Boffa Miskell

Milford Opportunities Project: Stage 3

Preliminary Assessment of Environmental Effects
Prepared for Milford Opportunities Project

2 May 2024

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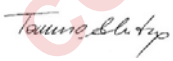
	Dr Tommaso Alestra Senior Ecologist	
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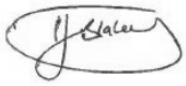
	Dr Tanya Blakely Senior Ecologist / Associate Partner	
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Cover photograph: *Milford Sound Piopiotahi from Sabre Peak over Adelaide Saddle, © Jaz Morris, 2016.*

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Whakarāpopoto Matua / Executive Summary

Tāhuhu Kōrero / Background

Milford Sound Piopiotahi is Aotearoa New Zealand's premier visitor attraction and an iconic destination. It is located within Aotearoa New Zealand's largest National Park (Fiordland National Park) and is a UNESCO World Heritage site Te Wāhipounamu. The Milford Opportunities Project (MOP) was created to look at the future of Milford Sound Piopiotahi, the Milford Road Corridor and to provide new thinking to protect the area's conservation values and deliver a safer, deeper visitor experience.

This phase of MOP (Stage 3, Phase 1) builds on the Masterplan and accompanying technical assessments completed in Stage 2 and takes them to the next level to establish, with a high degree of certainty, the technical feasibility of the proposed Masterplan concepts. As such, the project requires high-level and preliminary, but site-specific, assessments of the environmental values and impacts of the concepts proposed in the Masterplan to establish with high confidence the technical feasibility of proceeding with Masterplan recommendations from an environmental impact perspective.

He Kaupapa / Purpose and Scope

This report:

- Describes the terrestrial, freshwater and marine ecosystem values including their constituent flora and fauna at the locations of each of the Masterplan concepts (including other proposals developed by MOP subsequent to Stage 2), based on desktop review and high-level ecological site investigations.
- Considers mātauranga Māori when expressing the value of terrestrial and aquatic ecosystems.
- Provides preliminary, high-level assessments of the ecological effects of establishing the Masterplan concepts / MOP proposals and identifies opportunities and constraints in proceeding with further site investigations and design and construction activities at the Masterplan locations, based on the information available. In doing this, it also:
    - Provides high-level recommendations to avoid, minimise, or remedy, or offset and compensate effects on ecological values[1];

[1] Using current best practice, i.e., following the effects management hierarchy.

- Assesses the overall technical feasibility of proceeding with Masterplan concepts from an environmental impact perspective; and
- Discusses cumulative effects arising from the combined implementation of Masterplan concepts and in relation to existing ongoing impacts.

The scope of this work excluded specific surveys for fauna at Masterplan locations; detailed assessment of effects to inform detailed design and / or consenting (to be carried out in later stages of the MOP); and consideration of, or assessment against, relevant planning instruments including legislation (to be carried out by others). Therefore, while this report provides a preliminary, high-level summary of the ecological values and potential impacts to those values of the Masterplan concepts, it is not intended to be a comprehensive Ecological Impact Assessment. Further, detailed technical assessments, environmental project shaping, and consideration of ecological effects management measures will need to be undertaken and implemented should any Masterplan concepts proceed. These further technical assessments may identify new ecological values and new effects that are not considered in this preliminary, high-level report.

Ngā Kauneke / Methods

To obtain background information and literature on environmental values within the study area (terrestrial, freshwater and marine ecosystems and habitats, and their flora and fauna), a desktop study was undertaken, with information gathered from the available scientific literature, published and unpublished reports, GIS databases and spatial layers, and key stakeholders including the Department of Conservation, Waka Kotahi / NZ Transport Agency on behalf of the Milford Road Alliance, and Milford Sound Tourism Ltd.

In addition to general background information obtained via desktop study, the specific values within the indicative development envelopes for each of the Masterplan concepts were investigated by high-level ecological site survey:

- Site survey methodology and environmental data / information obtained was tailored depending on the proposed Masterplan concept, the size of the concept location envelope, and access / health and safety considerations. For accessible locations with well-defined envelopes, targeted site surveys were possible and relatively more detailed field information was collected.
- For more remote locations / concepts with large envelopes (i.e., Te Anau Downs to Cascade Creek Cycle and Walking Trail, proposed walking tracks, or the routes of overnight tramps), site surveys involved brief visits on foot or by helicopter to a small number of representative locations.
- In all cases, this focused largely on vegetation and habitat appraisal (including rapid habitat assessments for freshwater) but did not involve detailed fauna surveys.

He Horopaki / Context

The Milford Sound Piopiotahi area and Milford Road (SH94) corridor is well known to contain an exceptionally important range of indigenous ecosystems that are intact ki uta ki tai (from mountain to sea), and the Upokororo / Eglinton Valley has long been a focal point for mainland conservation efforts in New Zealand.

The SH94 corridor is overall one of the most ecologically important areas on the mainland and a stronghold for numerous taonga species, including key populations of Threatened and At Risk tipu / plant, manu / bird, mokomoko / lizard, te aitinga pekepeke / invertebrate and pekapeka / bat species. In addition to these inherent values, the SH94 corridor has additional importance because its accessibility has facilitated many decades of threatened species research and ongoing predator control. The ecological values of the corridor are largely dependent on active predator and pest control efforts and are sensitive to further habitat loss or unmanaged visitor impacts.

He Aromatawai Whakamana Taiao / High-Level Assessment of Environmental Effects

At a very high level, some of the key values of the locations of the study area include:

- Upokororo / Eglinton River: extensive tall tawai / red beech (and mixed beech species) forests on lowland alluvial terraces; habitat for numerous threatened manu / bird species and two pekapeka / bat species, e.g., including species such as South Island kākā, mohua, and pekapeka / long-tailed bat; large complex fen, bog, and swamp wetlands; extensive valley floor grasslands providing invertebrate, lizard, and bird habitat; unmodified upper river catchments with non-migratory galaxiid fish species and other threatened freshwater fauna; and intact / representative examples of naturally uncommon ecosystem / landform types including a mobile braided river, frost flats, and ancient glacial deposits.
- Whakatipu-ka-tuku / Hollyford River: extensive tawai / silver beech forests, seral forests and valley floor forest / shrubland / tussock grassland mosaics in areas susceptible to winter and spring avalanche; precipitous alpine habitats and extensive fellfields supporting specialised lizard and bird species including kea and pīwauwau / southern rock wren; and a dynamic and powerful river system that supports kōwhiowhio / blue duck.
- Waipāteke / Cleddau River: extensive lowland mixed tawai / beech – podocarp forests that supports threatened forest bird species including northern Fiordland tokoeka, kākā; and fast-flowing river habitat supporting kōwhiowhio / blue duck.

Key impacts of the Masterplan concepts include:

- Vegetation clearance and associated ‘edge effects’. In addition to direct clearance, edge effects are inherent to all track construction and habitat clearance, resulting in greater localised changes in vegetation composition and structure, typically alongside the entire

physical footprint of the track itself. Where vegetation involves clearance of large canopy tawai / beech trees, this can result in loss of critical habitat for species including pekapeka / bats, kākā, and mohua, as well as potential mortality and injury to those species.

- Impacts to freshwater habitat. Earthworks and vegetation clearance can generate sedimentation and erosion, and structures within or adjacent to habitats can result in loss of critical spawning habitat or creation of fish passage barriers. This is of particular concern for Masterplan concepts that involve earthworks alongside freshwater habitats, or creation of hardstand (e.g., buildings and carparks) near waterways.
- Mortality of terrestrial fauna (bats / lizards / nesting birds):
    - Earthworks and vegetation clearance (especially removal of trees) can lead to direct mortality and injury of fauna. Whilst this is of year-round concern (especially for pekapeka / bats), it is especially important during the bird breeding season (when eggs and chicks are present) and in winter (when lizards and bats are sedentary).
    - Clearance of rank grassland and shrubland can lead to mortality of lizards, even in vegetation types where exotic grass species are dominant.
    - All / most species of concern (in terms of likelihood of impact) are nationally Threatened and At Risk and absolutely protected under the Wildlife Act 1953. For some of these species, injury or mortality of individuals may have species population-level effects.
- Disturbance to fauna. A key effect of some Masterplan concepts is disturbance to fauna in physically isolated and sensitive habitat types that are not currently regularly visited by humans. International and local studies consistently highlight that visitors, especially walkers and cyclists, are highly disruptive to fauna (particularly water birds and wetland birds), which will respond with vigilance behaviours or flight, reducing feeding rates and in the worst case leading to effective habitat loss.
    - A notable feature of the existing environment in many Masterplan areas (such as the Te Anau Downs to Cascade Creek cycleway alignment) is the large range of suitable habitats for disturbance-sensitive wetland and water bird species that are distant from and free of sources of anthropogenic disturbance. Displacement of populations of these species elsewhere from the Upokororo / Eglinton Valley would expose them to potentially lower quality habitat and / or habitat with higher predator numbers.
    - Additional impacts in terms of lighting, noise, and physical interruption of habitat by new or upgraded buildings are of additional concern due to the potential to prevent feeding and

foraging by species including pekapeka / bats and tarapirohe / black-fronted tern.

- Pest and weed introduction and spread. Weeds can be introduced on machinery (a temporary risk during construction) or on an ongoing basis via visitors. Considerable sources of several weed species occur along both the proposed Te Anau Downs to Cascade Creek cycleway alignment and the SH94 alternative, especially in the Te Anau Downs area, posing a serious threat to the integrity of vegetation and habitats in the Eglinton area of Te Rua-o-Te-Moko / Fiordland National Park. New tracks can provide corridors for pest movement and spread, with key concerns (in terms of the potential for this effect) being feral cats and pigs.

Against a backdrop of largely intact forest, river, and alpine habitat under protection as a National Park and World Heritage Area, many Masterplan concepts would be located at existing stopping areas along SH94 that have already been modified or developed to some degree. For example, this includes developments within an existing small village area at Te Huakaue Knobs Flat and a large campground at Cascade Creek, as well as the large, developed footprint of Piopiotahi Milford Sound Village. A substantially positive aspect of the Masterplan concepts involves removal of the existing fixed wing runway at Piopiotahi Milford Sound Village and an opportunity for habitat restoration in this area.

Where new impacts or developments would occur beyond these already modified locations, they typically involve creation of new tracks. Exceptions include a small number of new visitor buildings / shelters along SH94 proposed at the 'Eglinton Reveal,' the 'Whakatipu Trails Head', Gertrude Valley, and the Cleddau Cirque. However, apart from the proposed Bowen Falls 'Top Links' cable car, no Masterplan concepts involve substantial creation of large infrastructure outside of already modified locations.

Drawing this together, this report concludes that:

- Masterplan concepts that are fully contained within an existing developed footprint are generally technically feasible from an environmental impact perspective. Nevertheless, intensification of visitor numbers and an increase in associated impacts (e.g., noise, lighting, impacts to kea) poses risks to fauna that will need to be carefully avoided and / or managed.
- Where Masterplan concepts would spread impacts beyond developed areas in the form of short tracks, again, these impacts are largely manageable but nevertheless warrant impact management measures and consideration of cumulative effects (we note that some 25 new or substantially upgraded tracks totalling c.135 km in length are proposed).
- Where Masterplan concepts involve substantial habitat clearance and habitat fragmentation, as well as introduction of visitors to currently undisturbed and sensitive habitats for fauna, we consider that either:

- Substantial impact management measures (including biodiversity offsetting and compensation approaches) will be required; or else:
- Biodiversity offsetting or compensation is not appropriate, and the proposal is therefore not technically feasible from an environmental impact perspective.

Proposals not considered feasible:

Walking / Cycling Trail – Te Anau Downs to Ō-Tāpara Cascade Creek

Based on the degree of direct and indirect impacts, the 'proposed trail' (which includes the true right of the Upokororo / Eglinton River below Black Creek) is likely to result in significant adverse impacts that are very unlikely to be able to be managed to an appropriate level. The 'SH94 alternative' (a route variation that largely follows SH94) whilst not without its own direct impacts, avoids the key concern of 'opening up' an extensive new area to human impacts, and is more likely to be environmentally feasible.

Additionally, we find that the 'Divide extension' is not feasible due to likely direct impacts associated primarily with vegetation clearance on steep slopes, as well as habitat loss and fragmentation in a key fauna feeding area.

