypericum androsaemum*, St John's Wort **Hypericum perforatum* subsp. *perforatum*, Sweet Briar **Rosa rubiginosa*, Common Blackberry **Rubus anglocandicans* and Forest Blackberry **Rubus polyanthemos*. The two Blackberry species are also identified WONS.

Other high threat environmental weeds recorded in the assessment area include Soft Rush **Juncus effusus* subsp. *effusus*, Jointed Rush **Juncus articulatus* subsp. *articulatus*, Slender Rush **Juncus tenuis* and Creeping Buttercup **Ranunculus repens* which are highly invasive, can spread rapidly and cause significant impacts on natural systems (White *et. al.* 2018). The Advisory list of environmental weeds in Victoria (White *et. al.* 2018) classifies the risk rating of Soft Rush as very high, and the remaining three species as high.

The highest number of weeds were recorded in track section 1 (24 species), and more than 10 species were recorded in sections 2, 5, 11 and 12. Less than 10 weed species were recorded in the remaining sections of track and proposed overnight nodes. Weeds were largely confined to the track edges, existing camping areas and Tawonga Huts area. The most common weed was Sheep Sorrel **Acetosella vulgaris* (Image 83).



Image 83. Sheep Sorrel **Acetosella vulgaris* along Heathy Spur Track, the most common weed in the study area (December 2020), (Image credit: Louise Rodda)

3.3 Fauna

3.3.1 Fauna values

Sixty-one fauna species were recorded in the assessment area, comprising 11 mammal, 25 bird, 13 reptile, two frog, two fish and eight invertebrate species (Table 10 and 11). Fish in the Mountain Galaxias *Galaxias olidus* complex, caddisflies, stonefly nymphs and mayfly nymphs are pending further clarification of their identity, so the total number of species may turn out to be higher. All are native to the assessment area apart from five introduced species (refer to Section 3.3.4).

Consideration of suitable habitat for additional fauna species of state or national conservation significance is provided in Tables 10 and 11, and a list of all fauna recorded during targeted surveys and other field assessments is provided in Appendix 5.

3.3.2 Significant fauna species

Eight threatened fauna species were recorded in the assessment area during the field surveys: the Alpine Bog Skink, Alpine She-oak Skink, Alpine Water Skink, Guthega Skink, Tussock Skink, Broad-toothed Rat, Platypus and Southern Greater Glider. The EPBC Act and FFG Act listed species recorded in the assessment area and their locations are described below.

Alpine She-oak Skink *Cyclodomprphus paealtus*

An Alpine She-oak Skink (Listed as Endangered under the EPBC Act, a threatened species under the FFG Act and Critically Endangered in Victoria) was seen incidentally in the vicinity of Tawonga Huts (section 9). Habitat for this species exists more broadly throughout the assessment area on the high plains (mostly above 1500 m) (Cleemann 2003), although not uniformly. The areas likely to support preferred habitat for this species (e.g. providing appropriate shelter and thermal conditions) have relatively open or no tree cover, and are where dense grass tussocks or other grasses, or low-growing heath or otherwise open shrub cover dominates. This will require considering alternative options for accommodation nodes along the Langford Aqueduct and near Cope Hut which support areas of potential habitat for the species, and possibly (although less likely) at High Knob. It is considered unlikely that the Alpine She-oak Skink occurs in the trail sections along the Razorback to Mt Feathertop and High Knob to Diamantina Spur (N. Cleemann pers. comm.), although there has been a lack of targeted survey for it in those areas.

Alpine Water Skink *Eulamprus kosciuskoi*

The Alpine Water Skink (listed under the FFG Act and considered Critically Endangered in Victoria) was found along Cope Creek and smaller tributaries intersecting the trail on Cope Saddle, as well as further west on the Southern Bogong High Plain section of the trail alignment between Mount Jim and Cope Saddle Hut (Image 84), and at Tawonga Huts (sections 6, 7 and 9 respectively).



Image 84. Alpine Water Skink found on the Southern Bogong High Plains (November 2020), (Image credit: Zak Atkins)

Guthega Skink *Liopholis guthega*

Guthega Skink (Listed as Endangered under the EPBC Act, a threatened species under the FFG Act, and as Critically Endangered in Victoria) colonies were mapped in detail where they were known to occur within the assessment area (Z. Atkins unpubl. data). Potential burrows were also identified in other areas of suitable habitat within the study area.

Alpine Bog Skink *Pseudemoia cryodroma*

The Alpine Bog Skink (listed under the FFG Act and considered Endangered in Victoria) and suitable, typical habitat for this species was noted in the same locations as habitat for the Alpine Water Skink, and more broadly where open damp heath, grassland or bogs were present. The species may also occasionally pass through or occur less commonly in areas further away from more typical habitat (e.g. grassland or heathland between bogs or riparian areas). For example, an individual was found at the edge of the trail towards the start of the Razorback (off the Great Alpine Rd), on the hillslope above the Diamantina River headwaters (section 15).

Tussock Skink *Pseudemoia pagenstecheri*

The Tussock Skink (listed as Vulnerable on the Advisory List of Threatened Vertebrate Fauna in Victoria and pending listing under the FFG Act) was also recorded or is likely to occur along the majority of the alignment wherever there is a cover of grasses, tussocks or low-growing shrubs with little or no tree cover (Hutchinson and Donnellan 1992; Wilson and Swan 2017). This is likely to be the most widespread and was the most numerous reptile species recorded in the assessment area, encountered in sections 2, 6 and 7, but with suitable habitat in all other sections apart from 1 and 12.

Broad-toothed Rat *Mastacomys fuscus mordicus*

Burrows and scats of the Broad-toothed Rat (Listed as Endangered under the EPBC Act, a threatened species under the FFG Act and as Endangered in Victoria) were recorded in the assessment area on an unnamed headwater tributary crossing the trail between Cope Hut and Cope Saddle Hut (section 6) (Image 85). There is potential for this species to occur along other waterways and damp habitats in the assessment area, including the tributaries and bog system at Tawonga Huts (section 9).



Image 85. Burrow entrance belonging to the Broad-toothed Rat on the bank of a headwater tributary at Cope Saddle (November 2020),
(Image credit: David De Angelis)

Platypus *Ornithorhynchus anatinus*

A Platypus (Listed as Vulnerable under the FFG Act) was seen in the Diamantina River beside the Horse Yards, swimming between the split proposed accommodation node which spans both banks. Platypus burrows are often difficult to find and identify (Serena *et al.* 1998), but it is

possible that they could be located along the banks of the river, with entrances potentially underwater and/or concealed by overhangs, vegetation or debris.

Southern Greater Glider *Petauroides volans*

Three Greater Gliders (Listed as Vulnerable under the EPBC Act, a threatened species under the FFG Act and as Vulnerable in Victoria) were seen while spotlighting at Diamantina Horse Yards, including one between the proposed accommodation node and vehicle bridge crossing the Diamantina River where a linking track had been proposed. The survey effort was not comprehensive enough to inform abundance.

Yellow-bellied Gliders *Petaurus australis* were also recorded while spotlighting at both Diamantina Horse Yards and Blairs Hut (two individuals at each location), although this species is not currently listed as threatened.

Mountain Galaxias *Galaxias olidus* species complex

While not threatened, the Mountain Galaxias *Galaxias olidus* (sensu stricto) was collected while dip netting in a tributary of Tawonga Hut Creek (section 9) and galaxiids belonging to the same species complex (*G. cf. olidus*) were caught in another bog system on the Bogong High Plains (Image 86). The trail intersects the former tributary, although there are not expected to be any impacts to the latter site resulting from the project. Specimens and tissue samples (fin clips) were collected from both locations and delivered to Tarmo Raadik at the Arthur Rylah Institute to confirm their identity, which is still pending for the specimens collected from Cope Saddle.



Image 86. *Galaxias cf. olidus* found on the Bogong High Plains (November 2020), (Image credit: David De Angelis)

The assessment area also supports potential habitat for a number of threatened fauna species not recorded during the current surveys, including but not limited to the following which are considered to have a moderate to higher likelihood of occurring there (Appendix 6):

- Mountain Pygmy Possum
- Smoky Mouse
- Latham's Snipe
- Mountain Skink
- Alpine Tree Frog

- Alpine Stonefly and other threatened freshwater invertebrates including spiny crayfish *Euastacus* spp., the stonefly *Riekoperla intermedia* and Alpine Darner.

Descriptions of the habitat requirements and considerations of the likelihood of these species occurring in the assessment area are provided in more detail below, and summarised in Appendix 6.

Mountain Pygmy Possum *Burramys parvus*

Habitat for the Mountain Pygmy Possum includes rock screes and boulder fields supporting shrubland and heath, including any dominated by Mountain Plum Pine *Podocarpus lawrencei* which is particularly favoured by the species, especially by breeding females (Mansergh *et al.* 1989).

Suitable habitat for the Mountain Pygmy Possum was identified in parts of section 5 of the preliminary assessment area and parts of optional overnight node 1G in the form of boulder fields.

Smoky Mouse *Pseudomys fumeus*

The Smoky Mouse (Listed as Endangered under the EPBC Act, a threatened species under the FFG Act and as Endangered in Victoria) has not previously been recorded in the West Kiewa Valley, however, this may be due to a lack of survey effort. The species is known to occur within the catchments of the Wonungarra River and Buckland River approximately 20 km further west (DELWP 2020a).

Suitable habitat for the Smoky Mouse exists in the proposed accommodation node at Red Robin Battery (section 12) (P. Burns pers. comm.). Potential habitat for this species also exists on the lower slope of the Diamantina Spur Walking Track.

Latham's Snipe *Gallinago hardwickii*

Latham's Snipe was not recorded in the assessment area during the field assessment, although has the potential to roost, seek cover and forage among grasses, sedges and rushes in and adjacent to bogs and riparian areas, including within trail sections 6, 7 and 9.

Mountain Skink *Liopholis montana*

Although the Mountain Skink is not currently listed as a threatened species in Victoria or federally, it has been assessed as being eligible for listing as Critically Endangered under the FFG Act applying the Common Assessment Method (CAM) (N. Cleemann pers. comm.). The species is currently awaiting nomination and subsequent assessment by the Scientific Advisory Committee for potential listing under the Act. Potential habitat and burrows for this species were noted within the study area.

Alpine Tree Frog *Litoria verreauxii alpina*

The Alpine Tree Frog *Litoria verreauxii alpina* is listed as Vulnerable under the EPBC Act, listed under the FFG Act and classified as Critically Endangered in Victoria. Surveys were not undertaken for the Alpine Tree Frog, as no breeding habitat (i.e. waterbodies where adult frogs would be expected to call from and be relatively easy to detect) was observed in or immediately adjacent to the eastern side of the alignment (Mount Hotham end) where the species is still known to occur. However, potential non-breeding habitat and the proximity of suitable breeding habitat for the species to the trail must be considered. The species has undergone pronounced declines on the Southern Bogong High Plains, not being recorded there during targeted surveys

undertaken in the past few decades, and is said to have undergone a partial contraction in its geographic range (Osborne *et al.* 1999). Although it may be unlikely to persist there, the species' likelihood of occurrence on the western side of the alignment cannot be determined with greater certainty given the absence of recent surveys (which were outside the scope of the this preliminary assessment).

While it is also critical to consider potential terrestrial (non-breeding) habitat for the Alpine Tree Frog next to and between waterbodies that are used for breeding, the species' use of terrestrial habitat and dispersal between breeding and non-breeding habitat is largely unknown (Clemann and Gillespie 2011). Sections of the trail alignment closest to known breeding occurrences of the species and elsewhere where it could still persist at the Mount Hotham end of the alignment are some distance away (e.g. approximately 80 m away from the headwaters of the Diamantina River), although it is possible the species might travel and at least disperse over and beyond such distances. The species may therefore still move between and regularly occupy habitat on either side of the alignment.

Freshwater invertebrates including the Alpine Stonefly *Thaumatoperla alpina*

Filtered water samples were collected from eight tributaries/catchments crossing the alignment for environmental DNA (eDNA) analysis to detect the Alpine Stonefly (Listed as Endangered under the EPBC Act and a threatened species under the FFG Act). All were taken from between Heathy Spur and the Diamantina River. The samples were sent to Julia Mynott at La Trobe University for DNA extraction and preparation to undergo sequencing, along with specimens of stonefly larvae from three of the sites for morphological identification. Results from eDNA analysis are likely to be available in the second half of 2021, expected to be included in reporting on impacts to the Alpine Stonefly from the 2019-2020 bushfires (part of a larger project being run with support from the federal Department of Agriculture, Water and Environment's Wildlife and Habitat Bushfire Recovery Program).

Apart from stonefly nymphs, no other freshwater invertebrates suspected as potentially belonging to threatened species were collected while dip netting or kick sampling, and no threatened invertebrates were known to have been observed incidentally or while undertaking other surveys. However, it is possible that species such as the stonefly *Riekoperla intermedia* or Alpine Darner might have been overlooked due to their small size, cryptic behavior or similarity to other species.

Further, while there are no records in the VBA for the Alpine Spiny Crayfish close to the assessment area, it is noted that a specimen in the Melbourne Museum was collected by P. Horwitz in 1982 from Pretty Valley Creek just upstream of the confluence with Bald Hill Creek off Bogong High Plains Road, and another was collected at Mt Hotham by A. Martin in 1972. Given these records, a lack of survey for the Alpine Spiny Crayfish in the assessment area and the species' cryptic habits, there remains potential for it to occur in suitable habitat there (T. Raadik pers. comm. 2021).

3.3.3 Introduced species

Five introduced fauna species were recorded in the assessment area:

- Sambar Deer *Cervus unicolor*
- Feral Horse *Equus caballus*
- European Hare *Lepus europaeus*

- European Rabbit *Oryctolagus cuniculus*
- Brown Trout *Salmo trutta*

Evidence of Sambar including trampled vegetation was noted in section 2, and scats and tracks were found in section 5 of the assessment area where the species has been seen previously (L. Rodda pers. obs.). Two Sambar were also seen while spotlighting for owls and arboreal mammals near Diamantina Horse Yards, and there was evidence of deer grazing in sections 2-9 (Image 87).

Horses including a stallion, several mares and a foal were seen on the Bogong High Plains including at Tawonga Huts, with indirect evidence of their presence including scats and grazing impacts seen in sections 2, 7, 8, 9 and 10 (Image 88 and 89).

Hares and rabbits were seen in the vicinity of the aqueducts (sections 2 and 5), although the area impacted by all observed introduced mammals is known to be much greater than what was documented during the current assessment.

Brown Trout were observed in the aqueducts, Cope Creek, the Diamantina River and West Kiewa River.

Table 10. Threatened fauna species and suitable habitat recorded along the proposed trail alignment in the Falls to Hotham Alpine Crossing assessment area (November/December 2020)**Legend:****R** = recorded**H** = suitable habitat**EPBC Act** = *Environment Protection and Biodiversity Conservation Act 1999***V** = Vulnerable,**E** = Endangered**FFG Act** = *Flora and Fauna Guarantee Act 1988*:**L** = listed,**P** = pending**Vic Advisory** = Advisory list of threatened vertebrate fauna in Victoria (DSE 2013)**nt** = Near Threatened,**vu** = Vulnerable,**en** = Endangered,**cr** = Critically Endangered

Scientific name	Common name	EPBC Act	FFG Act	Vic Advisory	Record
Mammals					
<i>Burramys parvus</i>	Mountain Pygmy Possum	E	L	cr	H
<i>Mastacomys fuscus mordicus</i>	Broad-toothed Rat	V	L	en	R, H
<i>Ornithorhynchus anatinus</i>	Platypus		L		R
<i>Petauroides volans</i>	Greater Glider	V	L	vu	R
<i>Pseudomys fumeus</i>	Smoky Mouse	E	L	en	H
Birds					
<i>Gallinago hardwickii</i>	Latham's Snipe				H
Reptiles					
<i>Cyclodomorphys praeltus</i>	Alpine She-oak Skink	E	L	cr	R, H
<i>Eulamprus kosciuskoi</i>	Alpine Water Skink		L	cr	R
<i>Liopholis guthega</i>	Guthega Skink	E	L	cr	R, H
<i>Liopholis montana</i>	Mountain Skink		P		H
<i>Pseudemoia cryodroma</i>	Alpine Bog Skink		L	en	R, H
<i>Pseudemoia pagenstecheri</i>	Tussock Skink		P	vu	R, H
Invertebrates					
<i>Austoaeschna flavomaculata</i>	Alpine Darner Dragonfly		P	vu	H
<i>Euastacus armatus</i>	Murray Spiny Crayfish	E	L	nt	H
<i>Riekoperla intermedia</i>	stonefly		L	en	H
<i>Thaumatoperla alpina</i>	Alpine Stonefly	E	L	vu	H

Table 11. Threatened fauna species and suitable habitat recorded at proposed overnight nodes within the Falls to Hotham Alpine Crossing assessment area (November/December 2020)[^]**Legend:****R = recorded****FFG Act = Flora and Fauna Guarantee Act 2019:****H = habitat****L = listed,****EPBC Act = Environment Protection and Biodiversity Conservation Act 1999****P = pending****V = Vulnerable,****Vic Advisory = Advisory list of threatened vertebrate fauna in Victoria (DSE 2013)****E = Endangered****nt = Near Threatened,****vu = Vulnerable,****en = Endangered,****cr = Critically Endangered**

Scientific name	Common name	EPBC Act	FFG Act	Vic Advisory	Record
Mammals					
<i>Burramys parvus</i>	Mountain Pygmy Possum	E	L	cr	H
<i>Mastacomys fuscus mordicus</i>	Broad-toothed Rat	V	L	en	H
<i>Ornithorhynchus anatinus</i>	Platypus		L		R
<i>Petauroides volans</i>	Greater Glider	V	L	vu	H
<i>Pseudomys fumeus</i>	Smoky Mouse	E	L	en	H
Birds					
<i>Gallinago hardwickii</i>	Latham's Snipe				H
Reptiles					
<i>Cyclodomorphys praeltus</i>	Alpine She-oak Skink	E	L	cr	H
<i>Eulamprus kosciuskoi</i>	Alpine Water Skink		L	cr	H
<i>Liopholis guthega</i>	Guthega Skink	E	L	cr	
<i>Liopholis montana</i>	Mountain Skink		P		
<i>Pseudemoia cryodroma</i>	Alpine Bog Skink		L	en	H
<i>Pseudemoia pagenstecheri</i>	Tussock Skink		P	vu	H
Invertebrates					
<i>Austoaeschna flavomaculata</i>	Alpine Darner Dragonfly		P	vu	H
<i>Euastacus armatus</i>	Murray Spiny Crayfish	E	L	nt	H
<i>Riekoperla intermedia</i>	stonefly		L	en	H
<i>Thaumatoperla alpina</i>	Alpine Stonefly	E	L	vu	H



Image 87. Evidence of deer browsing at Tawonga Huts (December 2020),
(Image credit: Louise Rodda)



Image 88. Evidence of horses along Heathy Spur Track (December 2020), (Image credit: Louise Rodda)



Image 89. Evidence of horses at Tawonga Huts (December 2020), (Image credit: Louise Rodda)

3.4 Geomorphology

3.4.1 Sites of geological significance

Sites of geological and geomorphological significance are determined on the basis that they either represent a specific characteristic of the region, or that they include an outstanding, rare, or possibly unique geological or geomorphological feature. A review of Victorian Resources Online (AV 2020a) identified that the proposed FHAC is located near a number of sites of geological and geomorphological significance including:

1. **Sites of National Significance:** Bogong High Plains South includes the areas of Mount Cope, Mount Jim, Cobungra Gap and Mount Loch (Figure 1). This area includes the best natural example of the High Plains in Victoria, and represents a substantial part of one of the major alpine and sub-alpine environments of continental Australia. Distinctive types of High Plains Gneiss are exposed on Mount Cope, while in the Mount Jim and Mount Loch areas the Bogong Volcanics, together with the intercalated and pre-volcanic sediments, are exposed. Landforms related to differential erosion along fault lines and consequent stream capture occur at Cobungra Gap, while well-developed stepped topography occurs on Mount Jim and in the head of Middle Creek. Bog-peat environments of importance occur throughout the area, particularly on Mount Cope.
2. **Sites of Regional Significance:** Basalt Hill (Figure 1) including the area surrounding Basalt Hill and Langfords Gap. Basalt Hill is a columnar basalt structure that has been formed by at least three volcanic flows that have been shaped by ice. Basalt Hill is surrounded by a boulder field that extends over Langford Gap into the head of Middle Creek, and is the most accessible representative example of Bogong Volcanics.

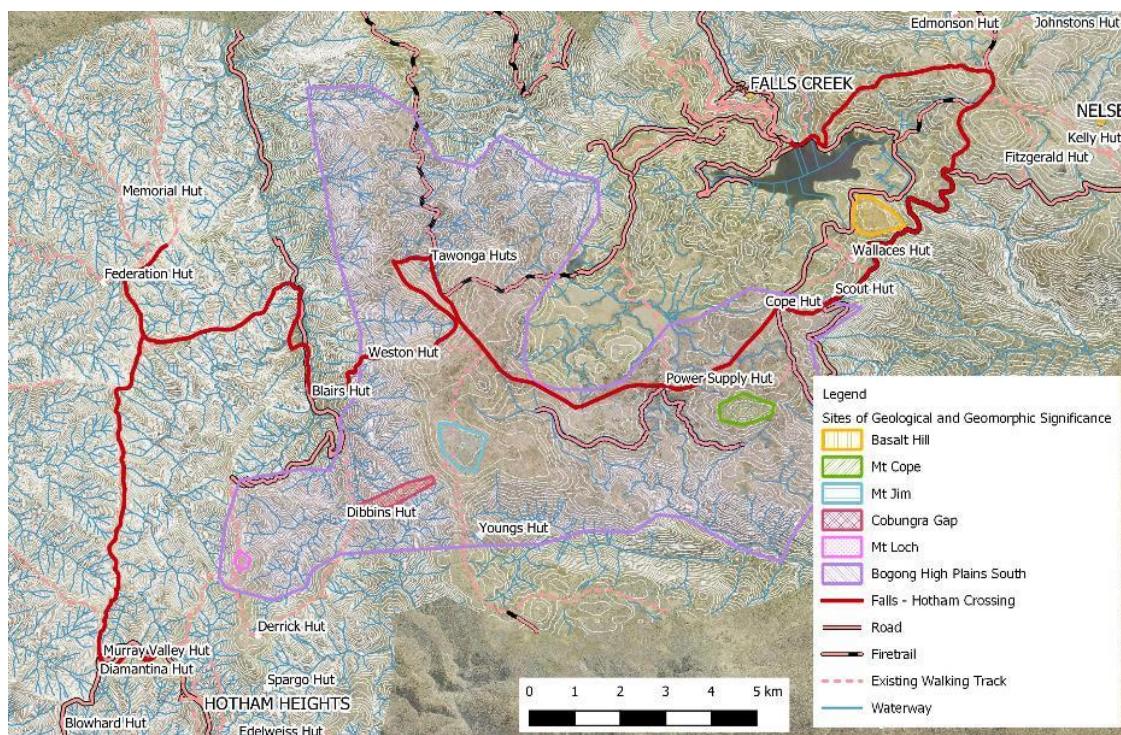


Figure 1. Bogong High Plains South sites of geological or geomorphological national significance: Mount Cope, Mount Jim, Cobungra Gap and Mount Loch, and a site of regional significance: Basalt Hill (AV2020b) (Figure produced by Water Technology)

3.5 Waterways and wetlands

3.5.1 Waterway types

A review of the proposed main trail alignment and associated waterway network, along with the contributing catchment area, found that there are numerous locations where the track intersects waterways. However, there are also large sections of the track where the alignment is positioned on ridgelines. Broadly, the waterways present across the alpine region, including those that intersect the proposed trail corridor, are highly variable in terms of their processes and behaviour. Hence, the extent to which of these waterways might be impacted by the track is also highly variable.

For the purposes of this investigation, a broad classification of the waterways present in the assessment area, mainly based on the type and degree of lateral confinement placed upon each waterway, has been made and is summarised in Table 12. The confining feature limits the ability of the stream to migrate or adjust laterally and is usually associated with where the channel comes in contact with the bedrock valley margin. This in turn indicates the potential for the waterway to degrade/erode in response to the trail upgrade. Note that this information is general in nature, and the project scope did not include the classification of each waterway that intersected the proposed trail alignment.

The waterway types summarised in Table 12 vary from the highly sensitive Alpine Bog Community and marshes to robust bedrock-controlled streams that have little capacity to adjust. The typical waterway processes and morphology features associated with these waterway types are discussed below.

Table 12. General classification of waterways within the assessment area (December 2020)

Stream Type	Channel controls and behaviour	Example
Bedrock-controlled	<p>High energy flows flush fine sediments through this setting. There is a strong longitudinal (bed) and horizontal (banks) control placed on the channel as much of the channel boundary is on or very close to bedrock. As such, there is limited capacity for lateral or vertical adjustment. Typical features within these streams include cascades, waterfalls and plunge pools.</p>	 <p data-bbox="1192 964 2001 1060">Image 90. Tawonga Hut Creek, downstream of the Tawonga Huts Camping Area (December 2020), (Image credit: Julian Martin, Water Technology)</p>

Stream Type	Channel controls and behaviour	Example
Confined (with occasional floodplain pockets)	<p>These systems are high energy waterway environments that are capable of flushing fine sediments and mobilising coarse bed load material. These streams generally only have a small potential for lateral or vertical adjustment caused by fluvial processes, with the exception of small discontinuous floodplain pockets. It is these floodplain pockets that can be subject to inundation and erosion.</p>	 <p>Image 91. Diamantina River, upstream of the Diamantina Horse Yards camping area (January 2021), (Image credit: Tom Atkin, Water Technology)</p>

Stream Type	Channel controls and behaviour	Example
Alpine Bog Community	<p>The channel arrangement within Alpine Bog Communities generally comprises a continuous channel or series of braided channels of varying sinuosity within a boggy (waterlogged) and densely vegetated (treeless) valley floor/floodplain. Conversely, the channel may also be poorly defined or discontinuous in some sections. Wetlands and ponds are also commonly present on the valley floor. In some instances, these wetlands are associated with prior (abandoned) channel courses.</p> <p>These systems have a significantly higher risk of disturbance compared to other stream types within the project area, on the basis that they are generally free to move laterally and vertically. The degradation of these systems involving lateral and vertical adjustment at individual sites/reaches will be dependent on specific site/reach features including the depth to bed rock, relative position of the channel to the floodplain margin, floating boulders, road crossings, etc. Vegetation cover is considered critical to maintaining resilience.</p> <p>Alpine Bog Communities are protected under the Commonwealth EPBC Act on the basis that they are threatened ecological communities that provide significant benefits to the natural environment, including contributing to plant and animal diversity, carbon storage, water quality and hydrologic processes (DAWE 2020a).</p>	

Image 92. Alpine Bog Community and wetland between the Bogong High Plains Road and Cope Saddle Hut (December 2020), (Image credit: Tom Atkin, Water Technology).

Stream Type	Channel controls and behaviour	Example
Aqueduct	<p>Aqueducts are artificially constructed channels positioned outside of the valley floor. In the context of this project, aqueducts typically follow the contours of the terrain and were designed to convey water from one catchment to another (e.g. to the Rocky Valley Pondage). Management vehicle tracks are typically located on the downhill side of the aqueduct and act as a levee. Throughout the aqueduct network, formal spillways allow excess water to spill from the aqueduct over the track/levee and into a receiving waterway. Aqueducts have a relatively flat longitudinal gradient and trapezoidal cross section. However, the aqueducts are piped in some sections. These systems are relatively stable, in part due to a relatively flat longitudinal gradient. Some minor bed and bank erosion was observed. It is expected that these systems are regularly monitored and maintained.</p>	 <p>Image 93. The Langford Aqueduct (December 2020), (Image credit: Tom Atkin, Water Technology).</p>

3.5.2 Waterway processes

In combination with natural stream processes, the proposed works (i.e. track and overnight node development) have the potential to negatively impact waterway values and processes. Most waterway processes are associated with natural stream function and can be exacerbated by changes in discharge and/or land use, disturbance (e.g. vehicle and pedestrian traffic, construction activities, cattle, deer and horses), and reduced riparian vegetation (in part as a result of disturbance). An overview of potentially relevant waterway processes is provided in Appendix 7.

3.5.3 Track section summary

A brief summary of the observations noted within each section of the proposed track is summarised in Table 13.

Table 13. Feature summary within in each track section along the proposed FHAC route (December2020/January 2021)

Section 1 – Rocky Valley Dam wall	
Key features	Nil
Section 2 – Heathy Spur Track	
Key features	<p>The proposed track alignment follows an existing walking track that is positioned on hill slopes separated by segments where the alignment runs parallel to or intersects sensitive waterways (i.e. Alpine Bog Communities and ground water discharge seepage areas) within the catchment headwaters. The track alignment also passes over the surrounding hill slopes (outside the valley floor). In some areas the track is entrenched and as a result, concentrates flow.</p> 
<p>Image 94. Alpine Bog Community, Heathy Spur Track (December 2020), (Image credit: Julian Martin, Water Technology)</p>	

Section 3 – Big River Track

Key features

The proposed track alignment within this section follows an existing vehicle track that incorporates one major waterway crossing over an Alpine Valley Peatland in the form of a culvert crossing.



Image 95. Existing Culvert crossing on Watchbed Creek, Fainter Fire Tail (December 2020), (Image credit: Tom Atkin, Water Technology)

Section 4 – Australian Alps Walking Track

Key features

The proposed track alignment within this section follows an existing walking track that intersects and runs parallel to minor drainage lines within the catchment headwaters.

Section 5 – The Langford Aqueduct Road

Includes proposed overnight node 1, Bogong High Plains

Key features

The proposed track alignment is situated adjacent to an aqueduct and proposed overnight node 1 (locations B-G) on the Bogong High Plains, which are also situated within close proximity to the aqueduct.



Image 96. Overnight node 1G, Langford Aqueduct, (December 2020),
(Image credit: Tom Atkin, Water Technology)

Section 6 – Australian Alps Walking Track

Key features

The proposed track alignment within this section follows an existing walking track over undulating terrain that incorporates several discrete waterway crossings. The existing crossing types include a small grated bridge, a culvert, stepping stones and a pedestrian bridge over the downstream end of a constructed channel at the confluence with the Cope East Aqueduct.



Image 97. Existing waterway crossing in the form of a small grated bridge on Cope Creek (December 2020), (Image credit: Julian Martin, Water Technology)

Section 7 – located between a point north of Mount Jim and Fainter Fire Trail

Key features

The proposed track alignment within this section follows an existing walking track over a ridgeline and along the western edge of the High Plains. The track intersects minor surface water flow paths at the head of the catchment.



Image 98. The existing track intersects a minor surface water flow path between pole 333 and Fainter Fire Trail (December 2020). (Image credit: Tom Atkin, Water Technology)

Section 8 – Fainter Fire Trail

Key features

The proposed track alignment follows an existing vehicle track downslope towards Tawonga Huts. The track runs parallel to Tawonga Hut Creek.



Image 99. Tawonga Hut Creek adjacent to Fainter Fire Trail, south of Tawonga Huts (December 2020), (Image credit: Julian Martin, Water Technology)

Section 9 – Section of track between Tawonga Huts and proposed new section of track south of Mount Jaithmathang

Includes proposed overnight node 2, Tawonga Huts

Key features

The proposed track alignment follows an existing walking track and bifurcates to provide access to the proposed overnight nodes near Tawonga Huts. The track intersects a number of sensitive waterways including an Alpine Valley Peatland community that incorporate a series of deep and narrow braided channels within a densely vegetated (treeless) valley floor/floodplain. The proposed track alignment will also cross a bedrock-controlled section of Tawonga Hut Creek.



Image 100. Track to overnight node location C through Tawonga Hut Creek on the Fainter Fire Trail (December 2020), (Image credit: Tom Atkin, Water Technology)

Section 10 – Proposed new section of track south of Mount Jaithmathang

Key features

The proposed track alignment within this section is to be a new track that follows a ridgeline, continuing along the western edge of the High Plains. The track intersects minor surface water flow paths at the head of the catchment.

Section 11 – Westons Spur Track between pole 333 and proposed new section of track

Key features

The proposed track alignment within this section follows an existing walking track over a ridgeline upstream of concentrated flow paths/waterways.

Section 12 – Westons Spur Track, West Kiewa Logging Road (between Red Robin Battery and Diamantina Spur Walking Track), and track to Diamantina Horse Yards

Includes proposed overnight node 3, Diamantina Horse Yards and Red Robin Battery

Key features

The proposed track alignment traverses down a forested hill slope (Westons Spur Track) intersecting several steep watercourses and partially occupying an existing informal 4WD vehicle track which connects with the West Kiewa Logging Road. The logging road then transitions onto the Kiewa River West Branch floodplain at Blairs Hut. The logging road runs parallel to the river for approximately 2 km before heading west up the Diamantina Spur Walking Track. The proposed track alignment splits off near Blairs Hut and the Diamantina Horse Yards, facilitating access to the Diamantina Horse Yards and the proposed overnight node 3 location on a vegetated floodplain pocket of the Diamantina River. The proposed track alignment also runs south to the proposed overnight node 3 location at Red Robin Battery.

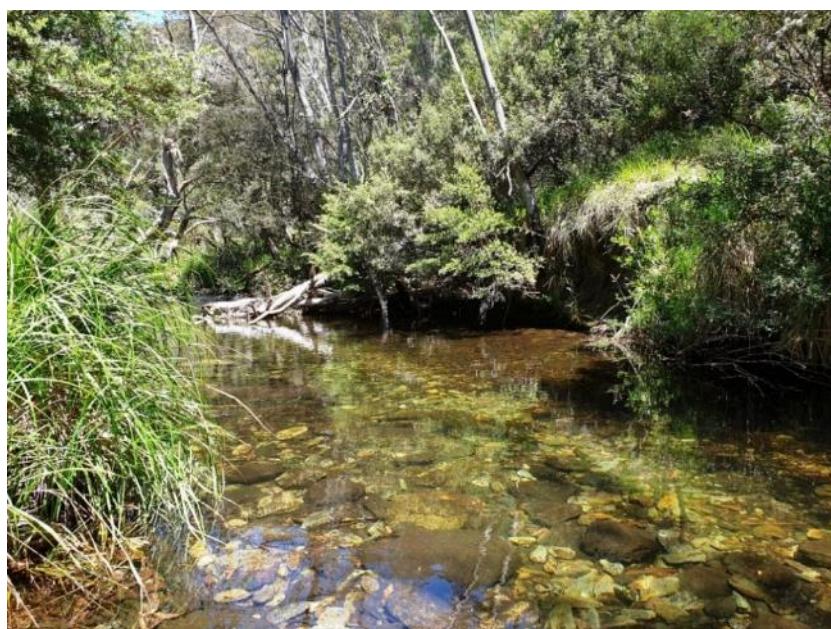


Image 101. Upstream view of Kiewa River West Branch near Blairs Hut (January 2021), (Image credit: Tom Atkin, Water Technology)

Section 12a – Proposed new section of track north of Diamantina River between West Kiewa Logging Road and Diamantina Spur Walking Track

Key features

Not assessed due to hazardous terrain and dense vegetation

Section 12b – Proposed new section of track north of Diamantina Spur between the eastern end of Diamantina Spur Track and part way along Diamantina Spur Walking Track

Key features

Not assessed due to hazardous terrain and dense vegetation

Section 13 – Diamantina Spur Walking Track

Includes proposed overnight node 4 at High Knob

Key features

The proposed track alignment within this section follows an existing walking track, mainly following a ridgeline up a steep rocky slope to High Knob. An overnight node is proposed on the southern side of the ridgeline.

Section 14 – Section of the Razorback track between foot and summit of Mount Feathertop

Key features

The proposed track alignment within this section follows an existing track on the rocky and steep ridgeline up to Mt Feathertop.

Section 15 – The Razorback track

Key features

The proposed track alignment within this section generally follows an existing track, positioned on a rocky steep ridgeline between Mt Feathertop and the Great Alpine Road.

Section 16 – Section of track within the Mount Hotham Alpine Resort between the southern end of the Razorback and Mount Loch car park

Key features

The proposed track alignment follows an existing narrow walking track between the Razorback track and the weather station at Mount Hotham. The trail then widens into an unsealed maintenance track that briefly follows the rocky ridgeline of Hotham Heights before turning north to the access point along the Great Alpine Road. The alignment then continues as an informal walking track on the northern side of the Great Alpine Road eastward to the Mount Loch carpark and the water storage dam.

3.5.4 Flooding risk

The proposed trail alignment intersects both the Kiewa River West Branch and Diamantina River. Planned overnight node three at Diamantina Horse Yards is currently proposed to be located on a floodplain pocket of the Diamantina River. Both the Kiewa River West Branch and the Diamantina River are relatively high energy and flashy rivers. As such potential flooding impacts include:

- Damage to infrastructure proposed at these locations in or over the rivers, or on the floodplain; and,
- safety issues resulting from damage to proposed infrastructure caused by floodwaters.

4 Potential impacts on environmental values

An overview of the potential impacts on environmental values in the assessment area is provided here.

Significant vegetation communities, significant flora, long unburnt Snow Gums, significant fauna habitat, sites of geomorphological significance, and waterways and wetlands in the assessment area have the potential to be impacted by:

- Track widening and construction.
- Ongoing track management and maintenance.
- Construction of overnight nodes.
- Ongoing maintenance and management of overnight nodes.
- Increased numbers of hikers.

Track

The calculation of the extent of environmental impacts from the construction of the proposed track assumes that disturbance will be contained within the track alignment and buffer.

The works would include impacts on flora and fauna habitat caused by vegetation removal, soil movement and soil compaction to widen and resurface the existing track, construct new sections of track, install waterway crossings and maintain the track.

Within the track buffer and parts of the overnight nodes there are likely to be impacts to vegetation from the temporary stockpiling of cleared vegetation and soil, and the movement of personnel and construction machinery.

Overnight nodes

The calculation of the extent of impacts of the proposed construction of the overnight nodes assumes that the entire area at each overnight node location shown in the FHACMP would be impacted. However, it is noted that accommodation and associated infrastructure may be contained within smaller, yet to be identified areas within those nodes.

The impacts would result from vegetation removal to construct accommodation huts/camping platforms, access tracks, water tanks, toilets and communal eating areas.

Ongoing impacts may include trampling native vegetation and fauna habitat by hikers beyond the immediate footprint of the buildings when hikers access the facilities and explore their accommodation surrounds. This type of disturbance was observed in the form of trampled vegetation beyond existing camping areas at Cope Hut and Tawonga Huts.

Large woody debris (logs) are also likely to be lost due to hikers collecting wood for campfires. Rocks may be removed and used to create a border around campfires. Evidence of these activities was observed at Cope Hut and High Knob.

4.1 Significant vegetation communities

The potential impacts to federal and state listed vegetation communities and rare or threatened EVCs recorded in the assessment area include:

- direct loss or reduction in extent through removal;

- degradation from vegetation trampling, soil disturbance, erosion, weed invasion and sedimentation; and,
- altered hydrology.

The most significant communities include:

Alpine Sphagnum Bogs and Associated Fens Community (EPBC, FFG)

- Track sections 7 and overnight node 2 (Tawonga Huts).

Snowpatch Community (FFG)

- Track section 14.

Sub-alpine Pond Herbland

- Track section 7.

Of particular concern is potential impacts on the Alpine Sphagnum Bogs and Associated Fens community. The national listing of the Alpine Sphagnum Bogs and Associated Fens community recognises that there are threats to the long-term survival of the community and aims to prevent further decline and promote recovery via landholder and community efforts for future generations (DAWE 2009).

Alpine Sphagnum Bogs and Associated Fens are very sensitive to disturbance. Grazing, trampling, weeds, fire and climate change are the major threats causing vegetation loss which results in soil erosion and altered hydrology (DAWE 2009).

This ecosystem experiences extreme climatic conditions and has a short growing period, so recovery from any impacts takes a long time (DAWE 2009). This is especially the case where disturbance is ongoing, which is occurring in the assessment area largely due to feral horses, deer, recreational horse riding and mountain bike riding.

In addition, hikers can also negatively impact these systems through trampling vegetation, soil compaction and spreading weeds and pathogens on footwear. The listing advice for this community states:

Recreational demands on alpine and subalpine regions continue to rise as more people visit the area in the summer months, as well as the more traditional winter ski season (McDougall and Walsh, 2007). Trampling of vegetation by walkers not keeping to pathways is a growing problem (Whinam and Chilcott, 2002).

4.2 Significant flora species

Potential impacts to rare or threatened flora species in the assessment area include:

- Direct loss of plants through removal.
- Degradation of habitat caused by trampling, soil disturbance, erosion, weed invasion and sedimentation.
- Fragmentation of plant populations.
- Altered hydrology.

The FHAC, as proposed in the Master Plan has the potential to impact the following listed flora:

- Shining Cudweed (EPBC)

- In track section 1, Shining Cudweed plants were located off the existing and potential new sections of track, so are not likely to be impacted by the proposed works unless the track alignment is altered.
- In track sections 2, 3 and 6, Shining Cudweed plants were growing on and beside the existing track so they would be impacted by any works taking place there.

Mountain Daisy (FFG)

- In track section 6, large numbers of Mountain Daisies were growing throughout the assessment area including along the existing track edges, so would be impacted by works in this location.
- In track section 14, Mountain Daisies occurred in parts of the assessment area including the track edges, so may be impacted by works in this area.

Suitable habitat for seven species listed under the EPBC Act and/or FFG Act was identified in the assessment area, and detailed targeted surveys would be required during their active growing season to detect their presence:

- Snow Daphne (EPBC, FFG)
- Rock Poa (FFG)
- Tasmanian Bladderwort (FFG)
- Wire-head Sedge (FFG)
- Thick Eyebright (EPBC, FFG)
- Bogong Eyebright (EPBC, FFG)
- Cushion Rush (FFG)

4.3 Long unburnt Snow Gums

Due to the increased frequency of fire, long unburnt Snow Gums are becoming rarer and are slow to recover because of their short growing season limited by temperature. They provide habitat for common understory flora and foraging, roosting and nesting habitat for common fauna within the study area.

The potential impacts to Snow Gums in the assessment area include:

- Damage to canopies if construction activities encroach on Tree Protection Zones (TPZs), (usually considered impacted if encroaching by more than 10%).
- Damage to roots if construction activities encroach on the Structural Root Zones (SRZs) or TPZs.
- Damage to canopies from routine track maintenance.
- Soil compaction from construction and ongoing foot traffic.
- The removal of or damage to trees from firewood collection.

Damage to the roots and/or canopy of a tree can affect the stability of the tree and affect tree health, and ultimately lead to its death and fall.

Long unburnt Snow Gums occur in:

- Four track sections: 2, 4, 5 and 14.

- Two overnight nodes: 1F (Bogong High Plains) and 4 (High Knob—operated huts).

4.4 Weeds

Weeds already present in the assessment area include WONS, designated noxious weeds and other high risk environmental weeds which provide ready sources of seed and propagules (Image 102). The construction of new tracks, proposed widening of the existing track and establishment of overnight nodes may result in the following impacts in the assessment area:

- Native vegetation removal and exposed soils providing opportunities for weed invasion.
- Transport of weed seeds and propagules into these newly disturbed areas during construction on work boots and construction equipment, leading to new weed infestations.
- After construction is complete, weed seeds may be carried on walkers' shoes and clothing, and spread along the proposed FHAC and into the proposed overnight nodes (Image 102).
- Weeds may spread via waterways into downstream catchments, causing infestations in the broader landscape which could degrade threatened vegetation communities and rare or threatened EVCs, and result in significant impacts to flora and fauna habitat in the wider landscape.



Image 102. Grey Sallow **Salix cinerea* recorded outside the study area at Tawonga Huts (December 2020), (Image credit: Louise Rodda)

4.5 Significant fauna species

Rare or threatened fauna species and/or potentially suitable habitat for them was recorded in track sections 2-16 and each overnight node.

Potential impacts on fauna species include:

- Habitat loss or fragmentation.
- Habitat degradation.
- Direct mortality.
- Spreading pathogens such as the Amphibian Chytrid Fungus.

The proposed FHAC would potentially have the greatest impact on reptile and mammal species. The following species were recorded in the assessment area:

- Broad-toothed Rat *Masacomys fuscus mordicus* (EPBC, FFG)
 - Track section 6.
 - Habitat also recorded in track section 9 and overnight node 2 (Tawonga Huts).
- Southern Greater Glider *Petauroides volans* (EPBC, FFG)
 - Track section 12.
 - Habitat also recorded in overnight node 3 (Diamantina Horse Yards and Red Robin Battery).
- Alpine She-oak Skink *Cyclodomorphys paealtus* (EPBC, FFG)
 - Track section 9.
 - Habitat also recorded in track section 2-8, 10-11 and 13-16 and all overnight nodes 1 (Bogong High Plains), 2 (Tawonga Huts), and 4 (High Knob).
- Guthega Skink *Liopholis Guthega* (EPBC, FFG)
- Platypus *Orithorhynchus anatinus* (FFG)
 - Track section 12.
 - Overnight node 3 (Diamantina Horse Yards).
- Alpine Water Skink *Eulamprus kosciuskoi* (FFG)
 - Track sections 6, 7, and 9.
 - Habitat also recorded in overnight node 2 (Tawonga Huts).
- Alpine Bog Skink *Pseudemoia cryodrama* (FFG)
 - Track sections 6, 7, and 15.
 - Habitat also recorded in track section 9 and overnight node 2 (Tawonga Huts).
- Tussock Skink *Pseudemoia pagenstecheri* (FFG pending)
 - Track sections 2, 6 and 7.
 - Habitat also recorded in track section 3-5, 8-11 and 13-16 and overnight nodes 1 (Bogong High Plains), 2 (Tawonga Huts) and 4 (High Knob).

Habitat was identified in the assessment area for:

- Mountain Pygmy Possum *Burramys parvus* (EPBC, FFG)
- Mountain Skink *Liopholis montana* (FFG nomination pending)
- Murray Spiny Crayfish *Euastacus armatus* (EPBC, FFG)
- Alpine Darner Dragonfly *Austroaeschna flavomaculata* (FFG pending)
- Alpine Stonefly *Thaumatoperla alpina* (EPBC, FFG)
- Stonefly *Riekoperla intermedia* (FFG)

Potential habitat was also identified for:

- Latham's Snipe *Galinago hardwickii* (EPBC migratory)

- Smoky Mouse *Pseudomys fumeus* (EPBC, FFG)
- Alpine Spiny Crayfish *Euastacus crassus* (FFG)

Detailed targeted surveys are required to further assess the likelihood of occurrence and population extent of several of these rare or threatened fauna species in the assessment area. Surveys need to be undertaken during the appropriate season, using adequate survey effort as outlined in accepted protocols, guidelines and peer-reviewed literature.

4.6 Sites of geomorphological significance

Sites of geomorphological significance occur throughout the assessment area (Figure 1). Vegetation cover is the main factor which preserves many of the features of geomorphological significance. Any activities that damage or remove vegetation during or after construction may potentially degrade the quality and significance of these sites.

Potential areas of impact include:

- Features of special interest such as the stone rings at Mount Jim, the solifluction lobes at Middle Creek and the fossil sites in High Plains Creek could be impacted by the siting of the FHAC if it is moved closer.
- While the trail alignment passes through the general Bogong High Plains South area (track sections 5-11 and proposed overnight nodes one and two), the proposed trail alignment in the current plan does not intersect or pass close to any of the discrete features identified (i.e. Mount Cope, Mount Jim, Cobungra Gap and Mount Loch) so is not likely to cause impacts unless the track alignment or overnight nodes are moved closer to them.
- The trail alignment passes in close proximity to Basalt Hill, however Langfords Aqueduct is positioned between the trail and Basalt Hill affording some protection. The significance of Basalt Hill site would be degraded if obscured by construction work, or if Langfords Gap was removed or obscured by track construction.

4.7 Waterways and wetlands

The proposed FHACMP has the potential to impact waterways and wetlands during its construction and operation beyond.

4.7.1 Track and overnight node construction impacts

The potential general impacts associated with construction include:

During construction

- Construction materials and waste may be washed into the nearby waterways.
- Construction activities may require the removal and destruction of vegetation cover contributing to an increased risk of erosion and excessive sediment inputs.

Post construction

- During the operation phase, water quality may be impacted through increased sediment inputs from:
 - Eroding sections of track.

- Areas where vegetation cover is reduced due to construction or off-track trampling by hikers.
- Concentrated flow paths (concentrated water runoff).

4.7.2 Waterway crossing impacts

The proposed trail alignment regularly intersects waterways along its length. As a result, numerous waterway crossings will need to be incorporated into the trail. The potential impacts associated with waterway crossings are site-specific, but may generally include:

- Altering the natural flow pattern of streams (both in-channel and floodplain flows), including:
 - The reduction in hydraulic capacity through the structure.
 - The raising of water levels (an increased afflux or backwater effect) upstream of the crossing structure, potentially increasing the flooding upstream.
 - Increased hydraulic forces and hence erosion potential surrounding the crossing structure (both upstream and downstream) through the concentration of flows and poor design arrangements.
- Disturbing and/or removing riparian and in-stream vegetation.
- Impeding the movement fish and other aquatic fauna through the crossing structure.
- Reducing sediment transport through the crossing structure.
- Increased sediment and nutrient loads due to altered roadside/trackside drainage arrangements.
- Physical damage (i.e. erosion) to the waterway.

4.7.3 Water runoff erosion risk

The track, drainage infrastructure, waterway crossings and impervious surfaces (e.g. roofs of buildings at proposed overnight nodes) have the potential to concentrate water runoff. The concentration of runoff combined with the potential loss of vegetation, particularly on steep slopes, may contribute to additional erosion. This includes but is not limited to:

- The proposed overnight node 1.
- Location B/E, D.
- Alternative locations F and G.
- Overnight node 2.
- Location C.
- Overnight node 3 at Red Robin Battery.
- Overnight node 4 at High Knob on the south side of the track.

5 Legislation and policy

The proposed FHAC is located on Crown land. The key biodiversity protection legislation and policies relevant to the assessment area are:

5.1 Environment Effects Act 1978

The *Environment Effects Act 1978* (EE Act) requires a referral of works that individually or in combination are capable of significantly affecting the environment. The Minister administering the EE Act will assess the referral and may request the preparation of an Environment Effects Statement (EES). If an EES is required, it must be prepared and submitted to the Minister for consideration before any works begin (DSE 2006).

Individual potential environmental effects include:

- Potential clearing of 10 ha or more of native vegetation from an area that:
 - is of an Ecological Vegetation Class identified as Endangered by the Department of Environment, Land, Water and Planning (in accordance with Appendix 2 of Victoria's Native Vegetation Management Framework); or,
 - is, or is likely to be, of very high conservation significance (as defined in accordance with Appendix 3 of Victoria's Native Vegetation Management Framework); and,
 - is not authorised under an approved Forest Management Plan or Fire Protection Plan.
- Potential long-term loss of a significant proportion (e.g. 1 to 5 percent depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria.
- Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'.
- Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems over the long term.
- Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions in air or water, chemical hazards or displacement of residences.
- Potential greenhouse gas emissions exceeding 200,000 tonnes of carbon dioxide equivalent per annum, directly attributable to the operation of the facility.

A combination of two or more of the following types of potential effects on the environment that might be of regional or state significance and therefore warrant referral of a project, are:

- Potential clearing of 10 ha or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan.
- Matters listed under the *Flora and Fauna Guarantee Act 1988*:
 - Potential loss of a significant area of a listed ecological community.

- Potential loss of a genetically important population of an Endangered or threatened species (listed or nominated for listing), including as a result of the loss or fragmentation of habitats.
- Potential loss of critical habitat.
- Potential significant effects on habitat values of a wetland supporting migratory bird species.
- Potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the *National Parks Act 1975*.
- Potential extensive or major effects on land stability, acid sulphate soils or highly erodible soils over the short or long term.
- Potential extensive or major effects on beneficial uses of waterbodies over the long term due to changes in water quality, streamflow's or regional groundwater levels.
- Potential extensive or major effects on social or economic wellbeing due to direct or indirect displacement of non-residential land use activities.
- Potential for extensive displacement of residences or severance of residential access to community resources due to infrastructure development.
- Potential significant effects on the amenity of a substantial number of residents, due to extensive or major, long-term changes in visual, noise and traffic conditions.
- Potential exposure of a human community to severe or chronic health or safety hazards over the short or long term, due to emissions in air or water, noise, chemical hazards or associated transport.
- Potential extensive or major effects on Aboriginal cultural heritage.
- Potential extensive or major effects on cultural heritage places listed on the Heritage Register or the Archaeological Inventory under the *Heritage Act 1995*.

Implications

If the proposed track enhancement and widening (to 900 mm and in limited locations, to 1.2 m) and all proposed overnight nodes are developed as per the FHACMP, then an EE referral would be required based on the following referral criteria:

- *Potential clearing of 10 ha or more of native vegetation from an area that:*
 - *is, or is likely to be, of very high conservation significance (as defined in accordance with Appendix 3 of Victoria's Native Vegetation Management Framework).*
- *Matters listed under the Flora and Fauna Guarantee Act 1988:*
 - Listed communities:
 - Alpine Bog Community
 - Alpine Snowpatch Community
 - Potential loss of critical habitat for:
 - Alpine Bog Skink
 - Alpine She-oak Skink

- Alpine Water Skink
- Guthega Skink
- Broad-toothed Rat
- Southern Greater Glider
- Platypus
- Smoky Mouse
- Aquatic invertebrates including the Murray Spiny Crayfish, Alpine Spiny Crayfish, Alpine Stonefly and the additional stonefly species *Riekoperla intermedia*
- *Potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the National Parks Act 1975.* This may include impacts on:
 - An EPBC Act listed heritage place (Australian Alps National Parks and Reserves).
 - Alpine Sphagnum Bogs and Associated Fens (EPBC Act and FFG Act listed community) equivalent to the Alpine Valley Peatland EVC (bioregional conservation status of Endangered).
 - Sub-alpine Pond Herbland (new record of a community limited in distribution at this location and altitude).
- *Potential extensive or major effects on land stability, acid sulphate soils or highly erodible soils over the short or long term.* This may include a combination of the following:
 - Track widening along narrow ridgelines with steep sides including the Razorback and eastern end of Diamantina Spur, increasing the risk of erosion.
 - Track widening on the Bogong High Plains in Sub-alpine Pond Herbland and Alpine Bog Communities which have highly erodible soils.
 - Overnight node development on steep slopes that may be prone to major instabilities³ including:
 - Overnight node 1 locations B/E (south side), D, F and G on the Bogong High Plains.
 - Overnight node 2 location C at Tawonga Huts.
 - Overnight node 4 at the High Knob hiker camp location.
 - The construction of the hiker camp on the Diamantina River floodplain at overnight node 3, Diamantina Horse Yards.
 - The construction of the hiker camps on the north side of Diamantina Spur, overnight node 4 at High Knob.

³ Geotechnical advice is required to assess land stability.

5.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the primary Commonwealth legislation for environmental protection. Under the Act, an action will require approval from the Commonwealth Minister for the Environment if it has, will have, or is likely to significantly impact on Matters of National Environmental Significance (MNES) under the act (DAWE 2021).

MNES include:

- Listed (nationally) threatened species and ecological communities.
- Migratory species protected under international agreements.
- Ramsar wetlands of international importance.
- The Commonwealth marine environment.
- World Heritage properties.
- National Heritage places.
- The Great Barrier Reef Marine Park.
- Nuclear actions.
- Water resources in relation to coal seam gas development and large coal mining development.

There are several MNES in the assessment area including:

- National Heritage Places: the majority of the assessment area is located within the Australian Alps National Parks and Reserves, National Heritage Place.
- Listed (nationally) threatened species and ecological communities: Alpine Sphagnum Bogs and Associated Fens.
- Listed migratory species.

The listing advice for Alpine Sphagnum Bogs and associated Fens (DAWE 2009) states:

The listing of the Alpine Sphagnum Bogs and Associated Fens ecological community under the EPBC Act does not prevent land managers from continuing to use land in the same way they were before the EPBC Act came into force, providing that they do not significantly change or intensify their activities (and the activity is lawful).

National protection means any new or intensified activities that may have a significant impact on the listed ecological community should be referred to the Australian Minister for the Environment, Heritage and the Arts for assessment.

Those activities that may require referral under the EPBC Act include, but are not restricted to:

- *Changes to natural drainage regimes, such as the diversion of water, affecting the community.*
- *Clearing of the ecological community, dumping of spoil, construction of structures fragmenting the community or impeding natural water balances (e.g. causeways, raised fencelines, fuel breaks, etc.).*
- *Clearing of native vegetation adjacent to the listed community or in the immediate upstream catchment such that drainage regimes supporting the ecological community are affected.*

- *Significant and adverse changes in management regimes affecting the community, including the use of fire.*
- *New weed management regimes that pose significant risk to the listed community.*
- *Allowing new access for domestic stock and other grazing animals (e.g. where there has previously been no access) or intensification in the numbers of animals with access to the ecological community.*

If these matters are considered likely to be significantly impacted by the proposed construction of the FHAC, a referral under the EPBC Act would likely be required.

Implications

If the current FHACMP is delivered without change then the project has the potential to impact a number of MNES requiring a referral, including:

- National Heritage Places: Australian Alps National Parks and Reserves.
- EPBC listed ecological communities: Alpine Sphagnum Bogs and Associated Fens.
- EPBC listed flora species: Shining Cudweed.
- Habitat for eight EPBC act listed fauna species:
 - Broad-toothed Rat
 - Greater Glider
 - Alpine She-oak Skink
 - Guthega Skink
 - Mountain Pygmy Possum
 - Smoky Mouse
 - Murray Spiny Crayfish
 - Alpine Stonefly
- Habitat for EPBC listed migratory species: Latham's Snipe

Further assessment of potential impacts to these MNES is required once the project scope, track alignment and location of overnight nodes has been determined. This must include direct impacts as well indirect and facilitated impacts (e.g. increase in visitation and impacts of recreational uses), and cumulative impacts. A referral under the EPBC Act 1999 is likely to be required.

5.3 Flora and Fauna Guarantee Act 1988

The FFG Act is the primary Victorian state legislation for the protection and conservation of threatened native plants, animals and ecological communities, and for the management of potentially threatening processes on public land and within waterways in the state (DELWP 2020b).

The Act includes lists of threatened flora and fauna species and threatened ecological communities, as well as a list of potentially threatening processes (DELWP 2020b).

The FFG Act also includes a list of protected flora that are plant species with legal protection under the act, comprising threatened flora species listed under the Act, plants belonging to FFG

Act listed communities, and species that need protection for other reasons such as overcollection (see the DELWP website for current lists) (DELWP 2020b). It is an offence to take (kill, injure, disturb or collect), trade, keep, move, or process protected flora without a permit or by Order of the Governor in Council published in the Government Gazette (GIC order), or if the above obligations do not apply (e.g. on freehold land) (DELWP 2020b).

The FFG Act was amended in 2019 (the *Flora and Fauna Guarantee Amendment Act 2019*) which came into effect in June 1, 2020 (DELWP 2020b). The Act includes:

- Guidance around the implementation of the FFG Act, including the rights and interests of traditional owner and impacts of climate change.
- Requirement for government departments to properly consider potential impacts on biodiversity.
- Clarification around the existing process for determination of critical habitat and protection through cooperative management.
- The introduction of a national method of assessing listed threatened species using the Common Assessment Method (CAM).
- Revised enforcement process including increased penalties.

Determination of critical habitat

The determination of critical habitat is a process that will involve a decision being made by the state Minister for Environment with input by the Scientific Advisory Committee (SAC) and consultation with stakeholders through a public consultation period. Specific details about how this process will be initially implemented are not yet available (DELWP 2020b).

Updated threatened species list

The FFG Act threatened species lists and Victoria's threatened species advisory lists have been reviewed and are presently being transitioned in line with the CAM to provide a consolidated list of species listed under the EPBC Act and FFG Act. Up until now, many of the species were classified on one of the three Victorian Advisory Lists: Advisory List of Rare or Threatened Plants in Victoria (DEPI 2014), Advisory List of Threatened Vertebrate Fauna (DSE 2013), and the Advisory List of Threatened Invertebrate Fauna in Victoria (DSE 2009) (DELWP 2020b). The consolidated list replaces the advisory lists and will be known as the 'FFG Act Threatened List' (DELWP 2020b).

Public authority duty

The revised act includes a requirement for public authorities and the relevant ministers to consider potential biodiversity impacts when performing their duties (DELWP 2020b). This includes consideration of the Biodiversity Strategy, relevant action statements, management plans or critical habitat determinations (DELWP 2020b). Different types of impacts on biodiversity must be considered, including:

- Long and short-term impacts.
- Detrimental and beneficial impacts.
- Direct and indirect impacts.
- Cumulative impacts.
- Potentially threatening processes.

Ministerial guidelines are being developed to provide practical steps to assist public authorities and ensure biodiversity is given proper consideration (DELWP 2020b).

The Act also protects threatened species and communities from direct impacts such as habitat clearing which must have approval (DELWP 2020b). The public authority may also be required to provide information to the Minister for Energy, Environment and Climate Change to demonstrate that their duty is being performed or that actions do not threaten listed species, communities, or critical habitat (DELWP 2020b).

Protected flora

The protected flora list is being reviewed under the amended FFG Act and there will be two categories each with different penalties if the Act is not adhered to. They include 'restricted use protected flora' and 'generally protected flora' (DELWP 2020b). At present, all protected flora sit under a single protected flora list (DELWP 2020b).

Implications

The assessment area is located on public land and the FFG Act applies. Ninety-five plant species that are protected flora under the FFG Act, were recorded during the field assessment and a protected flora permit will be required to remove them. A list of protected flora in each proposed section of track and each proposed overnight node is provided in Appendix 9.

Threatened fauna species listed under the Act that may be impacted by the FHAC proposal include, but may not be limited to:

- Alpine Bog Skink
- Alpine She-oak Skink
- Alpine Water Skink
- Guthega Skink
- Broad-toothed Rat
- Southern Greater Glider
- Platypus
- Smoky Mouse
- Aquatic invertebrates including:
 - Murray Spiny Crayfish
 - Alpine Stonefly
 - The stonefly species *Riekoperla intermedia*

Management of threatening processes is also required to be undertaken by PV. Potentially threatening processes that may result from or be increased by the project include:

- Alteration to the natural flow of rivers and streams.
- Degradation of native riparian vegetation along Victorian rivers and streams.
- Habitat fragmentation as a threatening process for fauna in Victoria.
- Increase in sediment input into Victorian rivers and streams due to human activities.
- Prevention of passage of aquatic biota as a result of instream structures.

- Use of *Phytophthora*-infected gravel in construction of roads, bridges and reservoirs.
- The spread of *Phytophthora cinnamomi* from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority.
- Invasion of vegetation by 'environmental weeds'.
- Loss of coarse woody debris from Victorian native forests.
- Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing.
- Infection of amphibians with chytrid fungus, resulting in chytridiomycosis. Infection by the Amphibian Chytrid Fungus has been identified as a threat to the Alpine Tree Frog *Litoria verreauxii alpina* (Clemann and Gillespie 2011).

Some changes have been made under the revised FFG Act to the listing status of flora and fauna species, and the species records recorded during the preliminary assessment should be updated in line with the FFG Act threatened species list in future to ensure implications for all threatened species are assessed through targeted surveys and updates to the project scope as required.

Fourteen listed flora and fauna species and two listed ecological communities have been recorded within the assessment area. Critical habitat for species may be identified during future investigations and there is likely to be direct impacts to listed species and communities (vegetation and habitat removal) resulting from the planned works. Therefore, it is recommended that the project is referred to DELWP for approval when the proposed alignment and locations of overnight nodes are finalised. This is to ensure compliance with the amended FFG Act and avoid potential penalties. If ministerial guidelines become available during the project, they should be followed to ensure biodiversity is given due consideration.

5.4 National Parks Act 1975 and National Parks (Wilderness) Act 1992

The Alpine National Park is designated under Schedule 2 of the *National Parks Act 1975* (NPA) which is the Victorian legislation for the protection and management of national and other protected parks across the state (NPA 2020). It is also covered by Public Land Management Overlays designated under Schedule 6. The NPA also covers the protection of remote and natural areas (NPA 2020). Section 21C of the Act, 'Protection of remote and natural areas' requires PV to control and manage each remote and natural area in accordance with the Act to protect and preserve the natural environment, including indigenous flora and fauna, and features of ecological, geological, scenic, archaeological, historic or scientific significance (NPA 2020).

Sections of the indicative FHAC pass through a remote and natural area; the Bundara-Cobungra remote and natural area, and pass nearby the Bogong remote and natural area. PV must ensure that in these areas:

- No new vehicle tracks are established.
- Existing vehicle tracks are not upgraded to carry heavier vehicles.
- No new structures are constructed.
- No new facilities are installed.
- No other construction or vegetation removal works are carried out.

Construction and vegetation removal works include (but are not limited to):

- Excavation works.
- The destruction, removal or lopping of vegetation.

In addition, under the *National Parks (Wilderness) Act 1992* (NPWA), the following applies under Section 21D 'Management of remote and natural areas', subject to conditions and restrictions (NPA 2020):

- Lawful uses of the land existing prior to the land being included as a remote and natural area may continue.
- Lawful activity or works begun on the land prior to it being included as a remote and natural area may continue.
- Structures lawfully constructed on the land prior to it being included as a remote and natural area may be used for their intended purpose.
- Any works lawfully carried out on the land prior to it being included as a remote and natural area may continue to be carried out for their intended purpose.

In a remote and natural area, anything necessary may be undertaken for:

- The eradication or control non indigenous flora and fauna; or,
- Protection of the natural environment; or,
- Health and safety of the public; or,
- Prevention or control of fire; or,
- Dealing with emergencies relating to disease.

With ministerial approval, actions may be undertaken that:

- Are essential for the responsible management of a remote and natural area; or,
- Are necessary to be done in the public interest, in relation to a remote and natural area; and,
- Do not substantially degrade the natural condition or appearance of the area.

Loss or degradation to the natural condition or appearance of the remote and natural area must be minimised through rehabilitation or other work if:

- The loss or degradation has resulted or is likely to result from activities under this section; or,
- There is evidence of increasing disturbance of the natural condition or appearance of the area, however caused.

Implications

Part of the proposed FHAC runs through the Bundara-Cobungra RNA. Any works in this area would need to be for the purpose of protecting significant and sensitive vegetation such as Sub-alpine Pond Herbland, Alpine Sphagnum Bogs and Associated Fens/Alpine Valley Peatland/Alpine Bog Communities, and rare or threatened flora and fauna species. These communities and threatened species are being impacted by hikers and horses using the existing walking track. Some track works to mitigate such impacts may be permitted in line with the legislation and should be considered.

5.5 Catchment and Land Protection Act 1994

The *Catchment and Land Protection Act 1994* (the CaLP Act) is administered by Agriculture Victoria (AV 2020b). The purpose of the Act is to protect primary production, Crown land, the environment and community health from the effects of noxious weeds and pest animals. Under the Act, all landowners and managers have legal obligations regarding the management and control of declared noxious weeds and pest animals on their land.

There are four categories of noxious weeds under the CaLP Act: State Prohibited, Regionally Prohibited, Regionally Controlled and Restricted. The Victorian Government is responsible for managing State Prohibited weeds. They either do not occur in Victoria or if present, can be expected to be eradicated. Landowners/occupiers must take all reasonable steps to eradicate Regionally Prohibited weeds and manage the growth and spread of Regionally Controlled weeds on their land. The trade in Restricted weeds or their propagules (plants, seeds, contaminants in other materials) is prohibited.

Under the CaLP Act, landowners/occupiers have a legal duty to prevent the spread of, and as far as possible, eradicate established pest animals. There are four categories of pest animals: Prohibited, Controlled, Regulated (collectively referred to as Restricted pest animals), and Established pest animals. Restricted pest animals are not established in the wild in Victoria but have the potential to become a serious threat to primary production, Crown land, the environment or community Health in Victoria, and cannot be kept without a permit. Established pest animals pose the same threat but are established in the wild in Victoria. Landowners/occupiers have a responsibility to prevent their spread and where possible, eradicate established pest animals.

The European Rabbit **Oryctolagus cuniculus* and European Hare **Lepus europaeus* are present in the assessment area, and the Red Fox **Vulpes vulpes* is the most common introduced predator found above the winter snowline (Green and Osborne 2012). The European Rabbit (feral or wild populations), European Hare and Red Fox are declared (established) pest animals under the CaLP Act. Other established pest animals with relevance to the assessment area include wild dogs and cats (feral or wild). All of these species are also priority pest animals in Victoria (AV 2020b).

Landowners/occupiers have a legal responsibility under the CaLP Act to undertake ongoing control measures to prevent the growth and spread of these weeds and pest animals on their land.

In addition, under the *Parks Victoria Act 1988* as well as the CaLP Act, the chief executive officer has park responsibilities in relation to managing noxious weeds and pest animals on PV managed land as the director of National Parks under the *National Parks Act 1975* (NP Act) (AV 2020b) which includes much of the assessment area.

Implications

Six Controlled and two Restricted CaLP Act listed weeds were recorded in the assessment area. As land public managers, PV is responsible for controlling declared noxious weeds in the National Park. Mount Hotham Alpine Resort Management Board is responsible for managing weeds on crown land within the Mount Hotham Alpine resort.

In addition, there are management priority weeds that are a threat to the Alpine National Park such as Hawkweeds **Pilosella* species (PV 2016). They were not recorded in the assessment area but if they do appear there, will need to be managed (Vicflora 2021).

Five or more established pest animals are also known or likely to occur in the assessment area, and are required to be managed with the aim of preventing their spread and a far as possible, eradicating them from affected land.

5.5.1 Declared water supply catchment

Many catchments supplying water for domestic, irrigation or other purposes within Victoria are protected under the CaLP Act (AV 2020c). These catchments have significant values as a source of water for both stock and domestic use (AV 2020c). Once a catchment is Declared, approvals for activities conducted under other statutes and statutory planning schemes must be referred to the responsible land management authority (water authority, CMA or DELWP) for approval (AV 2020c). Information provided in a referral assists planners and those managing land disturbance or development activities to readily determine the suitability of proposed activities within these catchment areas (AV 2020c).

Implications

The entire Falls – Hotham trail is within the Upper Kiewa Declared Water Supply Catchment (AV 2020c). Therefore, approval will be required from the relevant water authority, North East CMA or DELWP.

It is likely that further design details will be required for both the proposed track and overnight nodes prior to seeking approval from relevant authorities. Potential conditions of approval from relevant authorities may include the determination of appropriate waterway buffers and wastewater management requirements (e.g. self-contained waste water systems).

5.6 Water Act 1989

The Water Act provides a legal framework for managing Victoria's water resources (Melbourne Water 2020). The main purpose of the Water Act is to:

- Promote the equitable and efficient use of our water resources.
- Make sure our water resources are conserved and properly managed for the benefit of all Victorians.
- Increase community involvement in conserving and managing our water resources.

Under the Act, the Catchment Management Authorities (CMAs) are responsible for regulating works on waterways. The regulation of works on waterways is managed through Works on Waterways Permits. These permits are required for any works or activities in, under, on, or over the bed and banks of a designated waterway in Victoria (North East CMA 2020). The Falls – Hotham trail is within the North East CMA region.

Designated waterways can be named or unnamed, permanent or seasonal, and range in size from major rivers to natural depressions or ephemeral drainage lines. Designated waterways are declared under the Water Act 1989. The North East CMA has maps of designated waterways in their region, and the CMA will need to be consulted to confirm which of the potential waterway crossings are located on designated waterways (North East CMA 2020).

Some examples of works and activities that are potentially relevant to the proposed trail which require a permit include, but are not limited to:

- Waterway crossings, including bridges, fords, and culverts.

- Stabilisation works.
- Services/utility crossings.
- Stormwater outlets.

To obtain a Works on Waterway Permit, an application form must be completed and submitted to the North East CMA. Depending on the complexity of the works detail provided in the application, the North East CMA may request additional information in order to assess the application. When the application and proposed works are deemed satisfactory, a permit will be issued. Once a permit is received, the North East CMA must be notified at least seven days prior to starting the works and at the completion of the works. A Works on Waterway Permit will generally be valid for 12 months from the date of issue (North East CMA 2020).

Implications

Parks Victoria should consult the North East CMA to identify which waterways are designated waterways within the planned FHAC, and requirements for a Works on Waterways permit.

5.7 *Wildlife Act 1975 and Wildlife Regulations 2002 (Victoria)*

The *Wildlife Act 1975* and *Wildlife Regulations 2002* is the primary legislation in Victoria providing for the management and protection of wildlife. The objectives of the Act are to regulate potential harm to, the taking, destruction and control of native wildlife, inform the conduct of those involved in working with wildlife, establish procedures for the protection and conservation of wildlife, and assist in preventing species extinctions. Controls for threatened fauna species listed under the FFG Act (apart from listed fish and invertebrates) are also applied under the Wildlife Act.