Hine-te-awa Bowen Falls Experience ('Top Links')

The 'Top Links' Masterplan concept involving a cable car structure to ascend to the Bowen Valley would likely involve significant vegetation clearance to construct new infrastructure with resulting major adverse impacts to indigenous habitats and fauna that cannot be avoided, including habitat fragmentation, edge effects, and ongoing disturbance to fauna. Based on these likely effects, the 'Top Links' concept is likely to result in significant adverse ecological effects that are unlikely to be able to be managed to an appropriate level. This concept is not considered feasible from an environmental impact perspective.

Little Tahiti Heliport

Owing to concerns for the critically endangered Milford boulder butterfly, and due to the substantial degree of forest clearance that would be required, Little Tahiti is not an appropriate / environmentally feasible location for the relocation of the existing aerodrome's passenger rotary services.

Ngā Hua o te Aromatawai / Cumulative Effects

Taken as a whole, the combined effect of all Masterplan concepts / MOP proposals will result in a substantially higher level of direct habitat loss and indirect habitat modification due to human / visitor impacts compared to existing levels. At a high level, cumulative effects include impacts to habitat type, extent, and quality, with implications for species populations and long-term ecosystem viability. Large-scale compensation measures, in terms of pest / predator control, weed control, and species management / research are necessary and already under resourced relative to what is already needed, without accounting for new impacts arising from the Masterplan / MOP.

Te Whakamutunga / Summary and Conclusions

This report finds that very few Masterplan concepts would include any positive outcomes for any aspect of indigenous biodiversity that are built in. Because of the general lack of any biodiversity benefits, further refinement and implementation of the Masterplan will require substantial effort to devise appropriate compensatory mechanisms, such as increased efforts in predator and pest control, species management, and research. As was suggested in the Conservation Impact Analysis for MOP Stage 2 (Boffa Miskell, 2021), the single most pressing opportunity for net biodiversity gains is landscape-scale control of introduced mammalian predators. Leveraging the proposed visitor access fee is a clear and important positive opportunity that would enable MOP to resource these efforts.

To address the adverse effects of the Masterplan concepts, it is considered likely that a combination of positive environmental measures will be required, as well as stakeholder support and significant ongoing financial commitment. This will most likely require leveraging visitor revenue to support a substantial increase in baseline management effort and staffing. Indeed, with sufficient resource, biodiversity gains compared to the existing situation are realistically possible, and this should be the goal.

Ongoing biodiversity management in the SH94 corridor must be seen as the essential 'quid pro quo' of the Masterplan concepts and the Piopiotahi / Milford tourism industry in general. This is recommended as a priority for additional investment, and as an integral component of the Masterplan.

In sum, the following Masterplan concepts / MOP proposals are considered to be technically feasible from an environmental impact perspective, with any impact management requirements likely to be generally straightforward to implement and sufficient to manage adverse effects:

- Node 1: Te Rua-o-Te-Moko Fiordland National Park Gateway;
- Node 4: Overnight Walk – Countess Range;
- Node 5: Key Summit to Cascade Creek (and Key Summit to Divide alternative);
- Node 7: Cleddau Cirque;
- Piopiotahi Visitors Hub – Various Proposals (i.e., those listed in Section 5.11);
- Piopiotahi Visitors Hub – Barren Peak Spur Walk;
- Piopiotahi Visitors Hub – Hine-te-awa Bowen Falls Experience ('Lower Pontoon Walkway');
- Piopiotahi Visitors Hub – Hine-te-awa Bowen Falls Experience ('Lower Viewpoint');
- Cleddau Delta Node – Cleddau Bush Tracks;
- Deepwater Basin Node: Recreational Boat Ramp and Trailer Parking;

- Cleddau Delta Node – Dedicated Sea Kayak Area;
- Deepwater Basin Node – Wastewater Treatment Plant; and
- Other MOP Proposals – Tūtoko Bridge to Milford Sound Lodge Walkway.

The following Masterplan concepts / MOP proposals are considered to be technically feasible from an environmental impact perspective but require some or all of the following: further information; carefully locating the proposal to avoid / minimise effects (noting that this may be inherently difficult in the context of the specific activity); implementation of complex and / or costly impact management measures; and proceeding with some aspects of the activity but not others:

- Node 2: Eglinton Reveal;
- Node 3: Te Huakaue Knobs Flat including Kiosk Creek and Walks;
- Node 3: Walking / Cycling Trail – Te Anau Downs to Cascade Creek ('SH94 alternative' option);
- Node 4: Ō-Tāpara / Cascade Creek;
- Node 5: Whakatipu Trails Head;
- Node 6: Gertrude Valley;
- Other MOP Proposals – The Chasm to Cleddau Horse Bridge Walk; and
- Other MOP Proposals – Little Tahiti (staff accommodation option).

Four Masterplan concepts / MOP proposals are considered likely to result in significant adverse ecological effects that are unlikely to be able to be managed to an appropriate level. There is limited ability to avoid, minimise or remedy their likely adverse effects. If pursued, complex and / or substantial ecological offset or compensation measures would be necessary, noting that it is generally considered inappropriate to offset / compensate significant adverse effects to irreplaceable and vulnerable biodiversity features. On this basis, the following Masterplan concepts / MOP proposals are **not** considered to be technically feasible, from an environmental impact perspective:

- Node 3: Walking / Cycling Trail – Te Anau Downs to Cascade Creek ('proposed trail');
- Node 3: Walking / Cycling Trail – Te Anau Downs to Cascade Creek ('Divide extension');
- Piopiotahi Visitors Hub – Hine-te-awa Bowen Falls Experience ('Top Links'); and
- Other MOP Proposals – Little Tahiti (heliport option).

RĀRANGI KAUPAPA / CONTENTS

He Āpitihanga / Appendices

Ngā Whakaahua / Figures

1.0 He Kupu Arataki / Introduction

1.1 Tāhuhu Kōrero / Background

Milford Sound Piopiotahi is Aotearoa New Zealand's premier visitor attraction and an iconic destination. It is located within Aotearoa New Zealand's largest National Park (Fiordland) and is a UNESCO World Heritage site Te Wāhipounamu. While boasting high visitor numbers, the current management of recreation and tourism along the Milford Corridor and Milford Sound Piopiotahi needs new thinking to protect its World Heritage status, cultural and conservation values and overall visitor experience.

The Milford Opportunities Project (MOP) was created to look at how the future of Milford Sound Piopiotahi, the Milford Road Corridor and to provide new thinking to protect the area's conservation values and deliver a safer, deeper visitor experience.

The Milford Opportunities Project involves three stages:

- Stage 1: establishing context, vision, and objectives (completed in September 2018).
- Stage 2: consultation, engagement, and research to develop a Milford Opportunities Masterplan (launched in July 2021).
- Stage 3:
    - Phase 1 (current phase): testing the feasibility of the Masterplan's recommendations.
    - Phase 2: design, planning and implementation.

Stages 1 and 2 were completed in September 2018 and July 2021, respectively. In Stage 2 of the project a Masterplan for Milford Sound Piopiotahi and the Milford Road corridor was developed. The purpose of the Masterplan is to:

> *Ensure that Milford Sound Piopiotahi maintains its status as a key Aotearoa New Zealand visitor 'icon' and provides a 'world class' visitor experience that is accessible, upholds the World Heritage status, national park and conservation values and adds value to Southland and Aotearoa New Zealand Inc.*

The Masterplan was informed by a number of technical reports including tourism, transport, legal and governance, hazards, landscapes, and iwi. Alongside the research work, engagement with the community, key stakeholders, national interests, and the New Zealand public was held over the 18 months of the development of the Masterplan. The research and engagement findings helped the project's Governance Group make the final decisions on the concepts and recommendations included in the Masterplan.

The MOP is in the first phase of Stage 3 of the project. Stage 3, Phase 1 of the MOP builds on the technical assessments completed in Stage 2 and takes them to the next level to establish, with a high degree of certainty, the technical feasibility of the proposed Masterplan concepts. As such the project requires site-specific assessments of environmental values to inform the feasibility of proceeding with the concepts presented in the Masterplan.

Boffa Miskell Ltd (Boffa Miskell) was commissioned to complete a high-level, preliminary assessment of environmental effects for the 'Assessment of Environmental Values – Terrestrial and Aquatic Species and Ecosystems' workstream for Stage 3, Phase 1 of the MOP.

The purpose and scope of this work is described in Section 1.2, below.

1.2 He Kaupapa / Purpose and Scope

The purpose of this work, as outlined in the Request for Proposal (RFP), was to:

> "*Assess the terrestrial, freshwater and marine ecosystem values including their constituent flora and fauna at the sites listed in Appendix A Schedule 1, sufficient for establishing with high confidence the technical feasibility of proceeding with Masterplan recommendations from an environmental impact perspective".*

The scope of this work was to:

- Review the MOP Masterplan, Stage 2 Conservation Impact Analysis report (Boffa Miskell Ltd, 2021), and source information for the Milford Road corridor and Milford Sound Piopiotahi including the marine environment, to build context and identify information gaps;
- Identify, collate, and review additional existing information and / or literature;
- Undertake site investigations to inform terrestrial, freshwater, and marine environmental assessments of area envelopes;
- Prepare a preliminary, high-level, Environmental Assessment Report (this report) that:
    - Provides preliminary, high-level assessments of the ecological effects of establishing the infrastructure proposed in the Masterplan and identifies opportunities and constraints in proceeding with further site investigation, design, and construction activities at the locations where Masterplan locations are proposed based on the information available on each of the Masterplan concepts.
    - Considers mātauranga Māori when expressing the value of terrestrial and aquatic ecosystems.
    - Provides high-level recommendations to avoid, minimise, remedy, or mitigate effects on ecological values[2].

The scope of this work excluded:

- Specific surveys for fauna (lizards, bats, invertebrates, marine infauna, or freshwater fauna). Due to the high-level feasibility study nature of this work, the spring timeframe for the main site investigations (i.e., during a single season only, and at a time of year when many fauna groups such as lizards are less active / less readily observed immediately following winter), and general time constraints, specific surveys for fauna were not practical. However, where relevant, recommendations for specific, detailed, fauna surveys are identified in this report. Specific fauna surveys will be required for the next stages of the project.
- A detailed assessment of the effects of the Masterplan Concepts to inform detailed design and / or consenting (to be carried out in later stages of the MOP).
- Consideration of, or assessment against, relevant planning instruments including legislation, National Policy Statements, Regional and District Plans and relevant

[2] Using current best practice, i.e., following the effects management hierarchy.

management plans (for example the Fiordland National Park Management Plan). This assessment is being carried out by others during Stage 3, Phase 1 of the MOP by other work streams.

Figure 1. Location overview of MOP Masterplan nodes and hubs (from Stantec NZ Ltd & Boffa Miskell Ltd, 2021).

1.3 Report Structure

This report:

- Outlines the methods used to undertake the desktop assessment, information gathering (including stakeholder consultation) and site investigations (Section 2.0);
- Provides a high-level review of the Ngāi Tahu Claims Settlement Act and Iwi Management Plan, in order to enable the consideration of mātauranga Māori when expressing the value of terrestrial and aquatic ecosystems (Section 3.0);
- Provides a high-level assessment of effects for each of the proposed Masterplan locations (Section 5.0). For each Masterplan concept / proposal[3] the following is provided:
  - A description of the Masterplan concept / proposal;
  - A description of the existing visitor facilities / infrastructure;
  - A description of the existing ecological environment;
  - A preliminary assessment of environmental effects;
  - Recommendations for effects management and, where relevant, further environmental / ecological investigations; and
  - Conclusions.
- Provides a summary of the assessments (Section 5.21);
- A description of general environmental effects and associated general recommendations (Section 6.0);
- An assessment of cumulative effects (Section 7.0);
- Summary and conclusions (Section 8.0); and
- References (Section 9.0).

[3] Where it was logical and appropriate to do so, assessment of some Masterplan concepts at Milford Sound Piopiotahi have been combined.

2.0 Ngā Kauneke / Methods

2.1 Definitions and Naming Conventions

Locations / Activities

The key terms used to refer to the project locations and activities are:

- **Masterplan concepts:** The concepts, as outlined in the Masterplan.
- **MOP proposals:** Additional proposals, not included in the Masterplan, that have been identified and proposed by MOP.
- **Masterplan locations:** The locations at which the Masterplan concepts and MOP proposals are proposed to be established.
- **Hubs:** Visitor hubs at the southern and northern end of the Milford Corridor (i.e., Te Anau township and Piopiotahi / Milford Sound Village, respectively)
- **Nodes:** Key Masterplan concepts that offer multiple trails and experiences.

For place / location names dual Te Reo Māori / English names have been used. Names recognised in the Ngāi Tahu Kā Huru Manu atlas[4] have been used (where known).