Implications

Management Authorisation under the Wildlife Act will be required before undertaking any actions likely to interfere with protected native fauna, including the salvage and release of animals from the works areas.

5.8 *Planning and Environment Act 1987*

The purpose of the *Planning and Environment Act 1987* is to establish a framework for planning the use, development and protection of land in Victoria. The removal of native vegetation in Victoria is regulated under the Act through local government planning schemes. Within the state, a permit is required to remove, destroy or lop native vegetation. Planning proposals that may impact native vegetation are governed by two provisions: Clause 52.16 *Native vegetation precinct plan* and Clause 52.17 *Native vegetation*, which are incorporated into all Victorian planning schemes under the Act.

5.8.1 Alpine Shire Council, East Gippsland Shire Council and Alpine Resorts planning schemes

The FHAC assessment area starts at the boundary of the Falls Creek Alpine Resort and finishes inside the boundary of Mount Hotham Alpine Resort. It is located on Crown Land and is not covered by a native vegetation precinct plan, so Clause 52.16 does not apply (DELWP 2020f).

The purpose of Clause 52.17 of the Alpine Resorts, Alpine Shire and East Gippsland Shire planning schemes (and all planning schemes) is to prevent net loss to biodiversity caused by the removal, destruction or lopping of native vegetation. This is achieved through the three-step approach to achieve avoidance and minimisation (DELWP 2020f).

Avoidance and minimisation

Under Clause 52.17 of all Planning Schemes, the three-step approach must be applied in accordance with the Guidelines (DELWP 2020f):

... to ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation:

1. *Avoid the removal, destruction or lopping of native vegetation.*
2. *Minimise impacts from the destruction or lopping of native vegetation that cannot be avoided.*
3. *Provide an offset to compensate for the biodiversity impacts from the removal, destruction or lopping of native vegetation.*

Under Clause 52.17-2, a planning application to remove, destroy or lop native vegetation must fulfill requirements under the Guidelines unless an exemption applies (DELWP 2017a).

As the assessment area is situated on Crown Land and PV are undertaking the works, the Crown Land Exemption applies, and a permit is not required under Clause 52.17 to remove, destroy or lop native vegetation. Details of the Exemption are provided in Section 5.8.2.

5.8.2 Crown land exemption

Under Clause 52.16 and Clause 52.17, there is a *Crown land exemption* and a *Road safety exemption* from requiring a permit to remove native vegetation by PV or DELWP on Crown land (DELWP 2018). To rely on these exemptions, the removal of native vegetation must be kept to a minimum (DELWP 2017b).

The document “*Exemptions from requiring a planning permit to remove, destroy or lop native vegetation – Guidance*” (DELWP 2017b), the Alpine Shire planning scheme and East Gippsland Shire planning scheme provisions outline exemptions from requiring a planning permit to remove, destroy or lop native vegetation under Clause 52.17-7 ‘Table of exemptions’ (Planning Victoria 2020), which states that:

The requirement to obtain a permit does not apply to:

Crown land

Native vegetation that is to be removed, destroyed or lopped to the minimum extent necessary to manage Crown land:

- *Crown land by or on behalf of the Secretary to the Department of Environment, Land, Water and Planning (as constituted under Part 2 of the Conservation, Forests and Lands Act 1987), or Parks Victoria, and in accordance with the Procedure for the removal, destruction or lopping of native vegetation on Crown land;*
- *Or with written permission from the Secretary to the Department of Environment, Land, Water and Planning (as constituted under Part 2 of the Conservation, Forests and Lands Act 1987).*

PV must comply with the *Procedure for the removal, destruction or lopping of native vegetation on Crown land – For use by the Department of Environment, Land Water and Planning and Parks Victoria*

(Procedure) (DELWP 2018) to rely on the Crown land and Road safety exemptions under Clause 52.16 and Clause 52.17 of the planning schemes. The Procedure is endorsed by the Secretary to DELWP under Part 2 of the *Conservation Forest and Lands Act*.

The Procedure applies to the removal of all native vegetation by DELWP and PV on Crown Land, and is classified as either maintenance or new removal of native vegetation (DELWP 2018).

Maintenance includes the removal of native vegetation that:

- Has re-established in an area where native vegetation was previously lawfully removed.
- Is encroaching on existing assets and/or maintenance areas.
- Is required to address immediate risk to life or assets.
- Relates to conservation works that provide an overall improvement for biodiversity⁴.
- Relates to planned burning.

The new removal of vegetation is defined as:

- Any native vegetation removal that is not a maintenance activity as described above.
- Includes the removal of native vegetation in areas where there is an expansion of an existing works or asset footprint, or where new works or assets are constructed (DELWP 2018).

As with Clause 52.17, a strategy of avoidance and minimisation must be followed, with the Procedure placing a strong emphasis on avoiding and reducing impacts on important biodiversity values outlined in the Procedure (DELWP 2018).

The Procedure requires consideration of important biodiversity values (as relevant to this project) such as:

- Known critical/important habitat, Endangered EVCs or species locations.
- Victorian Biodiversity Atlas records for rare or threatened species.
- Important habitat for a rare or threatened species whose habitat is dispersed.
- Highly localised habitat for rare or threatened species.
- Endangered Ecological Vegetation Classes.

The Procedure provides some approaches to minimising impacts of native vegetation removal. Those that may apply to the FHAC (DELWP 2018), include:

- Locating activities, use or development in areas with no or low value native vegetation.
- Designing the activity or development to minimise its footprint.
- Placing buildings close to existing roads or close together to minimise the length of new roads or pathways.
- Measures to minimise off-site impacts to the surrounding environment, for example sediment runoff resulting from soil erosion.
- Using a vegetation removal method that causes minimal impacts on native vegetation. Generally using hand-held tools rather than machinery or herbicides assists with minimising impacts.

⁴ In accordance with the conservation exemption in Clause 52.17 of all planning schemes

Other considerations for minimisation include:

- Whether there is a way to undertake the management activity without removing any native vegetation.
- Whether one management activity can be used to meet multiple objectives, for example, an access track may also serve as a fuel break.
- Only removing vegetation that is necessary to allow the undertaking of the activity, use or development.
- Ensure those acting on behalf of DELWP and PV, such as contractors, understand their obligations under this Procedure.

The removal of vegetation and resultant loss of biodiversity on Crown land by PV is to be counterbalanced by actions to improve native vegetation condition, extent or security.

Counterbalancing actions also include activities beyond improvement of vegetation condition such as improving waterway habitat.

Implications

PV is exempt from requiring a permit to remove native vegetation for the redevelopment of the FHAC under Clause 52.17 of the Alpine Shire and Alpine Resorts Planning Schemes, but will still need to demonstrate avoidance or minimisation.

Parks Victoria have existing management obligations in their role as public land managers to improve vegetation condition such as removal of weeds and pest animals which are currently being undertaken through the delivery of various programs, for example feral horse management. Under the Crown land exemption these actions may be considered counterbalancing activities.

The national park status of most of the assessment area already provides security, and a substantial increase in the extent of alpine vegetation is not possible due to natural climate and altitude limitations as well as increasing pressures from climate change.

5.8.3 Zones and overlays

The FHAC assessment area is located across three local government areas (the Alpine Shire and East Gippsland Shire) and the Mount Hotham Alpine Resort which is managed by the Mount Hotham Alpine Resort Management Board (Appendix 1). The assessment area is covered by a number of zones and overlays which stipulate planning requirements that must be met (Table 14) (Appendix 1).

Table 14. Local government areas, resort management boards, planning zones and overlays that apply to the FHAC assessment area (DELWP 2020f), (September 2020)

Local Government Area	Zone	Zone code	Requirements
Alpine Shire Council	Public Conservation and Resource Zone	PCRZ	A permit is required to construct a building or carry out works under the PCRZ in the Alpine Shire and East Gippsland Shire, and may be required for the construction of the proposed FHAC trail and accommodation nodes.
East Gippsland Shire Council	Public Conservation and Resource Zone	PCRZ	
Alpine Shire Council	Bushfire Management Overlay	BMO	There are overnight accommodation nodes proposed within the Alpine Shire and East Gippsland Shire in areas covered by a BMO (Appendix 1). Construction of proposed overnight accommodation may need to meet requirements under Clause 44.06-2 'Permit requirement' which states that a permit may be required to construct or carry out works associated with accommodation or leisure and recreation (DELWP 2020f). A permit application must be accompanied by a bushfire hazard site assessment, a bushfire hazard landscape assessment and a bushfire statement, and may also need to meet other conditions (DELWP 2020f). These conditions may be waived, varied or reduced in agreement with the responsible authority (DELWP 2020f).
East Gippsland Shire Council	Bushfire Management Overlay	BMO	
Mount Hotham Alpine Resort (Uninc)	Public Park and Recreation Zone	PPRZ	The western part of the assessment area within the Mount Hotham Alpine Resort is situated within the PPRZ. No requirements were identified for the FHAC under this zoning.
Mount Hotham Alpine Resort (Uninc)	Comprehensive Development Zone - Schedule 2	CDZ2	The last c. 500 m of the planned FHAC is located within the CDZ2 in the Mount Hotham Alpine Resort. Under the CDZ2 a planning permit may be required for the removal of native vegetation (DELWP 2020f). The permit application must be accompanied by a plan for 'building and works', 'native vegetation', and by a 'site environmental plan' which provides information outlined in Schedule 2 to Clause 37.02 'Comprehensive Development Zone' (Appendix 1) (DELWP 2020f).
Mount Hotham Alpine Resort (Uninc)	Road Zone - Category 1	RDZ1	No requirements were identified under the RDZ1 within the Mount Hotham Alpine Resort.

Local Government Area	Zone	Zone code	Requirements
Mount Hotham Alpine Resort (Uninc)	Erosion Management Overlay - Schedule 1	EMO1	Approximately 1 km of the proposed track between the Mount Hotham Alpine Resort and Mount Hotham is covered by an EMO1. Under this overlay, either a permit or a site development plan may be required to remove, destroy or lop native vegetation (DELWP 2020f). The permit must meet application requirements outlined in Clause 44.01-6 of the EMO (DELWP 2020f). Alternatively, a site development plan can be prepared and provided to the satisfaction of the responsible authority (DELWP 2020f). The site development plan must meet the requirements outlined in Schedule 1 to Clause 44.01 Erosion Management Overlay which includes a Preliminary Geotechnical Assessment (DELWP 2020f).
Mount Hotham Alpine resort (Uninc)	Bushfire Management Overlay - Schedule 1	BMO1	The entire Mount Hotham Resort is covered by a BMO1, and a permit is required to construct a building or carry out works associated with a number of uses, one of which is 'leisure and recreation' (DELWP 2020f). A permit application must be accompanied by a bushfire hazard site assessment, a bushfire hazard landscape assessment and a bushfire statement (DELWP 2020f).

Implications

PV will need to consult with Alpine Shire Council, East Gippsland Shire Council and the Mount Hotham Resort Management Board to confirm their permit requirements, in particular, requirements under the BMO for a bushfire hazard site assessment, a bushfire hazard landscape assessment and a bushfire management statement.

6 Recommendations

The preliminary environmental assessment indicates that implementation of the current FHACMP could significantly impact federal and state listed flora, vegetation communities, fauna and fauna habitat. A number of waterways are also likely to be affected which could impact soil stability, cause erosion and impact water quality in the assessment area and downstream. The following recommendations are provided to assist with the revision of the project scope to mitigate environmental impacts including the avoidance and minimisation of impacts on native vegetation in line with the Procedure.

6.1 Track design and construction

6.1.1 Overview

These are general recommendations only, and qualified, experienced track designers will need to be consulted to develop effective design options based on those used elsewhere in similar environs (e.g. alpine parks in Tasmania and New South Wales).

Ecologists with appropriate alpine experience should be involved in the design process to ensure impacts on biodiversity are minimised.

6.1.2 Track realignment

The option to realign the existing track around significant communities such as Sub-alpine Pond Herbland and Alpine Bog Community that are highly susceptible to impacts from hikers and horses was examined. However, these communities extend for hundreds of metres beyond the assessment area. Building a track around these communities (or realigning the track in any other section) would entail a significant amount of vegetation removal and destruction, substrate disturbance and associated impacts of soil erosion, potential waterway sedimentation, altered hydrology and wetland impacts, and facilitation of weed invasion. In some locations it may also impact sites of geomorphological significance.

Track realignment works should be limited to that necessary for the protection of natural values, for example:

- Realignment of section 9 at Tawonga Huts is recommended to minimise impacts on an Alpine Bog Community (Table 15).
- Positioning of discrete waterway crossings in more stable/robust locations (e.g. a straight section of waterway or bedrock-controlled areas).

6.1.3 Track widening

If a decision is made to construct new sections of track or widen existing sections of track, then the recommended average track width is 600 mm (or less) rather than 900 mm. This may still be a comfortable width for people to walk on, but would minimise and avoid some clearing of vegetation and habitat for threatened fauna. This decision could be reviewed during further stages of planning and revising the scope in consultation with suitably qualified and experienced track construction engineers.

Limit widening of existing tracks to where this may protect natural values, for example:

- Areas damaged by off-track walking where widening is required which may also improve definition and to deter hikers from walking off-track.
- In some locations up on the Razorback and a section near Cope Saddle Hut on the Bogong High Plains (Image 103), walkers have diverged creating two tracks. It is recommended that PV close additional tracks and define and retain one track to reduce impacts to vegetation and fauna habitat.
- Use existing vehicle tracks to achieve the objective of providing opportunity for side-by-side walking. This may not require construction works that would impact environmental values.



Image 103. View toward Cope Saddle Hut (SEC Hut) showing a secondary track parallel to the main track which is marked by a snow pole and located on higher ground further from the aqueduct (out of frame to the south) (December 2020), (Image credit: Louise Rodda)

6.1.4 Track surface

Of the existing track surface material currently being used, rubber matting appeared to have the least direct impact on biodiversity. Native vegetation grew right up to and over the edges of the rubber mats, and some persisted in the grid openings. There was very little bare exposed ground or erosion around rubber mats and as a result, fewer weeds. The grid openings allow water penetration, and the matting is fixed in place so is not likely to move or wash away.

Drawbacks of using rubber matting include potential destruction by fire and the large clean-up effort that would then be required. Even in the absence of fire, eventual deterioration may require significant efforts to remove the rubber to avoid it littering the landscape. Black rubber matting may also attract skinks seeking warm places for basking which can lead to them being inadvertently trampled on and killed by hikers, as has been observed by PV staff (M. Antos pers. obs.).

Unlike the rubber matting, river pebbles did not support vegetation growth along the path where they remained intact. In places, the pebbles had also moved, leaving exposed bare ground which may then result in weed establishment and erosion. There is a risk that river pebbles may also carry Cinnamon Fungus *Phytophthora cinnamomi* into sites, so this substrate should be used with caution. The use of *Phytophthora*-infected gravel in the construction of roads, bridges and

reservoirs is a threatening process listed under the FFG Act, and PV as public land managers are responsible for managing this threat. River pebbles are fire resistant and are unlikely to deteriorate significantly over time.

Stepping stones are probably the most permanent or stable substrate for wet areas, however different people require different spacing of steps to walk on them comfortably, so they would need to be positioned with this in mind. Evidence of off-track walking was observed beside some basalt stepping stones (Image 5).

Logs are not recommended as a track treatment due to their potential to deteriorate more quickly than other materials, and there was evidence of off-track walking adjacent to parts of the track stabilised with parallel logs. The log surfaces were difficult to walk on and would not be fire resistant.

Steel bridges have been used as waterway crossings in the assessment area and may offer an option to manage impacts on flora, sensitive and significant communities, and threatened fauna habitat through good design (Images 97 and 104). This could include long spans between footings to reduce soil and vegetation disturbance during construction. Steel grids may offer a solution that is strong enough to take the weight of snow, allows snow melt to drain away, allows water and light to reach vegetation below, and may withstand fire. This is one track treatment option that could be considered to protect fragile significant and listed vegetation communities, including:

- Alpine Bog Community:
 - c. 1 km along walking tracks; and,
 - c. 1 km along existing vehicle tracks.
- Sub-alpine Pond Herblad along existing walking track for c. 1.2 km.

However, Sub-alpine Pond Herblad and areas of Alpine Bog Community lie within the Bundara Cobungra RNA (see Section 5.4) and therefore careful consideration should be given to the benefits and impacts of these structures.



Image 104. Example of steel bridging over a drainage line intersecting Pretty Valley Road within the Falls Creek Alpine Resort boundary (December 2020), (Image credit: Louise Rodda)

Any track surfacing should include remediation of sections of channelised track created by hikers and horses.

During the design phase, consideration should be given to the potential effects of introducing perches or clearings that predatory birds could exploit to increase predation on reptiles and other terrestrial fauna in these habitats.

Bridging design and installation anywhere along the proposed FHAC should be undertaken in consultation with scientists/ecologists who have extensive knowledge of alpine flora and fauna, working in collaboration with the track designers and engineers.

6.1.5 General track drainage recommendations

The track surface and drainage should be managed along the entire route to protect receiving waterways from sediments resulting from erosion. Physical damage to the waterways will also need to be avoided. Waterway treatments must consider direct impacts to the edges of riparian and bog habitats that may be used by threatened fauna.

The concentration of water flow along or next to the track can result in the degradation (erosion) of the track and surrounding environment. The following general principles are recommended to manage drainage along the alignment and are based on the proposed track arrangement (i.e. a formalised 900 mm wide track) provided in the FHACMP.

- Incorporating appropriate drainage arrangements for all track sections. Appropriate drainage arrangements will depend on the final track design but may include:
 - Use appropriate crossfall profiles in conjunction with one or a combination of the following drainage techniques to avoid flow concentration and subsequent erosion:
 - Table drains.
 - Mitre drains.
 - Rollovers.
 - Cross drains (also known as relief pipes or culverts).
 - Dish drains (also known as swales or spoon drains).
 - Catch drains.
- Erosion and scouring risk can be further minimised with appropriate reinstatement of any vegetation removed during construction along the trail (e.g. sods of native *Poa* tussock grasses).

Where the existing track is retained (e.g. 400 mm wide with rubber matting or similar) the extent of drainage infrastructure should be kept to a minimum and aim to avoid the concentration of runoff along or adjacent to the track.

These recommendations are general in nature and should be reviewed and refined in the updated scope of works.

6.1.6 General waterway crossing design principles

In general, most waterway crossings will have some influence on the hydrologic, hydraulic and physical conditions surrounding the crossing site. However, suitably designed and constructed

waterway crossings need to consider the long-term stream dynamics and hydrologic and hydraulic conditions at the crossing site to minimise potential impacts. The failure to do so potentially risks long-term physical damage to the surrounding waterway, and potential damage to, and/or failure of the crossing structure.

The following general principles are recommended for the construction of waterway crossings and are general in nature. They should be reviewed and refined as more detailed design information becomes available.

We recommend that a suitably qualified waterway engineer and geomorphologist is involved in the design of the waterway crossings to ensure the crossings do not negatively impact on the waterway.

The proposed trail arrangement commonly intersects waterways along its length. As a result, there will be numerous waterway crossings that will need to be incorporated into the trail.

Possible waterway crossing types include:

- Low profile ford crossings (typically earthen or rock lined crossings/stepping stones that do not incorporate a culvert).
- Pipe culverts.
- Box culverts.
- Bridges (inclusive of raised walkways).

The key design considerations, advantages and disadvantages of each of these options is provided in Appendix 8.

Many of the existing waterway crossings can be retained. Where new water crossings are required, the crossing type will need to be determined on a site-by-site basis. However, in general, culverts should typically be avoided for the following reasons:

- Culverts have the potential to catch debris and therefore exacerbate impacts associated with increased afflux upstream of the crossing and maintenance requirements.
- Poor construction methods have the potential to initiate bed deepening in the waterway upstream of the crossing.
- Culverts concentrate flows through the structure, increasing hydraulic forces (and therefore erosion potential) surrounding the structure.
- Culverts could prevent the passage of fish and other aquatic fauna through the crossing.
- Culverts typically restrict bed load sediment transport through the structure.

Additional recommendations:

- Where possible, realign the track to minimise the number of waterway crossings and avoid crossings over sensitive waterways or wetlands (e.g. Alpine Bog Communities).
- Construction activities should be managed to avoid initiating stream bed or bank erosion. This can be achieved by:
 - Generally ensuring that any works in the bed of the waterway are designed not to lower the existing invert (level) of the stream bed.

- Returning the stream invert to its pre-works level if excavation works are necessary.
- Minimising disturbance to the stream bed and banks during construction activities.
- As required, placing appropriate rock protection within the stream bed both upstream and downstream of any crossing structure (e.g. pipe or box culvert) for scour protection. We recommend the rock lining arrangements be designed by a suitably qualified engineer.
- The location of all crossings should be sited on a stable section of stream. As such, some minor track realignment may be required. For example:
 - Infrastructure or crossings placed upstream of a knickpoint (a bed erosion feature) should consider the potential for that knickpoint to migrate upstream and harm assets such as crossing infrastructure.
 - Generally, all track crossings should be aligned so that the crossings are perpendicular to the mainstream flow path where practicable.
 - Infrastructure or crossings placed near a waterway should generally not be placed close to an outside bend unless suitable protection is provided.
- Incorporate appropriate drainage arrangements for all track crossings. Appropriate drainage arrangements include:
 - Ensuring that runoff from access tracks leading to the crossing, other than from the battered access ramp excavated into the stream banks, is diverted away from the waterway into vegetated verges adjacent the waterway.
 - Drainage lines associated with access tracks leading to the crossing should be armoured with rock lining to prevent scour.
- Ensure that suitable erosion control measures are implemented to prevent sediment generated from construction activities entering the waterway or moving downstream.
- Constrictions to the floodplain and channel cross-sectional area associated with a crossing have the potential to increase the hydraulic forces and erosion potential within the vicinity of the crossing. Where such works are proposed, we recommend that:
 - Appropriate scour protection works (rock armouring of the stream bed and banks) are incorporated into the works.
 - Any rock lining arrangements are designed by a suitably qualified engineer. Appropriate rock armouring will also be required where crossing structures are designed to be overtopped during high flow events.
- Although outside of the Melbourne Water region, Melbourne Water's Shared Pathway Guidelines (2009) may provide relevant guidance for shared pathway design adjacent waterways that may be useful for the proposed trail (Section 4.9.1).

6.1.7 Flood risk management

The design of the trail should identify measures to ensure the safety of path users, including how access to sections of the path liable to flooding at the 10% annual exceedance probability (AEP)⁵ event level will be prevented in high flow events.

While its specific alignment is yet to be determined, the proposed trail will likely be partially located within the 1% AEP floodplain, with sections prone to flooding during 10% AEP events. Consequently, it is recommended that the design:

- Allows for crossing structures (e.g. pedestrian bridges), as discussed in the previous sections.
- Allows for well-marked refuge areas.
- Gives path users advanced warning of moderate and high hazard areas. This may include:
 - Additional signage along the trail such as depth gauges.
 - Flood-activated boom gates or other barriers to block access to inundated sections of track in the event of a flood.
 - Non-structural measures, such as integrating responses as part of a Flood Response Plan.
 - The use of drown-outs (a shallow inundated barrier that deters entry to other flooded sections of trail that have unsafe depths (e.g. along the Kiewa River West Branch and Diamantina River floodplains) (Figure 2).

⁵ Annual exceedance probability (AEP) is the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year (BOM 2021).

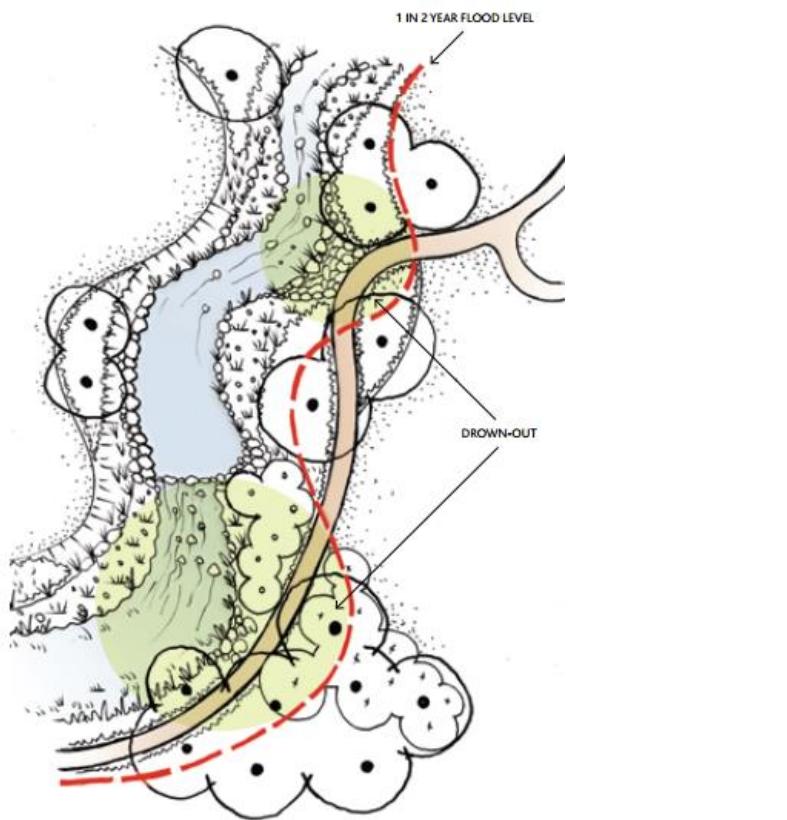


Figure 2. Schematic of a drown-out arrangement (source: Melbourne Water's Shared Pathways Guidelines)

6.1.8 Ongoing track management

Ongoing management will be required to minimise impacts on natural values including:

- Undertake weed control along the existing track and surrounding areas with a focus on WONS, declared noxious weeds and other very high to high risk environmental weeds, to prevent their further spread in the assessment area and beyond.
- Continue to implement the Feral Horse Action Plan 2021.
- Maintain track surface integrity and remediate damage caused by horses and hikers walking off-track.
- Ensure ongoing maintenance to manage erosion of soil around stepping stones.
- Maintain track runoff drainage controls.
- Mitigate erosion.

A detailed description, summary of natural values and minimisation recommendations for each section of track is provided in Table 15.

Table 15. Summary of flora and fauna values likely to be impacted, potential waterway impacts, and management recommendations to avoid or minimise impacts, FHAC trail alignment, December 2020

Track Section	Track type	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna values potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
1	Existing vehicle track New track A new section of track is required between the maintenance hut and the western end of dam wall	Located below and extending along the length of the Rocky Valley storage dam wall. Situated at around 1600 m ASL. One half of this section is located between the western end of the dam wall and a management hut at the centre of the wall. It is dominated by weeds, with no clearly defined track. The other half extends from the management hut to the car park at the beginning of Heathy Spur Track. This part is a management vehicle track providing a ready-made wide section of track for side-by-side walking. This part is also dominated by weeds with some scattered rare or threatened plants.	<ul style="list-style-type: none"> Shining Cudweed <i>Argyroxiphium nitidulum</i> (EPBC, FFG) Plants are located beyond the current track alignment and buffer zone but within the assessment area 10 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> None identified. 	<ul style="list-style-type: none"> 1 EPBC Act listed species 2 FFG Act listed species 	<ul style="list-style-type: none"> Waterways below the dam have the potential to be negatively impacted through concentration of flows, track runoff and construction activities that lead to physical damage/erosion 	<ul style="list-style-type: none"> Minimise track widening Minimise track realignment Incorporate appropriate track runoff arrangements to avoid concentration of flow and associated erosion along and/or adjacent to the track Undertake weed control
2	Existing track	Heathy Spur Track is a well-used, narrow dirt track located on Heathy Spur. Ascending from around 1600 m ASL from the Rocky Valley Dam wall to around 1760 m ASL near Big River Fire Trail. Evidence of off-track walking was observed beside some basalt stepping stones. Off-track brush cutting was evident in some parts where dense shrubs grew up to the track edges. Parts of the track have become channelised making it difficult to walk on and leading to hikers walking off-track and damaging vegetation. There are a number of high threat weeds in this	<ul style="list-style-type: none"> Shining Cudweed (EPBC, FFG) 26 Victorian rare or threatened flora species Suitable habitat for: <ul style="list-style-type: none"> Bogong Eyebright <i>Euphrasia eichleri</i> (EPBC, FFG) Snow Daphne <i>Kelleria bogongensis</i> (EPBC, FFG) 	<ul style="list-style-type: none"> Alpine Sphagnum Bogs and Associated Fens (EPBC) Alpine Bog Community (FFG) 4 EVCs with a bioregional conservation status of Endangered or Rare: <ul style="list-style-type: none"> Alpine Valley Peatland (Endangered) Alpine Grassland (Rare) Alpine Grassy Heathland (Rare) Sub-alpine Shrubland (Rare) 	<ul style="list-style-type: none"> 2 EPBC Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Multiple sensitive waterways in the Alpine Bog Community have the potential to be negatively impacted through the concentration of flows and construction activities that lead to physical damage/erosion and/or the loss of vegetation Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion 	<ul style="list-style-type: none"> Minimise track widening limiting it to areas where it may be required to deter off-track walking Avoid track realignment Undertake targeted surveys for rare or threatened species in the appropriate seasons Install crossings at waterways and ground water expression/seepage points to avoid physical damage Incorporate appropriate track runoff arrangements to avoid concentration of flows and associated erosion along and/or adjacent to the track

Track Section	Track type	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna values potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
		area including CaLP Act listed Grey Sallow * <i>Salix cinerea</i> , Jointed Rush * <i>Juncus articulatus</i> subsp. <i>articulatus</i> , Soft Rush * <i>Juncus effusus</i> subsp. <i>effusus</i> and Slender Rush * <i>Juncus tenuis</i> .	<ul style="list-style-type: none"> ○ Cushion Rush <i>Juncus antarcticus</i> (FFG) ○ Tasmanian Bladderwort <i>Utricularia monanthus</i> (FFG) ● Patches of long unburnt Snow Gums 				<ul style="list-style-type: none"> ● Apply treatments and manage channelised track areas and off-track walking areas required ● Undertake weed control
3	Existing track	Big River Fire Trail is a well-used maintenance vehicle track that can meet multiple objectives i.e. also wide enough for side-by-side walking. Situated at around 1750 m ASL. The track intersects an Alpine Bog Community. There are some weeds along the track edges.	<ul style="list-style-type: none"> ● Shining Cudweed (EPBC, FFG) ● 24 Victorian rare or threatened flora species ● Suitable habitat for: <ul style="list-style-type: none"> ○ Snow Daphne (EPBC, FFG) ○ Cushion Rush (FFG) ○ Tasmanian Bladderwort (FFG) 	<ul style="list-style-type: none"> ● Alpine Sphagnum Bogs and Associated Fens (EPBC) ● Alpine Bog Community (FFG) ● 4 EVCs with a bioregional conservation status of Endangered or Rare: <ul style="list-style-type: none"> ○ Alpine Valley Peatland (Endangered) ○ Alpine Grassland (Rare) ○ Alpine Grassy Heathland (Rare) ○ Sub-alpine Shrubland (Rare) 	<ul style="list-style-type: none"> ● 1 EPBC Act listed species ● 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> ● Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion 	<ul style="list-style-type: none"> ● Avoid track widening ● Avoid realignment ● Undertake targeted surveys for rare or threatened species in the appropriate seasons ● Maintain appropriate track runoff arrangements to avoid erosion and sedimentation into the receiving waterway ● Undertake weed control
4	Existing track	Consists of a narrow well-used walking track which is part of the Australian Alps Walking Track between Marum Point Track and Langford West Aqueduct Road. Descending from around 1750 m ASL at Big River Fire Trail to 1600 m ASL at the aqueduct. Steeper sections on the descent to the Langford Aqueduct have dense shrubby understory along the track edges.	<ul style="list-style-type: none"> ● 21 Victorian rare or threatened flora species ● Suitable habitat for: <ul style="list-style-type: none"> ○ Snow Daphne (EPBC, FFG) ○ Cushion Rush (FFG) 	<ul style="list-style-type: none"> ● Alpine Sphagnum Bogs and Associated Fens (EPBC) ● Alpine Bog Community (FFG) ● 4 EVCs with a bioregional conservation status of Endangered or Rare: <ul style="list-style-type: none"> ○ Alpine Valley Peatland (Endangered) ○ Alpine Grassland (Rare) 	<ul style="list-style-type: none"> ● 2 EPBC Act listed species ● 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> ● Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion 	<ul style="list-style-type: none"> ● Minimise track widening, limiting it to areas where it may be required to deter off-track walking ● Avoid track realignment ● Undertake targeted surveys for rare or threatened species in the appropriate seasons ● Install waterway and ground water expression/seepage point crossing arrangements to

Track Section	Track type	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna values potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
			<ul style="list-style-type: none"> Patches of long unburnt Snow Gums 	<ul style="list-style-type: none"> Alpine Grassy Heathland (Rare) 			<ul style="list-style-type: none"> avoid physical damage to the waterways Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to track Undertake weed control
5	Existing track	A well-used maintenance vehicle road along the Langford West Aqueduct between the Australian Alps Walking Track and Bogong High Plains Road. Situated at 1600 m ASL. The track is wide enough for hikers to walk side-by-side. There are a variety of weeds including species listed under the CaLP Act and other high threat environmental weeds in this section. They include *Grey Sallow, Spear Thistle * <i>Cirsium vulgare</i> , *Jointed Rush, *Soft Rush and *Slender Rush.	<ul style="list-style-type: none"> Silky Snow-daisy <i>Celmisia sericophylla</i> (FFG) 20 Victorian rare or threatened flora species Suitable habitat for: <ul style="list-style-type: none"> Snow Daphne (EPBC, FFG) Cushion Rush (FFG) Patches of long unburnt Snow Gums 	<ul style="list-style-type: none"> Alpine Sphagnum Bogs and Associated Fens (EPBC) Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic (EPBC) Alpine Bog Community (FFG) 4 EVCs with a bioregional conservation status of Endangered or Rare: <ul style="list-style-type: none"> Alpine Valley Peatland (Endangered) Alpine Grassland (Rare) Alpine Grassy Heathland (Rare) Sub-alpine Shrubland (Rare) 	<ul style="list-style-type: none"> 2 EPBC Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion 	<ul style="list-style-type: none"> Avoid track widening Avoid realignment Undertake targeted surveys for rare or threatened species in the appropriate seasons Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to track Undertake weed control
6	Existing track	Consists of a narrow, well used walking track marked by intermittent snow poles. Located between the Bogong High Plains Road and a point north of the end of Cope West Aqueduct Road, and east of Mount Jim. Situated around 1700 m ASL. Of all the sections of the proposed FHAC alignment, the greatest number of rare or threatened flora species were recorded in this	<ul style="list-style-type: none"> Shining Cudweed (EPBC, FFG) Mountain Daisy <i>Brachyscome foliosa</i> (FFG) 30 Victorian rare or threatened flora species Suitable habitat for: 	<ul style="list-style-type: none"> Alpine Sphagnum Bogs and Associated Fens (EPBC) 5 EVCs with a bioregional conservation status of Endangered or Rare: <ul style="list-style-type: none"> Alpine Valley Peatland (Endangered) Alpine Damp Grassland (Rare) 	<ul style="list-style-type: none"> 4 EPBC Act listed species 3 FFG Act listed species 2 Victorian rare or threatened species 	<ul style="list-style-type: none"> Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion The track alignment is situated within a Site of Geologic/Geomorphic significance 	<ul style="list-style-type: none"> Minimise track widening limiting it to areas where it may be required to deter off-track walking Avoid track realignment Undertake targeted surveys for rare or threatened species in the appropriate seasons Incorporate appropriate waterway crossing arrangements as part of the