Flora and Fauna

Where possible, common names for plants and animals have been used throughout the text of this report. This includes the use of dual Te Reo Māori / English common names (where known). Where a species has a well-known Te Reo Māori common name, that name is thereafter used alone. Where a species does not have a well-known Te Reo Māori common name, or its Te Reo Māori / English common name cannot be used to identify the species without ambiguity, dual or scientific names have been used. Throughout our high-level assessment of environmental effects in Section 5.0 below, we have identified the presence of taonga species listed in Ngāi Tahu Claims Settlement Act 1998[5] by bolding the species name e.g., **kōtare** / kingfisher.

Upon first mention of a nationally Threatened or At Risk indigenous species, its threat status is provided. Where the threat status of a species is not provided upon first mention of that species, its threat status is Not Threatened. Threat status data used in this report are from the most current versions of their respective New Zealand Threat Classification System[6] status reports:

- Vascular plants: de Lange et al. (2018);
- Birds: Robertson et al. (2021);
- Reptiles: Hitchmough et al. (2021);
- Freshwater fish: Dunn et al. (2018);
- Marine invertebrates: Funnel et al. (2023);
- Bats: O'Donnell et al. (2023); and

[4] https://kahurumanu.co.nz/atlas

[5] https://www.legislation.govt.nz/act/public/1998/0097/latest/DLM429090.html

[6] https://nztcs.org.nz/

- Macroalgae: Nelson et al. (2019).

A glossary of fauna species, which provides the Te Reo Māori, English and scientific names and the threat status of those terrestrial and freshwater fauna species mentioned in this report, and additional species known to be present, is provided in Appendix 1.

2.2 Desktop Assessment

2.2.1 Review of Existing Project Information

A range of existing project information was reviewed. This included (but was not limited to) the following documents:

- The Masterplan (Stantec NZ Ltd & Boffa Miskell Ltd, 2021);
- The Stage 2 Conservation Impact Analysis Report (Boffa Miskell Ltd, 2021);
- The Stage 2 Mana Whenua Aspirations and Values Report (Kauati Ltd, 2021); and
- The comprehensive range of literature and information collated by Boffa Miskell during the literature review and information gathering stages of the preparation of the Conservation Impact Analysis Report (i.e., during MOP Stage 2).

2.2.2 Review of Existing Information

A desktop study was undertaken to obtain additional information and literature on environmental values (terrestrial, freshwater, and marine ecosystem and habitats and their flora and fauna) within the study area. Information was largely gathered from:

- The available scientific literature;
- Published and unpublished reports;
- GIS databases and spatial layers; and
- Key stakeholders (see Section 2.3).
- MOP provided several unpublished reports completed following finalisation of the Stage 2 reporting.

2.3 Stakeholder Engagement

In addition to a review of available literature, to obtain information from key stakeholders we attended:

- A 2-hour Teams meeting / hui with DOC Te Anau Biodiversity staff on 11 September 2023 to obtain specific information and local knowledge on the environmental values within the specific Masterplan / proposal locations.
- A separate Teams meeting with Richard Kinsey (Senior Ranger, Marine and Freshwater – Kaitiaki Matua, DOC) on 21 September 2023 to obtain specific information on freshwater and marine ecological values within the locations where Masterplan concepts are proposed.

- Separate phone calls with DOC specialists / Technical Advisors Colin O'Donnell, Terry Greene, Lynn Adams, Jamie McAulay, and Kerry Weston to obtain specific information, including general local knowledge, held on avifauna, bat, lizard and invertebrate values within the locations where Masterplan concepts are proposed.
- A Teams meeting with Waka Kotahi / NZ Transport Agency staff on 6 September 2023 to obtain environmental information, including environmental assessment reports prepared for Waka Kotahi in relation to road infrastructure projects along the Milford Corridor (State Highway / SH94) information.
- A Teams meeting with Milford Sound Tourism Ltd. on 13 September 2023 to discuss obtaining information on the environmental values at Milford Sound Piopiotahi and Knobs Flat.

We acknowledge the role of Ngāi Tahu as both mana whenua of Piopiotahi Milford Sound and as a Treaty partner in the wider MOP. In preparing this report, we have endeavoured to acknowledge Ngāi Tahu values and cultural identity, especially in terms of the use of traditional place names and species names (see also Section 3.0). A separate workstream is advising MOP in relation to heritage values and Ngāi Tahu partnership.

2.4 Site Investigations

The survey methodology and environmental data / information obtained was tailored depending on the proposed Masterplan concept, the size of the concept location envelope, and access / health and safety considerations. For accessible locations with well-defined envelopes, targeted site surveys were possible and relatively more detailed field information was collected. For more remote locations / concepts with large envelopes (i.e., Te Anau Downs to Cascade Creek Cycle Trail, proposed walking tracks or the routes of overnight tramps), site surveys involved visits on foot or by helicopter to a small number of representative / indicative locations. All assessments were supplemented by interrogating existing desktop information, analysis of aerial imagery and mapping of ecological features and constraints.

2.4.1 Terrestrial Ecology Site Investigations

Terrestrial site investigations were carried out over the course of three site visits. The first site visit to survey locations along the Milford Sound Corridor (SH94) was undertaken on 9 – 12 October 2023. The second site visit to survey locations at Milford Sound Piopiotahi was completed on 30 October – 1 November 2023.

The first and second site visits were carried out by Jaz Morris and Cara-Lisa Schloots (Ecologists, Boffa Miskell Limited) and included the following for all Masterplan locations for which a site survey was carried out[7]:

- Making notes about the locations, extent and composition of vegetation communities and habitats within areas proposed for development, particularly wetlands and other high-value habitats, as well as highly modified low value areas;

[7] While most sites were surveyed at least partially on the ground, the Chasm – Cleddau Horse Bridge walkway alignment was surveyed by drone only.

- Recording the dominant or notable plant species in each of the main vegetation communities;
- Recording any nationally Threatened or At Risk plant species observed, including their specific locations where this may inform development decisions;
- Assessing habitat suitability for avifauna and terrestrial indigenous fauna (bats, lizards, and terrestrial invertebrates) and recording observations of indigenous fauna where possible.
- Using a drone to capture aerial photographs (where weather and conditions and airspace / DOC approvals allowed).
- Marking any locations of interest using a using a handheld GPS and taking photographs and notes.

During the first and second site visit, approximately 0.5-4 h was spent at each location / node.

Following the delivery of the first draft of this report, an additional (third) site visit to survey locations at Key Summit, Countess Range, and along the proposed Te Anau Downs to Cascade Creek Cycle Trail occurred on 30-31 January 2024. The third site visit was carried out by Jaz Morris, with Tim Dennis (Principal Trail Designer, Southern Land Ltd.) in attendance. The third site survey generally included the above process (although no drone flights were undertaken), albeit in less detail and with 10-90 mins each spent at Key Summit, Countess Range and at nine representative / indicative locations along the proposed Te Anau Downs to Cascade Creek Cycle Trail. Locations were accessed via SH94 on foot, or via helicopter.

2.4.2 Freshwater Ecology Site Investigations

Freshwater site investigations were carried out on 30 October-3 November 2023 by Jess Schofield or Kate Hornblow (Ecologists, Boffa Miskell Limited) and included:

- Rapid Habitat Assessment (RHA) (Clapcott, 2015) to assess riparian and in-stream habitat conditions at each site (Appendix 2). The RHA involves ranking each of the following ten parameters between 1 and 10: deposited sediment, invertebrate habitat diversity, invertebrate habitat abundance, fish cover diversity, fish cover abundance, hydraulic heterogeneity, bank erosion, bank vegetation, riparian width, and riparian shade. RHA scores for these individual parameters[8] are summed for each site, giving a total score ranging from 10 to 100, where higher scores indicate better habitat availability.
- Where proposed waterway crossing locations or specific development activities adjacent to waterways were known (and these waterways were easily accessible), waterways were investigated for existing structures (e.g., culverts, fords, bridges) to provide an overview of current and potential risk to fish passage and ecological connectivity along the waterways and within the catchments.

Approximately 0.5-2 h was spent at each location / node.

[8] For each parameter, RHA score of 1 indicates poor condition, and 10 indicates optimal condition.

2.4.3 Marine Ecology Site Investigations

Marine site investigations were carried out on 30 October-1 November 2023 by Tommaso Alestra (Ecologist, Boffa Miskell Limited) and included:

- Visiting intertidal locations on foot, at low tide, where new developments within the Coastal Marine Area (CMA) are proposed.
- Carrying out a snorkelling survey in Freshwater Basin where a floating pontoon or gantry is proposed to link the boat terminal with the Hine-te-awa Bowen Falls Delta.
- Recording the nature of the intertidal/subtidal benthic substrate, the dominant benthic habitat types, and the main organisms visible on the surface of the seabed.
- Recording any Threatened and At Risk benthic species observed, including their specific locations where this may inform development decisions.
- Taking videos and / or photographs of the areas surveyed.

Approximately 0.5 h – 2 h was spent at each location / node.

2.5 Limitations

- The maps in Appendix 3 depict the site survey envelopes for the MOP locations / concepts. They also depict:
    - ‘Specific habitat types of note’:
        - These are areas that have been identified as containing habitat values that make most forms of future development inappropriate, excluding activities that directly protect or enhance their specific conservation values. This includes habitat types identified for specific protections under applicable national or regional policies (e.g., wetlands).
        - However, the broader study area consists almost entirely of relatively intact primary (original growth) vegetation and habitats that are ecologically significant and of very high ecological value; therefore, these areas are not the only places of important ecological value.
    - ‘Somewhat modified areas’:
        - Depending on the activity proposed, these areas are generally considered relatively more appropriate for future development, due to existing habitat modifications, such as areas where the original vegetation has been historically cleared but that have not been developed into buildings or other hardstand.
    - ‘Highly modified / built areas’:
        - Depending on the activity proposed, these areas are generally considered most appropriate for future development, due to existing habitat modifications, such as areas where the original vegetation has been fully removed and replaced e.g., with buildings or other hardstand. Note that the SH94 road surface and additional side roads have generally not been mapped, for simplicity.

These maps are intended to be high level and indicative. They are not exhaustive and are based on often incomplete or sparse specific data. These areas have been mapped based on desktop information, aerial imagery, and the high-level ecological surveys undertaken at some Masterplan locations during the site visits undertaken as part of this project. The text in each of the sub-sections of Section 5.0 identifies other important ecological values, for example important fauna habitats that are widespread across some areas and that are not shown on the maps in Appendix 3. It is important that the map of each location in Appendix 3 is read / interpreted in conjunction with the relevant sub-section in Section 5.0 of this report.

- Site visits / surveys at all of the locations of Masterplan concepts / MOP proposals were outside the scope of this work. Specifically, site surveys were not completed at the following locations / concepts with large envelopes:
    - Walking / Cycling Trail – Te Anau Downs to Ō-Tāpara Cascade Creek, aside from a helicopter survey and brief landings or visits on foot from SH94 at nine representative / indicative locations along the proposed route alignment;
    - Overnight Walk – Countess Range, aside from helicopter survey and brief (10 min) landing at the preferred hut site);
    - Whakatipu Trails Walks;
    - Key Summit to Cascade Creek Walkway, south of pt. 1086 on Topo50 maps near the existing Key Summit track;
    - The Chasm to Cleddau Horse Bridge Walk;
    - Tūtoko Bridge to Milford Sound Lodge Walkway.

  For the sites that were visited, survey effort varied (largely dependent on the scale and specificity of the proposed project envelope), but detailed surveys were not undertaken at any site.
- Specific surveys for birds, lizards, bats, invertebrates, marine infauna, or freshwater fauna were not undertaken, as they did not form part of this scope of this high-level assessment. Further, due to the high-level feasibility study nature of this work, the spring timeframe for the main site investigations (i.e., during a single season only, and at a time of year when many fauna groups such as lizards are less active / less readily observed immediately following winter), and general time constraints, specific surveys for fauna were not practical. However, where relevant, recommendations for specific, detailed, fauna surveys are identified in this report. Specific fauna surveys will be required for the next stages of the project.
- Because there is very little specific information on any Masterplan concepts or proposals to inform a detailed and thorough assessment of ecological effects, assessments were generally made on a site envelope basis. Masterplan concepts / proposals are just that, and there are no detailed descriptions of any of the Masterplan concepts / proposals from which to complete more detailed assessments at this time. As part of the current phase of the MOP project, further work is being done to refine and develop more detail around them. Therefore, this report provides a high-level summary based on the information available at this time. The information available includes some or all of the following: indicative location maps, concept diagrams, 1-2 descriptive sentences (on average) in the Masterplan, high-level site footprint estimates / specifications in Appendix 2 of the Infrastructure Assessment Report prepared for MOP Stage 2 (Stantec NZ Ltd, 2021), and track alignments and level of service specifications based on the Walking & Cycling

Experiences Feasibility report (Southern Land Ltd, 2024) for MOP Stage 3, Phase 1 (see also track / trail standards in Appendix 5 of this report). These are relied upon as providing a general / indicative summary of what is envisaged. Within this report, important assumptions are stated where necessary, and the possible ecological effects discussed are assessed generally based on the information available and the experience and expertise of the report authors.