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		<p>section. Alpine Bogs and groundwater discharge seepage areas that are intersected by the track are being trampled and degraded by human and horse traffic at present. Although not part of this assessment, it was observed that a bog system between the Bogong High Plains Road and the SEC Hut at Cope Aqueduct was being damaged by hikers via a trail intersecting it and marked by intermittent snow poles. We recommended that this section of trail be decommissioned to avoid further impacts on the bog, and walkers be diverted onto the nearby proposed FHAC route. In another area just west of the power supply hut at the Cope Aqueduct, the existing track divides in two and rejoins after a short distance just west of the power supply hut. We recommended that the northern alignment be retained, and the southern alignment be decommissioned. There were also a number of weeds in this section around the Cope Aqueduct area.</p>	<ul style="list-style-type: none"> ○ Bogong Eyebright (EPBC, FFG) ○ Thick Eyebright <i>Euphrasia crassiuscula</i> subspecies <i>crassiuscula</i> (EPBC, FFG) ○ Snow Daphne (EPBC, FFG) ○ Cushion Rush (FFG) ○ Rock Poa <i>Poa saxicola</i> (FFG) ○ Tasmanian Bladderwort (FFG) ● Partially in Cobungra RNA 	<ul style="list-style-type: none"> ○ Alpine Dwarf Heathland (Rare) ○ Alpine Grassland (Rare) ○ Alpine Grassy Heathland (Rare) ○ Sub-alpine Shrubland (Rare) 			<p>track upgrade to avoid physical damage to the waterways and ground water expression/seepage point crossing areas</p> <ul style="list-style-type: none"> ● Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to track ● Undertake weed control ● Decommission secondary trail
7	Existing track	<p>Section between a point north of the end of Cope West Aqueduct Track east of Mount Jim and the Fainter Fire Trail. Consists of narrow, well-used walking track marked by intermittent snow poles. Situated between 1600 and 1700 m ASL. This section is</p>	<ul style="list-style-type: none"> ● 23 Victorian rare or threatened flora species ● Suitable habitat for: <ul style="list-style-type: none"> ○ Thick Eyebright (EPBC, FFG) 	<ul style="list-style-type: none"> ● Alpine Sphagnum Bogs and Associated Fens (EPBC) ● 5 EVCs with a bioregional conservation status of Endangered or Rare: <ul style="list-style-type: none"> ○ Alpine Valley Peatland (Endangered) 	<ul style="list-style-type: none"> ● 4 EPBC Act listed species ● 2 FFG Act listed species ● 2 Victorian rare or 	<ul style="list-style-type: none"> ● Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion ● The track alignment is situated within a Site of 	<ul style="list-style-type: none"> ● Minimise track widening limiting it to areas where it may be required to deter off-track walking ● Avoid track realignment ● Undertake targeted surveys for rare or threatened species in the appropriate seasons

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		distinct in that it contains several rare or threatened and significant damp vegetation communities along much of its length. The vegetation is being damaged by hikers and horses which are causing soil disturbance and pugging. Hikers are walking off-track to avoid wetter areas.	<ul style="list-style-type: none"> ○ Bogong Eyebright (EPBC, FFG) ○ Snow Daphne (EPBC, FFG) ○ Cushion Rush (FFG) ○ Rock Poa (FFG) ○ Tasmanian Bladderwort (FFG) ● Partially in Cobungra RNA 	<ul style="list-style-type: none"> ○ Alpine Damp Grassland (Rare) ○ Alpine Dwarf Heathland (Rare) ○ Alpine Grassland (Rare) ○ Alpine Grassy Heathland (Rare) ○ Sub-alpine Shrubland (Rare) ○ Alpine Rocky Outcrop Heathland (Rare) ● Sub-alpine Pond Herbland (no conservation status allocated as yet) 	threatened species	Geologic/Geomorphic significance	<ul style="list-style-type: none"> ● Design suitable waterway crossings to avoid physical damage to the waterways ● Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to track
8	Existing track	Consists of a well-used maintenance vehicle track between the Fainter Fire Trail and Tawonga Huts. Situated from 1650 to 1750 m ASL. The track is wide enough to allow side-by-side walking. Several weed species were recorded on the roadside	<ul style="list-style-type: none"> ● 5 Victorian rare or threatened flora species ● Suitable habitat for: <ul style="list-style-type: none"> ○ Snow Daphne (EPBC, FFG) 	<ul style="list-style-type: none"> ● 2 EVCs with a bioregional conservation status of Rare: ○ Alpine Grassland ○ Alpine Grassy Heathland 	<ul style="list-style-type: none"> ● 1 EPBC Act listed species ● 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> ● Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion ● The track alignment is situated within a Site of Geologic/Geomorphic significance (Bogong High Plains South) 	<ul style="list-style-type: none"> ● Avoid track widening ● Avoid realignment ● Undertake targeted surveys for rare or threatened species in the appropriate seasons ● Suitable waterway crossing arrangements required to avoid physical damage to the waterways ● Undertake weed control
9	Existing track	This track consists of an informal walking trail between Tawonga Huts and a point around 0.8 km west of Tawonga Huts. Situated at 1750-1800 m ASL. The Alpine Bog was in the 40 m assessment area buffer.	<ul style="list-style-type: none"> ● 2 Victorian rare or threatened flora species ● Suitable habitat for: <ul style="list-style-type: none"> ○ Cushion Rush (FFG) 	<ul style="list-style-type: none"> ● Alpine Sphagnum Bogs and Associated Fens (EPBC) ● 5 EVCs with a bioregional conservation status of Endangered or Rare: ○ Alpine Valley Peatland (Endangered) ○ Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic (Endangered) 	<ul style="list-style-type: none"> ● 4 EPBC Act listed species ● 2 FFG Act listed species ● 2 Victorian rare or threatened species 	<ul style="list-style-type: none"> ● Sensitive waterways and wetland such as EPBC and FFG listed Alpine Bog Communities have the potential to be damaged through the concentration of flows and construction activities that lead to physical damage/erosion ● Steepness of the track creates potential for erosion within/adjacent to the upgraded track 	<ul style="list-style-type: none"> ● Minimise track widening, limiting it to areas where it may be required to deter off-track walking ● Realign the track near proposed overnight node 2 site B at Tawonga Huts. Move it 10-15 m south for a distance of around 250 m, and decommission the existing track to minimise impacts on the Alpine Bog Community

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			<ul style="list-style-type: none"> ○ Alpine Grassland (Rare) ○ Sub-alpine Shrubland (Rare) ○ Alpine Grassy Heathland (Rare) 		<ul style="list-style-type: none"> ● The track alignment is situated within a Site of Geologic/Geomorphic significance 		<ul style="list-style-type: none"> ● Undertake targeted surveys for rare or threatened species in the appropriate seasons ● Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track ● Suitable waterway crossing arrangements required to avoid physical damage to the waterways
10	New section of track	A proposed new section of track to start approximately 0.8 km west of Tawonga Huts and head south-east across the ridge of the Bogong High Plains South region, before turning south-west along the upper northern slope of the Jaithmathang Creek valley to join Westons Spur Track. Part of the proposed new track follows feral horse trails, however, most of the alignment coincides with dense vegetation, with no evidence of previous recreational or other use. Situated at approximately 1700 to 1800 m ASL. Has a dense cover of native vegetation that would need to be removed and require ongoing and regular maintenance.	<ul style="list-style-type: none"> ● 10 Victorian rare or threatened flora species ● Suitable habitat for: <ul style="list-style-type: none"> ○ Snow Daphne (EPBC, FFG) ● Partially in Cobungra RNA 	6 EVCs with a bioregional conservation status of Rare <ul style="list-style-type: none"> ○ Alpine Damp Grassland ○ Alpine Dwarf Heathland ○ Alpine Grassland ○ Alpine Grassy Heathland ○ Sub-alpine Shrubland ○ Alpine Rocky Outcrop Heathland ● Sub-alpine Pond Hermland (no conservation status allocated as yet) 	<ul style="list-style-type: none"> ● 1 EPBC Act listed species ● 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> ● Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion ● Steepness of track creates the potential for erosion within/adjacent to upgraded track ● Several minor seepage line intersections ● The track alignment is situated within a Site of Geologic/Geomorphic significance 	<ul style="list-style-type: none"> ● Consider not installing this section of track and instead backtrack to Westons Spur Track at Pole 333 and continue along the FHAC ● If constructing this section then the following actions are recommended: <ul style="list-style-type: none"> ○ Undertake targeted surveys for rare or threatened species in the appropriate seasons ○ Waterway and ground water expression/seepage point crossing arrangements are required to avoid physical damage to waterways ○ Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track
11	Existing track	This section consists of an existing narrow walking track along Westons Spur marked by intermittent snow poles. It is	<ul style="list-style-type: none"> ● 21 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> ● Alpine Sphagnum Bogs and Associated Fens (EPBC) 	<ul style="list-style-type: none"> ● 2 EPBC Act listed species 	<ul style="list-style-type: none"> ● Steepness of the existing track creates potential for erosion within/adjacent to upgraded track 	<ul style="list-style-type: none"> ● Minimise track widening, limiting it to areas where it may be required to deter off-track walking

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		located between the end of the proposed new section of track (section 10) and Weston Hut. The track is located between the intersection of sections 6 and 7 (Pole 333) and the end of the new section of track (section 10). It was an additional assessment area not included in the FHACMP. Situated around 1800 m ASL at the eastern end and descending to 1600 m ASL at the western end near Weston Hut. Widening the track in wetter sections is likely to lead to additional erosion and degradation, as well as facilitate weed invasion. Several sections of Westons Spur Track interact with minor seepage lines which have logs in place for track management that have now rotted. There are CaLP Act listed weeds in this section including Sweet Briar <i>*Rosa rubiginosa</i> , *Rusty Willow and *Common Blackberry <i>*Rubus anglocandicans</i> .	<ul style="list-style-type: none"> • Suitable habitat for: <ul style="list-style-type: none"> ◦ Snow Daphne (EPBC, FFG) ◦ Cushion Rush (FFG) ◦ Tasmanian Bladderwort (FFG) • Partially in Cobungra RNA 	<ul style="list-style-type: none"> • 6 EVCs with a bioregional conservation status of Endangered or Rare: <ul style="list-style-type: none"> ◦ Alpine Valley Peatland (Endangered) ◦ Alpine Damp Grassland (Rare) ◦ Alpine Dwarf Heathland (Rare) ◦ Alpine Grassland (Rare) ◦ Alpine Grassy Heathland (Rare) ◦ Alpine Rocky Outcrop Heathland (Rare) • Sub-alpine Pond Hermland (no conservation status allocated as yet) 	<ul style="list-style-type: none"> • 2 FFG Act listed species • 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> • Multiple minor ground water expression/seepage crossings • The track alignment is situated within a Site of Geologic/Geomorphic significance 	<ul style="list-style-type: none"> • Avoid track realignment • Undertake targeted surveys for rare or threatened species in the appropriate seasons • Suitable waterway crossing arrangements should be designed to avoid physical damage to the waterways • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track • Undertake weed control
12	Existing track	Section 12 is distinct from other track sections, being the only section situated in montane vegetation and also at lower elevations than the rest of proposed FHAC. It includes a narrow walking trail between Weston Hut and the eastern end of Diamantina Spur Walking Track. The alignment travels along a narrow walking	<ul style="list-style-type: none"> • 5 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> • None identified 	<ul style="list-style-type: none"> • 4 EPBC Act listed species • 1 FFG Act listed species • 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> • The proposed track alignment intersects both the Kiewa River West Branch and the Diamantina River within this section. The waterways within this section have the potential to be negatively impacted through poorly designed and constructed crossing arrangements 	<ul style="list-style-type: none"> • Minimise track widening limiting it to areas where it may be required to deter off-track walking • Avoid track realignment • Undertake targeted surveys for rare or threatened species in the appropriate seasons • Suitable waterway crossing arrangements should be

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		track and opens to a 4WD track prior to joining the West Kiewa Logging Road, which currently acts as the walking trail until the junction with Diamantina Spur Walking Track. This section descends from 1600 m ASL at Weston Hut to around 1100 m ASL at Diamantina Spur Walking Track before ascending Diamantina Spur. Section 12 also includes a track east to the Diamantina Horse Yards proposed overnight node and a track which is part of the logging road south to the proposed Red Robin Battery overnight node. There are likely to be extensive construction requirements given the steepness of the surrounding slopes and impacts to native vegetation that may facilitate erosion and weed invasion and impact biodiversity. CaLP Act listed weeds in this section include *Common Blackberry, Forest Blackberry * <i>Rubus polyanthemus</i> , *Rusty Willow, St John's Wort * <i>Hypericum perforatum</i> subsp. <i>perforatum</i> and Apple trees * <i>Malus pumila</i> .				<ul style="list-style-type: none"> Multiple waterway crossings over the Kiewa River West Branch and Diamantina River Steepness of existing track creates potential for erosion within/adjacent to upgraded track The track alignment is situated within a Site of Geologic/Geomorphic significance 	designed to avoid physical damage to the waterways <ul style="list-style-type: none"> Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track Undertake weed control
12a	New section of track – not assessable	Section between West Kiewa Logging Road at a point east of Diamantina Horse Yards, travelling in southerly direction and then looping around to the north to the start of Diamantina Spur Walking Track. Most of this section is located on the western side of	<ul style="list-style-type: none"> Unknown 	<ul style="list-style-type: none"> Not assessed 	<ul style="list-style-type: none"> Not assessed 	<ul style="list-style-type: none"> Not assessed 	<ul style="list-style-type: none"> Consider not installing this section of track and instead retain the route along the West Kiewa Logging Road If constructing this section then the following actions are recommended:

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		the Diamantina River so hikers can avoid walking on the West Kiewa Logging Road. However, the proposed track was inaccessible due steep, rocky, terrain obscured by dense vegetation, and was therefore unable to be assessed. The planned route would also require hikers to cross the Diamantina River.					<ul style="list-style-type: none"> ○ Undertake targeted surveys for rare or threatened species in the appropriate seasons ○ Suitable waterway crossing arrangements should be designed to avoid physical damage to the waterways ○ Appropriate track runoff arrangements would need to be incorporated to avoid erosion within/adjacent to upgraded track ○ Consider installing flood warning systems (e.g. flood-outs, signage) where the track is susceptible to flooding
12b	New section of track – not assessable	Section from the start of Diamantina Spur Walking Track at the junction of West Kiewa Logging Road that heads north and loops around to the west to join the Diamantina Spur Walking Track, approximately 1 km west of the West Kiewa Logging Road. This section was impassable and therefore not able to be assessed due to steep slopes and very dense vegetation.	<ul style="list-style-type: none"> • Not assessed 	<ul style="list-style-type: none"> • Not assessed 	<ul style="list-style-type: none"> • Not assessed 	<ul style="list-style-type: none"> • Not assessed 	<ul style="list-style-type: none"> • Consider not installing this section of track and instead retain the route along the West Kiewa Logging Road • If constructing this section, the following actions are recommended: <ul style="list-style-type: none"> ○ Undertake targeted surveys for rare or threatened species in the appropriate seasons ○ Appropriate track runoff arrangements would need to be incorporated to avoid erosion within/adjacent to the upgraded track
13	Existing track	Well-used narrow walking track between the eastern end of Diamantina Spur Walking Track and the Razorback track,	<ul style="list-style-type: none"> • 8 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> • 6 EVCs with a bioregional conservation status of Rare: 	<ul style="list-style-type: none"> • 1 EPBC Act listed species 	<ul style="list-style-type: none"> • Steepness of track creates the potential for erosion within/adjacent to upgraded track. 	<ul style="list-style-type: none"> • Avoid track widening • Avoid track realignment

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		ascending from 1500 to 1800 m ASL. The eastern third of the existing track is very steep. This section of track will always pose maintenance challenges as the vegetation is very dense and will close over the path without regular brush cutting and log clearing. Accessibility to less mobile hikers will also pose a challenge unless the grade is altered by undertaking substantial earthworks, or an alternative path is formed on a shallower approach. CaLP Act listed weeds include *Common Blackberry and *Forest Blackberry.	<ul style="list-style-type: none"> ○ Alpine Damp Grassland ○ Alpine Dwarf Heathland ○ Alpine Grassland ○ Alpine Grassy Heathland ○ Sub-alpine Shrubland ○ Alpine Rocky Outcrop Heathland 	<ul style="list-style-type: none"> • 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> • Shallow bedrock has the potential to limit erosion in some areas 	<ul style="list-style-type: none"> • Undertake targeted surveys for rare or threatened species in the appropriate seasons • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to the upgraded track • Undertake weed control 	
14	Existing track	This section was steeper and more exposed than the rest of the Razorback track. It is a narrow well-used walking track between the foot (c. 1800 m ASL) and top (c. 1940 m ASL) of Mount Feathertop. Many parts of the alignment along the ridgeline also have inadequate space to widen the track without potentially significant excavation.	<ul style="list-style-type: none"> • Mountain Daisy (FFG) • 15 Victorian rare or threatened flora species • Suitable habitat for: <ul style="list-style-type: none"> ○ Wire-head Sedge <i>Carex cephalotes</i> (FFG) • Patches of long unburnt Snow Gums 	<ul style="list-style-type: none"> • 1 FFG Act listed Snowpatch Community • 4 EVCs with a bioregional conservation status of Rare – Alpine Grassland, Alpine Grassy Heathland, Sub-alpine Shrubland and Snowpatch Grassland 	<ul style="list-style-type: none"> • 1 EPBC Act listed species • 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> • Steepness of track creates potential for erosion within/adjacent to upgraded track • Shallow bedrock has the potential to limit erosion in some areas 	<ul style="list-style-type: none"> • Avoid track widening • Avoid track realignment • Undertake targeted surveys for rare or threatened species in the appropriate seasons • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track
15	Existing track	Well-used narrow steep walking track along the Razorback between the foot of Mount Feathertop and the Mount Hotham Alpine Resort at 1800 m ASL. The track is situated on a narrow ridgeline with steep slopes either side	<ul style="list-style-type: none"> • 12 Victorian rare or threatened flora species • Suitable habitat identified for: <ul style="list-style-type: none"> ○ Thick Eyebright (EPBC, FFG) 	<ul style="list-style-type: none"> • 5 EVCs with a bioregional conservation status of Rare: <ul style="list-style-type: none"> ○ Alpine Grassland ○ Alpine Grassy Heathland 	<ul style="list-style-type: none"> • 2 EPBC Act listed species • 1 FFG Act listed species 	<ul style="list-style-type: none"> • Steepness of the existing track creates potential for erosion within/adjacent to upgraded track • Shallow bedrock has the potential to limit erosion in some areas 	<ul style="list-style-type: none"> • Avoid track widening • Avoid track realignment • Undertake targeted surveys for rare or threatened species in the appropriate seasons

Track Section	Track type	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna values potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
		and shallow soils. Track widening would require significant construction works and resultant impacts on biodiversity. In a small section midway along the Razorback, hikers have created a second trail that skirts around a small peak and we recommend this informal trail be decommissioned to minimise impacts on natural values in this area. There are some off-track deviations along the Razorback track that could be closed and walkers directed to a single track to reduce impacts on biodiversity.		<ul style="list-style-type: none"> ○ Sub-alpine Shrubland ○ Alpine Rocky Outcrop Heathland ○ Sub-alpine Shrubland 	<ul style="list-style-type: none"> ● 1 Victorian rare or threatened species 		<ul style="list-style-type: none"> ● Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track ● Decommission secondary trails
16	Existing track	Well-used narrow walking track, management vehicle track and section of the Great Alpine Road in the Mount Hotham Alpine Resort. Starts at 1750 m ASL at the Great Alpine Road and ascends to 1850 m ASL near Mount Hotham before descending to around 1800 ASL at the Mount Loch car park. Includes steep slopes to either side.	<ul style="list-style-type: none"> ● 3 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> ● 3 EVCs with a bioregional conservation status of Rare: <ul style="list-style-type: none"> ○ Alpine Dwarf Heathland ○ Alpine Grassland ○ Alpine Grassy Heathland 	<ul style="list-style-type: none"> ● 2 EPBC Act listed species ● 1 FFG Act listed species ● 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> ● Steepness of track creates potential for erosion within/adjacent to upgraded track ● Shallow bedrock has the potential to limit erosion in some areas 	<ul style="list-style-type: none"> ● Avoid track widening ● Avoid track realignment ● Undertake targeted surveys for rare or threatened species in the appropriate seasons ● Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to the upgraded track

6.2 Overnight node design and construction

6.2.1 Location

The extent of the overnight nodes should be limited to minimise impacts on natural values.

One option PV could consider is upgrading existing camp and visitor infrastructure in the Cope Hut camping area and at Tawonga Huts. At Cope hut there are informal camping areas with very short grass, trampled vegetation, weeds and bare ground. Huts or camping platforms could be established here where there are existing facilities such as toilets and camping platforms, perhaps reducing the need to construct new facilities and clear good quality vegetation and fauna habitat.

The existing camping ground around the Tawonga Huts is also disturbed and flattened, with a high number of weeds, and damage from horses including pugging, bare ground, evidence of grazing and browsing, and piles of horse dung. Similar to the existing camping site at Cope Hut, this may be an optimal area to develop hiker camps or operated huts to minimise impacts on sensitive flora and fauna values.

Informal camping areas should not be extended into better quality habitat at Cope Hut or Tawonga Huts as threatened fauna species are resident at both locations. If development in this area is considered then it will require careful planning for the location of facilities to avoid impacts on native flora and fauna.

These existing camping areas were not part of the scope of works in the preliminary environmental assessment. A detailed environmental assessment will need to be undertaken if this option is included in the refined scope of the FHAC development.

6.2.2 Overnight accommodation structures

Sensitive building design, construction principles and techniques should be explored to minimise work footprints and the amount of construction equipment and material storage required. For example, air lifting pre-fabricated structures will minimise vehicle and foot traffic, and the need to store building equipment, fuel and construction materials, all of which can impact native vegetation and fauna habitat.

Construction should be avoided in steep areas to reduce the risk of soil/substrate disturbance and vegetation removal which increases the risks of erosion and soil/substrate instability.

The design should consider treatments to address runoff control requirements and minimise hillslope erosion and erosion around structures such as huts, camping platforms, toilets and water tanks.

6.2.3 Internal tracks

Use existing tracks, where possible, to access overnight nodes, therefore minimising the need for vegetation removal and soil disturbance.

Off-track walking impacts on vegetation and fauna habitat, and should be minimised by ensuring new and existing paths are clearly defined between huts and/or tent platforms.

6.2.4 Track drainage and flooding risk management

Consider general track drainage and flooding risk management requirements as discussed under the previous section on track design.

6.2.5 Interpretive signage

Potential ongoing impacts to native vegetation and fauna habitat within existing and proposed overnight areas from increased future visitation should be considered and addressed. For example during the preliminary environmental assessment, rock-stacking and taking rocks for establishing fireplaces or modifying existing fire places (removing habitat for reptiles and other small terrestrial fauna) was observed. Logs and twigs (organic litter) had been cleared from areas surrounding informal and formal campsites (removing habitat for small reptiles and invertebrates) and likely used for firewood in campfires. Interpretive signage explaining these impacts may encourage hikers not to carry out these activities.

6.2.6 Ongoing overnight node management

- Undertake weed control in proposed overnight nodes and surrounding areas with a focus on WONS, declared noxious weeds and other very high to high risk environmental weeds, to prevent their further spread in the assessment area and beyond.
- Continue to implement the Feral Horse Action Plan 2021 to reduce impacts.
- Maintain track surface integrity within overnight nodes and remediate damage caused by horses (overnight node 2, Tawonga Huts) and hikers walking off-track.
- Remediate informal camping areas (e.g. remove rock stacking and informal fireplaces).
- Maintain track runoff drainage controls.
- Mitigate erosion.

A detailed description, summary of natural values and mitigation recommendations for each overnight node is provided in Table 16.

Table 16. Summary of environmental values likely to be impacted, potential waterway impacts and management recommendations to avoid or minimise impacts in FHAC proposed overnight nodes, December 2020

Overnight node locations	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna species potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
Overnight node 1, Bogong High Plains						
This proposed node includes multiple overnight locations located along the Langford Aqueduct, with one location near Cope Hut, and is serviced by the Langford West Aqueduct Road. The track is well used by individual hikers, school groups and maintenance vehicles associated with the aqueduct. The node offers direct access for construction, management vehicles and people with a range of physical abilities.						
1A Cope Hut – hiker camps	A relatively flat site with closed Alpine Grassland and Alpine Grassy Heathland, fringed by open Sub-alpine Woodland (burnt) in good condition with few weeds. The site is situated on a gentle easterly aspect with scenic views of the surrounding landscape. During the field assessment we found that location A was clearly visible from the nearby camping area, so the assessment area was expanded south-west to where vegetation would provide some screening. There were some natural openings amongst Snow Gums that may be suitable for huts and provide some screening between them.	<ul style="list-style-type: none"> 11 Victorian rare or threatened flora species Suitable habitat identified for: <ul style="list-style-type: none"> Thick Eyebright (EPBC, FFG) Snow Daphne (EPBC, FFG) 	<ul style="list-style-type: none"> 2 EVCs with a Victorian bioregional conservation status of Rare: <ul style="list-style-type: none"> Alpine Grassland Alpine Grassy Heathland 	<ul style="list-style-type: none"> 1 EPBC Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Runoff from huts and loss of vegetation may contribute to erosion around the huts 	<ul style="list-style-type: none"> Undertake targeted surveys for rare or threatened species in the appropriate seasons Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to the upgraded track
1B/E Cope Hut – hiker camps/operated huts	This location is situated on a spur with steep slopes. The management vehicle track along the cutting adjoining Langford Aqueduct follows the contour and intersects this area. The vegetation includes Sub-alpine Woodland with a dense shrubby understory, interspersed with small breaks of dense Sub-alpine Shrubland. This location would provide privacy from existing popular dispersed hiker camps. Accommodation on the north side would be visible in some places from Location C, the Bogong River Chalet (also known as the Rover Chalet or Scout Hut) and Langford West Aqueduct Road on the other side of the valley to the north-west. We suggest the western side would provide a sense of privacy and isolation. Some sections to the south and north are quite steep, while the eastern aspect is on a gentler	<ul style="list-style-type: none"> 10 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> 1 EVC with a bioregional conservation status of Rare: <ul style="list-style-type: none"> Sub-alpine Shrubland 	<ul style="list-style-type: none"> 1 EPBC Act listed species 	<ul style="list-style-type: none"> Runoff from huts and loss of vegetation may contribute to erosion of the hillslope. Located near waterways, including Langford West Aqueduct which could be impacted by works 	<ul style="list-style-type: none"> Proposed overnight node design needs to consider runoff arrangements to avoid erosion Proposed overnight nodes will likely require a buffer (e.g. 30 m wide) from all waterways

Overnight node locations	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna species potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
	slope. Although it is possible that the grassy verge 2 m in from the existing vehicle track could provide limited/marginal habitat for the Alpine She-oak Skink, this site is not considered to be of high value from a threatened fauna perspective, partly as it is dominated by thick, tall heath which reduces its thermal suitability for threatened reptiles.					
1C Cope hut – hiker camps	A long, linear site positioned along the south-east side of the Langford Aqueduct. It sits on a gentle south-easterly slope and supports open Sub-alpine Woodland. A short section of the aqueduct track edge near Wallace Hut Track has mounds of spoil that are largely covered by weeds, likely resulting from the construction of the aqueduct and aqueduct trail. This site would be visible from the Langford West Aqueduct Road which is well used by school groups, individual hikers accessing Wallace Hut and Cope Hut, and for occasional maintenance access associated with the aqueduct. A greater number of weed species was recorded here than at any other node or location.	<ul style="list-style-type: none"> 8 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Loss of vegetation may contribute to erosion of the hillslope Located near waterways, including Langford West Aqueduct which could be impacted by the works 	<ul style="list-style-type: none"> Undertake control of the high number of herbaceous and grassy weeds along the edges of the track to prevent their further spread Proposed overnight node design needs to consider runoff arrangements to avoid erosion Proposed overnight nodes will likely require a buffer (e.g. 30 m wide) from all waterways
1D Cope Hut – operated huts	Situated on the Langford West Aqueduct Road, this location straddles the aqueduct and is positioned on a moderately steep east-facing slope. The vegetation consists of closed Sub-alpine Woodland with a variably shrubby to grassy understory.	<ul style="list-style-type: none"> 9 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> 1 EPBC Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Runoff from huts and loss of vegetation may contribute to erosion of the hillslope Located near waterways, including Langford West Aqueduct which could be impacted by the works 	<ul style="list-style-type: none"> Undertake targeted surveys for rare or threatened species in the appropriate seasons Proposed overnight node design needs to consider runoff arrangements to avoid erosion Proposed overnight nodes will likely require a buffer (e.g. 30 m wide) from all waterways

Overnight node locations	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna species potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
1F – Alternative Option – (not included in FHACMP) hiker camps/operated huts	The site sits on a moderately steep slope with a south-easterly aspect. This site supports a variety of vegetation types ranging from closed Sub-alpine Woodland to dense Sub-alpine Shrubland and Alpine Grassy Heathland. There are dense stands of Royal Grevillea which is classified as Rare in Victoria, in both the woodland and heathland EVCs. The soils are shallow and large boulders and areas of exposed rock are scattered throughout the site. The Sub-alpine Shrubland does not provide screening opportunities for campers from the track but does offer clear views of the surrounding landscape. The Sub-alpine Woodland areas would provide some screening and obscured views of the surrounding landscape.	<ul style="list-style-type: none"> 7 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> 2 EVCs with a bioregional conservation status of Rare: <ul style="list-style-type: none"> Sub-alpine Shrubland Alpine Grassy Heathland 	<ul style="list-style-type: none"> 1 EPBC Act listed species 	<ul style="list-style-type: none"> Runoff from huts and loss of vegetation may contribute to erosion of the hillslope Located near waterways, including Langford West Aqueduct which could be impacted by works 	<ul style="list-style-type: none"> Proposed overnight node design needs to consider runoff arrangements to avoid erosion Proposed overnight nodes will likely require a buffer (e.g. 30 m wide) from all waterways
1G – Alternative Option – (not included in FHACMP) hiker camps/operated huts	Situated on the Langford Aqueduct on a steep south-facing slope. The vegetation includes a mix of Sub-alpine Woodland and dense Sub-alpine Shrubland. The site offers views of the surrounding hills and valleys from the shrubland areas.	<ul style="list-style-type: none"> 7 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> 1 EVC with a bioregional conservation status of Rare: <ul style="list-style-type: none"> Sub-alpine Shrubland 	<ul style="list-style-type: none"> 2 EPBC Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Runoff from huts and loss of vegetation may contribute to erosion of the hillslope Located near waterways, including Langford West Aqueduct which could be impacted by the works 	<ul style="list-style-type: none"> Undertake targeted surveys for rare or threatened species in the appropriate seasons Proposed overnight node design needs to consider runoff arrangements to avoid erosion on the hillslope Proposed overnight nodes will likely require a buffer (e.g. 30 m wide) from all waterways

Overnight node 2, Tawonga Huts.

The proposed Tawonga Huts node sits in a valley which supports Sub-Alpine Wet Heathland/Alpine Bog Community and sits on Tawonga Hut Creek.

Incidental observation

An informal track was observed between the edge of the peatland from a point some 50 m north of Tawonga Huts in a more direct route (bypassing Tawonga Huts) to the Fainter Fire Trail. It is recommended that this track be closed, and installing interpretive signage and redefining the main track may encourage hikers to avoid the peatland and reduce impacts on biodiversity.

Overnight node locations	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna species potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
2A Tawonga Huts – hiker camps	Situated in the north-eastern section of this node in Alpine Grassy Heathland, fringed by Sub-Alpine Woodland on a relatively flat area with views of the landscape to the north-east. The site sits behind a slight rise that screens it from Tawonga Huts, and the fringing Eucalypt Woodland screens it from the other overnight locations and walking tracks.	<ul style="list-style-type: none"> 4 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> 1 EVC with a bioregional conservation status of Rare: <ul style="list-style-type: none"> Alpine Grassy Heathland 	<ul style="list-style-type: none"> 1 EPBC Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Loss of vegetation may contribute to erosion of the hillslope. Located near waterways, including Langford West Aqueduct which could be impacted by works 	<ul style="list-style-type: none"> Undertake targeted surveys for rare or threatened species in the appropriate seasons Proposed overnight node design needs to consider runoff arrangements to avoid erosion
Track to 2A – (new proposed track not included in FHACMP)	The proposed track to 2A is an extension of that to 2C. This section of track is in Sub-alpine Eucalypt Woodland with a dense shrubby understory. The track heads east from location C, descending to a pool (swimming hole) on a creek then ascending to location A. The track is in Sub-alpine Eucalypt Woodland with a dense shrubby understory. The construction of this section of track would require the removal of Snow Gums and shrubby understory. Care would need to be taken to mitigate erosion risk and prevent sediment running into the creek. The creek bed is situated on stable bedrock and would not require any treatment.	<ul style="list-style-type: none"> 4 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> 1 EPBC Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> The track may be more vulnerable to erosion if vegetation is lost 	<ul style="list-style-type: none"> Undertake targeted surveys for rare or threatened species in the appropriate seasons Track design arrangement needs to consider runoff arrangements to avoid erosion
2B Tawonga Huts – operated huts	This location is situated along the proposed FHAC walking track on a gentle north-facing slope in Sub-Alpine Eucalypt Woodland with views to the west into the valley. As requested by PV, an extension to this location was assessed to the north in Sub-Alpine Heathland and Sub-Alpine Grassy Heathland on a gentle slope with a southerly aspect. This area is fringed by Sub-Alpine Woodland. This location is screened from other accommodation by Snow Gums and gentle slopes, but as it is located on the planned FHAC	<ul style="list-style-type: none"> 7 Victorian rare or threatened flora species Suitable habitat identified for: <ul style="list-style-type: none"> Thick Eyebright (EPBC, FFG) in the northern extended area Bogong Eyebright (EPBC, FFG) 	<ul style="list-style-type: none"> Alpine Sphagnum Bogs and Associated Fens (EPBC) Alpine Bog Community (FFG) 3 EVCs with a bioregional conservation status of Endangered or Rare: <ul style="list-style-type: none"> Alpine Valley Peatland (Endangered) 	<ul style="list-style-type: none"> 2 EPBC Act listed species 1 FFG Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Sensitive waterways and wetlands such as Alpine Bog have the potential to be negatively impacted through concentration of flows and construction activities that lead to physical damage/erosion Runoff from huts and loss of vegetation may contribute to erosion of the hillslope 	<ul style="list-style-type: none"> Undertake targeted surveys for rare or threatened species in the appropriate seasons Proposed overnight node design needs to consider runoff arrangements to avoid erosion Proposed overnight nodes will likely require a buffer (e.g. 30m wide) from all waterways

Overnight node locations	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna species potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
	walking track, walkers would be visible to visitors staying there.	<ul style="list-style-type: none"> ○ Snow Daphne (EPBC, FFG) in the northern extended area 	<ul style="list-style-type: none"> ○ Alpine Grassy Heathland (Rare) ○ Alpine Grassland (Rare) 			
2C Tawonga Huts – operated huts	This site is in the northern section of this node on a steep rocky east-facing slope. The vegetation consists of open Sub-alpine Woodland, and the site overlooks the Fainter Fire Trail with views of the Bogong High Plains to the east. This location is screened from other overnight locations by Snow Gums and elevated topography, but would be in view of hikers walking along the Fainter Fire Trail.	<ul style="list-style-type: none"> • 5 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> • None identified 	<ul style="list-style-type: none"> • 1 EPBC Act listed species • 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> • Runoff from huts and loss of vegetation may contribute to erosion of the hillslope. 	<ul style="list-style-type: none"> • Undertake targeted surveys for rare or threatened species in the appropriate seasons • Proposed overnight node design arrangement needs to consider runoff arrangements to avoid erosion
Track to 2C – (not included in FHACMP) located on existing Fainter Fire Trail	The track to Location C is a proposed dirt track and part of the Fainter Fire Trail that starts at Tawonga Huts, descends a gentle slope through Alpine Grassland and Sub-alpine Woodland, then Sub-alpine Wet Heathland/Alpine Valley Peatland mosaic, over the creek, and then ascends into Sub-alpine Woodland to Location C. There is an Alpine Bog Community in the eastern buffer of the assessment area but not along the track alignment proper. The existing track crosses Tawonga Hut Creek. This track has a number of weeds growing along it. Evidence of horses along the track include pugging and dung.	<ul style="list-style-type: none"> • 8 Victorian rare or threatened flora species • Suitable habitat identified for: <ul style="list-style-type: none"> ○ Cushion Rush (EPBC, FFG) 	<ul style="list-style-type: none"> • Alpine Sphagnum Bogs and Associated Fens community (EPBC) • Alpine Bog Community (FFG) • 2 EVCs with a bioregional conservation status of Endangered: <ul style="list-style-type: none"> ○ Alpine Valley Peatland ○ Sub-alpine Wet Heathland/alpine Valley Peatland Mosaic 	<ul style="list-style-type: none"> • 4 EPBC Act listed species • 3 FFG Act listed species • 2 Victorian rare or threatened species 	<ul style="list-style-type: none"> • Sensitive waterways such as Alpine Bog Communities have the potential to be negatively impacted through the concentration of flows and construction activities that lead to physical damage/erosion • Existing track intercepts groundwater and localised surface water, forming a concentrated flow path along the track 	<ul style="list-style-type: none"> • Undertake targeted surveys for rare or threatened species in the appropriate seasons • Undertake weed control of the high number of herbaceous and grassy weeds along the edges of the track to prevent further spread • Recommend using the existing track alignment. The creek base is stable bedrock and is unlikely to be impacted by hikers, however, given the close proximity of the Alpine Bog Community, bridging is recommended to prevent trampling and damage to creek banks. • Potential impacts to fauna habitat from construction, and vegetation impacts at bridge contact points, and potential for

Overnight node locations	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna species potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
						<p>sedimentation should be addressed in the design and construction phase</p> <ul style="list-style-type: none"> Appropriate track runoff arrangements need to be incorporated to avoid erosion within/adjacent to the track Management of feral horses and recreational horseback riders is recommended to reduce the damage they are causing to vegetation, soil and fauna habitat here
2D Tawonga Huts – alternative option (not included in FHACMP) hiker camps/operated huts	Location D is situated west of Tawonga Huts. This site has a high cover of *Sheep Sorrell in Alpine Grassland and Alpine Grassy Heathland. The site is screened from other accommodation sites and the walking track, so would offer privacy and views of the surrounding hills. Tall Mountain Tussock-grass <i>Poa helmsii</i> and Tall Sedge <i>Carex appressa</i> occur in the drainage areas to the west and south of this proposed node.	<ul style="list-style-type: none"> 3 Victorian rare or threatened flora species Suitable habitat identified for: <ul style="list-style-type: none"> Thick Eyebright (EPBC, FFG) Bogong Eyebright (EPBC, FFG) 	<ul style="list-style-type: none"> 2 EVCs with a bioregional conservation status of Rare: Alpine Grassy Heathland Alpine Grassland 	<ul style="list-style-type: none"> 1 EPBC Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Runoff from huts and loss of vegetation may contribute to erosion of the hillslope. 	<ul style="list-style-type: none"> Undertake targeted surveys for rare or threatened species in the appropriate seasons Undertake weed control of *Sheep Sorrell to prevent further spread If overnight accommodation is to be provided here, it is recommended that this area not be extended too far west or south to avoid damp drainage lines dominated by Tall Mountain Tussock-grass <i>Poa helmsii</i> and Tall Sedge <i>Carex appressa</i> (Image 105) Proposed overnight node design needs to consider runoff arrangements to avoid erosion
Track to 2D – (not included in FHACMP) new proposed track	The proposed track that would turn south from the existing track (section 9) and ascend through Alpine Grassland / Alpine Grassy Heathland to location	<ul style="list-style-type: none"> 2 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> 2 EVCs with a bioregional conservation status of Rare: 	<ul style="list-style-type: none"> 1 EPBC Act listed species 	<ul style="list-style-type: none"> Sensitive waterways such as Alpine Bog Communities have the potential to be negatively 	<ul style="list-style-type: none"> Undertake targeted surveys for rare or threatened species in the appropriate seasons

Overnight node locations	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna species potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
	node D. There is high cover of *Sheep Sorrell in parts.	<ul style="list-style-type: none"> • Suitable habitat identified for: <ul style="list-style-type: none"> ◦ Alpine Grass Heathland ◦ Alpine Grassland 	<ul style="list-style-type: none"> ◦ Thick Eyebright (EPBC, FFG) 	<ul style="list-style-type: none"> • 1 Victorian rare or threatened species 	impacted through the concentration of flows and construction activities that lead to physical damage/erosion	<ul style="list-style-type: none"> • Undertake weed control of *Sheep Sorrel to prevent spread into nearby Alpine Bog Community • Track design needs to consider runoff arrangements to avoid erosion
Overnight node 3 – Diamantina Horse Yards and Red Robin Battery						
These two proposed overnight locations are in montane forest accessed via the West Kiewa Logging Road. They are two distinct and separate locations; Diamantina Horse Yards and Red Robin Battery.						
3 Diamantina Horse Yards – hiker camps (includes existing track to a dispersed camping area just north of a proposed hiker camps location which was not included in FHACMP)	The proposed hiker camp occurs to either side of the Diamantina River. It is located on a floodplain terrace that is a potentially hazardous area to camp as it is subject to flooding. This location is densely vegetated with riparian and montane damp forest species, especially ferns, and supports large canopy trees (> 30 m tall). A large amount of vegetation would need to be removed and ongoing clearing would be required to maintain the camping area. Therefore, we do not recommend that this site be developed for accommodation. The existing Diamantina Horse Yards location is preferable as it is already cleared of native vegetation, is dominated by weeds and located above the floodline. Because vegetation is already disturbed, the space could be altered to include huts or camping platforms, potentially without the need to impact native vegetation and habitat for threatened fauna. A high number of weeds were recorded here.	<ul style="list-style-type: none"> • 2 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> • None identified 	<ul style="list-style-type: none"> • 1 EPBC Act listed species • 1 FFG Act listed species 	<p>Situated on a vegetated floodplain pocket of the Diamantina River which is a relatively high energy and flashy river. As such:</p> <ul style="list-style-type: none"> • The floodplain pocket has the potential to be rapidly inundated with floodwaters, which presents a safety issue • Infrastructure at this overnight node has the potential to be damaged by floodwaters • Construction activities, infrastructure and hiking access has the potential to physically damage the floodplain pocket and vegetation 	<ul style="list-style-type: none"> • Construction is not recommended on the river floodplain where there are likely to be issues for camper safety and integrity of infrastructure • Undertake targeted surveys for rare or threatened species in the appropriate seasons • Eradicate *Rusty Sallow, *Forest Blackberry and Tutsan <i>*Hypericum adnrosaemum</i>, and control other herbaceous weeds before they spread further • A buffer will likely be required (e.g. 30m wide) from all waterways
3 Red Robin Battery – operated huts (includes existing track to Red Robin Battery which was not included in FHACMP and	The site is located on a western slope within a fork between West Kiewa Logging Road and Dungeys Track. It is situated in dense Montane Damp Forest	<ul style="list-style-type: none"> • 2 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> • None identified 	<ul style="list-style-type: none"> • 2 EPBC Act listed species 	<ul style="list-style-type: none"> • Runoff from huts and loss of vegetation may contribute to erosion of the hillslope. 	<ul style="list-style-type: none"> • Undertake targeted surveys for rare or threatened species in the appropriate seasons

Overnight node locations	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna species potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
is part of the West Kiewa Logging Road)	with negligible weed cover and would require substantial removal of native vegetation for the installation of operated huts. The vegetation includes 30 m tall eucalypts with relatively high canopy cover, which may pose a risk to campers from limb or tree failure. The location would be visible to hikers on Dungeys Track and the West Kiewa Logging Road. However, there are some discrete openings in the vegetation along Dungeys Track where huts could be installed in a row facing downslope. We recommend soil testing as the node is closely associated with the former Red Robin Battery mining facility that may be contaminated by tailings from previous mining activities.				<ul style="list-style-type: none"> Soils potentially contaminated by tailings from the mine Sections of track, including crossings, may be subject to inundation during flood events 	<ul style="list-style-type: none"> Undertake control of *Forest Blackberry to prevent its further spread Address soil contamination from the Red Robin mining activities before constructing accommodation here Runoff arrangements are required to avoid erosion A buffer (e.g. 30m wide) will likely be required from all waterways
Overnight node 4 – High Knob						
High Knob sits along the Diamantina Spur which is flanked by steep slopes, and the planned accommodation area sits in Snow Gum Woodland. There are existing informal camping areas on both side of Diamantina Spur Track in the proposed locations for overnight accommodation. They include a number of well-defined although informal fire pits made from rocks taken from the surrounding landscape.						
4 High Knob –hiker camps	The hiker camps location is on the north side of Diamantina Spur Walking Track in partially cleared Snow Gum Woodland with an understorey that is substantially constrained by exotic species. This location is relatively discrete and not readily visible from the track. Fixed camping platforms within this area may lead to greater or more permanent impacts from repeated disturbance, whereas randomised camping on the ground is unlikely to result in permanent impacts.	<ul style="list-style-type: none"> 4 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> 1 EPBC Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Loss of vegetation may contribute to erosion of the hillslope 	<ul style="list-style-type: none"> Undertake targeted surveys for rare or threatened species in the appropriate seasons Proposed overnight node design needs to consider runoff arrangements to avoid erosion A buffer (e.g. 30m wide) will likely be required from all waterways
4 High Knob –operated huts	The proposed location of the High Knob operated huts is on a south-facing steep slope of greater than 20 degrees. The vegetation consists of dense Sub-alpine Woodland, with no existing gaps suitable for hut accommodation. The proposed area would be discrete and	<ul style="list-style-type: none"> 4 Victorian rare or threatened flora species 	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> 1 EPBC Act listed species 1 Victorian rare or threatened species 	<ul style="list-style-type: none"> Runoff from huts and loss of vegetation may contribute to erosion of the hillslope. 	<ul style="list-style-type: none"> Undertake targeted surveys for rare or threatened species in the appropriate seasons Proposed overnight node design needs to consider

Overnight node locations	Description	Rare or threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Rare or threatened fauna species potentially impacted	Waterway impacts	Opportunities to avoid or minimise impacts on environmental values
	well-hidden on approach. However, establishment would require impacts to native vegetation and Victorian advisory list flora to be accounted for, not only for the building footprints but also for the creation of access tracks to each hut. The investigation area is also one of the few remaining regions that supports long unburnt Snow Gums in the form of Bogong Sally, which is state listed as rare.					<p>runoff arrangements to avoid erosion</p> <ul style="list-style-type: none"> • A buffer (e.g. 30m wide) will likely be required from all waterways



Image 105. Location D at overnight node 2, with Tall Mountain Tussock-grass *Poa helmsii* and Tall Sedge *Carex appressa* in a drainage area (green vegetation in the centre of image) to be avoided if constructing accommodation in this location (December 2020), (Image credit: Louise Rodda)

6.3 Specific recommendations for the assessment of threatened flora and threatened fauna habitat

Recommendations for further surveys and avoidance or minimisation of potential impacts on threatened flora species and fauna habitat are provided here.

6.3.1 Flora

- Additional surveys should be undertaken for flora species included under the updated FFG Act threatened species list in their active growing season in suitable habitat. Alternatively, a precautionary approach is to be taken whereby the species are assumed to be present and works are avoided in these areas or modified to minimise potential impacts.
- Where threatened flora species have been identified, works should be avoided in those areas or minimised to reduce potential impacts.

6.3.2 Fauna

- Additional surveys should be undertaken for fauna species included under the updated FFG Act threatened species list in suitable habitat that has not been surveyed. Alternatively, a precautionary approach must be taken whereby the species are assumed to be present and works are avoided in these areas or modified to minimise potential impacts.

- Where threatened fauna species habitat has been identified, works should be avoided in those areas or minimised to reduce potential impacts.
- The protection of habitat for threatened fauna species in the assessment area should be detailed in a conservation management plan to inform any construction works associated with the FHAC.

Specific fauna species

- Unless survey effort is sufficient to have a high probability of detecting the Alpine She-oak Skink in suitable habitat (including undertaking surveys across multiple seasons), a precautionary approach should be adopted. The species should be assumed to be present and works avoided at those locations unless the works can be modified to avoid or minimise habitat fragmentation, impeded movement and the creation of additional opportunities for predation.
- Targeted surveys and the identification of potential burrows for the Mountain Skink are recommended before any works are undertaken in suitable habitat for the species, and works in areas supporting burrows are to be avoided.
- The edges of riparian and bog habitats may be habitat for federally and/or state threatened fauna such as the Broad-toothed Rat, Platypus, Alpine Water Skink, Alpine Bog Skink, and aquatic invertebrates such as spiny crayfish *Euastacus* spp. and the Alpine Stonefly. Surveys for these species may be required if they are not already known to occur in suitable habitat where works are planned and impacts are likely. Works such as the construction of bridges in these locations must be undertaken in an appropriately sensitive manner so as to avoid direct impacts and minimise indirect impacts on habitat for these species.
- We recommend undertaking surveys for the Alpine Tree Frog at sites supporting potential breeding habitat for the species in and adjacent to the assessment area. If the Alpine Tree Frog is identified, then design and construction must avoid impeding movement between areas of suitable breeding habitat for the species.
- Targeted surveys are required for the Greater Glider and Smoky Mouse in areas supporting suitable habitat for these species. If they are identified, works in these areas should be avoided. Alternatively, if targeted surveys are not undertaken, a precautionary approach would need to be taken whereby the potential presence of these species is acknowledged and works in areas of suitable habitat are avoided or minimised.
- Threatened Fauna Program Leader at the Arthur Rylah Institute for Environmental Research, Nick Cleemann, is to be consulted regarding the identification and flagging of potential Guthega Skink burrows immediately before construction and it must be ensured that they are not disturbed during works. Flags should be removed immediately after works are completed to reduce risk of interference with habitat and poaching.

References

Abzeco (2020). Falls to Hotham Alpine Crossing: Environmental Values Assessment: Desktop Review. Report prepared for Parks Victoria by Applied Botany, Zoology and Ecological Consulting, Eltham, Victoria.

Anstis, M. (2017). *Tadpoles and frogs of Australia*, 2nd Edition. New Holland, Sydney.

Atkins, Z., Robert, K. and Cleemann, N. (2015). Does shelter site selection aid persistence of a threatened alpine lizard? Assessing *Liopholis guthega* populations a decade after severe fire in southeastern Australia. *Journal of Herpetology* **49**: 222–229.

Austroads (2021). Guide to Road Design Part 6A: Paths for Walking and Cycling. Austroads, Sydney.

AV (2020a). Agriculture Victoria website. Agriculture Victoria, Melbourne. Available at: <https://agriculture.vic.gov.au/> (Accessed: September 2020).

AV (2020b). Victorian Resources Online: Bogong mapsheet. Agriculture Victoria, Melbourne. Available at: http://vro.agriculture.vic.gov.au/dpi/vro/egregn.nsf/pages/eg_geo_bogong (Accessed: September 2020).

AV (2020c). Declared special water supply catchment areas. Agriculture Victoria, Melbourne. Available at: <http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/landuse-water-supply-catchments> (Accessed: September 2020).

Bates, H. L. (2018). Indirect impacts of the feral horse on the Mountain Pygmy-possum. In: *Feral Horse Impacts: The Kosciuszko Science Conference*. G. L. Worboys, D. A. Driscoll and P. Crabb (Eds.). Australian Academy of Science, Fenner School of Environment and Society, Australian National University and Deakin University, Canberra. Pp 76–78.

Beadle, N. C. W. (1981). *The Vegetation of Australia*. Cambridge University Press, Cambridge.

Biosis (2016). Falls to Hotham Alpine Crossing Environmental Risk Assessment, Final Report. Prepared for Parks Victoria. Biosis, Ballarat.

BOM (2021). Climate data online. Bureau of Meteorology, Melbourne. Available at: <http://www.bom.gov.au/climate/data/> (Accessed: January 2021).

Booth, D. B. (1990). Stream-channel incision following drainage-basin urbanization. *Water Resource Bulletin* **26**: 407–417.

Carter, O., and Walsh, N. (2006b). National Recovery Plan for the Bogong Eyebright *Euphrasia eichleri*. Department of Sustainability and Environment, Melbourne.

Carter, O., Walsh, N., and Murphy, A. (2006a). National Recovery Plan for the This Eyebright *Euphrasia crassiuscula* subspecies *glandulifera*. Department of Sustainability and Environment, Melbourne.

Cherubin, R. C., Venn, S. E., Doherty, T. S., Driscoll, D. A. and Ritchie, E. G. (2019). Feral horse impacts on threatened species and ecological communities in Victoria. *Ecological Management and Restoration* **20**: 47–56.

Chick, R., Nelson, J. and Molloy, J. (2018a). Forest Protection Survey Program Survey Guideline: Elliott trapping (V2). Department of Environment, Land, Water and Planning, Melbourne.

Chick, R., Nelson, J. and Molloy, J. (2018b). Forest Protection Survey Program Survey Guideline: Spotlighting and call playback (V3). Department of Environment, Land, Water and Planning, Melbourne.

Claridge, A. W. (2016). Ecological and agricultural impacts of introduced deer across the Australian Alps. A Final Report to the Australian Alps Liaison Committee. NSW National Parks and Wildlife Service, Queanbeyan, NSW.

Cleemann, N. (2003). Flora and Fauna Guarantee Action Statement for the Alpine She-oak Skink *Cyclodomorphus praealtus*. Department of Sustainability and Environment, Melbourne.

Cleemann, N. and Gillespie, G. (2011). Draft National Recovery Plan for the Alpine Tree Frog *Litoria verreauxii alpina*. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Cropper, S. C. (1993). *Management of Endangered Plants*. CSIRO, Melbourne.

Davis, N. E., Bennett, A., Forsyth, D. M., Bowman, D. M. J. S., Lefroy, E. C., Wood, S. W., Woolnough, A. P., West, P., Hampton, J. O., and Johnson, C. N. (2016). A systematic review of the impacts and management of introduced deer (family Cervidae) in Australia. *Wildlife Research* **43**: 515–532.

DAWE (2009). Alpine Sphagnum Bogs and Associated Fens, A nationally threatened ecological community, *Environment Protection and Biodiversity Conservation Act 1999*, Policy Statement 3.16. Department of Agriculture, Water and the Environment, Canberra.

DAWE (2020a). EPBC Act listed threatened species and ecological communities. Department of Agriculture, Water and the Environment, Canberra. Available at: <https://www.environment.gov.au/biodiversity/threatened> (Accessed: September 2020).

DAWE (2020b). National Heritage Places – Australian Alps National Parks and Reserves. Department of Agriculture, Water and the Environment, Canberra. Available at: <https://www.environment.gov.au/heritage/places/national/australia-alps>. (Accessed: September 2020).

DAWE (2020c). Protected Matters Search Tool. Department of Agriculture, Water and the Environment, Canberra. Available at: <http://www.environment.gov.au/epbc/protected-matters-search-tool> (Accessed: September 2020c).

DAWE (2021). *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Department of Agriculture, Water and the Environment, Canberra. Available at: <http://www.environment.gov.au/epbc> (Accessed: January 2021).

DELWP (2016). The Victorian wetland classification framework 2014. Victorian Department of Environment and Primary Industries, East Melbourne.

DELWP (2017a). Guidelines for the removal, destruction or lopping of native vegetation, Version 1.0. Department of Environment, Land, Water and Planning, East Melbourne.

DELWP (2017b). Exemptions from requiring a planning permit to remove, destroy or lop native vegetation – Guidance. Department of Environment, Land, Water and Planning, East Melbourne.

DELWP (2018). Procedure for the removal, destruction or lopping of native vegetation on Crown land – For use by the Department of Environment, Land, Water and Planning and Parks Victoria. Department of Environment, Land, Water and Planning, East Melbourne.

DELWP (2020a). Victorian Biodiversity Atlas. Version 3.2.6. Department of Environment, Land, Water and Planning, East Melbourne. Available at: <https://vba.dse.vic.gov.au> (Accessed: August 2020).

DELWP (2020b). *Flora and Fauna Guarantee Act 1988*. Department of Environment, Land, Water and Planning, East Melbourne. Available at: <https://www.environment.vic.gov.au/conserving-threatened-species/victorias-framework-for-conserving-threatened-species> (Accessed: September 2020).

DELWP (2020c). NatureKit online tool. Department of Environment, Land, Water and Planning, East Melbourne. Available at: <http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit> (Accessed: December 2020).

DELWP (2020d). Native Vegetation Information Management online tool (NVIM). Department of Environment, Land, Water and Planning, East Melbourne. Available at: <https://nvim.delwp.vic.gov.au> (Accessed: September 2020).

DELWP (2020e). Bioregions, Ecological Vegetation Class (EVC) Benchmarks and EVC Conservation status. Department of Environment, Land, Water and Planning, East Melbourne. Available at: <https://www.environment.vic.gov.au/biodiversity/bioregions-and-evt-benchmarks> (Accessed: September 2020).

DELWP (2020f). VicPlan Planning Schemes Online. Department of Environment, Land, Water and Planning, East Melbourne. Available at: <http://planning-schemes.delwp.vic.gov.au> (Accessed: September 2020).

DELWP (2020g). Index of Wetland Condition—Assessment of Wetland Vegetation: December 2020 update. Department of Environment, Land, Water and Planning, East Melbourne.

DEPI (2014). Advisory list of rare or threatened plants in Victoria. Department of Environment and Primary Industries, East Melbourne.

DEWHA (2009). Alpine Sphagnum Bogs and Associated Fens: A nationally threatened ecological community: *Environment Protection and Biodiversity Conservation Act 1999*: Policy Statement 3.16. Department of Environment, Water, Heritage and the Arts, Canberra.

DEWHA (2010). Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the **Environment Protection and Biodiversity Conservation Act 1999**. Department of Environment, Water, Heritage and the Arts, Canberra.

DOE (2013). Draft Survey Guidelines for Australia's Threatened Orchids: Guidelines for detecting orchids listed as Threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. Department of Environment, Canberra.

DOE (2015) National recovery plan for the Alpine Sphagnum Bogs and Associated Fens ecological community. Department of the Environment, Canberra.

Dolby, T. (2009). Bird-finding guide: An annotated list of the birds of Victoria. In: *Where to see birds in Victoria*. T. Dolby, P. Johns and S. Symonds (Eds.), Allen and Unwin, Sydney. Pp 147–183.

Donnellan, S. C., Hutchinson, M. N., Dempsey, P. and Osborne, W. S. (2002). Systematics of the *Egernia whitii* species group (Lacertilia: Scincidae) in south-eastern Australia. *Australian Journal of Zoology* **50**: 439–459.

DotEE (2017). Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species. Department of the Environment and Energy, Canberra.

DotEE (2019). *Thaumatoperla alpina* – Alpine Stonefly. In: Species Profile and Threats Database, Department of the Environment and Energy, Canberra. Available from: <http://www.environment.gov.au/sprat> (Accessed: June 2019).

DPIE (2004). Herbivory and environmental degradation caused by feral deer – key threatening process listing: NSW Scientific Committee - final determination. Department of Planning, Industry and Environment, Parramatta, NSW.

DPIE (2020). Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method. Department of Planning, Industry and Environment, Parramatta, NSW.

Driscoll D. A., Worboys G. L., Allan H., Banks S. C., Beeton N. J., Cherubin R. C., Doherty T. S., Finlayson C. M., Green K., Hartley R., Hope G., Johnson C. N., Lintermans M., Mackey B., Paull D. J., Pittock J., Profirio L. L., Ritchie E. G., Sato C. F., Scheele B. C., Slatterey D. A., Venn S., Watson D., Watson M. and Williams R. M. (2019). Impacts of feral horses in the Australian Alps and evidence-based solutions. *Ecological Management and Restoration* **20**: 63–72.

DSE (2006). Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978. Victorian Department of Sustainability and Environment, East Melbourne.

DSE (2009). Advisory list of threatened invertebrate fauna in Victoria. Victorian Department of Sustainability and Environment, East Melbourne.

DSE (2013). Advisory list of threatened vertebrate fauna in Victoria. Victorian Department of Sustainability and Environment, East Melbourne.

DSE (undated) Bioregional Conservation Status for each BioEVC. Department of Sustainability and Environment. East Melbourne. Available at: https://www.environment.vic.gov.au/__data/assets/pdf_file/0012/50511/Bioregional-Conservation-Status-for-each-BioEVC.pdf

DSEWPC (2011). Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. Department of Sustainability, Environment, Water Population and Communities, Canberra.

ECAV (undated). Ecological Consultants Association of Victoria, Treeless Alpine EVCs descriptions. Ecological Consultants Association of Victoria, Melbourne. Available at: <https://ecavic.org.au/wp-content/uploads/2019/06/Alps-Treeless-EVCs-2005.pdf> (Accessed: September 2020).

Edgar, R. and Belcher, C. (1995). Spotted-tailed Quoll *Dasyurus maculatus*. In: *The Mammals of Australia*, 2nd Edition. R. Strahan (Ed.), Reed New Holland, Sydney. Pp 67–68.

Elridge, D. J., Travers, S. K., Val, J., Zaja, A. and Veblen, K. E. (2019). Horse activity is associated with degraded subalpine grassland structure and reduced habitat for a threatened rodent. *Rangeland Ecology and Management* **72**: 467–473.

EPA (1991). *Construction Techniques for Sediment Pollution Control*. Victorian Environment Protection Authority, Melbourne.

Fjeldså, J. (1985). Classification of waterbird communities in south-eastern Australia. *Emu* **85**: 141–149.

Frith, H. J. (1959). The ecology of wild ducks in inland New South Wales I: Waterfowl habitats. *Wildlife Research* **4**: 97–107.

Frith, H. J. (1982). *Waterfowl in Australia*. Angus and Robertson, Sydney.

Frith, H. J., Crome, F. H. J. and Brown, B. K. (1977). Aspects of the Biology of the Japanese Snipe *Gallinago hardwickii*. *Australian Journal of Ecology* **2**: 341–368.

Frood, D. (2003). Typology for wetlands and related vegetation in Victoria: EVC descriptions: Existing, proposed amendments and new descriptions. Report prepared for the Department of Sustainability and Environment by Pathways Bushland and Environment, Greensborough, Victoria.

Garnet, S. T. and Crowley, G. M. (2000). *The Action Plan for Australian Birds*. Environment Australia, Canberra.

Geoscience (2020). Online 1:250000 Geological Map Series, Tallangatta, SJ 55-3, Edition 2, May 1997. Available at: <http://scanned-maps.geoscience.gov.au/250dpi/sj5503.jpg> (Accessed: December 2020).

Gillespie, G. R. and Hollis, G. J. (1996). Distribution and habitat of the spotted tree frog *Litoria spenceri* Dubois (Anura: Hylidae), and an assessment of potential causes of population declines. *Wildlife Research* **23**: 49–75.

Green, K. and Osborne, W. (2012). *Field Guide to wildlife of the Australian Snow-country*. Reed New Holland, Sydney.

Hansen, B. (2018). Latham's Snipe surveys of the proposed Yumbah Nymat abalone farm, Dutton Way, Portland. Report prepared for Yumbah Aquaculture Limited by the Centre for eResearch and Digital Innovation, Federation University, Mount Helen, Victoria.

Hero, J-M., Littlejohn, M. and Marantelli, G. (1991). *Frogwatch field guide to Victorian frogs*. Department of Conservation and Environment, East Melbourne.

Higgins, P. J (Ed.) (1999). *Handbook of Australian, New Zealand and Antarctic Birds. Volume 4: Parrots to Dollarbird*. Oxford University Press, Melbourne.

Higgins, P. J. and Peter, J. M. (Eds.) (2002). *Handbook of Australian, New Zealand and Antarctic Birds. Volume 6: Pardalotes to Shrike Thrushes*. Oxford University Press, Melbourne.

Hutchinson, M. N. and Donnellan, S. C. (1992) Taxonomy and genetic variation in the Australian lizards of the genus *Pseudemoia* (Scincidae: Lygosominae). *Journal of Natural History* **26**: 215–264.

Kavanagh, R. P. (2000). Effects of variable-intensity logging and the influence of habitat variables on the distribution of the Greater Glider *Petauroides volans* in montane forest, southeastern New South Wales. *Pacific Conservation Biology* **6**: 18–30.

Keith, D. (2000). Sampling designs, field techniques and analytical methods for systematic plant population surveys. *Ecological Management and Restoration* **1**: 125–139.

Keith, D. and Pellow, B. (2004). Effects of Javan rusa deer (*Cervus timorensis*) on native plant species in the Jibbon-Bundeena area, Royal National Park, New South Wales. *Proceedings of the Linnean Society of New South Wales* **126**: 99–110.

Leopold L. B., Wolman M. G. and Miller J. P. (1964). *Fluvial processes in geomorphology*. Freeman, San Francisco.

Loyn, R., McNabb, E. and MacHunter, J. (2011). Survey Standards: Sooty Owl, *Tyto tenebricosa*. Department of Sustainability and Environment, Melbourne.

Mansergh, I. M., Kelly, P., and Scotts, D. J. (1989). Management strategy and guidelines for the conservation of the Mountain Pygmy-possum (*Burramys parvus*) in Victoria. Technical Report 66. Arthur Rylah Institute for Environmental Research, Heidelberg, Victoria.

Marchant, S. and Higgins, P. J. (Eds.) (1990). *Handbook of Australian, New Zealand and Antarctic Birds, Volume 1, Part B: Ratites to Ducks*. Oxford University Press, Melbourne.

Marchant, S. and Higgins, P. J. (Eds.) (1993). *Handbook of Australian, New Zealand and Antarctic Birds, Volume 2: Raptors to Lapwings*. Oxford University Press, Melbourne.

McCormack, R. B. (2012). *A guide to Australia's spiny freshwater crayfish*. CSIRO, Melbourne.

McDougall, K. and Walsh, N. (2007). Treeless vegetation of the Australian Alps. *Cunninghamia* **10**: 1–57.

Melbourne Water (2009). Shared Pathways Guidelines. Melbourne Water, Melbourne.

Menkhorst, P. W. (1995a). Dingo and feral dog *Canis familiaris* Linnaeus, 1978. In: *Mammals of Victoria: Distribution, ecology and conservation*. P. Menkhorst (Ed.). Oxford University Press, Melbourne. Pp 236–238.

Menkhorst, P.W. (1995b). Spot-tailed Quoll *Dasyurus maculatus* (Kerr, 1972). In: *Mammals of Victoria: Distribution, ecology and conservation*. P. Menkhorst (Ed.), Oxford, Melbourne. Pp 51–52.

Menkhorst, P. W. (1995c). Broad-toothed Rat *Mastacomys fuscus* (Thomas, 1882). In: *Mammals of Victoria: Distribution, ecology and conservation*. P. Menkhorst (Ed.). Oxford University Press, Melbourne. Pp 208–210.

Menkhorst, P., Broome, L., Heinze, D., Mansergh, I., Watson, K. and Hynes, E. (2016). National Recovery Plan for the Mountain Pygmy-possum *Burramys parvus*. Australian Government Department of the Environment, Canberra.

Menkhorst P., Rogers D., Clarke R., Davies J., Marsack P. and Franklin K. (2017). *The Australian Bird Guide*. CSIRO Publishing, Melbourne.

Morcombe, M. (2000). *Field Guide to Australian Birds*. Steve Parish Publishing, Brisbane.

Murray, K., Skerratt, L., Marantelli, G., Berger, L., Hunter, D., Mahony, M. and Hines, H. (2011). Hygiene protocols for the control of diseases in Australian frogs. Report prepared for the Department of Sustainability, Environment, Water, Population and Communities by James Cook University, Townsville, Queensland.

Naarding, J. A. (1983). Latham's Snipe (*Gallinago hardwickii*) in Southern Australia. Wildlife Division Technical Report 83/01. Parks and Wildlife Service, Hobart.

North East CMA (2020) North East Catchment Management Authority website. North East Catchment Management Authority, Wodonga, Victoria. Available at: <https://www.necma.vic.gov.au/About-Us/Programs-Initiatives/Undertake-Works-on-Waterways>. (Accessed: February 2021).

NPA (2020). National Parks Act 1975 and National Parks (Wilderness) Act 1992. Victorian Government, Melbourne. Available at: http://classic.austlii.edu.au/au/legis/vic/consol_act/npa1975159/ (Accessed: February 2021).

Osborne, W., Hunter, D. and Hollis, G. (1999). Population declines and range contraction in Australian alpine frogs. In: Declines and disappearances of Australian frogs. A. Campbell (Ed.). Environment Australia, Department of the Environment and Heritage, Canberra. Pp 145–157.

Pizzey, G. and Knight, F. (2007). *The Field Guide to the Birds of Australia*. Harper Collins, Sydney.

PV (2016). Great Alpine National Parks Management Plan. Parks Victoria, Melbourne. Available at: https://www.parliament.vic.gov.au/file_uploads/Greater_Alpine_National_Parks_Management_Plan_2016_9FyDnQMt.pdf (Accessed: February 2021)

PV (2018). Falls to Hotham Alpine Crossing Master Plan. Parks Victoria, Melbourne. Available at: <https://www.parks.vic.gov.au/-/media/project/pv/main/parks/documents/visitor-guides-and-publications/alpine-national-park/falls-hotham-alpine-crossing-master-plan.pdf> (Accessed: September 2020).

PV (2021a) Protection of the Alpine National Park – Feral Horse Action Plan 2021. Parks Victorian, Melbourne. Available at: <https://engage.vic.gov.au/alpine-feral-horse-action-plan>.

PV (2021b) Parks Victoria website: Deer control program information, Parks Victoria , Melbourne. Available at: parks.vic.gov.au

Robertson, P. and Coventry, A. J. (2019). *Reptiles of Victoria: a guide to identification and ecology*. CSIRO, Melbourne.

Robertson, P. and Gillespie, G. (1998). Recovery Plan for the Spotted Tree Frog (*Litoria spenceri*). Report prepared for Environment Australia, Canberra. Department of Natural Resources and Environment, Melbourne.

Sato, C. F., Wood, J. T., Schroder, M., Green, K., Osborne, W. S., Michael, D. R. and Lindenmayer, D. B. (2014). An experiment to test key hypotheses of the drivers of reptile distribution in subalpine ski resorts. *Journal of Applied Ecology* **51**: 13–22.

Schulz, M., Schroder, M. and Green, K. (2019). The occurrence of the broad-toothed rat *Mastacomys fuscus* in relation to feral horse impacts. *Ecological Management and Restoration* **20**: 31–36.

Schumm, S. A. (1977). *The Fluvial System*. Wiley, New York.

Seebeck, J. H. (1995). Long-footed Potoroo *Potorous longipes* Seebeck and Johnston, 1980. In: *Mammals of Victoria: Distribution, ecology and conservation*. P. Menkhorst (Ed). Oxford University Press, Melbourne. Pp 129–131.

Serena, M., Thomas, J. L., Williams, G. A. and Officer, R. C. E. (1998). Use of stream and river habitats by the platypus, *Ornithorhynchus anatinus*, in an urban fringe environment. *Australian Journal of Zoology* **46**: 267–282.

Serenty, V. (1959). The birds of Willis Island. *Emu* **59**: 167–176.

Simpson, K. and Day, N. (1999). *Field guide to the birds of Australia*, 6th Edition. Penguin Books, Melbourne.

Tarburton, M. K. (1993). Radiotracking a White-throated Needletail to roost. *Emu* **93**: 121–124.

Theischinger, G. (1985). The Species of the Australian Stonefly Genus *Riekoperla* McLellan (Insecta: Plecoptera: Gripopterygidae). *Australian Journal of Zoology* **33**: 785–830.

Theischinger, G. and Hawking, J. (2006). *The complete field guide to dragonflies of Australia*. CSIRO, Melbourne.

Triggs, B. (1996). *Tracks, scats and other traces: A field guide to Australian mammals*. Oxford University Press, Melbourne.

Turner, V. and Ward, S. J. (1995). Eastern Pygmy-possum *Cercatetus nanus*. In: *The Mammals of Australia*, 2nd Edition. R. Strahan (Ed.). Reed New Holland, Sydney. Pp 104–106.

Tyndale-Biscoe, C. H. and Smith, R. F. C. (1969). Studies on the marsupial glider *Schoinobates volans* (Kerr). III. Response to habitat destruction. *Journal of Animal Ecology* **38**: 651–659.

Vestjens, W. J. M. (1977). Status, habitats and food of vertebrates at Lake Cowal. *Wildlife Research Technical Memorandum* **12**: 1–87.

VC (2021). Rocky Valley Dam construction historical information and photographs sourced from the Kiewa Valley Historical Society, Victorian Collections. Kiewa Valley Historical Society, Mount Beauty, Victoria. Available at: <https://victoriancollections.net.au/items/4ff8ee092162ef091c7901f3> (Accessed: February 2021).

VicFlora (2021). Vicflora: online resource of Flora of Victoria. Royal Botanic Gardens, Melbourne. Available at: <https://vicflora.rbg.vic.gov.au> (Accessed: February 2021).