- This report provides a preliminary, high-level summary of the ecological values and potential impacts to those values of the Masterplan concepts / MOP proposals, but it is not a complete or detailed Ecological Impact Assessment report, such as would be required to accompany any resource consent / permit applications for any of the proposed activities, such as under the Resource Management Act 1991, Conservation Act 1987, National Parks Act 1980, and Wildlife Act 1953 (or successor legislation). It is notable that essentially all of the bat, bird, and lizard fauna referred to in this report are absolutely protected under the Wildlife Act 1953, and that the other aforementioned Acts generally protect their habitat.
- Further, detailed technical assessments will need to be undertaken, should the proposed Masterplan / MOP proposals proceed. These further technical assessments may identify new ecological values and new effects that are not considered in this preliminary, high-level report.

3.0 Mana Whenua, Mana Moana / Recognition of Ngāi Tahu ki Murihiku

3.1 The Ngāi Tahu Claims Settlement Act 1998

As recognised in the *Mana Whenua Aspirations and Values Report* prepared for Milford Opportunities Project (Kauati Ltd, 2021), the Ngāi Tahu Claims Settlement Act 1998 (NTCSA) includes a number of provisions that are of relevance to the management of natural resources in Milford Sound Piopiotahi. Of particular relevance to this assessment is Schedule 97: Taonga Species.

The provisions of the NTCSA, particularly Schedule 97, place additional weight on specific species and their management must be considered when considering the effects of the MOP and Masterplan concepts.

As noted earlier, the presence of taonga species listed in the NTCSA have been identified by bolding the species name e.g., **kōtare** / kingfisher. It is important to note that the NTCSA does not include a complete list of taonga species or mahinga kai species of importance to Ngāi Tahu ki Murihiku but has instead been used as a foundation for early recognition of cultural values regarding taonga species. Engagement with mana whenua to better understand this is still to come.

3.2 Te Tangi a Tauira

In 2008, *Te Tangi a Tauira Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan* (IMP; Ngāi Tahu ki Murihiku, 2008) was published. This IMP consolidates the values, knowledge and perspectives on natural resource and environmental management issues from the perspective of Ngāi Tahu ki Murihiku[9]. The purpose of the IMP is to assist Ngāi Tahu ki Murihiku in carrying out kaitiaki (guardianship) roles and responsibilities and is designed to assist local authorities and government agencies in understanding tangata whenua values and policy.

The IMP provides a foundational framework that sets out the position of Ngāi Tahu ki Murihiku regarding environmental policy and planning that aims to achieve good environmental outcomes and healthy environments for iwi and the wider community. In writing this report, it was important to understand sections and policies that are relevant to the Milford Sound Piopiotahi area. The policies of relevance can be found in Appendix 3.

[9] The eight Ngāi Tahu Papatipu Rūnanga who have shared interests in the Milford Sound Piopiotahi and Te Anau basin area make up the collective known as Ngāi Tahu ki Murihiku.

4.0 He Horopaki / Context

The MOP concepts / proposals relate to nodes / locations along SH94 (Milford Road). More specifically, this means sites in the:

- Upokororo / Eglinton River[10] valley, from Te Ana-au / Lake Te Anau[11] at Te Anau Downs to the Divide (largely on the east / true left of the valley, except near the Divide);
- The upper Ōkare / Whakatipu-ka-tuku / Hollyford River[12] valley, on the west / true right from the vicinity of the Lake Marian carpark to the Homer Tunnel east portal; and
- The Awa-piopiotahi / Waipāteke / Cleddau River[13] valley, from the Homer Tunnel west portal to Piopiotahi / Milford Sound Village, largely on the east / true right except for the proposed Chasm to Cleddau Horse Bridge Walk on the true left.

Section 5.0 of this report describes ecological values that occur within the proposed envelope of each MOP location. A broader description of the existing conservation / ecological values of the overall SH94 corridor is provided in the MOP Masterplan, Stage 2 Conservation Impact Analysis report (Boffa Miskell Ltd, 2021) and in other previous reports (e.g., Department of Conservation, 2017). For overall context, at a very high level, some of the key values of the overall SH94 corridor include:

- Upokororo / Eglinton River: extensive tall **tawai** / red beech (and mixed beech species) forests on lowland alluvial terraces; habitat for numerous threatened manu / bird species and two pekapeka / bat species, e.g., hole-nesting species using large red beech such as South Island **kākā** (Threatened – Nationally Vulnerable), **mohua** (At Risk – Declining), and pekapeka / long-tailed bat (Threatened – Nationally Critical[14]); large complex fen, bog, and swamp wetlands; extensive valley floor grasslands providing invertebrate, lizard, and bird habitat; unmodified upper river catchments with non-migratory gollum galaxias (Threatened – Nationally Vulnerable) and other threatened freshwater fauna; and intact / representative examples of naturally uncommon ecosystem / landform types including a mobile braided river, frost flats, and ancient glacial deposits.
- Whakatipu-ka-tuku / Hollyford River: extensive **tawai** / silver beech forests, seral forests and valley floor forest / shrubland / tussock grassland mosaics in areas susceptible to winter and spring avalanche; precipitous alpine habitats and extensive fellfields supporting specialised lizard and bird species such as awakopaka skink (Threatened – Nationally Critical), **kea** (Threatened – Nationally Endangered), and pīwauwau / southern rock wren (Threatened – Nationally Endangered); and a dynamic and powerful river system that supports **kōwhiowhio** / blue duck (Threatened – Nationally Vulnerable).
- Waipāteke / Cleddau River: extensive lowland mixed beech – podocarp forests (remarkably, these are deer free) that supports threatened forest bird species including

[10] Kā Huru Manu (https://kahurumanu.co.nz/atlas) recognises Upokororo as the traditional name for the Eglinton River.

[11] Kā Huru Manu recognisesTe Ana-au as the correct spelling for Lake Te Anau.

[12]Ōkare / Whakatipu-ka-tuku are the two recognised traditional names on Kā Huru Manu for the Hollyford River. We have referred to it as Whakatipu-ka-tuku / Hollyford River in all subsequent mentions in this report.

[13] [13] Awa-piopiotahi / Waipāteke are the two recognised names on Kā Huru Manu. We have referred to it as Waipāteke / Cleddau River in all subsequent mentions in this report.

[14] The highest threat status under the New Zealand Threat Classification System.

northern Fiordland **tokoeka** (Threatened – Nationally Vulnerable), **kākā**; and fast-flowing river habitat supporting **kōwhiowhio** / blue duck.

These habitat types are generally intact and representative examples of the original vegetation of the Te Anau, Upukerora, Livingstone, Dart, and Darrans Ecological Districts, which cover the SH94 corridor (McEwen, 1987).

In addition to these significant inherent values, the SH94 corridor has additional importance because its accessibility has facilitated many decades of threatened species research and ongoing predator control (particularly in the Eglinton **tawai** / red beech forest ecosystems). The Eglinton has long been a focal point for mainland conservation efforts in New Zealand; it is overall one of the most ecologically significant sites on the mainland and is one of the most important areas for species recovery outside of predator-free offshore islands.

*Figure 2. **Tawai** / red beech forest in the Upokororo / Eglinton Valley.*

5.0 He Aromatawai Whakamana Taiao / High-Level Assessment of Environmental Effects

The following section of this report provides a preliminary, high-level assessment of the environmental effects and feasibility of the MOP concepts / proposals. For each Masterplan location, it provides a summary of what is proposed and the existing facilities / infrastructure. It then describes the existing ecological environment within that area, and provides a preliminary, high-level assessment of the environmental effects (whether adverse or positive) of the concept / proposal to that environment. It then provides general recommendations for effects management and further information requirements that will likely be necessary if the proposal is pursued further. Finally, it provides an overall conclusion as to the likely technical feasibility of the proposal, assuming implementation of effects management measures.

Whilst described at a high-level, the effects management measures in this report generally follow the 'effects management hierarchy' (Figure 3) as described in Maseyk et al. (2018).In accordance with the hierarchy, emphasis is given to measures that would 'avoid' (or minimise), 'remedy,' or 'mitigate' impacts, in that order and where possible. Where these effects cannot be avoided, remedied, or mitigated to acceptable levels (i.e., to a point where a proposal is likely feasible), broad options for offset / compensation measures are provided in Section 6.0-7.0. Offset / compensation measures are also discussed in relation to the need to address cumulative impacts of implementation of the overall MOP proposals / concepts.

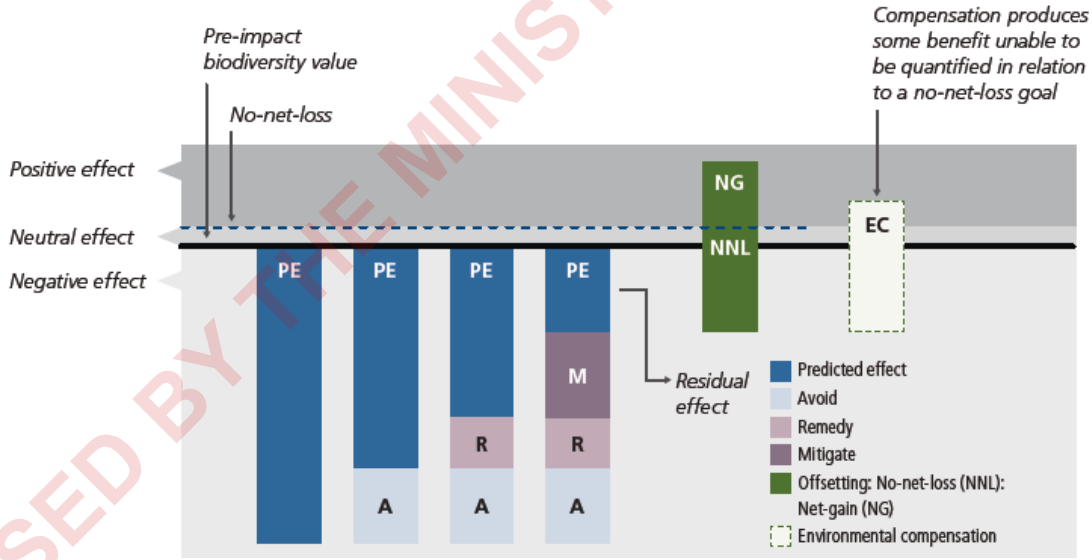


Figure 3. Conceptual illustration of the effects management hierarchy from Maseyk et al. (2018).

5.1 Node 1: Te Rua-o-Te-Moko Fiordland National Park Gateway

5.1.1 Masterplan Concept / Proposal

The proposed development at Node 1 is to create a gateway to the park which enhances the transition from the rural environment to the Te Rua-o-Te-Moko Fiordland National Park and wider UNESCO Te Wāhipounamu – Aotearoa New Zealand World Heritage Area. The proposal includes the construction of drive through signage, markers, or artwork. Currently the proposal includes several pou[15] at the entrance to the park which visitors would drive through, signalling the entrance to the park.

Whilst the Masterplan proposal does not include any stopping areas or infrastructure due to the confined space available within the existing road reserve, stopping areas (which would presumably be constructed on adjacent farmland) have not been ruled out (S. Moran, *pers. comm.* 2023).

Figure 4. Node 1.

[15] Carved posts or columns used to mark territorial boundaries or places of significance.

5.1.2 Existing Visitor Facilities / Infrastructure

There are no existing visitor facilities or infrastructure present, except for a DOC sign demarcating the entrance to the National Park.

The Node 1 footprint comprises road reserve (SH94) and private farmland (belonging to Te Anau Downs Station). It sits just outside the National Park boundary, and it is therefore assumed that the Node 1 proposal does not include works or the installation or any structures within Te Rua-o-Te-Moko Fiordland National Park itself.

5.1.3 Description of the Existing Ecological Environment

Figure 5. The Te Rua-o-Te-Moko Fiordland National Park Gateway area. Existing DOC sign at centre.

The Node 1 – Te Rua-o-Te-Moko Fiordland National Park Gateway area comprises of grazed exotic pasture with areas of wetland and indigenous shrubland. The Node 1 area is on road reserve and private land at the edge of the National Park. It is grazed by sheep and cattle.

Vegetation

The majority of the surveyed area comprises of road margins and exotic improved pastures (with scattered indigenous rushes and sedges, e.g., **wīwī**, *Carex comans*) of low ecological value. Small pockets of wetland habitat on the west side of SH94 are grazed and modified but contain rautahi (*Carex coriacea)* and paewhenua / New Zealand dock. Grey scrub largely comprising grazing-tolerant species such as tūmatakuru / matagouri (At Risk – Declining), porcupine shrub, pūniu / prickly shield fern, and mikimiki (*Coprosma* spp.) and some small herbs such as **pātōtara** and creeping pōhuehue fringes a gully. On the east side of the road, grazed areas between indigenous forest and SH94 are generally wet pastures (marsh / seasonal seepage wetland areas) with a substantial cover of indigenous wetland rushes and

sedges. The pest plants scotch broom and tree lupin are present along a fence line at the National Park boundary.

Terrestrial Fauna

Node 1 likely provides habitat for common / widespread indigenous bird species typical of open pastoral areas and grey shrublands (e.g., **rironiro** / grey warbler, **kāhu** / harrier hawk). The productive pastures in the general Node 1 area are located close to the braided river habitat of the Upokororo / Eglinton River and likely provide periodic foraging habitat for **tarapirohe**[16] / black-fronted tern (Threatened – Nationally Endangered) and tarāpuka black-billed gull (At Risk – Declining). **Kārearea** / southern falcon (Threatened – Nationally Endangered), **ruru**[17] / morepork and **kōtare** / kingfisher likely feed from time to time on forest edges and in open areas in the vicinity of Node 1.

Shrublands and rank pasture areas within or at the fringes of Node 1 may support southern grass skink (At Risk – Declining).

The adjacent **tawai**[18] / red beech forest to the north (i.e., within the National Park) is known as an important roost site of pekapeka / long-tailed bat, and it is likely that the open pasture on the shrubland / forest margins within Node 1 provide feeding habitat for pekapeka, in particular for juveniles and post-lactating females (O'Donnell, 2001). It is also a foraging habitat (C. O'Donnell, *pers. comm.*, 2023) for another pekapeka species, southern lesser short-tailed bat (Threatened – Nationally Increasing); the Eglinton is the largest and one of only two known mainland South Island populations of this species (the other being in the Murchison Mountains; Department of Conservation, 2020).

Freshwater Habitats and Fauna

No freshwater habitats that would support freshwater fish are present within the proposed footprint for Node 1 - Te Rua-o-Te-Moko Fiordland National Park Gateway.

Overall

The overall Node 1 – Te Rua-o-Te-Moko Fiordland National Park Gateway area is modified by ongoing farming but contains pockets of indigenous wetland and scrub habitats.

[16] In the NTCSA, '**tara**' more generally is listed, which gives regard to all *Sterna* species.

[17] We acknowledge that the Ngāi Tahu Settlement Act 1998 recognises the full name as '**ruru koukou**'. For ease of recognition, we have referred to this taonga species in the report as **ruru**.

[18] In the NTCSA, **tawai** / beech generally are listed, which gives regard to all indigenous beech species.

Wetland pond (at left) and grey scrub near the existing National Park sign, west of SH94.

Wet pastures / wetland with sedges and rushes at the edge of indigenous forest, east of SH94.

Indigenous shrubs on the eastern margin of SH94.

Exotic pastures with occasional *Carex comans*.

Figure 6. Additional Node 1 photos.

5.1.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concept at Node 1 – Te Rua-o-Te-Moko Fiordland National Park Gateway that need to be considered are listed below:

- The potential adverse effects at this location will depend on the exact nature of the pou and their location but are considered very unlikely to be of ecological concern. Assuming installation of signage, pou or similar, the potential effects are limited to permanent vegetation clearance (the foundation of the pou themselves) and temporary disturbance to install the pou.
- An additional effect of the proposal may arise if outdoor lighting is used. It is assumed that the pou or interpretative signage will not be lit at night and that no associated trenching, cabling, or electricity infrastructure is required. Outdoor lighting can cause a range of adverse effects to bird, bat, fish, and invertebrate (terrestrial and freshwater) species, including mortality and loss of habitat.

5.1.5 Recommendations

5.1.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 1. Effects management measures recommended for Node 1 – Te Rua-o-Te-Moko Fiordland National Park Gateway.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Vegetation clearance / wetland loss / habitat loss	Avoid	Locate pou or other interpretative signage on unvegetated road margins or areas of exotic pasture, avoiding wetlands and grey scrub. This may be a challenge if installing pou on the elevated eastern side of SH94 where these habitats form general cover. Avoid installing pou in areas where existing indigenous scrub on the highway margin would need to be cleared to enable views. Fully avoid clearing mature trees. Practically, this means pou or signage are most appropriately located on road margins or within paddocks in the general vicinity of the existing DOC sign to the west of SH94.
Adverse ecological effects of light pollution	Avoid	The pou or signage should not be lit at night.

5.1.5.2 Further Investigations

- None recommended at this time.

5.1.6 Conclusion – Node 1 Te Rua-o-Te-Moko Fiordland National Park Gateway

Subject to further investigations and refinement of the proposal, and generally assuming implementation of the recommendations listed above, the potential ecological effects of installation of pou / signage at the National Park entrance are likely to be minor and able to be managed to a sufficient level. The proposal is considered environmentally feasible.

5.2 Node 2: Eglinton Reveal

5.2.1 Masterplan Concept / Proposal

The proposal may include a visitors' centre or small building for shelter, toilets, interpretative viewing areas and an area for bus and car parking and turning around, and a walking track. This track will be up to 500 m-long (Southern Land Ltd, 2024) built to Grade 2 or 'Short Walk' standard (meaning 1.0-2.0 m in width, machine built with a well-formed and compacted surface; refer to Appendix 5 for full walking track and cycle trail grade definitions / explanations). The 'Eglinton Reveal' is also the proposed point at which private vehicles would not be able to access the park without an appropriate permit. Carparking at this location will be available for visitors who intend to go no further within the park, or who may use the hop on / hop off bus system to access the park without a permit. The proposed park is anticipated to require at least a c.900 m^2 area[19]. No indicative size for the proposed visitor centre is available.

Based on advice provided to MOP in relation to landscape and visual effects, we understand that there are three potential options for the location of the park and ride, bus stop, and visitors' centre or small shelter. This includes the following:

- **Option 1:** Immediately north of Mackay Creek to the west of SH94. This would be located below the Mackay Creek Bridge. Access to this area could be from the existing pull-in bay area before turning south towards the Mackay Creek bridge.
- **Option 2:** The Eglinton Reveal currently shown in the Milford Masterplan could also serve as a potential location for the proposed visitors' building and parking facilities. The area is located west of the existing pull-in bays for vehicles and within the existing viewing area.
- **Option 3:** Opposite the current Eglinton Reveal area, east of SH94 at the base of an existing terrace. There is also the potential for the visitors' centre or shelter to be located along the base of the terrace, or alternatively a viewing area with picnic tables to be located on the terrace.

[20] Detailed surveys for terrestrial invertebrates and other fauna were outside the scope of this high-level assessment.

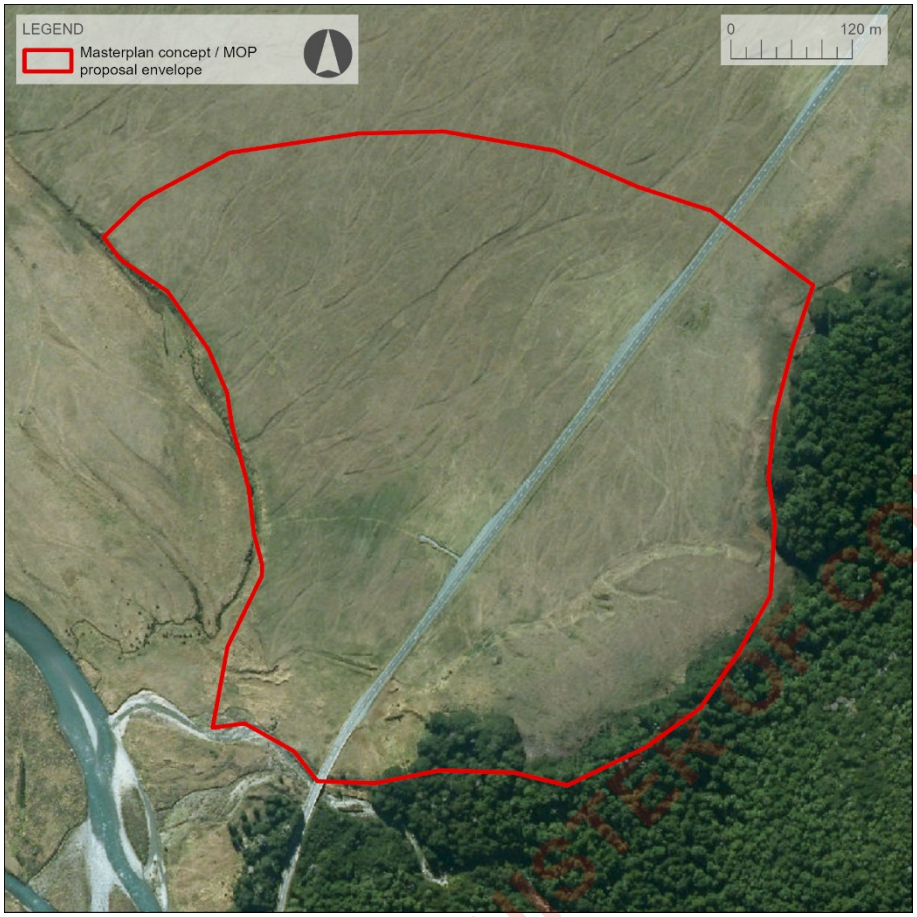


Figure 7. Node 2.

5.2.2 Existing Visitor Facilities / Infrastructure

The Node 2 area includes two existing pull-in areas for vehicle parking on the western side of SH94, with a short track to interpretive signage at the first pull-in. A campground at Tōtara Flat is located nearby on the western side of SH94 with access via a gravel road, but it is well south of Mackay Creek and is entirely outside the Node 2 area.

5.2.3 Description of the Existing Ecological Environment

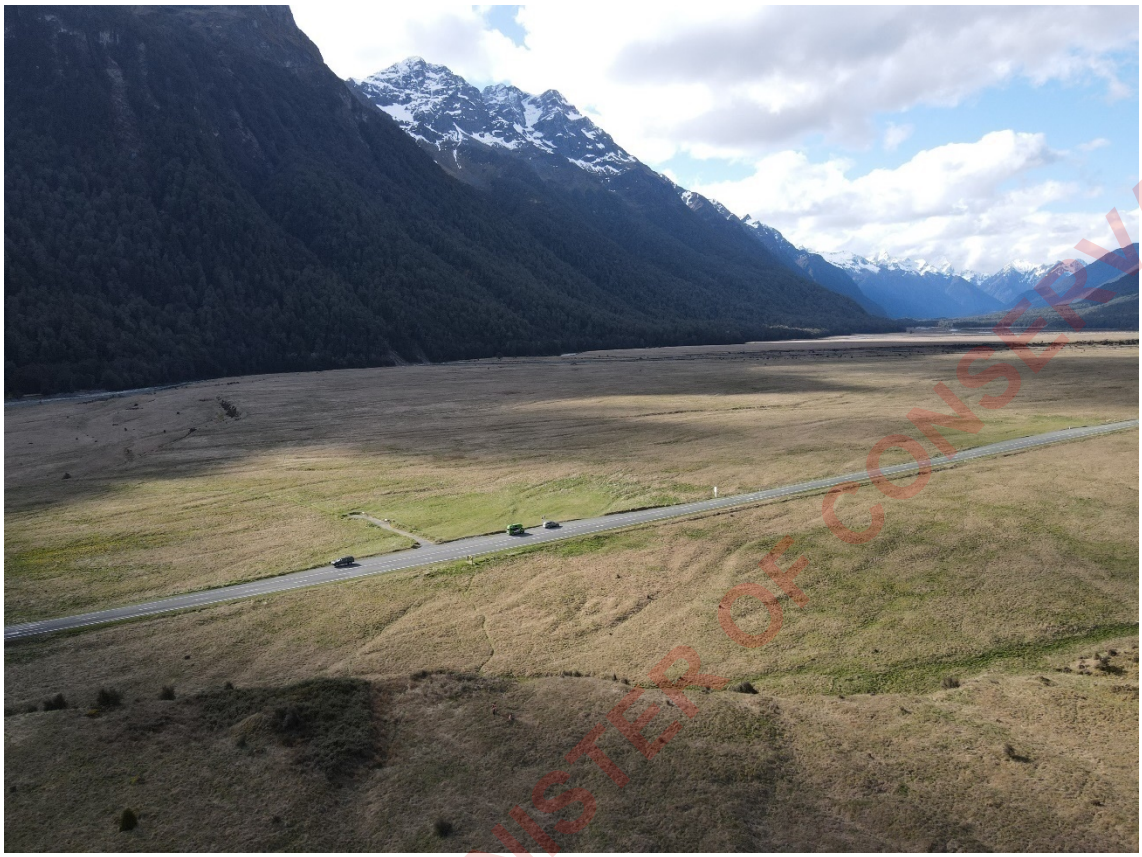


Figure 8. The 'Eglinton Reveal' area on a series of terraces near the Upokororo / Eglinton River. Note the existing vehicle pull-in.