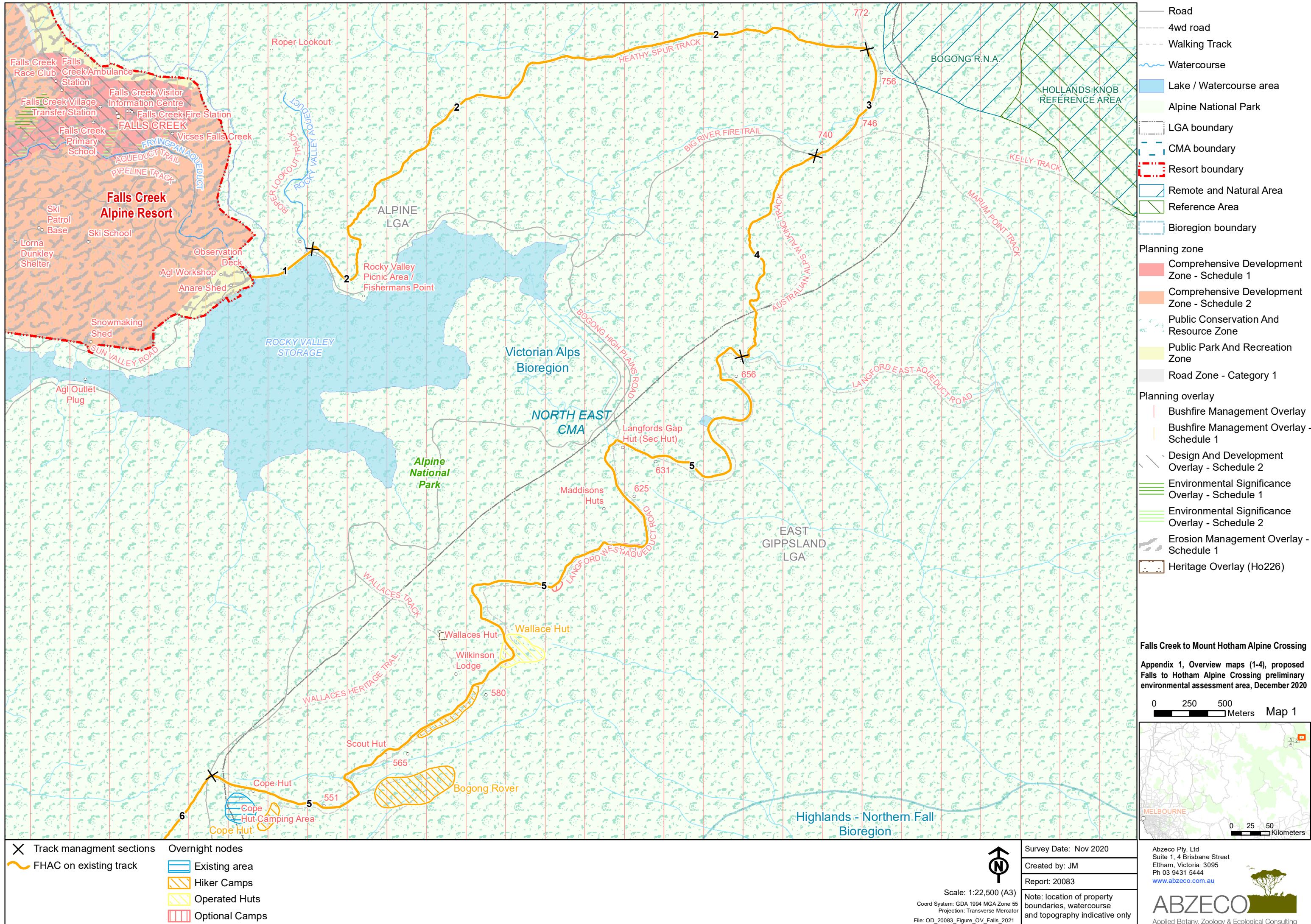
Walter, M. and Broome, L. (1998). Snow as a factor in animal hibernation and dormancy. In: *Snow: A natural history, an uncertain future*. K. Green (Ed.), Australian Alps Liaison Committee, Canberra. Pp 165–191.

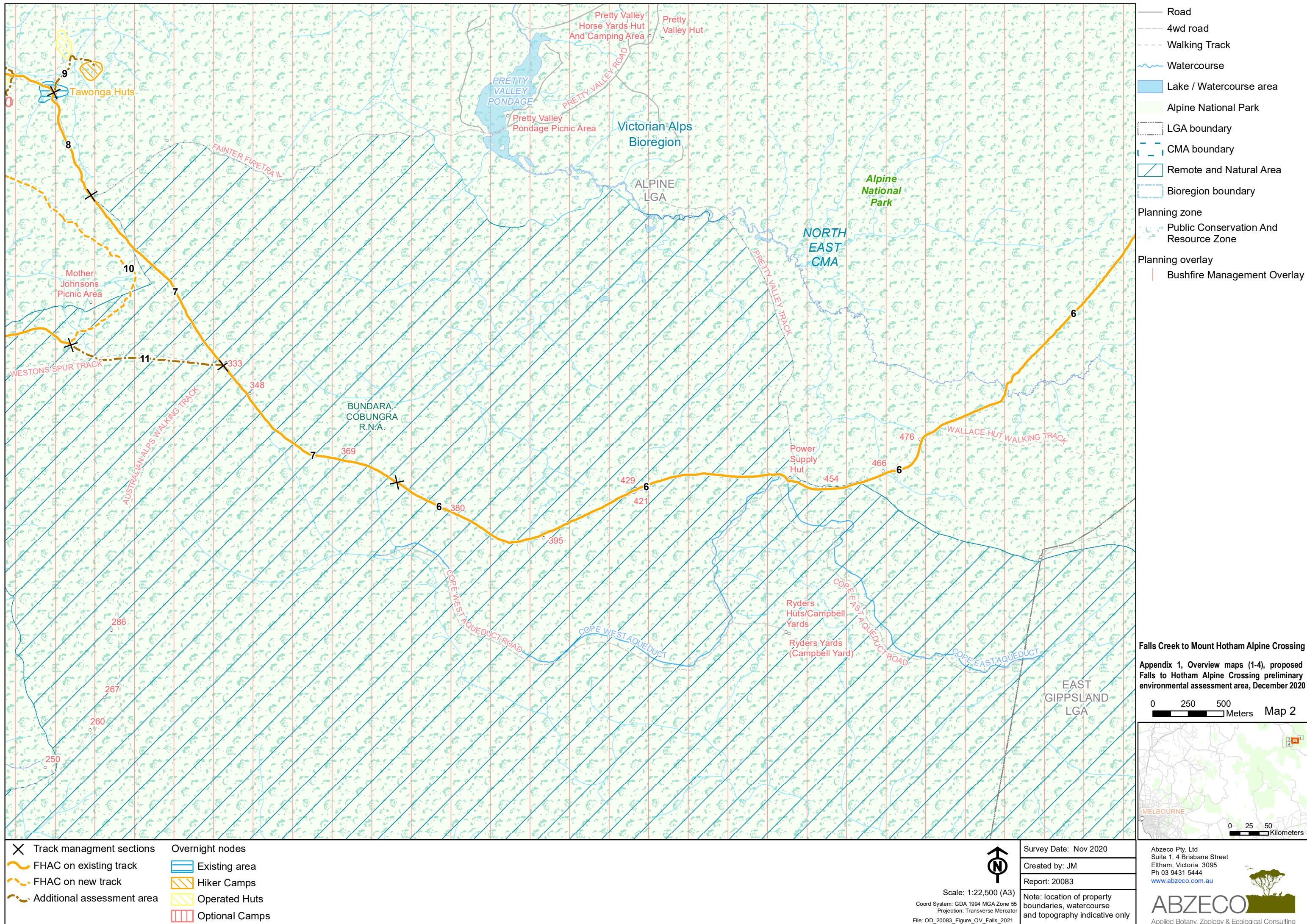
Whinam, J. and Chilcott, N. (2002). Floristic description and environmental relationships of Sphagnum communities in NSW and the ACT and their conservation management. *Cunninghamia* **7**: 463–500.

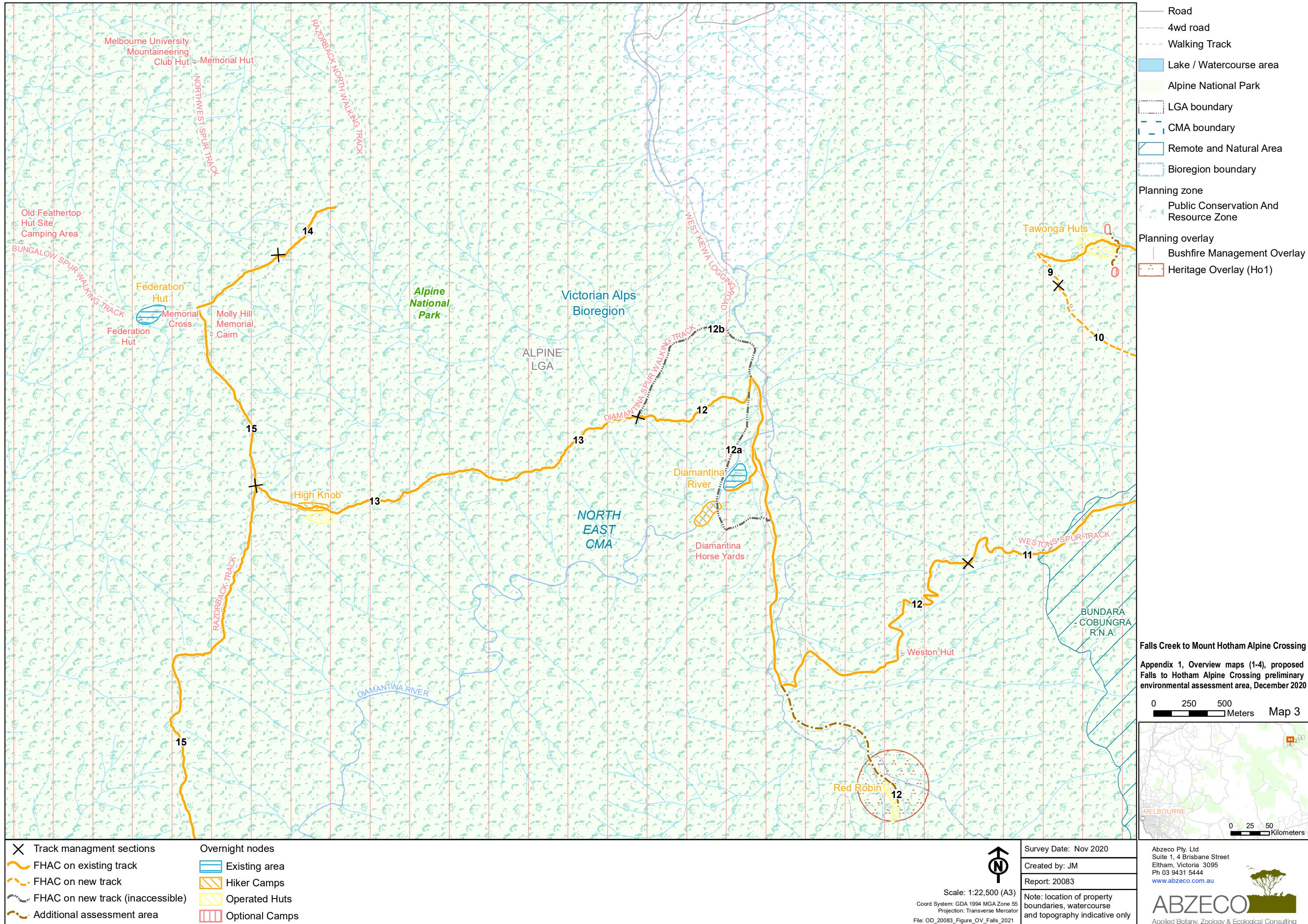
White, M., Cheal, D., Carr, G. W., Adair, R., Blood, K. and Meagher, D. (2018). Advisory list of environmental weeds in Victoria. Arthur Rylah Institute for Environmental Research Technical Report Series No. 287. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

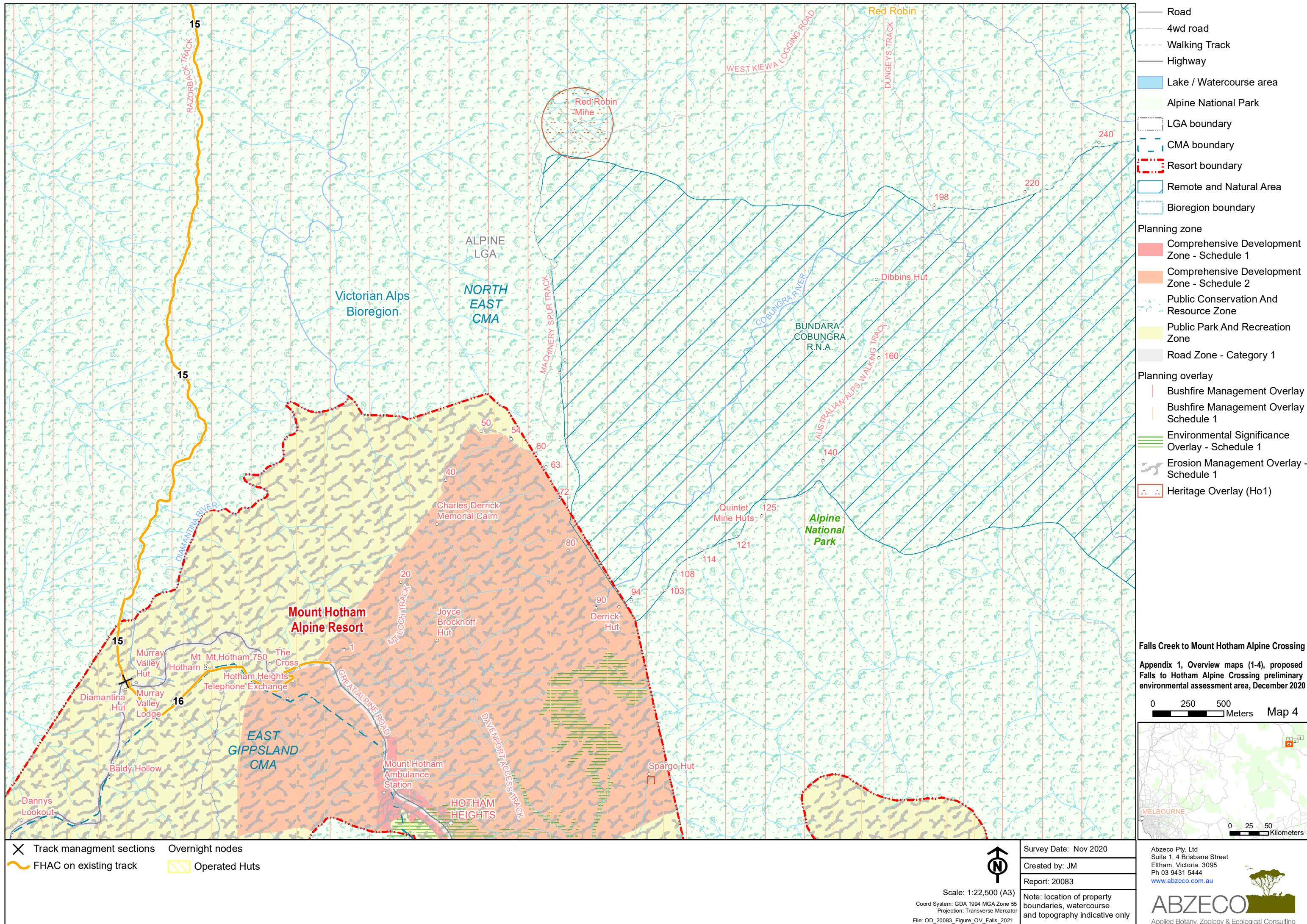
Wellington, R. and Haering, R. (2008). *Hygiene protocol for the control of disease in frogs*. DECC Information Circular Number 6. Department of Environment and Climate Change, Sydney.

Wilson, S. and Swan, G. (2017). *A complete guide to reptiles of Australia*, 5th Edition. Reed New Holland, Sydney.









Appendix 2. Falls to Hotham Alpine Crossing flora species list for proposed trail alignment and nodes (December 2020)

Legend:

S = status

* = Species introduced to Victoria

CaLP = Conservation and Land Protection Act 1994

SP = State Prohibited

P = Regionally Prohibited Weeds

C = Regionally Controlled Weeds

R = Restricted Weeds

W = Weeds of National Significance

EPBC = Environment Protection and Biodiversity Conservation Act 1999

CR = Critically Endangered

EN = Endangered

VU = Vulnerable

FFG = Flora and Fauna Guarantee Act 1988

L = listed

DEPI = Advisory List of Rare or Threatened Plants in Victoria (DEPI 2014)

e = Endangered

v = Vulnerable

r = Rare

k = Poorly known

p = Not formally listed but all subordinate taxa included in VROTS list

S	Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight nodes																				
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp	3 Op Hut	4 HK Hiker Camp	4 HK Op Hut				
P	<i>Acacia alpina</i>	Alpine Wattle			r																																					
P	<i>Acacia dallachiana</i>	Catkin Wattle			r																														✓	✓						
P	<i>Acacia dealbata</i>	Silver Wattle																																	✓							
P	<i>Acacia obliquinervia</i>	Mountain Hickory Wattle																																			✓					
	<i>Acaena echinata</i>	Sheep's Burr																																								
	<i>Acaena novae-zelandiae</i>	Bridge-widgee				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
*	<i>Acetosella vulgaris</i>	Sheep Sorrel				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
*	<i>Achillea millefolium</i>	Milfoil				✓	✓																																			
P	<i>Aciphylla glacialis</i>	Snow Aciphyll			r						✓	✓	✓																													
P	<i>Acrothamnus hookeri</i>	Mountain Beard-heath								✓																																
P	<i>Acrothamnus montanus</i>	Snow Beard-heath			r	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
P	<i>Acrothamnus</i> spp.	Mountain Beard-heath																																								
*	<i>Agrostis capillaris</i> var. <i>capillaris</i>	Brown-top Bent				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																✓	✓	✓	✓	✓	✓				
	<i>Agrostis</i> s.l. spp.	Bent/Blown Grass																																						✓		

S	Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight nodes																					
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp	3 Op Hut	4 HK Hiker Camp	4 HK Op Hut					
*	<i>Agrostis stolonifera</i>	Creeping Bent																		✓																							
*	<i>Aira caryophyllea/elegantissima</i>	Silvery/Delicate Hair-grass				✓				✓																																	
	<i>Ajuga australis</i>	Austral Bugle					✓			✓																																	
	<i>Alchemilla xanthochlora</i>	Lady's Mantle			r											✓	✓																										
*	<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass					✓	✓			✓		✓				✓	✓	✓											✓	✓												
*	<i>Aphanes arvensis</i>	Parsley Piert																			✓																						
P	<i>Argyrotegium fordanum</i>	Alpine Cudweed						✓	✓	✓	✓	✓	✓	✓																													
P	<i>Argyrotegium nitidulum</i>	Shining Cudweed	V		r	✓	✓	✓			✓																																
	<i>Arthropodium milleflorum</i> s.s.	Pale Vanilla-lily																			✓	✓	✓	✓	✓	✓																	
	<i>Asperula conferta</i>	Common Woodruff																		✓	✓	✓																					
	<i>Asperula gunnii</i>	Mountain Woodruff						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								
	<i>Asperula polymera</i>	Forest Woodruff																																									
	<i>Asperula pusilla</i>	Alpine Woodruff							✓			✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
	<i>Astelia alpina</i> var. <i>novae-hollandiae</i>	Silver Astelia							✓																																		
	<i>Asterolasia trymalioides</i>	Alpine Star-bush						✓	✓	✓	✓	✓	✓	✓	✓																												
P	<i>Baeckea gunniana</i>	Alpine Baeckea						✓	✓		✓	✓			✓	✓	✓				✓																						
	<i>Baloskion australe</i>	Mountain Cord-rush											✓																														
	<i>Blechnum nudum</i>	Fishbone Water-fern																																					✓				
	<i>Blechnum penna-marina</i> subsp. <i>alpina</i>	Alpine Water-fern							✓		✓	✓	✓	✓	✓						✓																	✓					
	<i>Blechnum wattsii</i>	Hard Water-fern																					✓																				
P	<i>Boronia algida</i>	Alpine Boronia			r																																						
	<i>Bossiaea foliosa</i> s.s.	Leafy Bossiaea									✓										✓	✓																					
	<i>Bossiaea sericea</i>	Silky Bossiaea							✓		✓	✓	✓		✓																												
P	<i>Brachyscome decipiens</i>	Field Daisy							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																							
P	<i>Brachyscome foliosa</i>	Mountain Daisy	L	v											✓																												

S	Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight nodes																			
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp	3 Op Hut	4 HK Hiker Camp	4 HK Op Hut			
P	<i>Brachyscome nivalis</i>	Snow Daisy																				✓	✓	✓																	
P	<i>Brachyscome rigidula</i>	Leafy Daisy											✓					✓																							
P	<i>Brachyscome scapigera</i>	Tufted Daisy											✓					✓																							
P	<i>Brachyscome spathulata</i>	Spoon Daisy							✓				✓				✓						✓		✓	✓	✓														
P	<i>Brachyscome tadgellii</i>	Tadgell's Daisy			r								✓	✓			✓	✓																							
	<i>Caesia alpina</i>	Alpine Grass-lily							✓													✓																			
P	<i>Caladenia alpina</i>	Mountain Hood-orchid																					✓																		
	<i>Callistemon pityoides</i>	Alpine Bottlebrush											✓	✓																											
	<i>Calochlaena dubia</i>	Common Ground-fern																																				✓			
	<i>Cardamine lilacina</i> s.s.	Lilac Bitter-cress			v				✓	✓	✓		✓	✓																											
	<i>Carex appressa</i>	Tall Sedge							✓		✓		✓	✓	✓	✓	✓	✓	✓																✓	✓	✓				
	<i>Carex breviculmis</i>	Common Grass-sedge						✓	✓	✓	✓	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
	<i>Carex canescens</i>	Short Sedge			r			✓		✓																															
	<i>Carex gaudichaudiana</i>	Fen Sedge						✓	✓				✓	✓	✓																						✓				
	<i>Carex hebes</i>	Mountain Sedge							✓																																
	<i>Carex inversa</i>	Knob Sedge							✓									✓																							
	<i>Carex jackiana</i>	Carpet Sedge			r								✓																												
	<i>Carex spp.</i>	Sedge							✓		✓							✓																							
P	<i>Cassinia aculeata</i> subsp. <i>aculeata</i>	Common Cassinia																				✓																	✓		
P	<i>Celmisia costiniana</i>	Carpet Snow-daisy			r	✓	✓	✓	✓	✓	✓							✓																							
P	<i>Celmisia latifolia</i>	Victorian Snow-daisy			r														✓				✓	✓															✓	✓	
P	<i>Celmisia pugioniformis</i>	Slender Snow-daisy											✓	✓			✓	✓		✓	✓	✓	✓	✓	✓													✓	✓		
P	<i>Celmisia sericophylla</i>	Silky Snow-daisy	L	v								✓																													
P	<i>Celmisia tomentella</i>	Silver Snow-daisy			r	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																										
*	<i>Cerastium glomeratum</i> s.s.	Sticky Mouse-ear Chickweed				✓	✓										✓		✓																			✓	✓		

S	Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight nodes																						
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp	3 Op Hut	4 HK Hiker Camp	4 HK Op Hut						
*	<i>Cerastium vulgare</i>	Common Mouse-ear Chickweed							✓		✓		✓										✓	✓		✓	✓																	
P	<i>Chiloglottis valida</i>	Common Bird-orchid														✓		✓																	✓									
P	<i>Chrysocephalum apiculatum</i> s.s.	Common Everlasting															✓	✓	✓	✓																								
P	<i>Chrysocephalum semipapposum</i>	Clustered Everlasting																			✓																							
*	<i>Cirsium vulgare</i>	Spear Thistle								✓				✓		✓																					✓							
	<i>Coprosma hirtella</i>	Rough Coprosma																			✓																	✓						
P	<i>Coronidium monticola</i>	Mountain Everlasting						✓	✓	✓	✓		✓	✓			✓							✓		✓	✓	✓	✓							✓								
P	<i>Coronidium scorpioides</i> s.s.	Button Everlasting																					✓																					
P	<i>Coronidium waddelliae</i>	Snowy Everlasting			r																✓																		✓					
P	<i>Cotula alpina</i>	Alpine Cotula						✓		✓	✓	✓	✓	✓	✓								✓																					
P	<i>Craspedia adenophora</i>	Sticky Billy-buttons				r			✓																																			
P	<i>Craspedia aurantia</i> s.l.	Orange/Green Billy-buttons			p			✓	✓	✓	✓	✓	✓	✓							✓																							
P	<i>Craspedia aurantia</i> var. <i>aurantia</i>	Orange Billy-buttons			r															✓		✓	✓	✓	✓	✓																		
P	<i>Craspedia aurantia</i> var. <i>jamesii</i>	Green Billy-buttons			r																	✓																						
P	<i>Craspedia gracilis</i>	Ashen Billy-buttons					✓	✓	✓	✓	✓		✓	✓	✓		✓								✓	✓										✓	✓							
P	<i>Craspedia lamicola</i>	Bog Billy-buttons			v			✓	✓	✓	✓				✓																													
P	<i>Craspedia maxgrayi</i> s.s.	Woolly Billy-buttons			v		✓	✓	✓												✓		✓																					
P	<i>Craspedia</i> spp.	Billy Buttons						✓	✓	✓	✓		✓	✓		✓		✓		✓		✓				✓										✓	✓							
	<i>Crassula sieberiana</i> s.s.	Sieber Crassula																				✓																						
*	<i>Dactylis glomerata</i>	Cocksfoot					✓																																					
	<i>Daviesia ulicifolia</i>	Gorse Bitter-pea																				✓																				✓		
	<i>Desmodium gunnii</i>	Southern Tick-trefoil																				✓																						
	<i>Deyeuxia monticola</i>	Mountain Bent-grass																					✓	✓																				
	<i>Deyeuxia</i> spp.	Bent Grass						✓	✓	✓		✓	✓			✓	✓						✓		✓		✓		✓															
	<i>Dianella tasmanica</i>	Tasman Flax-lily													✓							✓	✓		✓		✓		✓											✓	✓	✓		

S	Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight nodes																	
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp	3 Op Hut	4 HK Hiker Camp	4 HK Op Hut	
	<i>Dichondra repens</i>	Kidney-weed												✓		✓												✓											
*	<i>Digitalis purpurea</i>	Foxglove				®																																	
	<i>Empodisma minus</i>	Spreading Rope-rush				✓	✓	✓	✓	✓	✓	✓	✓																										
P	<i>Epacris breviflora</i>	Drumstick Heath																		✓																			
P	<i>Epacris celata</i>	Cryptic Heath			r	✓	✓	✓		✓	✓	✓	✓																										
P	<i>Epacris gunnii</i>	Ace of Spades				✓	✓		✓	✓	✓	✓	✓	✓	✓	✓																		✓					
P	<i>Epacris paludosa</i>	Swamp Heath				✓	✓		✓	✓																			✓	✓	✓								
P	<i>Epacris</i> spp.	Heath																			✓																		
	<i>Epilobium billardiereanum</i>	Variable Willow-herb															✓		✓																	✓			
	<i>Epilobium billardiereanum</i> subsp. <i>hydropitum</i>	Robust Willow-herb																																		✓			
	<i>Epilobium curtisae</i>	Bald-seeded Willow-herb			r	✓					✓	✓																											
	<i>Epilobium gunnianum</i>	Gunn's Willow-herb				✓	✓																						✓	✓									
	<i>Epilobium</i> spp.	Willow Herb							✓	✓	✓	✓	✓	✓	✓	✓					✓																		
	<i>Eucalyptus dalrympleana</i> subsp. <i>dalrympleana</i>	Mountain Gum																				✓														✓			
	<i>Eucalyptus delegatensis</i> subsp. <i>delegatensis</i>	Alpine Ash																				✓															✓		
	<i>Eucalyptus dives</i>	Broad-leaf Peppermint																					✓															✓	
	<i>Eucalyptus pauciflora</i> subsp. <i>hedraia</i>	Bogong Sally			r																																✓	✓	
	<i>Eucalyptus pauciflora</i> subsp. <i>niphophila</i>	Alpine Sally						✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
P	<i>Euchiton sphaericus</i>	Annual Cudweed																																					
P	<i>Euchiton umbricola</i>	Cliff Cudweed			r																		✓																
	<i>Euphrasia crassiuscula</i> subsp. <i>crassiuscula</i>	Thick Eyebright			r									✓				✓		✓																			
	<i>Euphrasia crassiuscula</i> subsp. <i>eglandulosa</i>	Thick Eyebright			r																		✓	✓															
P	<i>Ewartia nubigena</i>	Silver Ewartia			r									✓			✓		✓		✓		✓		✓														
*	<i>Festuca pratensis</i>	Meadow Fescue				✓																																	

S	Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight nodes																	
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp	3 Op Hut	4 HK Hiker Camp	4 HK Op Hut	
*	<i>Festuca rubra</i> s.s.	Creeping Fescue				✓	✓			✓	✓												✓	✓					✓		✓	✓							
*	<i>Galium aparine</i>	Cleavers												✓																									
P	<i>Gaultheria appressa</i>	Wax-berry																				✓	✓																
	<i>Geranium potentilloides</i>	Soft Crane's-bill											✓				✓						✓		✓	✓	✓	✓	✓										
	<i>Geranium</i> sp. 2	Variable Crane's-bill																																					
	<i>Geranium</i> spp.	Crane's Bill																				✓	✓															✓	✓
	<i>Gonocarpus micranthus</i>	Creeping Raspwort								✓		✓	✓	✓																								✓	
	<i>Gonocarpus montanus</i>	Mat Raspwort								✓			✓				✓						✓				✓	✓	✓	✓									
	<i>Goodenia hederacea</i> subsp. <i>alpestris</i>	Ivy Goodenia								✓	✓	✓	✓	✓			✓					✓		✓		✓											✓		
	<i>Gratiola peruviana</i>	Austral Brooklime																																				✓	
P	<i>Grevillea australis</i>	Alpine Grevillea								✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
P	<i>Grevillea victoriae</i> s.l.	Royal Grevillea								✓				✓				✓	✓			✓			✓														
P	<i>Helichrysum leucopsideum</i>	Satin Everlasting																																				✓	
*	<i>Holcus lanatus</i>	Yorkshire Fog								✓				✓								✓	✓		✓												✓	✓	✓
	<i>Hovea montana</i>	Alpine Rusty-pods									✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
	<i>Hydrocotyle algida</i>	Mountain Pennywort																				✓																	
	<i>Hydrocotyle sibthorpioides</i>	Shining Pennywort												✓																								✓	
*	<i>Hypericum androsaemum</i>	Tutsan																																					✓
	<i>Hypericum japonicum</i>	Matted St John's Wort															✓	✓			✓																		
*	<i>Hypericum perforatum</i> subsp. <i>veronense</i>	St John's Wort															✓																						
*	<i>Hypochaeris radicata</i>	Flatweed									✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
	<i>Hypolepis</i> spp.	Ground Fern																																				✓	
	<i>Isolepis crassiuscula</i>	Alpine Club-sedge																✓																					
	<i>Isolepis inundata</i>	Swamp Club-sedge																																				✓	
	<i>Isolepis</i> spp.	Club Sedge									✓		✓		✓		✓	✓																					

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						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp	3 Op Hut	4 HK Hiker Camp	4 HK Op Hut							
	<i>Juncus alexandri</i> subsp. <i>alexandri</i>	Mountain Rush																																		✓									
*	<i>Juncus articulatus</i> subsp. <i>articulatus</i>	Jointed Rush						✓			✓																																		
*	<i>Juncus effusus</i> subsp. <i>effusus</i>	Soft Rush				✓	✓		✓	✓																																			
	<i>Juncus</i> spp.	Rush									✓																																		
*	<i>Juncus tenuis</i>	Slender Rush					✓	✓			✓	✓	✓																																
	<i>Kunzea muelleri</i>	Yellow Kunzea					✓		✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓	✓																					
	<i>Kunzea</i> sp. (Upright form)	Forest Burgan																				✓																							
P	<i>Lagenophora montana</i>	Mountain Bottle-daisy																				✓																							
P	<i>Lagenophora stipitata</i>	Common Bottle-daisy																																			✓	✓	✓						
	<i>Leionema phyllicifolium</i>	Alpine Leionema									✓																																		
*	<i>Leontodon saxatilis</i> subsp. <i>saxatilis</i>	Hairy Hawkbit																																											
P	<i>Leptinella filicula</i>	Mountain Cotula																																											
P	<i>Leptorhynchos squamatus</i> subsp. <i>alpinus</i>	Alpine Buttons			r			✓	✓	✓		✓										✓	✓	✓	✓	✓	✓	✓	✓	✓															
	<i>Leptospermum grandifolium</i>	Mountain Tea-tree																																						✓					
P	<i>Leucochrysum albicans</i> subsp. <i>albicans</i>	Hoary Sunray																																											
P	<i>Leucochrysum alpinum</i>	Alpine Sunray			r																	✓	✓		✓																				
P	<i>Leucopogon gelidus</i>	Drooping Beard-heath																																							✓				
	<i>Lobelia surrepens</i>	Mud Pratia								✓				✓	✓																														
	<i>Lomatia fraseri</i>	Tree Lomatia																																							✓				
*	<i>Lotus uliginosus</i>	Greater Bird's-foot Trefoil																																								✓			
	<i>Luzula acutifolia</i> subsp. <i>acutifolia</i>	Sharp-leaf Woodrush		r																																									
	<i>Luzula alpestris</i>	Tussock Woodrush		r															✓	✓																									
	<i>Luzula meridionalis</i> var. <i>flaccida</i>	Common Woodrush							✓		✓											✓	✓																	✓	✓				
	<i>Luzula meridionalis</i> var. <i>meridionalis</i>	Common Woodrush																																											
	<i>Luzula modesta</i>	Southern Woodrush						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓											✓	✓					

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						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp	3 Op Hut	4 HK Hiker Camp	4 HK Op Hut	
	<i>Luzula novae-cambriae</i>	Coarse Woodrush									✓																												
	<i>Luzula</i> spp.	Woodrush									✓																												
	<i>Lycopodium fastigiatum</i>	Mountain Clubmoss				✓					✓																												
*	<i>Malus pumila</i>	Apple					✓														✓															✓			
	<i>Melicytus angustifolius</i> subsp. <i>divaricatus</i>	Tangled Shrub-violet						✓	✓	✓	✓	✓	✓																										
	<i>Melicytus dentatus</i> s.l.	Tree Violet																			✓															✓			
	<i>Melicytus</i> sp. aff. <i>dentatus</i> (Snowfields variant)	Alpine Shrub-violet																			✓	✓																	
	<i>Microseris stipoides</i> var. <i>stipoides</i>	Weeping Grass																			✓														✓	✓			
P	<i>Microseris lanceolata</i>	Alpine Yam-daisy						✓	✓	✓		✓	✓			✓	✓		✓	✓		✓									✓	✓							
	<i>Montia australasica</i>	White Purslane											✓			✓	✓																						
	<i>Myosotis australis</i>	Austral Forget-me-not																																		✓			
*	<i>Myosotis discolor</i>	Yellow-and-blue Forget-me-not																			✓																		
	<i>Myriophyllum pedunculatum</i> subsp. <i>pedunculatum</i>	Mat Water-milfoil							✓					✓																									
P	<i>Olearia algida</i>	Mountain Daisy-bush										✓																											
P	<i>Olearia brevipedunculata</i>	Rusty Daisy-bush			r			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
P	<i>Olearia erubescens</i>	Moth Daisy-bush																																					
P	<i>Olearia frostii</i>	Bogong Daisy-bush			r		✓	✓	✓	✓	✓										✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
P	<i>Olearia megalophylla</i>	Large-leaf Daisy-bush																																			✓		
P	<i>Olearia phlogopappa</i> subsp. <i>flavescens</i>	Dusty Daisy-bush			r		✓		✓	✓	✓										✓	✓														✓			
	<i>Oreobolus distichus</i>	Fan Tuft-rush							✓					✓	✓																								
	<i>Oreomyrrhis eriopoda</i>	Australian Caraway						✓	✓			✓	✓	✓																						✓	✓	✓	
	<i>Oreomyrrhis pulviniflora</i>	Cushion Caraway			e									✓																									
	<i>Orites lancifolius</i>	Alpine Orites					✓	✓	✓	✓	✓	✓	✓	✓			✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							
	<i>Oxylobium arborescens</i>	Tall Oxylobium																			✓																		
	<i>Oxylobium ellipticum</i>	Common Oxylobium													✓																					✓	✓		