The Node 2 – Eglinton Reveal area comprises grassland habitats on a sequence of terraces above Upokororo / Eglinton River, and Mackay Creek in the vicinity of the Upokororo / Eglinton River confluence. Grasslands have been modified by former grazing, which ceased in the late 1990s; a terrace riser and elevated terrace to the east of SH94 remains more intact with substantial short tussockland habitat values for vegetation. **Tarapirohe** feed widely across the entire Node 2 grassland area, which is overall also an important invertebrate and lizard habitat. Bush edges support good populations of nationally At Risk mistletoe species and provide core feeding habitat for a monitored population of pekapeka / long-tailed bat.

Vegetation

A low terrace west of SH94 north of the Mackay Creek bridge (understood to be the Option 1 area) includes an expansive area of marsh wetland (rautahi *Carex coriacea* sedgeland / grassland), a terrace toe spring-fed waterway with associated riparian wetland vegetation, and dry grasslands that are somewhat modified and dominated by exotic grass species (chiefly Chewings fescue, sweet vernal, Yorkshire fog, and browntop). These areas support populations of generally scattered / sparse indigenous shrubs, grass, herb, sedge, fern, and non-vascular species (common species in each group respectively include porcupine shrub; blue wheatgrass and hard tussock; pātōtara, creeping pohuehue, and bidibid species / *Acaena inermis*; red bastard grass; little hard fern; and a range of mosses and lichens. Based on site observations, wetland and grassland vegetation values in this area are moderate.

The terraces immediately west and east of SH94 (Option 2 area, and lower part of Option 3 area below a terrace) contains dry grasslands that are more modified and dominated by exotic

grass species, with a relatively minor component of indigenous shrubs, grass, herb, sedge, and moss species (as above). Based on site observations, grassland vegetation values are low-moderate.

Option 3 includes an elevated terrace east of SH94 at the bush edge north of Mackay Creek. There are moderately diverse indigenous shrublands along the terrace riser. The terrace itself supports dryland short tussock grassland habitat with scattered indigenous shrubs. Relative to other grassland habitats in the vicinity and the wider Eglinton Valley, it is a diverse and highly representative mesic short tussock grassland with some elements more typical of drier eastern South Island grasslands. Important or notable indigenous species observed during the survey include hard tussock, bog pine, and tūmatakuru / matagouri, and generally higher densities of other indigenous species listed in the Option 1 area above. Short tussock grassland values are high.

In the Option 1-3 areas, exotic grass species are visually dominant in terms of cover (especially in the immediate vicinity of SH94), and a brief observation in any given area may suggest that diversity / cover indigenous plant species is low. However, when the entire grassland area is considered, indigenous plant diversity is moderate-high, including numerous representative grassland species and nationally At Risk taxa. Whilst not observed within the Option 1-3 areas during the high-level surveys for this study, the wider grassland in the vicinity of the Eglinton Reveal is known to support **taramea** / grassland spaniard (At Risk – Declining) and an indigenous dwarf broom (*Carmichaelia uniflora*, At Risk – Declining; B. Rance, *pers. comm.* 2023). These species may possibly be present in the Option 1-3 areas in low densities. It is also noteworthy that these grassland areas, whilst presently dominated in terms of cover by exotic species, are thought to be regenerating and improving in condition gradually, following the cessation of sheep and cattle grazing in the late 1990s (C. O'Donnell *pers. comm*. 2023). This means that in the absence of further disturbance, ongoing improvement in the ecological values is likely in the Option 2 and 3 areas, and in the Option 1 area outside of the more modified existing short stop and carpark.

Outside the immediate Option 1-3 areas, **tawai** / silver beech and red beech forests support three At Risk – Declining mistletoe species (yellow, red, and scarlet mistletoe). Forest areas in the vicinity of Mackay Creek occupy 'Q4.1d' land environments (southeastern hill country with very gently low rolling hills with well-draining moderately fertile soils; Landcare Research Ltd, 2012) on which only 10-20% indigenous vegetation remains nationwide (Walker et al., 2015); this means that these forest areas are a high priority for protection.

Terrestrial Fauna

The terraces encompassing the Node 2 area provide core grassland foraging habitat for a nationally important breeding population of **tarapirohe**, support **pihoihoi** / New Zealand pipit (At Risk – Declining) and the river flats also provide foraging habitat for tarāpuka / black-billed gull. A diverse assemblage of forest birds (including several nationally Threatened and At Risk species) are present in **tawai** / beech forest nearby, and **kōtare** / kingfisher feed on forest edges and likely on terrace risers. Forest edges and open areas likely also provide feeding habitat for **kārearea** / southern falcon.

Grasslands in the area support south-western large gecko (At Risk – Declining; C. O'Donnell *pers. comm.* 2023), and a population of southern grass skink (At Risk – Declining) which was the subject of a detailed study from 2009-2020. Based on very recently published work (Monks et al., 2023), this skink population has not increased despite general control of mammalian predators such as stoats and rats (potentially because of meso-predator release of mice; Monks et al. 2023).

No desktop information about indigenous invertebrate values was found for the area, but brief observations of invertebrate species in grasslands[20] (especially the short tussock grassland on an upper terrace) included species indicative of functioning and diverse indigenous invertebrate assemblages. This includes red admiral butterfly, nurseryweb spider, various indigenous flies (Tachinidae and Empididae) and a specialist parasite species of small-headed fly (*Ogcodes* sp.) likely to be an undescribed and / or Data Deficient species. Creeping pōhuehue and indigenous tussocks throughout the area likely support indigenous lepidoptera (moths and butterflies).

Pekapeka / long-tailed bats roost in the adjacent **tawai** / red beech forest and bush edges in the Node 2 area are an important bat feeding habitat. This specific area, as well as the Eglinton Valley in general, is home to one of the largest and best-studied populations of pekapeka / long-tailed bats in the South Island (C. O'Donnell, DOC, *pers. comm.* 2023; Department of Conservation, 2017). They roost in cavities of large **tawai /** beech trees, typically those over 16 m in height and over 100 years in age, and 95% of roosts are found in open forest on the level valley floor within 500 m of the forest edge (O'Donnell & Sedgeley, 1999). Roosts are frequently shifted and in fact seldom used on an ongoing basis. Pekapeka / long-tailed bats feed over a wide range, and these habitat preferences mean that the vast majority of the population roosts within a short distance of SH94. This also means that essentially the entire forested area of the valley floor and forest margins are likely bat roosting and feeding habitat.

Freshwater Habitats and Fauna

Mackay Creek is a perennial, 3rd order cobble-bottomed river and tributary of Upokororo / Eglinton River, fed from upper subalpine and alpine tributaries draining the Countess Range. The Node 2 area encompasses the lower reaches of Mackay Creek, immediately upstream of where it enters Eglinton River and up to where SH94 crosses the creek. Here, Mackay Creek and has one main swift-flowing channel with a range of substrate sizes (boulders to sand). The SH94 bridge crossing has four concrete piles within the river channel but these are unlikely to create any barriers to fish passage.

On the western edge of the Node 2 area and in the Option 1 area, there is a terrace toe wetland and a spring-fed creek (located in an occasional flood channel of Upokororo / Eglinton River), which discharge into a braid of Upokororo / Eglinton River, upstream of its confluence with Mackay Creek.

There are only two freshwater fish surveys in Mackay Creek recorded in the New Zealand Freshwater Fish Database (NZFFD) and only rainbow trout and brown trout were recorded, however, native galaxiids have been recorded in Upokororo / Eglinton River. Based on site observations, the swift-flowing hard-bottomed habitats for Mackay Creek could provide suitable habitat for a range of native fish species. Mackay Creek is likely suitable habitat for a diverse community of freshwater macroinvertebrates, including 'clean water' mayfly, stonefly and caddisfly taxa.

The spring-fed tributary of Upokororo / Eglinton River provides more stable freshwater habitat than Mackay Creek and the river, which could provide refuge habitats support additional species or critical lifecycle periods.

Overall

The overall Node 2 – Eglinton Reveal area supports a range of regenerating and remnant grassland habitat values, with more important areas located on an upper terrace. Lower terrace areas include wetlands and a spring-fed tributary of Upokororo / Eglinton River; Mackay Creek itself is high quality stream habitat. The most important values of the area are representative

[20] Detailed surveys for terrestrial invertebrates and other fauna were outside the scope of this high-level assessment.

short tussock grasslands on the upper terrace, and the open grasslands that provide habitat for sparse rare plants species and numerous important fauna including bird, lizard, invertebrate and bat species (including key taonga species).

Exotic grassland near the existing 'Eglinton Reveal.'

Eglinton Reveal including existing parking and viewpoint.

Elevated terrace on bush edge with indigenous short tussock grassland habitat.

Terrace toe spring-fed waterway with associated riparian wetland vegetation in an occasional flood channel of Upokororo / Eglinton River, west of / below the existing Eglinton Reveal and just outside the Option 1-3 areas

Terrace riser with indigneous shrubs, Option 3 area.

Porcupine shrubs provide good invertebrate and lizard habitat particularly on terrace edges and on upper terraces.

Mackay Creek where the SH94 bridge crosses the waterway. Note the four concrete piles within the creek bed.

Mackay Creek downstream of SH94 with evidence of large log transport during a flood event.

Figure 9. Additional Node 2 photos at the Eglinton Reveal area.

5.2.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concept at Node 2 – Eglinton Reveal that need to be considered are listed below:

- A key effect of the proposal is moderate-large scale vegetation clearance (assuming a c. 900 m^2 carpark, a walking track, and visitor centre infrastructure development) leading to direct loss of important habitat for bird, lizard, invertebrate and bat species, and (if the Option 3 location is pursued) loss of a high-quality example of drier short tussock grassland habitat not well represented in the area. Whilst existing vegetation values are somewhat lower in the Option 1 and Option 2 areas, these grassland areas are recovering slowly from historic grazing and include various indigenous species (likely) including scattered At Risk plant species.
- A key effect of the proposal is indirect habitat loss and modification well beyond the immediate visitor infrastructure footprint due to fauna disturbance and the presence of structures fragmenting feeding habitats and rendering it less attractive as foraging habitat. Fauna such as **tarapirohe** generally do not feed in areas where humans or structures are congregated. Indirect habitat loss and modification will likely also affect diverse indigenous invertebrates, lizards, and potentially pekapeka species (especially for Option 3, and generally if structures are placed near forest edges).
- An additional effect of the proposal, if the proposals are implemented in the Option 1 area, is drainage / loss of wetland extent, and possible impacts to spring-fed creek habitats due to increased impervious surfaces and stormwater inputs during rainfall events which may bring changes to hydrology, increased inputs of sediments and contaminants.
- An additional effect of the proposal may arise if outdoor lighting is used. Outdoor lighting can cause a range of adverse effects to bird, bat, fish, and invertebrate (terrestrial and freshwater) species, including mortality and loss of habitat.
- An additional effect of the proposal, if the SH94 bridge is re-located to align it with new visitor infrastructure (T. Hopkins, *pers. comm.* 2023), this may require clearance of riparian vegetation and habitats that contribute to the overall health and ecological functioning of Mackay Creek. There is a forested riparian canopy upstream of SH94, providing shading to the freshwater habitats, while downstream of the bridge the riparian vegetation is limited to short stature tussock grassland, providing limited shading to the creek.

- An additional effect of the proposals, depending on their location and any stormwater mitigations implemented, is localised adverse effects due to increased impervious surfaces (carparks / buildings) near Mackay Creek or Upokororo / Eglinton River. Effects include increased flashiness (immediate conveyance of water runoff) from the carpark to waterways during rainfall events (though this is unlikely to be substantial in magnitude given the proposed small area / extent of impervious surfaces), and an increase in conveyance of vehicle-derived contaminants to waterways during rainfall. The extent of direct effect to freshwater habitats would need to be mediated by a buffer of vegetation between built areas and the creek / river.

5.2.5 Recommendations

5.2.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 2. Effects management measures recommended for Node 2 – Eglinton Reveal.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Grassland vegetation clearance / wetland loss / habitat loss	Avoid & Minimise	The grassland area west of the road including, and in the vicinity of, the existing parking area (Option 2 area) supports the lowest grassland / habitat values, due to existing and ongoing visitor trampling and damage. On this basis, locating the proposed developments in this part of Node 2 would minimise direct effects in terms of permanent habitat loss. The built footprints of proposals should be minimised (kept clustered and compact) to reduce the loss of foraging habitat for **tarapirohe** and other indigenous fauna. Reducing the range of visitor facilities to the bare minimum will help to reduce building footprints. For example, it can be imagined that a basic shelter with solar lighting and vault toilets would require substantially less additional developments than a facility with AV displays, air conditioning, food, flush toilets etc. If a more substantive visitor centre is desired, it should be located on less valuable habitat (potentially outside the National Park).
Adverse effects to pekapeka / bats	Avoid	Avoid the upper terrace area (part of the Option 3 area); this approach would also protect forest edge foraging habitat as well as general habitat values for dry grasslands.
Adverse ecological effects of light pollution	Avoid	Development at Node 2 should not include outdoor lighting. The proposal is intended to serve day visitors, and outdoor lighting will adversely affect indigenous fauna.
Erosion and sediment runoff to Upokororo / Eglinton River, Mackay Creek, and the spring-fed tributary	Avoid	Care should be taken to avoid erosion and sediment runoff during construction, and robust stormwater management controls included to ensure avoiding contaminants from areas of hardstand entering waterways. Any new / relocated SH94 crossing of Mackay Creek should be designed to

		minimise riparian and in-stream disturbance and ensure fish passage is not impeded.
Direct and indirect loss of bird foraging habitat, lizard habitat, and invertebrate habitat	Mitigate	Adverse effects to extensive grassland bird foraging habitat and lizard / invertebrate habitat due to habitat loss / fragmentation / disturbance (from the presence of buildings and visitors) would exceed existing impacts and be similar regardless of which option is pursued. It is unlikely that this impact could be avoided by the proposal at this location. It may be possible to mitigate effects by constructing unobtrusive, low (potentially underground / partly underground) buildings or parking; these could be designed to blend into the surrounding grassland using green roofs (etc.).

In addition to the above, and whilst the effects management hierarchy dictates that adverse effects should be managed sequentially by avoiding / minimising first, then remedying, the mitigating, final options to offset / compensate for a loss of or impact to grassland habitat include enhancement of the existing wider grassland on the East Eglington fan. Enhancement options include: ongoing control of currently low-density ragwort and Russell lupin[21]; investigation of and implementation of measures to boost skink populations that may be suppressed by meso-predator release from other ongoing pest control; and ongoing control of browsing mammals such as rabbits / hares and deer. Indigenous plantings in grassland areas are generally unnecessary / ineffective and would be unlikely to provide meaningful habitat improvement.

5.2.5.2 Further Investigations

- Although general habitat values are described above in Section 5.2.3, more detailed vegetation, lizard, and invertebrate surveys (prior to refinement of the proposals / development footprint at the approvals phase) will be required to enable appropriate impact management responses. However, no further investigations are recommended at this time.

5.2.6 Conclusion – Node 2 Eglinton Reveal

- Sensitively locating the proposed visitor developments in the Node 2 area will be challenging, due to general foraging habitat values of uninterrupted open grasslands for various fauna groups (such as tarapirohe in open areas and pekapeka / long-tailed bats on forest edges), and variability in vegetation values ranging from higher values in wetlands and short tussock areas further west and east of SH94 (respectively), to lower value grasslands at the existing pull-in immediately adjacent to SH94.
- Works in or near Mackay Creek and / or the spring-fed tributary would need to be carefully managed due to high in-stream habitat values and likely diverse and sensitive freshwater fauna communities.

Adverse effects of the overall proposal at Node 2 are likely to be manageable (i.e., the proposal is likely to be environmentally feasible), but this conclusion is fully reliant on implementation of measures to fundamentally avoid and minimise effects in the first instance. The measures

[21] These weeds are abundant and largely beyond control nearer the river but are sparse and manageable on the upper terraces.

available will depend on factors such as the scale of the proposed buildings / carpark areas, whether potentially costlier but lower-impact options are available (such as a partly underground structure with high-quality green roofing), whether small / simple structures with a basic service offering meet the project objective, and (in the situation that effects are not sufficiently avoided / minimised) whether available offset / compensatory measures are adequate and ecologically appropriate. For clarity, a development in the Node 2 area that substantially exceeds the general scale of the Masterplan proposal (i.e., a 900 m^2 carpark, a visitors' centre or small building for shelter, and toilets) is not likely to be environmentally feasible.

5.3 Node 3: Te Huakaue / Knobs Flat including Kiosk Creek and Walks

5.3.1 Masterplan Concept / Proposal

The proposed development at Te Huakaue / Knobs Flat encompasses both the existing Knobs Flat Camp and the Kiosk Creek Campsite and largely contains development along the forest edge within each of the clearings to the east of the valley. The Eglinton Valley Camp known as Te Huakaue / Knobs Flat within the Masterplan will include an upgrade to the existing facilities including designated caravan and camping sites, and cabins. A new research facility is also included within the proposal and will be co-located with the shelters containing interpretative displays and information, while the existing visitors' centre and bus stop will remain. Te Huakaue / Knobs Flat will be a key node at the mid-point of the corridor with interpretive displays, and pūrākau (cultural narratives) in addition to providing several accommodation options. Additional extras including Wi-Fi and seasonal food carts are also part of this proposal. The existing campground to the north of Kiosk Creek is proposed to accommodate extensive additional development, with the proposed construction of a lodge with up to 25 beds, and several cabins. The development of both sites will be set back from SH94 against the forest edge.

In addition to the development proposed at Kiosk Creek and Te Huakaue / Knobs Flat several new tracks are proposed with a total length of 1300 m ('Short Walk' standard). The proposed bike trail, which connects Te Anau Downs to Cascade Creek via the Eglinton Valley, will pass through Te Huakaue / Knobs Flat to the west of SH94. Tracks are also proposed within the margins of Kiosk Creek and between the Kiosk Creek lodge and cabins, to the Te Huakaue / Knobs Flat research facility, visitors' centre, and accommodation, to the Kiosk Creek waterfall, and a looped nature trail with pūrākau is also proposed. Two small 16 m bridges spanning Kiosk Creek would connect the Kiosk Creek development to Te Huakaue / Knobs Flat. Observation points will be used to enhance existing tracks. Te Huakaue / Knobs Flat may also act as a key base for guided experiences within the Milford corridor.

Figure 10. Node 3.

5.3.2 Existing Visitor Facilities / Infrastructure

Te Huakaue / Knobs Flat has been used for accommodation since the early 1930s during the construction of the highway. The present 'village' at Te Huakaue / Knobs Flat has cabins and powered camp sites for visitors with a sealed road access / carparking area. Between the camp and SH94 there is an existing vehicle pull-in area with a visitors' centre / toilet block accessed from SH94. The visitors' centre is powered by a small hydro scheme with an offtake from a northern tributary of the Creek, c.160 m in elevation above the village. Drinking water appears to be sourced from infrastructure such as an intake gallery[22] supplying storage tanks adjacent to of Kiosk Creek southeast of the village. There is also a grassed campsite at Kiosk Creek for tents and non-powered campervans with a gravel access road. There is a gravel stockpile on the western side of SH94 near Upokororo / Eglinton River.

[22] Based on site observations that the Kiosk Creek bed at the apparent intake area is dry with no surface flows.

5.3.3 Description of the Existing Ecological Environment

Figure 11. Kiosk Creek campground (lower left), Te Huakaue / Knobs Flat (upper left) and terraces above Upokororo / Eglinton River including a gravel stockpile.

The Node 3 – Te Huakaue / Knobs Flat area comprises modified grassy / built areas, less modified and essentially indigenous grasslands, wetlands, and tall **tawai** / silver beech and red beech forest. Kiosk Creek flows between the Te Huakaue / Knobs Flat 'village' and a campground at Kiosk Creek.

Vegetation

Intact, tall, and very old **tawai** / red beech and silver beech forests on alluvial surfaces are a notable feature of the Te Huakaue / Knobs Flat area. On valley floors, the understory is generally open and mossy, and on hillsides a diverse mid-canopy is present, including tōtara kōtukutuku / Hall's tōtara[23], haumangōroa / *Raukaua simplex* and makomako / wineberry. Forests, including forest edges near buildings and the campsite, support yellow, red, and scarlet mistletoe.

The Kiosk Creek campground contains modified exotic grasslands that appear to be regularly mown south of the gravel access road. Whilst these areas contain indigenous turf species, they are not of high importance in terms of vegetation values. North of the access road, taller grasslands include mounds of mosses, and diverse indigenous herbs, grasses, ferns, shrubs, and sedges. A moderately large fen / marsh wetland dominated by indigenous *Carex* spp. and wire rush begins at the forest edge and extends towards the river (it is interrupted by a drain and SH94). Other marsh wetland habitats are present on low terraces near Upokororo / Eglinton

[23] In the NTCSA, only lowland tōtara *Podocarpus totara* is listed.

River south of the Kiosk Creek confluence near a large gravel borrow / stockpile used for road works. These areas (aside from the stockpile and its access road) are of high value.

The vicinity of the existing Te Huakaue / Knobs Flat 'village' contains largely modified habitats of mown grassland, scattered retained and planted beech trees, and occasional plantings including some ecologically inappropriate species (golden akeake). Gorse and scotch broom are present. An apparent gravel borrow area encroaches into the forest behind (east of) the village, with recent understory vegetation clearance evident during surveys. At Risk mistletoe species are present throughout the area. Beale Consultants (2022) noted yellow mistletoe along the water tank track. Based on brief site surveys conducted for this study, yellow mistletoe is scattered widely, with scarlet mistletoe also present along the water tank track.

Terrestrial Fauna

The Te Huakaue / Knobs Flat and Kiosk Creek area is a notable habitat for forest bird species, especially tree cavity nesting species that are dependent on tall, mature forests, such as South Island **kākā**, **mohua**, and yellow-crowned **kākāriki** (At Risk - Declining), and **ruru** / morepork. This nesting behaviour makes these species extremely vulnerable to predation, particularly following mast seeding events; their populations are protected by aerial pesticide, trap networks, and management of populations via monitoring and even translocations. **Kākā** and **mohua** have been known to nest near the forest edge in close proximity to existing campsites and buildings in recent years, and harakeke / flax plantings around buildings are used seasonally by **kākā** for feeding (T. Greene and C. O'Donnell, *pers. comms*. 2023). Forest edges and open areas also provide feeding habitat for **kārearea**. A good population of **kakaruai** / South Island robin is also present in the area, and **tarapirohe** frequently form nesting colonies on the riverbed in the vicinity of Te Huakaue / Knobs Flat (C. O'Donnell, *pers. comm.* 2023). **Mātā** / South Island fernbird (At Risk – Declining) were heard in the fen near Kiosk Creek and are known from nearby wetland habitats based on recent DOC monitoring data. Grasslands are suitable for **pīhoihoi** / New Zealand pipit (At Risk – Declining). Fen habitat at Kiosk Creek is also suitable for At Risk – Declining koitareke / marsh crake and pūweto / spotless crake, although the areas of fen at Kiosk Creek east of SH94 are of lower habitat quality than areas west of SH94.

Based on GIS data provided by DOC, pekapeka / southern lesser short-tailed bat roosts are known from forests in the Te Huakaue / Knobs Flat area; the Eglinton is the largest and one of only two known mainland South Island populations of this species (the other being the Murchison Mountains; Department of Conservation, 2020). Long-tailed bats are also present in the area, with forests and forest edges in the area providing high-quality habitat.