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P	<i>Ozothamnus alpinus</i>	Alpine Everlasting			r			✓	✓	✓	✓				✓					✓																							
P	<i>Ozothamnus cupressoides</i>	Kerosene Bush				✓			✓	✓	✓												✓	✓	✓	✓	✓																
P	<i>Ozothamnus secundiflorus</i>	Cascade Everlasting								✓										✓			✓												✓								
P	<i>Ozothamnus thyrsoides</i>	Sticky Everlasting								✓	✓							✓	✓				✓												✓								
P	<i>Pappochroma bellidioides</i>	Violet Fleabane						✓	✓	✓	✓	✓					✓			✓																							
P	<i>Pappochroma nitidum</i>	Sticky Fleabane			r															✓																							
P	<i>Pappochroma paludicola</i>	Bog Fleabane					✓																																				
	<i>Parietaria debilis</i> s.s.	Shade Pellitory																																			✓						
P	<i>Pentachondra pumila</i>	Carpet Heath			r			✓			✓			✓	✓																												
	<i>Phedbalium squamulosum</i> subsp. <i>alpinum</i>	Alpine Phedbalium			r		✓	✓	✓	✓	✓	✓	✓				✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								
	<i>Phllotheca myoporoidea</i> subsp. <i>myoporoidea</i>	Long-leaf Wax-flower																	✓																								
*	<i>Phleum pratense</i>	Timothy Grass					✓			✓	✓																																
P	<i>Picris angustifolia</i> subsp. <i>merxmulleri</i>	Highland Picris											✓										✓																				
	<i>Pimelea alpina</i>	Alpine Rice-flower						✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓																	
	<i>Pimelea axiflora</i> subsp. <i>alpina</i>	Alpine Bootlace Bush			r	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
	<i>Pimelea ligustrina</i> subsp. <i>ciliata</i>	Fringed Rice-flower			r		✓		✓	✓	✓				✓			✓				✓			✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							
	<i>Pimelea ligustrina</i> subsp. <i>ligustrina</i>	Tall Rice-flower																				✓		✓																			
	<i>Plantago antarctica</i>	Mountain Plantain							✓										✓																				✓	✓			
*	<i>Plantago coronopus</i>	Buck's-horn Plantain																					✓	✓																			
	<i>Plantago euryphylla</i>	Broad Plantain							✓																																		
	<i>Plantago</i> spp.	Plantain							✓	✓	✓		✓	✓																													
*	<i>Poa annua</i> s.s.	Annual Meadow-grass																					✓																				
	<i>Poa costiniana</i>	Bog Snow-grass						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							
	<i>Poa ensiformis</i>	Sword Tussock-grass																			✓																✓	✓					
	<i>Poa fawcettiae</i>	Horny Snow-grass							✓	✓			✓	✓	✓				✓			✓	✓	✓	✓	✓																	

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	<i>Poa helmsii</i>	Tall Mountain Tussock-grass								✓			✓	✓	✓																		✓	✓	✓							
	<i>Poa hiemata</i>	Soft Snow-grass				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								
	<i>Poa hothamensis</i> var. <i>hothamensis</i>	Ledge Grass						✓	✓	✓	✓	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								
	<i>Poa hothamensis</i> var. <i>parviflora</i>	Soft Ledge-grass			r					✓																																
	<i>Poa phillipsiana</i>	Blue Snow-grass							✓	✓							✓																									
*	<i>Poa pratensis</i>	Kentucky Blue-grass					✓				✓																															
	<i>Poa sieberiana</i>	Grey Tussock-grass																✓																								
	<i>Poa sieberiana</i> var. <i>sieberiana</i>	Grey Tussock-grass																			✓	✓																				
	<i>Poa tenera</i>	Slender Tussock-grass																		✓																		✓				
	<i>Podocarpus lawrencei</i>	Mountain Plum-pine									✓																															
P	<i>Podolepis laciniata</i>	High-plain Podolepis			r			✓	✓		✓	✓																														
P	<i>Podolepis robusta</i>	Alpine Podolepis						✓	✓	✓		✓	✓								✓																					
	<i>Podolobium alpestre</i>	Alpine Podolobium						✓		✓	✓	✓										✓	✓	✓	✓																	
	<i>Polyscias sambucifolia</i> subsp. 1	Broad-leaf Panax																			✓																		✓			
	<i>Polyscias sambucifolia</i> subsp. 2	Ferny Panax																			✓																		✓			
	<i>Polyscias sambucifolia</i> subsp. 3	Mountain Panax																			✓																					
	<i>Polystichum proliferum</i>	Mother Shield-fern						✓	✓		✓		✓		✓						✓																		✓			
	<i>Poranthera oreophila</i>	Mountain Poranthera			r			✓	✓	✓	✓		✓																													
	<i>Portulaca oleracea</i>	Common Purslane																																					✓			
P	<i>Prasophyllum</i> spp.	Leek Orchid								✓																																
P	<i>Prostanthera cuneata</i>	Alpine Mint-bush						✓	✓	✓		✓		✓		✓																						✓				
P	<i>Prostanthera lasianthos</i> var. <i>lasianthos</i>	Victorian Christmas-bush																																								
*	<i>Prunella vulgaris</i>	Self-heal																																							✓	✓
	<i>Psychrophila introloba</i>	Alpine Marsh-marigold			r								✓	✓																												
	<i>Pteridium esculentum</i> subsp. <i>esculentum</i>	Austral Bracken																			✓																		✓			

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	<i>Ranunculus eichlerianus</i>	Eichler's Buttercup			r						✓	✓	✓															✓		✓					✓	✓						
	<i>Ranunculus gunnianus</i>	Gunn's Alpine Buttercup			r		✓				✓																															
	<i>Ranunculus millanii</i>	Dwarf Buttercup			r		✓			✓		✓																														
	<i>Ranunculus muelleri</i>	Felted Buttercup			v								✓																													
	<i>Ranunculus pimpinellifolius</i>	Bog Buttercup											✓							✓																						
*	<i>Ranunculus repens</i>	Creeping Buttercup																																		✓						
	<i>Ranunculus scapiger</i>	Hairy Buttercup																																		✓						
	<i>Ranunculus spp.</i>	Buttercup																		✓																						
	<i>Ranunculus victoriensis</i>	Victorian Buttercup			r	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓					✓	✓	✓	✓	✓	✓	✓											
P	<i>Rhodanthe anthemoides</i>	Chamomile Sunray																																								
P	<i>Richea continentis</i>	Candle Heath					✓	✓	✓		✓	✓	✓	✓	✓	✓																			✓	✓						
*	<i>C Rosa rubiginosa</i>	Sweet Briar																			✓																					
*	<i>W C Rubus anglocandicans</i>	Common Blackberry																			✓	✓	✓																			
	<i>Rubus parvifolius</i>	Small-leaf Bramble																			✓															✓						
*	<i>W C Rubus polyanthemus</i>	Forest Blackberry																			✓	✓															✓	✓				
*	<i>Rumex crispus</i>	Curled Dock																			✓																	✓				
	<i>Rytidosperma alpicola</i>	Crag Wallaby-grass			r																																					
	<i>Rytidosperma nivicola</i>	Snow Wallaby-grass			r																✓																					
	<i>Rytidosperma nudiflorum</i>	Alpine Wallaby-grass									✓	✓								✓		✓	✓																			
	<i>Rytidosperma pallidum</i>	Silvertop Wallaby-grass																			✓																					
	<i>Rytidosperma spp.</i>	Wallaby Grass															✓		✓	✓																	✓		✓			
*	<i>W R Salix cinerea</i>	Grey Sallow															✓																									
*	<i>W R Salix cinerea</i> subsp. <i>oleifolia</i>	Rusty Sallow																	✓	✓	✓																	✓				
	<i>Scaevola hookeri</i>	Creeping Fan-flower																																								

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	<i>Schoenus maschalinus</i>	Leafy Bog-sedge																																															
	<i>Scleranthus biflorus</i> s.s.	Twin-flower Knavel						✓	✓	✓	✓	✓	✓																							✓	✓												
	<i>Scleranthus diander</i>	Tufted Knavel			r																																	✓	✓										
	<i>Scleranthus singuliflorus</i>	Mossy Knavel			r				✓	✓	✓	✓	✓																																				
P	<i>Senecio gunnii</i>	Mountain Fireweed						✓	✓	✓	✓	✓	✓				✓		✓	✓	✓														✓	✓	✓	✓											
P	<i>Senecio hispidulus</i> s.l.	Rough Fireweed																																					✓										
P	<i>Senecio linearifolius</i> var. <i>latifolius</i>	Fireweed Groundsel (montane variant)																✓		✓	✓																	✓	✓										
P	<i>Senecio minimus</i>	Shrubby Fireweed																																															
P	<i>Senecio pinnatifolius</i> var. <i>alpinus</i>	Snowfield Groundsel			r			✓	✓	✓	✓	✓	✓	✓	✓	✓																																	
P	<i>Senecio</i> spp.	Groundsel																																															
*	<i>Spergularia rubra</i> s.s.	Red Sand-spurrey						✓																																									
P	<i>Sphagnum</i> spp.	Peat Moss							✓		✓	✓	✓	✓	✓	✓																								✓									
	<i>Stackhousia monogyna</i> s.s.	Creamy Candles							✓	✓	✓	✓	✓	✓	✓																																		
	<i>Stackhousia pulvinaris</i>	Alpine Stackhousia			r			✓	✓				✓	✓				✓	✓																														
	<i>Stellaria pungens</i>	Prickly Starwort						✓	✓		✓	✓						✓		✓	✓	✓	✓	✓														✓	✓	✓	✓								
P	<i>Stylium armeria</i>	Common Triggerplant							✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓															✓	✓	✓	✓							
P	<i>Styphelia nesophila</i>	Sharp Beard-heath																																															
*	<i>Symphyotrichum lanceolatum</i>	Narrow-leaf Michaelmas Daisy							✓																																								
*	<i>Taraxacum</i> spp.	Dandelion							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																			✓										
	<i>Tasmannia lanceolata</i>	Mountain Pepper												✓					✓																							✓	✓						
	<i>Tasmannia xerophila</i> subsp. <i>xerophila</i>	Alpine Pepper								✓				✓				✓																											✓				
	<i>Trachymene humilis</i> subsp. <i>breviscapa</i>	Alpine Trachymene			r				✓	✓	✓	✓	✓	✓	✓																																		
*	<i>Trifolium dubium</i>	Suckling Clover							✓																																								
*	<i>Trifolium repens</i> var. <i>repens</i>	White Clover							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<i>Trisetum spicatum</i> subsp. <i>australiense</i>	Bristle Grass								✓			✓				✓		✓																														

S	Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight nodes																			
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp	3 Op Hut	4 HK Hiker Camp	4 HK Op Hut			
	<i>Urtica incisa</i>	Scrub Nettle																																		✓					
*	<i>Veronica arvensis</i>	Wall Speedwell				✓																																			
	<i>Veronica derwentiana</i> subsp. <i>derwentiana</i>	Derwent Speedwell					✓	✓	✓	✓		✓	✓			✓	✓	✓													✓	✓									
	<i>Veronica derwentiana</i> subsp. <i>maideniana</i>	Derwent Speedwell																	✓																						
	<i>Veronica serpyllifolia</i>	Thyme Speedwell						✓	✓																																
	<i>Veronica subtilis</i>	Thread Speedwell									✓																														
	<i>Viola betonicifolia</i> subsp. <i>betonicifolia</i>	Showy Violet					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
*	<i>Vulpia bromoides</i>	Squirrel-tail Fescue										✓																													
	<i>Wahlenbergia gloriosa</i>	Royal Bluebell																																							
P	<i>Xerochrysum subundulatum</i>	Orange Everlasting					✓	✓	✓	✓		✓	✓				✓				✓				✓																
						Totals	59	111	74	84	101	88	84	25	29	45	101	60	59	39	60	24	46	50	37	38	34	39	17	29	25	25	38	28	33	47	27	27	29		

Appendix 3. Rare or threatened vascular flora species records listed under the EPBC Act and FFG Act within 2.5 km of the assessment area (DELWP 2020a)

Likelihood of occurrence within the assessment area (Source: Victorian Biodiversity Atlas, September 2020), updates informed by field assessments (November/December 2020) and detailed descriptions of species with a highly likely determination.

Legend:

EPBC = *Environment Protection and Biodiversity Conservation Act 1999*

CR = Critically Endangered

EN = Endangered

VU = Vulnerable

FFG = *Flora and Fauna Guarantee Act 1988*

L = Listed

Taxon ID	Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Distance of nearest record from the planned trail alignment (m)	Habitat description (source: VicFlora 2021)	Likelihood occurrence based on field assessment results	Desktop Review (Abzeco 2020) likelihood of occurrence
501467	<i>Argyroxiphium nitidulum</i>	Shining Cudweed	VU		Rare	58	3/13/2014	7	Damp open grassland communities on the Bogong High Plains between Mount Cope and Mount Nelse, also Shaws Creek in the Snowy Range.	Present.	Highly likely
500479	<i>Brachyscome foliosa</i>	Mountain Daisy		L	Vulnerable	27	12/14/2013	2	Tussock grassland and alpine herbfield, often on basaltic soils on the Bogong High Plains, Dargo and Cobungra area.	Present.	Highly likely
505026	<i>Cardamine franklinensis</i>	Franklin Bitter-cress		L	Endangered	1	11/6/1961	1469	Bogong High Plains, Mount Wellington and Wonnangatta-Macalister River divide.	Unchanged. Little is known about the habitat requirements and it was not recorded.	Unlikely
500631	+ <i>Carex cephalotes</i>	Wire-head Sedge		L	Vulnerable	12	1/9/2007	1344	Very rare in Victoria, only in sheltered rocky areas on the highest points e.g. Mount Bogong,	Moderate to Highly likely as suitable habitat is present, but	Moderately likely

Taxon ID	Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Distance of nearest record from the planned trail alignment (m)	Habitat description (source: VicFlora 2021)	Likelihood occurrence based on field assessment results	Desktop Review (Abzeco 2020) likelihood of occurrence
									Mount Feathertop, Mount Hotham and Mount Nelse where snow persists.	not recorded.	
500646	<i>Carex paupera</i>	Dwarf Sedge		L	Vulnerable	7	1/1/1992	19	Rare, on basalt soils on the Bogong High Plains near Mount Jim, Mount Hotham, the Dargo High Plains and Nunniong Plateau.	Unchanged. Basalt soils were identified near Mount Jim but species was not recorded.	Moderately likely
500693	<i>Celmisia sericophylla</i>	Silky Snow-daisy		L	Vulnerable	82	4/5/2016	49	Victorian endemic, occurring along rocky stream banks, among boulders and on rocks overhanging water, occasionally in Alpine Bog Communities and below snow patches. On the Bogong High Plains, especially between Mount Bogong and Mount Cope, also isolated occurrences between Mount Loch and Mount Hotham.	Present.	Highly likely
504643	+ <i>Craspedia canens</i>	Grey Billy-buttons		L	Endangered	2	9/28/2016	22	Noted in Victoria from grassland often bordering swamps at low altitude between Cranbourne and Traralgon, but VBA records suggest otherwise.	Unlikely, as it was not recorded, and VicFlora states the known distribution is low altitude Grassland	Moderately likely

Taxon ID	Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Distance of nearest record from the planned trail alignment (m)	Habitat description (source: VicFlora 2021)	Likelihood occurrence based on field assessment results	Desktop Review (Abzeco 2020) likelihood of occurrence
										between Cranbourne and Traralgon.	
501009	<i>Deyeuxia affinis</i>	Allied Bent-grass		L	Endangered	14	2/16/2010	3	Rare in Victoria, possibly confined to gravelly seepage areas near <i>Sphagnum</i> mossbeds in the vicinity of Mount Cope on the Bogong High Plains.	Moderately likely. There were minimal and only shallow moss beds identified in the assessment area.	Moderate-highly likely
504475	[^] <i>Euphrasia crassiuscula</i> subsp. <i>glandulifera</i>	Thick Eyebright	VU	L	Vulnerable	9	1/26/2004	22	Tall alpine herbfield and margins of alpine heath, open grassy sites and sometimes stony ground in the higher summit area between Mount Bogong and Mount Hotham.	Unchanged as suitable habitat was identified in the assessment area.	Highly likely
501340	[^] <i>Euphrasia eichleri</i>	Bogong Eyebright	VU	L	Vulnerable	25	3/24/2007	35	Victorian endemic. Occurs in low open heath, grassland and Sphagnum Bogs between the Dargo High Plains and the Bogong High Plains.	Unchanged as suitable habitat identified in the assessment area.	Highly likely
501343	<i>Euphrasia scabra</i>	Rough Eyebright		L	Endangered	3	2/8/2005	775	Damp grassy locations, shrubby areas, sclerophyllous forest clearings and sub-alpine woodland in lowland and montane regions. Confined to a few sites in the eastern	Unchanged despite the presence of suitable habitat.	Unlikely

Taxon ID	Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Distance of nearest record from the planned trail alignment (m)	Habitat description (source: VicFlora 2021)	Likelihood occurrence based on field assessment results	Desktop Review (Abzeco 2020) likelihood of occurrence
									ranges (e.g. Mount Koonika, Nunniong Plateau and Bendock area). Another taxa, <i>E. caudata</i> , occurs in a single sub-alpine site near the Bogong High Plains.		
501804	+ <i>Juncus antarcticus</i>	Cushion Rush		L	Vulnerable	30	4/5/2016	3	Restricted in Victoria to late-lying snow patches and the margins of bogs and creeks on the Bogong High Plains.	Unchanged as suitable habitat was identified in the assessment area.	Highly likely
501100	^ <i>Kelleria bogongensis</i>	Snow Daphne	VU	L	Endangered	12	4/3/2006	2	Basalt soils between snow-grass tussocks in alpine grassland on the Bogong High Plains.	Highly likely, as basalt derived soils and alpine grassland were identified in the assessment area across the Bogong High Plains.	Moderately likely
504155	+ <i>Prasophyllum suttonii</i> s.s.	Buffalo Leek-orchid		L	Presumed extinct	16	2/2/1994	106	Alpine and sub alpine grasslands or exposed slopes, especially post-fire.	Highly likely, as alpine grassland and exposed slopes were identified in the assessment	Highly likely ⁶

⁶ *Prasophyllum suttonii* is now considered extant and conspecific with *Prasophyllum alpestre* which is now referred to as *P. suttonii* (taxonomic status updated in 2017) (VicFlora 2021).

Taxon ID	Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Distance of nearest record from the planned trail alignment (m)	Habitat description (source: VicFlora 2021)	Likelihood occurrence based on field assessment results	Desktop Review (Abzeco 2020) likelihood of occurrence
										area, and <i>Prasophyllum</i> species were recorded during assessments.	
502607	+ <i>Saxipoa saxicola</i>	Rock Poa		L	Vulnerable	15	4/3/2006	2	Rare in Victoria, occurs on rocky grassland or in open shrubland on higher ranges including the Bogong High Plains, Cobberas Range, and Bennison Plain north of Licola.	Highly likely, as alpine grassland on rocky sites and open shrubland were recorded across the Bogong High Plains in the assessment area.	Moderately likely
503481	+ <i>Utricularia monanthos</i>	Tasmanian Bladderwort		L	Vulnerable	10	3/18/2009	3	Occurs in wet soils beside streams and pools near Mount Nunniong and the Bogong High Plains.	Highly likely, as streams and pools surrounded by very wet soil were recorded across the Bogong High Plains in the assessment area.	Moderately likely

[^]EPBC Act listed species**Thick Eyebright *Euphrasia crassiuscula* subsp. *glandulifera* – EPBC Act listed – Vulnerable, Victorian FFG Act listed, Victorian advisory list classified – Vulnerable**

Suitable habitat for Thick Eyebright was identified within the assessment area during the field survey. The species is known from higher summit areas between Mount Hotham and Mount Bogong, occurring in tall alpine herbfield, the edges of alpine heath, open grassy locations and sometimes on stony terrain (VicFlora 2021). This species has a national recovery plan which lists associated flora including *Astrolasia trymaloides*, Snow Aciphylla *Aciphylla glacialis*, Slender Snow-daisy *Celmisia pugioniformis*, Orange Billy-buttons *Craspedia aurantia*, Wooly Billy-buttons *Craspedia maxgrayi*, Alpine Grevillea, Yellow Kunzea, Snow Beard-heath, Alpine Orites and Soft Snow-grass (Carter *et. al.* 2006a), all of which were recorded in the alpine heathland and alpine grassland communities in the assessment area (Appendix 2). Suitable habitat was identified in higher parts of Heathy Spur Track in Alpine Grassland and Alpine Heathy Grassland. These communities were also present at high altitudes providing suitable habitat north-east of Mount Jim in the Bundara-Cobungra RNA along the Australian Alps Walking Track, which also included some stony areas. The species flowers between December and February, and given the 2020 season had been cooler and wetter than average, it may have been too early for detection, and the occurrence of the species within the assessment area can therefore not be ruled out.

If any track enhancement/overnight node construction works are undertaken in suitable habitat in the abovementioned areas, it is recommended that targeted surveys be undertaken during the active growing season from mid-December to mid-February to identify the species.

Bogong Eyebright *Euphrasia eichleri* – EPBC Act listed – Vulnerable, Victorian FFG Act listed, Victorian advisory list classified – Vulnerable

The known distribution of Bogong Eyebright is on higher subalpine tracts between the Bogong High Plains and Mount Bogong, and on the Dargo High Plains (VicFlora 2021). The species' preferred habitat includes low open heath, grassland and Sphagnum bogs (VicFlora 2021). There is a national recovery plan for the species which lists associated flora including the Mountain Woodruff, Alpine Star-bush, Common Grass-sedge *Carex breviculmis*, *Celmisia asteliifolia* spp. agg. (now *C. costiniana*, *C. pugioniformis* and *C. tomentella*) (VicFlora 2021), Short Bent-grass *Deyeuxia brachyathera*, Spreading Rope-rush, *Kunzea ericoides* (now mainly referable to *K. peduncularis* and *K. sp.* (Upright form) in the Victorian High Country), Alpine Buttons *Leptorhynchos squamatus* subsp. *alpinus*, Snow Beard-heath, Southern Woodrush, Australian Caraway *Oreomyrrhis eriopoda*, Carpet Heath, Alpine Rice-flower *Pimelea alpina*, Bog Snow-grass, Soft Snow-grass, Alpine Podolepis *Podolepis robusta*, Victorian Buttercup and Alpine Trachymene, which were recorded in the assessment area. Bogong Eyebright has also been recorded from low open shrubland dominated by Alpine Orites (Carter and Walsh 2006b). Suitable habitat for the Bogong Eyebright was identified in the assessment area including areas of Alpine Grassland, Alpine Heathy Grassland and Alpine Valley Peatland along Heathy Spur Track, and between Bogong High Plains Road and Mount Jim. The species is an annual that flowers between January and February (VicFlora 2021) and would not have been readily detectable at the time of the field assessment. Cattle grazing is listed as major threat and as that has now stopped, the species may be better able to recover (Carter and Walsh 2006b). Mountain Daisy appears to be making a good recovery in the Bundara-Cobungra RNA and surrounds after cattle grazing ceased, and other species such as Bogong Eyebright may also respond positively. As suitable habitat was identified, the presence of the species in the assessment area cannot be ruled out.

If any track enhancement works or overnight node construction is planned to be undertaken in suitable habitat in the abovementioned areas, it is recommended that targeted surveys are undertaken during the active growing season from mid-January to mid-February to identify the species.

Snow Daphne *Kelleria bogongensis* – EPBC Act listed – Vulnerable, Victorian FFG Act listed, Victorian advisory list classified – Endangered

Suitable habitat was identified in the assessment area for Snow Daphne *Kelleria bogongensis*, including alpine grassland dominated by tussock grasses and on basalt soils across the Bogong High Plains (VicFlora 2021). The species flowers in January, so may not have been readily detected in late spring and early summer when the field assessment was undertaken. The species may therefore still be present within the assessment area.

If any track enhancement works or overnight node development is planned to be undertaken in suitable habitat for Snow Daphne, it is recommended that targeted surveys are undertaken for it during the active growing season from mid-January to mid-February.

⁺Victorian FFG Act listed species**Cushion Rush *Juncus antarcticus* – FFG Act listed – Victorian FFG Act listed, Victorian advisory list classified – Vulnerable**

Cushion Rush is restricted to late-lying snowpatches and margins of bogs and streams on the Bogong High Plains (VicFlora 2021). Habitat for Cushion Rush was identified in the assessment area around a number of bogs and streams across the Bogong High Plains. This is a small plant (0.5 to 5 cm high) that flowers and fruits in January (VicFlora 2021), so it may have been difficult to detect and identify without inflorescences given the earlier timing of the field assessment. Therefore, the presence of the species in the assessment area cannot be ruled out.

If any track enhancement and/or overnight node works are proposed in suitable habitat in the abovementioned areas, it is recommended that targeted surveys be undertaken for the species during the flowering season in January.

Buffalo Leek-orchid *Prasophyllum suttonii* s.s. – Victorian FFG Act listed

The Buffalo Leek-orchid is listed under the FFG Act and regarded as extinct on the Victorian Advisory list, however, according to VicFlora (2021), this species is considered conspecific with Mauve Leek-orchid *Prasophyllum alpestre* which is not listed or classified as rare or threatened. As such, this species is not considered further in this assessment.

[Rock Poa *Saxipoa saxicola* – Victorian FFG Act listed, Victorian advisory list classified – Vulnerable](#)

Rock Poa habitat includes rocky grassland or open shrubland on the higher ranges, including the Bogong High Plains (VicFlora 2021) where this type of habitat is common. Inflorescences are generally required to confirm the identification of grasses at seed set. As the field assessment was undertaken early in the season and the species flowers in December to February, inflorescences would not have been readily identifiable, so its presence in the assessment area cannot be ruled out.

If any track enhancement or overnight node construction is planned to be undertaken in suitable habitat in the abovementioned areas, it is recommended that targeted surveys are undertaken during the peak active flowering period for the species from January to February.

[Tasmanian Bladderwort *Utricularia monanthos* – Victorian FFG Act listed, Victorian advisory list classified – Vulnerable](#)

Suitable habitat for the Tasmanian Bladderwort was identified across the Bogong High Plains, including in streams and pools surrounded by wet soils (VicFlora 2021). This species flowers between December and February (VicFlora 2021), and it may have been too early to be easily detectable at the time of the field assessment. The presence of this species in the assessment area can therefore not be ruled out.

If any track enhancement works or overnight node works are proposed to be undertaken in suitable habitat in the abovementioned areas, it is recommended that targeted surveys be undertaken during the peak active flowering season for the species in January.

[Wire-head Sedge *Carex cephalotes* – Victorian FFG Act listed, Victorian advisory list classified – Vulnerable](#)

Suitable habitat was identified in the assessment area for Wire-head Sedge *Carex cephalotes*, including alpine and snowpatch grassland on Mount Feathertop. The species is small and cryptic, sharing similarities with other species in the genus. It flowers in late summer, and therefore may not have been readily detectable during the field assessment. As the species has previously been recorded on Mount Feathertop which is a relatively discrete area supporting suitable habitat, its presence cannot be discounted and is considered to be moderately to highly likely to occur there.

If any track enhancement works or overnight node development is planned to be undertaken in suitable habitat in the abovementioned areas, it is recommended that targeted surveys are undertaken during the peak active flowering season for the species in February.

[Grey Billy-buttons *Craspedia canens* – Victorian FFG Act listed, Victorian advisory list classified – Endangered](#)

One species, Grey Billy-buttons *Craspedia canens*, initially deemed to have a moderate likelihood of occurrence in the assessment area, was later determined to be unlikely to occur there. There is one unverified record at the Mt Loch car park at Mt Hotham, and another record near the assessment area in 1958, rated as acceptable. As there are only two records and one of them is unverified, as well as there being no recorded sightings for more than 60 years and given the species was not recorded during the field assessment, it is considered unlikely to occur there.

Appendix 4. Introduced plant species recorded in the assessment area

Legend:

* = Species introduced to Victoria

W = Weeds of National Significance

CaLP = Conservation and Land Protection Act 1994

SP = State Prohibited

P = Regionally Prohibited Weeds

C = Regionally Controlled Weeds

R = Restricted Weeds

S	Scientific name	Common name	Track sections																Overnight node locations																	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camps	3 Op Huts	4 HK Hiker Camp	4 HK Op Huts	
*	<i>Acetosella vulgaris</i>	Sheep Sorrel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
*	<i>Achillea millefolium</i>	Milfoil	✓	✓															✓	✓																
*	<i>Agrostis capillaris</i> var. <i>capillaris</i>	Brown-top Bent	✓	✓	✓	✓	✓	✓			✓									✓	✓								✓	✓	✓					
*	<i>Agrostis stolonifera</i>	Creeping Bent																✓																		
*	<i>Aira caryophyllea/elegantissima</i>	Silvery/Delicate Hair-grass	✓					✓																												
*	<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass	✓	✓			✓		✓			✓	✓	✓						✓	✓	✓	✓				✓	✓								
*	<i>Aphanes arvensis</i>	Parsley Piert												✓																						
*	<i>Cerastium glomeratum</i> s.s.	Sticky Mouse-ear Chickweed	✓	✓							✓		✓					✓														✓	✓	✓		
*	<i>Cerastium vulgare</i>	Common Mouse-ear Chickweed			✓		✓		✓											✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓				
*C	<i>Cirsium vulgare</i>	Spear Thistle					✓				✓		✓																				✓			
*	<i>Dactylis glomerata</i>	Cocksfoot	✓																		✓		✓													
*	<i>Digitalis purpurea</i>	Foxglove	✓																																	
*	<i>Festuca pratensis</i>	Meadow Fescue	✓																																	
*	<i>Festuca rubra</i> s.s.	Creeping Fescue	✓	✓			✓	✓												✓	✓					✓	✓	✓	✓	✓	✓	✓				
*	<i>Galium aparine</i>	Cleavers												✓																			✓			
*	<i>Holcus lanatus</i>	Yorkshire Fog	✓				✓											✓	✓	✓													✓	✓	✓	
*C	<i>Hypericum androsaemum</i>	Tutsan																																	✓	
*C	<i>Hypericum perforatum</i> subsp. <i>veronense</i>	St John's Wort	✓																✓																	
*	<i>Hypochaeris radicata</i>	Flatweed	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
*	<i>Juncus articulatus</i> subsp. <i>articulatus</i>	Jointed Rush		✓			✓																													
*	<i>Juncus effusus</i> subsp. <i>effusus</i>	Soft Rush	✓	✓		✓	✓																													
*	<i>Juncus tenuis</i>	Slender Rush	✓	✓				✓	✓	✓																										

S	Scientific name	Common name	Track sections																Overnight node locations																												
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camps	3 Op Huts	4 HK Hiker Camp	4 HK Op Huts												
*	<i>Leontodon saxatilis</i> subsp. <i>saxatilis</i>	Hairy Hawkbit													✓																																
*	<i>Lotus uliginosus</i>	Greater Bird's-foot Trefoil													✓																				✓												
*	<i>Malus pumila</i>	Apple	✓												✓																						✓										
*	<i>Myosotis discolor</i>	Yellow-and-blue Forget-me-not													✓																																
*	<i>Phleum pratense</i>	Timothy Grass	✓			✓	✓																																								
*	<i>Plantago coronopus</i>	Buck's-horn Plantain																		✓	✓																										
*	<i>Poa annua</i> s.s.	Annual Meadow-grass																			✓																										
*	<i>Poa pratensis</i>	Kentucky Blue-grass	✓					✓																																							
*	<i>Prunella vulgaris</i>	Self-heal																																					✓	✓							
*	<i>Ranunculus repens</i>	Creeping Buttercup																																						✓							
*C	<i>Rosa rubiginosa</i>	Sweet Briar														✓																															
*W C	<i>Rubus anglocandicans</i>	Common Blackberry																	✓	✓	✓																										
*W C	<i>Rubus polyanthemus</i>	Forest Blackberry																		✓	✓																			✓	✓						
*	<i>Rumex crispus</i>	Curled Dock																	✓																						✓						
*W R	<i>Salix cinerea</i>	Grey Sallow		✓																																											
*W R	<i>Salix cinerea</i> subsp. <i>oleifolia</i>	Rusty Sallow																✓	✓	✓																					✓						
*	<i>Spergularia rubra</i> s.s.	Red Sand-spurrey	✓																																												
*	<i>Symphytum lanceolatum</i>	Narrow-leaf Michaelmas Daisy	✓																																												
*	<i>Taraxacum</i> spp.	Dandelion	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								
*	<i>Trifolium dubium</i>	Suckling Clover	✓																																												
*	<i>Trifolium repens</i> var. <i>repens</i>	White Clover	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
*	<i>Veronica arvensis</i>	Wall Speedwell	✓																																												
*	<i>Vulpia bromoides</i>	Squirrel-tail Fescue							✓																																						
Total			24	13	6	7	17	7	7	3	6	4	12	11	7	3	8	6	2	7	9	4	2	6	2	2	3	7	7	5	7	8	3	5	6												

Appendix 5. Falls to Hotham Alpine Crossing list of fauna species recorded on or near to the proposed trail alignment and overnight nodes (December 2020)[^]

Legend:

S = status

FFG = *Flora and Fauna Guarantee Act 1988*

* = introduced to Australia

L = listed

EPBC = *Environment Protection and Biodiversity Conservation Act 1999*

P = pending

E = Endangered

Vic Adv = Advisory list of threatened vertebrate fauna in Victoria (DSE 2013)

V = Vulnerable

cr = Critically Endangered

en = Endangered

vu = Vulnerable

Status	Scientific name	Common name	EPBC	FFG	Vic Adv.	Track	Overnight nodes
Mammals							
	<i>Austronomus australis</i>	White-striped Freetail Bat					✓
*	<i>Cervus unicolor</i>	Sambar					✓
*	<i>Equus caballus</i>	Horse (feral)					✓
*	<i>Lepus europaeus</i>	European Hare					✓
	<i>Mastacomys fuscus mordicus</i>	Broad-toothed Rat	V	L	en	✓	
	<i>Ornithorhynchus anatinus</i>	Platypus		L		✓	✓
*	<i>Oryctolagus cuniculus</i>	European Rabbit					✓
	<i>Petauroides volans</i>	Greater Glider	V	L	vu	✓	
	<i>Petaurus australis</i>	Yellow-bellied Glider					✓
	Suborder Microchiroptera	microbat species					✓
	<i>Trichosurus cunninghami</i>	Mountain Brushtail Possum					✓
Birds							
	<i>Anthochaera carunculata</i>	Red Wattlebird					✓
	<i>Anthus novaeseelandiae</i>	Australasian Pipit					✓
	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo				✓	✓
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush				✓	
	<i>Cormobates leucophaea</i>	White-throated Treecreeper					✓
	<i>Corvus mellori</i>	Little Raven				✓	✓
	<i>Cracticus tibicen</i>	Australian Magpie					✓
	<i>Dacelo novaeguineae</i>	Laughing Kookaburra					✓
	<i>Falco berigora</i>	Brown Falcon					✓
	<i>Falco cenchroides</i>	Nankeen Kestrel					✓
	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater					✓
	<i>Melithreptus lunatus</i>	White-naped Honeyeater					✓
	<i>Ninox novaeseelandiae</i>	Southern Boobook Owl					✓
	<i>Pachycephala pectoralis</i>	Golden Whistler					✓

Status	Scientific name	Common name	EPBC	FFG	Vic Adv.	Track	Overnight nodes
	<i>Pachycephala rufiventris</i>	Rufous Whistler				✓	
	<i>Pardalotus punctatus</i>	Spotted Pardalote				✓	
	<i>Pardalotus striatus</i>	Striated Pardalote				✓	
	<i>Petroica phoenicea</i>	Flame Robin				✓	
	<i>Platycercus elegans</i>	Crimson Rosella				✓	✓
	<i>Psophodes olivaceus</i>	Eastern Whipbird				✓	
	<i>Rhipidura albiscapa</i>	Grey Fantail				✓	✓
	<i>Rhipidura leucophrys</i>	Willie Wagtail				✓	
	<i>Sericornis frontalis</i>	White-browed Scrubwren				✓	
	<i>Strepera graculina</i>	Pied Currawong				✓	
	<i>Zosterops lateralis</i>	Silvereye				✓	
Reptiles							
	<i>Austrelaps ramsayi</i>	Highland Copperhead				✓	
	<i>Cyclodomorphus praecox</i>	Alpine She-oak Skink	E	L	cr	✓	
	<i>Drysdalia coronoides</i>	White-lipped Snake				✓	
	<i>Eulamprus kosciuskoi</i>	Alpine Water Skink		L	cr	✓	
	<i>Eulamprus tympanum tympanum</i>	Southern Water Skink				✓	✓
	<i>Lampropholis guichenoti</i>	Garden Skink				✓	
	<i>Liopholis guthega</i>	Guthega Skink	E	L	cr	✓	
	<i>Notechis scutatus</i>	Tiger Snake				✓	
	<i>Pseudemoia cryodroma</i>	Alpine Bog Skink		L	en	✓	
	<i>Pseudemoia pagenstecheri</i>	Tussock Skink		P	vu	✓	
	<i>Pseudemoia entrecasteauxii</i>	Southern Grass Skink				✓	✓
	<i>Rankinia diamensis</i>	Mountain Dragon				✓	
	<i>Tiliqua nigrolutea</i>	Blotched Blue-tongued Lizard				✓	
Frogs							
	<i>Crinia signifera</i>	Common Froglet				✓	
	<i>Litoria ewingii</i>	Southern Brown Tree Frog				✓	
Fish							
	<i>Galaxias olidus</i>	Mountain Galaxias				✓	
	<i>Galaxias cf. olidus</i>	galaxias (Cope Saddle)				✓	
*	<i>Salmo trutta</i>	Brown Trout				✓	
Invertebrates							
	<i>Diphucephala</i> spp.	Green Scarab Beetle				✓	
	<i>Eusthenia venosa</i>	stonefly				✓	
	<i>Graphium macleayanum</i>	Macleay's Swallowtail				✓	
	<i>Monistria concinna</i>	Spotted Mountain Grasshopper				✓	
	Order Ephemeroptera	mayflies				✓	
	Order Plecoptera	stoneflies				✓	
	Order Trichoptera	caddisflies				✓	

Status	Scientific name	Common name	EPBC	FFG	Vic Adv.	Track	Overnight nodes
	<i>Vanessa itea</i>	Australian Admiral				✓	
		Total	4	7 (+P)	7		

[^]For the purposes of conservation location information for sensitive species has been removed.

Appendix 6. Threatened fauna species listed under the EPBC Act and FFG Act recorded within 5 km of the assessment area (DELWP 2020a) or otherwise expected to occur there

Likelihood of occurrence within the assessment area (Source: Victorian Biodiversity Atlas, September 2020), including revised likelihood of occurrence initially informed by field assessments (November/December 2020)

Legend:

EPBC = Environment Protection and Biodiversity Conservation Act 1999

FFG = Flora and Fauna Guarantee Act 1988

CR = Critically Endangered

L = Listed

EN = Endangered

VU = Vulnerable

Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Sections of the alignment targeted for survey	Habitat description	Likelihood of occurrence
Birds									
<i>Ardea modesta</i>	Eastern Great Egret		L	Vulnerable	1	1/01/1968	N/A	Shallow waters in a wide range of inland and coastal wetland habitats including large, small, natural and artificial water bodies (DSEWPC 2010a). Roosts in trees at night (Serventy 1959).	Unlikely
<i>Aythya australis</i>	Hardhead			Vulnerable	1	18/12/1975	N/A	Prefers larger, deep water bodies including lakes, billabongs, creeks and artificial wetlands (Frith 1959). Usually nests in dense emergent vegetation, including reeds, bulrushes and shrubs, as well as on tree stumps and amongst long grass (Frith 1982).	Unlikely
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo		L	Vulnerable	2	21/10/2013	N/A	Eucalypt forests and woodlands close to the coast, along waterways or in hilly areas supporting stands of <i>Casuarina</i> or <i>Allocasuarina</i> (Menkhorst <i>et al.</i> 2017). Occurs in far-east Gippsland in Victoria (Dolby 2009).	Unlikely
<i>Cinclosoma punctatum</i>	Spotted Quail-thrush			Near Threatened	4	28/04/1979	N/A	Most commonly in drier woodlands, preferring grassy slopes and hillcrests with sparse cover (Higgins and Peter 2002).	Unlikely

Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Sections of the alignment targeted for survey	Habitat description	Likelihood of occurrence
<i>Circus assimilis</i>	Spotted Harrier			Near Threatened	1	7/01/2019	N/A	Open grasslands, shrublands, woodlands and crops (Morcombe 2000). Widespread but sparsely distributed in drier inland areas of Australia, being most common in the mid-Murray Valley in Victoria (Marchant and Higgins 1993).	Unlikely
<i>Climacteris affinis</i>	White-browed Treecreeper		L	Vulnerable	1	4/02/2010	N/A	Woodlands and tall shrublands in arid and semi-arid habitats, especially those dominated by mulga, <i>Casuarina</i> or <i>Callitris</i> (Menkhorst <i>et al.</i> 2017).	Unlikely
<i>Climacteris picumnus</i>	Brown Treecreeper			Near Threatened	3	28/04/1979	N/A	Coastal to semi-arid inland environments including dry forests, woodlands and scrubs (Pizzey and Knight 2007). Often nests in hollows and forages on tree trunks and amongst fallen branches and leaf litter (Garnett and Crowley 2000).	Unlikely
<i>Dromaius novaehollandiae</i>	Emu			Near Threatened	3	5/12/1977	N/A	Woodlands and shrublands from coastal plains to subalpine areas, avoiding dense forests (Menkhorst <i>et al.</i> 2017). In Victoria, mainly in the Mallee, Grampians, south-west of the state, and Gippsland (Dolby 2009).	Unlikely
<i>Gallinago hardwickii</i>	Latham's Snipe			Near Threatened	8	12/02/2018	Riparian areas and fens in alpine grassland and sedgeland.	In and around permanent and ephemeral water bodies including open freshwater wetlands, swamps and flooded meadows and paddocks, as well as modified and artificial wetlands (Frith <i>et al.</i> 1977; Naarding 1983).	Possible
<i>Hirundapus caudacutus</i>	White-throated Needletail	VU	L	Vulnerable	8	11/03/2000	Incidentally throughout the assessment area.	Airborne for much of the day and may roost aerially at night (Higgins 1999), although also roosts in trees (Tarburton 1993).	Possible

Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Sections of the alignment targeted for survey	Habitat description	Likelihood of occurrence
<i>Hydroprogne caspia</i>	Caspian Tern		L	Near Threatened	1	27/01/1996	N/A	Sheltered coastal and inland waters including large rivers, lakes, reservoirs and temporary wetlands. Nests mainly on islands off the coast (Menkhurst <i>et al.</i> 2017).	Unlikely
<i>Lewinia pectoralis</i>	Lewin's Rail		L	Vulnerable	1	1/01/1968	N/A	Swamps, lakes, tidal areas, lush wet pasture, paperbark swamps and swampy woodlands (Morcombe 2000).	Unlikely
<i>Nycticorax caledonicus</i>	Nankeen Night-Heron			Near Threatened	1		N/A	Littoral and estuarine coastal waters as well as terrestrial wetlands, foraging at night in shallow water or on exposed banks and flats, and roosting in nearby trees during the day (Simpson and Day 1999).	Unlikely
<i>Phalacrocorax varius</i>	Pied Cormorant			Near Threatened	1	1/01/1968	N/A	Mainly marine in its habits, although can also be found around large, open inland waters including lakes, rivers, swamps and artificial water bodies (Fjeldså 1985).	Unlikely
<i>Platalea regia</i>	Royal Spoonbill			Near Threatened	2	4/01/1977	N/A	Forages in the shallows of fresh and saltwater wetlands including a variety of permanent and ephemeral water bodies (Marchant and Higgins 1990). Nests on the crowns and side-branches of trees, or in lignum, reeds and rushes (Vestjens 1977).	Unlikely
<i>Tyto tenebricosa</i>	Sooty Owl		L	Vulnerable	1	3/05/1996	Blairs Hut and Diamantina Horse Yards.	Temperate and subtropical rainforests, and old-growth wet sclerophyll forests supporting dense understorey vegetation. May also forage in younger forests, though generally in the vicinity of old-growth trees that provide suitable nesting sites (Higgins 1999).	Possible
Mammals									
<i>Burramys parvus</i>	Mountain Pygmy-possum	EN	L	Critically Endangered	326	14/12/2017	Rocky outcrops and boulder fields among shrubs	Boulder fields and outcrops associated with shrubby heathy vegetation in alpine and subalpine environments, particularly where Mountain Plum-	Known

Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Sections of the alignment targeted for survey	Habitat description	Likelihood of occurrence
							and heathy vegetation.	pine <i>Podocarpus lawrencei</i> is present (Menkhorst <i>et al.</i> 2016).	
<i>Canis lupus dingo</i>	Dingo	L		Data Deficient	2	24/10/2006	Incidentally throughout the assessment area.	In Victoria, now largely restricted to a variety of forest, heath and woodland habitats in the eastern highlands, snowfields east of about Marysville, and in East Gippsland (Menkhorst 1995a).	Possible
<i>Cercartetus nanus</i>	Eastern Pygmy-possum			Near Threatened	2	14/05/1952	N/A	Rainforest, sclerophyll forest and heath, often associated with banksias and other myrtaceous shrubs and trees (Turner and Ward 1995). Thought to rarely move above the subalpine zone (Green and Osborne 2012).	Unlikely
<i>Dasyurus maculatus maculatus</i>	Spot-tailed Quoll	EN	L	Endangered	1	1/02/1980	N/A	Rainforest, open forest, woodland, coastal heathland and riparian forest. Populations are highly fragmented due to land clearing and competition and predation by introduced predators. Requires suitable den sites such as caves, rock crevices and hollow logs (Edgar and Belcher 1995; Menkhorst 1995b).	Unlikely
<i>Mastacomys fuscus mordicus</i>	Broad-toothed Rat	VU	L	Endangered	56	13/12/2017	Sections of the alignment supporting damp heath and grassland.	Sedgelands, herbfields, heathlands and grassy woodlands at altitudes of greater than about 1000 m, and usually found in wet, densely-vegetated forests to coastal heathlands at lower altitudes where trees are largely absent (Menkhorst 1995c).	Known
<i>Petauroides volans</i>	Southern Greater Glider	VU	L	Vulnerable	1	6/05/1996	N/A	Typically high-elevation forests, dependent on a tall <i>Eucalyptus</i> canopy (Kavanagh 2000). Reported to be particularly sensitive to forest clearance (Tyndale-Biscoe and Smith 1969), although roosts may vary (Kavanagh 2000).	Known

Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Sections of the alignment targeted for survey	Habitat description	Likelihood of occurrence
<i>Potorous longipes</i>	Long-footed Potoroo	EN	L	Vulnerable	1	1/04/2019	N/A	In Victoria, mainly known from near-coastal East Gippsland and adjacent uplands east of the Snowy River. Typically nests and shelters in densely vegetated gullies and forages in more open, drier forests (Seebeck 1995).	Possible
Reptiles									
<i>Cyclodomorphus praecox</i>	Alpine She-oak Skink	EN	L	Critically Endangered	104	21/03/2017	Sections of the alignment dominated by tussock grasses and low heath.	In Victoria, occurs in alpine habitats above 1500 m, typically inhabiting areas of tussock grasses and low heathy vegetation. Shelters in tussocks and under rocks (Robertson and Coventry 2019).	Known
<i>Eulamprus kosciuskoi</i>	Alpine Water Skink		L	Critically Endangered	636	9/03/2017	Bogs and fens.	Largely confined to sphagnum bogs, fens and wet heaths, sheltering in crayfish burrows and under dense vegetation (Green and Osborne 2012).	Known
<i>Liopholis guthega</i>	Guthega Skink	EN	L	Critically Endangered	40	20/10/2015	In and around rocky outcrops above the snowline, including the Falls Creek end of the alignment.	Favours rocky areas in snow gum woodland, heathland, and tussock grassland above 1600 m (Donnellan <i>et al.</i> 2002). Burrows are usually located under rocks or shrubs (Atkins <i>et al.</i> 2015), and occasionally along embankments and track edges.	Known
<i>Pseudemoia cryodroma</i>	Alpine Bog Skink		L	Endangered	17	22/01/2008	Bogs, damp frost hollows, and adjacent to drainage lines.	Dense low-growing vegetation in bogs, along drainage lines and in adjoining habitats, often in treeless areas above 1000 m. Occasionally basks on rocks or low vegetation (Robertson and Coventry 2019).	Known
<i>Pseudemoia pagenstecheri</i>	Tussock Skink			Vulnerable	52	12/03/2010	Sections of the alignment dominated by grassland.	Tussock grasslands with little or no tree cover (Wilson and Swan 2017), as well as subalpine and alpine grassland, snow gum woodland and heathland (Hutchinson and Donnellan 1992). Usually basks on fallen timber, surface rocks or within grass tussocks (Robertson and Coventry 2019).	Known

Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Sections of the alignment targeted for survey	Habitat description	Likelihood of occurrence
Frogs									
<i>Litoria spenceri</i>	Spotted Tree Frog	EN	L	Critically Endangered	4	8/03/2011	West Kiewa River and Diamantina River.	Largely restricted to the central-eastern highlands of Victoria including the Taponga, Howqua, Kiewa, Jamieson and Wongungarra River catchments (Robertson and Gillespie 1998). Occurs in dissected mountainous country, usually found among vegetation, rocks and fallen debris along the riffle sections of streams (Gillespie and Hollis 1996).	Unlikely in the assessment area, although likely further downstream
<i>Litoria verreauxii alpina</i>	Alpine Tree Frog	VU	L	Critically Endangered	236	26/10/2016	Fens, pools and dams towards the western end of the assessment area, including in the vicinity of Mount Hotham Alpine Resort.	Alpine ponds and pools in creeks and streams in forest, moorland and partially cleared habitat (Anstis 2017).	Possible
<i>Pseudophryne dendyi</i>	Dendy's Toadlet			Data Deficient	2	9/03/2017	N/A	Moist depressions, ponds and ditches in alpine areas and at lower altitude in wet and dry forests (Hero <i>et al.</i> 1991). Nest sites are located under logs, rocks or among the roots of grasses or other vegetation (Anstis 2017).	Possible
Invertebrates									
<i>Riekoperla intermedia</i>	Stonefly		L	Endangered	1	18/02/1972	Rocky tributaries and seepages.	Small alpine streams and trickles (Theischinger 1985).	Possible
<i>Thaumatoperla alpina</i>	Alpine Stonefly	EN	L	Vulnerable	12	1/02/2016	Rocky tributaries.	Montane and hilly areas at least 760 m above sea level (DotEE 2019). Typically steep, cool streams with cascading water, under cobblestones or detritus (DSE 2003).	Possible
<i>Austroaeschna (Austroaeschna) flavomaculata</i>	Alpine Darner Dragonfly			Vulnerable	7	25/02/2012	Fens and tributaries.	Larvae inhabit minor alpine streams and runoff waters, sheltering in sphagnum moss and under rocks (Theischinger and Hawking 2006).	Possible

Scientific Name	Common Name	EPBC Act	FFG Act	Victorian Advisory List	Count of Sightings	Last Record	Sections of the alignment targeted for survey	Habitat description	Likelihood of occurrence
<i>Euastacus armatus</i>	Murray Spiny Crayfish	EN	L	Near Threatened	9	24/03/2015	West Kiewa River, Diamantina River, and associated tributaries.	Faster-flowing waters and occasionally in large dams, usually burrowing under rocks or logs. In Victoria, found in the Murray River and its tributaries including the Mitta Mitta, Kiewa, Ovens and Goulburn Rivers (McCormack 2012).	Possible

Appendix 7. Waterway processes

Bed level lowering

Bed level lowering is a process by which the bed level is lowered through erosion. This can occur for many reasons (including catchment clearing, riparian vegetation clearing, poor waterway crossing design and construction, artificial channelisation, etc.), and can have a number of effects on bank stability, in-stream geomorphic diversity and floodplain hydrology. It is almost always accompanied by channel widening as the steepening banks collapse.

Commonly, bed level lowering (incision) occurs through a process called head-cut migration (or knickpoint regression). Head-cut migration presents as an abrupt change in channel slope, similar to small waterfalls or cascades within the channel (Schumm 1977) (Figure 3). A small plunge pool may be present at the base of the head-cut due to the higher energy of falling water. This is particularly common in steeper channels.

Head-cut erosion occurs in an upstream direction. In general, after a head-cut forms, it will continue to migrate upstream until it reaches either the head of the catchment or a solid barrier (e.g. a rock bar or road crossing). That is, without physical intervention within the creek, the head-cut will continue to migrate, and the channel will continue to deepen and subsequently cause channel widening (Booth 1990). This has the potential to impact on infrastructure that is aligned with the current bed elevation. Alpine Bog Communities are particularly vulnerable to this form of erosion. Minor head-cuts were also observed within the aqueduct network.

Conversely, bedrock-controlled streams have limited to no capacity to incise further.

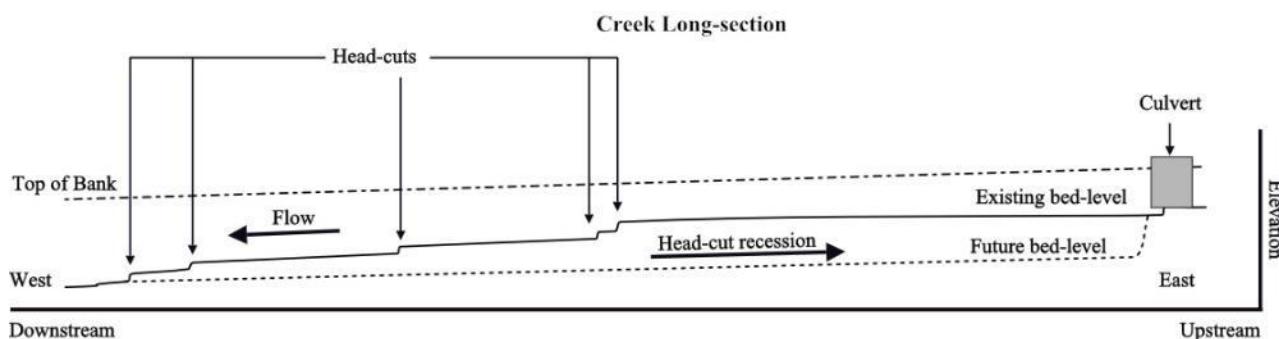


Figure 3. Conceptual diagram of knickpoint recession showing head-cuts moving upstream

Channel widening

Bank collapse will occur in response to channel deepening, resulting in widening of the channel (Leopold *et al.* 1964). Increased channel capacity results in larger flows being contained within the channel, which leads to increased erosive power. This is a significant problem when combined with disturbed or unvegetated bank substrates.

Bank erosion

Bank erosion can occur in response to several different processes and can present in a variety of forms. Toe erosion of banks, particularly on the outside of meander bends (lateral migration) was observed in the form of bank erosion. Erosion of this sort is often associated with a lack of riparian vegetation to stabilise the bank. The toe of the bank is gradually (or episodically) eroded until the bank is vertical or undercut, and the bank subsequently collapses under its own weight. Erosion on the outside of meander bends is a natural process of gradual channel planform change called lateral migration (lengthening). Erosion is expected at the outside of bends as these

are areas of increased flow velocity. Likewise, deposition is expected on the inside of the bend, as it is an area of reduced flow velocity.

Slumping or mass failure of the bank can also be initiated through geotechnical instabilities within the bank and saturation of the sediments, rather than being directly associated with channel flow. This can also occur through drawdown, where the bank becomes unstable through the transfer of ground water through the saturated bank to the channel. Once a bank fails, erosion can occur rapidly due to the exposed unconsolidated sediment behaving as a slurry.

Sediment supply

Sediment supply is a major influence for geomorphic change in river systems. Sediment is supplied to the river system through a variety of mechanisms such as the erosion of bedrock, catchment denudation, runoff, and bed and bank erosion. As such, sediment delivery volumes to a river system are dependent on a myriad of factors including, but not limited to, regional geology, regional hydrology, valley size, valley slope, anthropogenic disturbance and vegetation cover.

The sediment transport capacity of a channel is determined by its morphology (channel cross-section, planform and slope), hydraulic characteristics (discharge) and sediment particle size. In general, higher discharge results in a higher sediment transport capacity, however, a higher channel width:depth ratio will reduce the sediment transport capacity due to a reduced depth of flow.

Geomorphic change in a river system occurs when sediment supply and sediment transport capacity relationships vary. Deposition will occur if sediment supply exceeds sediment transport capacity, and erosion will occur when sediment transport capacity exceeds sediment supply.

Sediment starvation

Sediment starvation is the process where the downstream transfer of sediment is limited. Sediment transfer may be limited by natural and anthropogenic factors such as log jams or artificial instream structures (e.g. waterway crossings such as pipe culverts or weirs) during both low flow and flood conditions due to the structure preventing the passage of sediment. The process involves sediment being eroded from the downstream side of a structure and not being replenished by sediment from upstream, as it would be if there was no structure. Bed deepening can also occur through sediment starvation (e.g. downstream of dams and crossings).

Excess sediment

Excess sediment can result in sand slugs or sediment pulses that are unable to move under low flow conditions but are transported downstream during floods. This results in episodic movement and storage of large sand deposits downstream. These features can often occur as a result of major channel degradation (widespread bank erosion and/or channel deepening) associated with large floods or significant land disturbances such as bushfires.

Appendix 8. Waterway crossings and potential waterway impacts

A summary of potential crossing types and their implications for management within the project area is provided in Table 17.

Table 17. Waterway crossing types and their implications (December 2020)

Crossing type	Key design considerations	Advantages	Disadvantages
Bridge	<ul style="list-style-type: none"> ▪ Surrounding channel dimensions, site characteristics and geomorphic processes. ▪ The height of bridge relative to flood levels. ▪ Floodplain flow restriction brought about by the bridge approaches constructed above the floodplain surface. ▪ Bridge abutment protection (rock beaching requirements) to prevent bank erosion where flows are concentrated beneath the bridge. ▪ Bridge span width. Single span bridges are preferred to minimise waterway disturbance and potential for debris capture. ▪ To reduce costs, bridges are generally placed where the floodplain width is naturally narrow. ▪ Impacts to surrounding riparian vegetation and habitat for native fauna. ▪ Trackside drainage arrangements. 	<ul style="list-style-type: none"> ▪ Bridges are generally the preferred structure from a waterway health perspective as they generally cause the least disturbance to the surrounding stream dynamics and hydrologic and hydraulic conditions. ▪ Bridges provide unrestricted fish passage and sediment transport. ▪ Bridges are likely to provide the most reliable crossing type as they are usually constructed above the 1% AEP flood level. 	<ul style="list-style-type: none"> ▪ Bridges are generally the most expensive crossing structure. ▪ The concentration of flow beneath the bridge deck may increase the hydraulic forces and contribute to bank erosion beneath and surrounding the bridge. ▪ Bridge approaches are generally constructed above the floodplain surface. This has the potential to reduce the hydraulic capacity through the structure creating an increased afflux upstream of the bridge and increasing hydraulic forces (and therefore erosion potential) surrounding the structure.

Crossing type	Key design considerations	Advantages	Disadvantages
Box culvert	<ul style="list-style-type: none"> ▪ Surrounding channel dimensions, site characteristics and geomorphic processes. ▪ Hydraulic capacity. ▪ Culvert crossing height. ▪ Culvert invert level. ▪ Provision for fish passage. ▪ Provision for sediment transport through the structure. ▪ Bed and bank erosion mitigation requirements. ▪ Impacts to surrounding riparian vegetation and habitat for native fauna. ▪ Trackside drainage arrangements. ▪ Maintenance requirements (e.g. blockage risk) 	<ul style="list-style-type: none"> ▪ Appropriately designed and constructed box culverts are an effective crossing type. ▪ Box culvert crossings are generally constructed to facilitate greater flow capacity through the crossing. ▪ If appropriate bed and bank protection works are undertaken, the box culvert crossing can be overtopped without threatening the integrity of the structure. ▪ They can be designed to allow fish passage through the crossing. ▪ If constructed at or just below the surrounding waterway bed level, box culverts allow sufficient sediment transport through the crossing. 	<ul style="list-style-type: none"> ▪ Box culverts have the potential to catch debris and therefore exacerbate impacts associated with an increased afflux upstream of the crossing. ▪ Poor construction methods have the potential to initiate bed deepening in the waterway upstream of the crossing. ▪ Box culverts concentrate flows through the structure, increasing hydraulic forces (and therefore erosion potential) surrounding the structure.

Crossing type	Key design considerations	Advantages	Disadvantages
Pipe culvert	<ul style="list-style-type: none"> ▪ Surrounding channel dimensions, site characteristics and geomorphic processes. ▪ Hydraulic capacity. ▪ Culvert crossing height. ▪ Culvert invert level. ▪ Provision for fish passage. ▪ Provision for sediment transport through the structure. ▪ Bed and bank erosion mitigation requirements. ▪ Impacts to surrounding riparian vegetation and habitat for native fauna. ▪ Trackside drainage arrangements. ▪ Maintenance requirements (e.g., blockage risk) 	<ul style="list-style-type: none"> ▪ If appropriate bed and bank protection works are undertaken, the pipe culvert crossing can be overtopped without threatening the integrity of the structure. ▪ If designed and constructed appropriately, pipe culverts can be a cost-effective method of facilitating access across a watercourse. 	<ul style="list-style-type: none"> ▪ Pipe culverts are susceptible to catching debris, becoming blocked and therefore exacerbating impacts associated with an increased afflux upstream of the crossing. They are therefore also maintenance intensive. ▪ Poor construction methods have the potential to initiate bed deepening in the waterway upstream of the crossing. ▪ Pipe culvert crossings generally result in the greatest reduction in cross sectional area (depending upon the track surface height). Hence, they typically have a significant influence on the surrounding hydraulic conditions. ▪ Pipe culverts concentrate flows through the structure, increasing hydraulic forces (and therefore erosion potential) surrounding the structure. ▪ Pipe culverts typically inhibit fish passage through the crossing. ▪ Pipe culverts typically restrict bed load sediment transport through the structure.

Crossing type	Key design considerations	Advantages	Disadvantages
Causeway (i.e. low-profile ford crossings that do not incorporate a culvert)	<ul style="list-style-type: none"> ▪ Surrounding channel dimensions, site characteristics and geomorphic processes. ▪ Crossing height. ▪ Provision for fish passage at low flows. ▪ Provision for sediment transport through the structure. ▪ Bed and bank erosion mitigation requirements. ▪ Impacts to surrounding riparian vegetation and habitat for native fauna. ▪ Trackside drainage arrangements. 	<ul style="list-style-type: none"> ▪ Causeways are generally set at or near the bed level of the waterway. As such, they can have a reduced impact upon the hydraulic conditions surrounding the waterway. ▪ Causeways are generally the least expensive crossing option. ▪ Causeways may facilitate fish passage during moderate to high flow events (when inundated). 	<ul style="list-style-type: none"> ▪ Without appropriate bed and bank protection, causeways are prone to failure through undermining and outflanking. ▪ Being low profile, causeways are regularly inundated and therefore provide the least reliable crossing type. ▪ Causeways do not facilitate flow passage through the crossing during low flow events. Consequently, the structure has its greatest hydraulic influence during low events. ▪ Causeways will not facilitate fish passage during low flow events. ▪ Causeways can prevent bed load sediment from being transported past the crossing.

Appendix 9. Protected flora listed under the FFG Act recorded within the assessment area and requiring a protected flora permit to remove

Legend:

EPBC = Environment Protection and Biodiversity Conservation Act 1999

CR = Critically Endangered

EN = Endangered

VU = Vulnerable

FFG = Flora and Fauna Guarantee Act 1988

L = listed

P = Protected flora

DEPI = Advisory List of Rare or Threatened Plants in Victoria (DEPI 2014)

e = Endangered

v = Vulnerable

r = Rare

k = Poorly known

P = Not formally listed but all subordinate taxa included in VROTS list

Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight node locations															
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp Camp	3 Op Huts	4 HK Hiker Camp
<i>Acacia alpina</i>	Alpine Wattle			r																																
<i>Acacia dallachiana</i>	Catkin Wattle			r																																
<i>Acacia dealbata</i>	Silver Wattle																																			
<i>Acacia obliquinervia</i>	Mountain Hickory Wattle																																			
<i>Aciphylla glacialis</i>	Snow Aciphyll			r																																
<i>Acrothamnus hookeri</i>	Mountain Beard-heath																																			
<i>Acrothamnus montanus</i>	Snow Beard-heath			r																																
<i>Acrothamnus spp.</i>	Mountain Beard-heath																																			
<i>Argyrotegium fordianum</i>	Alpine Cudweed																																			
<i>Argyrotegium nitidulum</i>	Shining Cudweed	V			r																															
<i>Baeckea gunniana</i>	Alpine Baeckea																																			
<i>Boronia algida</i>	Alpine Boronia			r																																
<i>Brachyscome decipiens</i>	Field Daisy																																			
<i>Brachyscome foliosa</i>	Mountain Daisy	L	v																																	
<i>Brachyscome nivalis</i>	Snow Daisy																																			
<i>Brachyscome rigidula</i>	Leafy Daisy																																			
<i>Brachyscome scapigera</i>	Tufted Daisy																																			
<i>Brachyscome spathulata</i>	Spoon Daisy																																			
<i>Brachyscome tadgellii</i>	Tadgell's Daisy			r																																

Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight node locations																	
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp Camp	3 Op Huts	4 HK Hiker Camp	4 HK Op Huts	
<i>Caladenia alpina</i>	Mountain Hood-orchid																																					
<i>Cassinia aculeata</i> subsp. <i>aculeata</i>	Common Cassinia																																					
<i>Celmisia costiniana</i>	Carpet Snow-daisy			r	✓	✓	✓	✓	✓						✓						✓	✓	✓	✓	✓	✓	✓	✓										
<i>Celmisia latifolia</i>	Victorian Snow-daisy			r														✓			✓	✓												✓	✓			
<i>Celmisia pugioniformis</i>	Slender Snow-daisy																	✓	✓		✓	✓	✓	✓	✓									✓	✓			
<i>Celmisia sericophylla</i>	Silky Snow-daisy	L	v						✓																													
<i>Celmisia tomentella</i>	Silver Snow-daisy			r	✓	✓	✓	✓	✓	✓	✓	✓									✓	✓		✓														
<i>Chiloglottis validia</i>	Common Bird-orchid																	✓	✓																	✓		
<i>Chrysoccephalum apiculatum</i> s.s.	Common Everlasting																	✓	✓	✓	✓																	
<i>Chrysoccephalum semipapposum</i>	Clustered Everlasting																			✓																		
<i>Coronidium monticola</i>	Mountain Everlasting						✓	✓	✓	✓	✓	✓	✓				✓																	✓				
<i>Coronidium scorpioides</i> s.s.	Button Everlasting																																					
<i>Coronidium waddelliae</i>	Snowy Everlasting			r																✓																	✓	
<i>Cotula alpina</i>	Alpine Cotula							✓		✓	✓	✓	✓								✓																	
<i>Craspedia adenophora</i>	Sticky Billy-buttons			r				✓																														
<i>Craspedia aurantia</i> s.l.	Orange/Green Billy-buttons			P	✓	✓	✓	✓	✓	✓										✓																		
<i>Craspedia aurantia</i> var. <i>aurantia</i>	Orange Billy-buttons			r																✓		✓	✓	✓	✓													
<i>Craspedia aurantia</i> var. <i>jamesii</i>	Green Billy-buttons			r																	✓																	
<i>Craspedia gracilis</i>	Ashen Billy-buttons							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															✓	✓			
<i>Craspedia lamicola</i>	Bog Billy-buttons			v				✓		✓	✓	✓				✓																						
<i>Craspedia maxgrayi</i> s.s.	Woolly Billy-buttons			v	✓	✓	✓	✓												✓	✓																	
<i>Craspedia</i> spp.	Billy Buttons							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓											✓	✓					
<i>Epacris breviflora</i>	Drumstick Heath																			✓																		
<i>Epacris celata</i>	Cryptic Heath			r	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																			
<i>Epacris gunnii</i>	Ace of Spades				✓	✓														✓	✓															✓		
<i>Epacris paludosa</i>	Swamp Heath				✓	✓																														✓		
<i>Epacris</i> spp.	Heath																				✓																	
<i>Euchiton sphaericus</i>	Annual Cudweed																					✓																
<i>Euchiton umbricola</i>	Cliff Cudweed			r																✓																		

Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight node locations																		
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp Camp	3 Op Huts	4 HK Hiker Camp	4 HK Op Huts		
<i>Ewartia nubigena</i>	Silver Ewartia			r							✓				✓				✓																				
<i>Gaultheria appressa</i>	Wax-berry															✓	✓																						
<i>Grevillea australis</i>	Alpine Grevillea					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
<i>Grevillea victoriae s.l.</i>	Royal Grevillea					✓			✓						✓	✓			✓			✓		✓															
<i>Helichrysum leucopsideum</i>	Satin Everlasting																																		✓				
<i>Lagenophora montana</i>	Mountain Bottle-daisy															✓																							
<i>Lagenophora stipitata</i>	Common Bottle-daisy																																	✓	✓	✓			
<i>Leptinella filicula</i>	Mountain Cotula															✓																							
<i>Leptorhynchos squamatus subsp. <i>alpinus</i></i>	Alpine Buttons			r		✓	✓	✓		✓							✓	✓	✓	✓	✓	✓	✓	✓															
<i>Leucochrysum albicans subsp. <i>albicans</i></i>	Hoary Sunray																				✓	✓	✓																
<i>Leucochrysum alpinum</i>	Alpine Sunray			r												✓	✓			✓																			
<i>Leucopogon gelidus</i>	Drooping Beard-heath																																			✓			
<i>Microseris lanceolata</i>	Alpine Yam-daisy					✓	✓	✓		✓	✓					✓	✓	✓	✓	✓	✓	✓	✓																
<i>Olearia algida</i>	Mountain Daisy-bush											✓																											
<i>Olearia brevipedunculata</i>	Rusty Daisy-bush			r		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
<i>Olearia erubescens</i>	Moth Daisy-bush																	✓																					
<i>Olearia frostii</i>	Bogong Daisy-bush			r		✓	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
<i>Olearia megalophylla</i>	Large-leaf Daisy-bush																																			✓			
<i>Olearia phlogopappa subsp. <i>flavescens</i></i>	Dusty Daisy-bush			r		✓		✓	✓								✓	✓																		✓			
<i>Ozothamnus alpinus</i>	Alpine Everlasting			r		✓	✓	✓	✓	✓						✓				✓																			
<i>Ozothamnus cupressoides</i>	Kerosene Bush					✓		✓	✓	✓										✓		✓	✓	✓	✓	✓													
<i>Ozothamnus secundiflorus</i>	Cascade Everlasting									✓								✓				✓															✓		
<i>Ozothamnus thyrsoides</i>	Sticky Everlasting								✓	✓							✓	✓																			✓		
<i>Pappochroma bellidiooides</i>	Violet Fleabane						✓	✓	✓	✓	✓	✓					✓		✓																				
<i>Pappochroma nitidum</i>	Sticky Fleabane			r															✓																				
<i>Pappochroma paludicola</i>	Bog Fleabane									✓																													
<i>Pentachondra pumila</i>	Carpet Heath			r				✓			✓	✓																											

Scientific name	Common name	EPBC	FFG	Vic Adv.	Track sections																Overnight node locations																
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1A	1BE	1C	1D	1F	1G	2A	Track to 2A	2B	2C	Track to 2C	2D	Track to D	3 Hiker Camp Camp	3 Op Huts	4 HK Hiker Camp	4 HK Op Huts
<i>Picris angustifolia</i> subsp. <i>merxmulleri</i>	Highland Picris								✓																												
<i>Podolepis laciniata</i>	High-plain Podolepis		r			✓	✓		✓	✓																											
<i>Podolepis robusta</i>	Alpine Podolepis					✓	✓	✓		✓	✓					✓																					
<i>Prasophyllum</i> spp.	Leek Orchid					✓	✓			✓																											
<i>Prostanthera cuneata</i>	Alpine Mint-bush					✓	✓	✓		✓	✓		✓	✓																				✓			
<i>Prostanthera lasianthos</i> var. <i>lasianthos</i>	Victorian Christmas-bush																																				
<i>Rhodanthe anthemoides</i>	Chamomile Sunray																	✓																			
<i>Richea continentis</i>	Candle Heath					✓	✓	✓		✓	✓	✓			✓	✓																		✓			
<i>Senecio gunnii</i>	Mountain Fireweed					✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓				
<i>Senecio hispidulus</i> s.l.	Rough Fireweed																																				
<i>Senecio linearifolius</i> var. <i>latifolius</i>	Fireweed Groundsel (montane variant)													✓	✓	✓																	✓	✓			
<i>Senecio minimus</i>	Shrubby Fireweed																	✓																			
<i>Senecio pinnatifolius</i> var. <i>alpinus</i>	Snowfield Groundsel		r			✓	✓	✓	✓	✓	✓	✓	✓																								
<i>Senecio</i> spp.	Groundsel																	✓																			
<i>Sphagnum</i> spp.	Peat Moss							✓		✓	✓	✓	✓	✓																				✓			
<i>Stylium armeria</i>	Common Triggerplant							✓	✓	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓			
<i>Styphelia nesophila</i>	Sharp Beard-heath																✓	✓																			
<i>Xerochrysum subundulatum</i>	Orange Everlasting					✓	✓	✓	✓	✓	✓	✓	✓				✓			✓		✓															
Totals					17	38	32	30	31	33	27	8	8	17	39	17	23	20	22	5	16	16	8	10	8	9	3	10	9	5	12	7	8	9	10	6	6