Mokomoko / southern grass skink are known to occupy grasslands near SH94[24], dense grass swards across the area and forest areas with rocky substrates, particularly along the track to the water tanks (Beale Consultants Limited, 2022), and a forest gecko species has been observed near Te Huakaue / Knobs Flat (C. O'Donnell, *pers. comm.* 2023). Over 7,500 skinks have been estimated to inhabit the proposed Te Huakaue / Knobs Flat site (LizardExpertNZ, 2022).

Creeping pōhuehue and indigenous tussocks throughout grassland areas are likely to support indigenous lepidoptera (moths and butterflies). Intact wetland areas with indigenous shrub species and **tawai** / beech forest also provide generally good quality terrestrial invertebrate habitat. No desktop information about indigenous terrestrial invertebrate values was found for the area.

[24] Unless otherwise indicated, herpetofauna records are from DOC's 'Bioweb' Database, an unpublished geodatabase accessed in November 2023. Due to concerns about facilitating the illegal poaching of rare herpetofauna, generic location descriptions for herpetofauna are given except where specific locations are already in the public record.

Freshwater Habitats and Fauna

Kiosk Creek is a perennial river fed by 1st and 2nd order tributaries, which drain from the Livingstone Mountains to Upokororo / Eglinton River (West Branch). Two other 2nd order tributaries join Kiosk Creek in the forested area upstream of the campground. Kiosk Creek riparian margins are forested upstream of SH94, while riparian margins are comprised of grassland / tussockland with mosses downstream, approaching its confluence with Upokororo / Eglinton River West Branch. Upstream of the campground, the 2nd order tributary has cascading flow habitat in places, and the c.30 m high Te Huakaue / Knobs Flat Waterfall sits c.300 m upstream of the confluence with Kiosk Creek. The water intake gallery sits c.140 m upstream of the Te Huakaue / Knobs Flat Waterfall. The section of Kiosk Creek from SH94 to its confluence with Upokororo / Eglinton River West Branch is considered a losing reach with intermittent flows, where surface water disappears below the riverbed gravels at times.

The SH94 road bridge across Kiosk Creek has concrete wingwalls at the riverbanks and does not currently obstruct water flow or fish passage. Good macroinvertebrate habitat is present in the creek, and multiple stoneflies and mayflies were observed in the slow-flowing shallow pools. There are no records in the NZFFD of fish surveys in Kiosk Creek within the Node 3 area. Perennial reaches of the river are likely to provide suitable fish habitat, but the intermittency of surface water flows may limit the upstream passage of fish. The cascading habitats and Te Huakaue / Knobs Flat Waterfall in the 2nd order tributary likely act as a barrier to the upstream passage most fish species. So, although an existing hydro intake structure located c.160 m in elevation above Te Huakaue / Knobs Flat poses a high risk to fish passage due to its overhanging nature, the large c.30 m waterfall downstream of this structure means that it may be unlikely fish are naturally present in this section of the waterway.

Overall

The overall Node 3 – Te Huakaue / Knobs Flat area supports very high value forest and forest edge habitats with grassland and wetland areas. These habitats support nationally important populations of tree-cavity nesting / roosting forest birds, with seven taonga species present, as well as bat species. These species utilise habitats in close proximity to existing buildings and camping areas.

Te Huakaue / Knobs Flat Visitors' Centre.

Buildings and grassland at Te Huakaue / Knobs Flat.

Tall **tawai** / silver beech and red beech forest edges at Kiosk Creek Te Huakaue / Knobs Flat provide ideal feeding habitat for indigenous bats.

Kiosk Creek campground, showing mown / modified grassland (at left, bright green) and indigenous grassland / wetland at right.

Palustrine fen / marsh wetland at Kiosk Creek campground.

Scarlet mistletoe at Te Huakaue / Knobs Flat.

Micro hydro intake from a tributary of Kiosk Creek.

Kiosk Creek upstream of SH94, with typical bare gravels.

Apparent gravel extraction area at bush edge, east of the village at Te Huakaue / Knobs Flat.

Gravel borrow / stockpile and constructed pond below SH94 at Te Huakaue / Knobs Flat.

Figure 12. Additional Node 3 photos at the Te Huakaue Knobs Flat and Kiosk Creek area.

5.3.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at Node 3 – Te Huakaue Knobs Flat are listed below:

- A key effect of the proposals is vegetation clearance and habitat loss. A proposed lodge and cabin accommodation at the Kiosk Creek campground area, whilst located in an existing forest gap (meaning no forest clearance is required) would require clearance of diverse grasslands and an area of fen wetland supporting At Risk plant and bird species. The existing campground is essentially undeveloped, meaning that normal hydrological processes are largely maintained (notwithstanding that SH94 bisects the wetland), little ongoing damage (e.g., from trampling or informal tracks) beyond the campground is evident, and natural forest edge vegetation succession processes can largely occur. Whereas establishment of buildings (and associated infrastructure requirements, e.g., 'three waters') and loss of high value vegetation will be compounded indirectly by altered runoff, nutrient inputs from waste or litter, and by additional foot or vehicle traffic, are likely to impact soil processes and drainage. These factors are likely to detrimentally alter habitat quality beyond the footprint of any developments, triggering possible localised trophic cascades (e.g., loss of grassland leads to loss of invertebrates which leads to loss of bat feeding opportunities).
- A key impact is increased fauna disturbance, potentially to the point that forest and particularly forest edge habitats in the area cease to be utilised by sensitive species. Our assumption, based on the content of the Masterplan, is that an overall increase in visitor numbers and use of the Knobs Flat area would be facilitated by the proposal.
    - The services and infrastructure proposed for Knobs Flat likely would lead to disturbance and other adverse effects on fauna via: walking and cycling, noise from operating services / refrigeration etc., window-strike, and ongoing nutrient / rubbish inputs from human food and wastewater.
    - Our understanding is that little is known about the relationship between levels of human activity and indigenous bat habitat usage in these sorts of environments (however, additional lighting in urban areas is well known to be detrimental to pekapeka / long-tailed bat; e.g.; Schamhart et al., 2023).
    - Additional lighting and sound will be broadly detrimental to forest edge foraging for bats. For avifauna, whilst some species are often tolerant of human activities, sensitive species respond to disturbance with vigilance behaviour or flight (because humans are perceived as potential predators), interrupting feeding and breeding and in the worst case causing effective habitat loss. The proposals may also contribute to habitat loss for and locally increased rodent numbers / predation on indigenous lizards (LizardExpertNZ, 2022).
- Additional effects from construction of the various proposed walking tracks are possible. The amount of vegetation clearance to construct the various proposed walking tracks is likely in the vicinity of no more than 0.26 ha (based on 1,300 m of tracks at 'Short Walk' standard at a max. 2 m width). Based on indicative alignments these are largely in open forest areas, meaning they are unlikely to require clearance of large (c.>150 mm diameter at breast height; DBH) tree and canopy trees. Tracks located too close to Kiosk Creek risk increased riverbank erosion (there is already obvious erosion along both banks in the section of Kiosk Creek near the campsite), reduced shading of the creek (if riparian vegetation is cleared; this may affect in-stream biotic and abiotic

conditions), and fine sediment runoff during construction and from unvegetated track surfaces.

- Additional direct effects from the proposed upgrade of the Te Huakaue / Knobs Flat campground and new research facility buildings may be relatively limited, provided that this occurs within existing cleared / built areas and does not require clearance of forest or indigenous grassland habitats. It is also understood that the proposals may require as yet unknown upgrades to an existing micro-hydro system; the impacts of this depend on what is proposed and whether or not there the downstream waterfall is a natural fish passage barrier, but potentially include further vegetation clearance and freshwater habitat impacts. The existing hydro infrastructure is unobtrusive and has apparently required very little permanent vegetation clearance.

The potential positive effects of the Masterplan concepts are listed below:

- A potential positive effect is that redevelopments within the existing cleared area at Te Huakaue / Knobs Flat represent an opportunity to consolidate buildings and infrastructure, incorporate more sensitive lighting design, and to allow recovery of forest edge habitats impacted by historic clearance and possible ongoing gravel excavation.

5.3.5 Recommendations

5.3.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 3. Effects management measures recommended for Node 3 – Te Huakaue / Knobs Flat.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Clearance of canopy trees providing bat and bird habitat	Avoid	Clearance of large canopy **tawai** / beech trees providing habitat for multiple indigenous bat and bird species of very high conservation importance must be avoided. The Te Huakaue / Knobs Flat area has been a focal point for research on endangered species for many decades highlighting the importance of large canopy trees for a wide range of nationally Threatened and At Risk fauna species. If clearance of canopy trees is not avoided, a survey for nesting birds (**kākā**, **mohua**, **kākāriki**) and bat roosts must be undertaken (and suitable mitigation actions implemented) prior to clearance of any trees that may provide nesting / roosting habitat.
Loss of grassland / wetland habitat and fauna disturbance at Kiosk Creek	Avoid	The proposed developments at the Kiosk Creek campground should be avoided. Whilst not of a large physical scale, they are nevertheless likely to represent a significant level of adverse ecological effect (arising from vegetation clearance and additional indirect habitat loss due to fauna disturbance) that would not be able to be effectively remedied or mitigated. It is unlikely that the proposed lodge and cabins could be located in a way that avoids fen / marsh

		habitat, contrary to national policy direction[25] that there is to be *no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted*. The existing campsite is outside this area and current direct impacts appear quite limited. Temporary camping use is considered less likely to be having substantial ongoing effects to fauna feeding habitat compared to the likely ongoing effects associated with the permanent presence of buildings (etc.).
Disturbance of sensitive fauna at Knobs Flat	Avoid / Mitigate	To avoid / minimise the introduction of additional disturbance at Te Huakaue / Knobs Flat, new developments should aim to cater generally to existing visitor numbers (especially overnight visitors) rather than effectively enabling an increased human population / presence in a sensitive area for fauna including nocturnal species. Local cumulative impacts to fauna from anthropogenic disturbance are potentially significant, especially if the Masterplan proposals are implemented at both Te Huakaue / Knobs Flat and Kiosk Creek campground. Consolidation of developments to the existing Te Huakaue / Knobs Flat footprint and increasing existing setbacks from buildings / hardstand to the forest edge is the best approach to avoid new effects and potentially to reduce existing effects.
Vegetation clearance	Avoid & Minimise	To construct / upgrade tracks in the Knobs Flat area, utilise the existing footprints of the various semi-formal tracks in the forest between the campsite and Te Huakaue / Knobs Flat (e.g., an existing waterfall track) to minimise vegetation clearance. Track construction is a deliberate choice to impact ecologically valuable and intact habitat. Minimisation of track length and footprint (width / degree of earthworks) while fully avoiding clearance of canopy trees is the clearest way to minimise effects.
Adverse ecological effects of light pollution	Avoid	Outdoor lighting can cause a range of adverse effects to bird, bat, fish, and invertebrate (terrestrial and freshwater) species, including mortality and loss of habitat. New outdoor lighting should be avoided in the first instance. Where it is considered essential to provide lighting on new or upgraded visitor facilities (e.g., for critical visitor safety reasons), these should be operated via motion sensor (not always-on) and must use warm-spectrum, hooded, and downward-pointing lights of the minimum brightness required to serve their purpose, and that are designed and installed to minimise spill. Walking tracks should be unlit.
Adverse effects to freshwater habitats	Avoid / Mitigate	Riparian areas and for waterway crossings, refinement of final walking track alignments and construction methodology should include input from a specialist freshwater ecologist. Input is recommended in relation to minimising exacerbation of bank erosion (observed at multiple points along the channel from upstream of SH94), retaining a vegetated buffer between the tracks and the creek (to avoid loss of shading and ecological functioning of the freshwater habitats), and to determine the appropriate management for

[25] National Policy Statement for Freshwater Management 2020, Policy 6.

		any proposed construction activity in, or in close proximity to Kiosk Creek (i.e., erosion and sediment controls, avoidance of working directly within the flowing channel). Any new permanent crossings proposed as part of the new tracks should be designed to minimise in-stream disturbance and piling, and allow for appropriate fish passage (i.e., bridge crossing with piles outside of the channel footprint).

5.3.5.2 Further Investigations

- If works with the potential to cause lizard injury or mortality are likely to occur in grassland areas that provide suitable lizard habitat, lizard management (habitat compensation measures and / or salvage during construction) will be required (e.g., see (LizardExpertNZ, 2022). However, no further investigations are recommended at this time.
- Once the proposed hydro-scheme upgrade is progressed, detailed and specific freshwater investigations will be required.

5.3.6 Conclusion – Node 3 – Te Huakaue Knobs Flat

- Impacts to fauna species using forest edge habitats at both Kiosk Creek and Te Huakaue / Knobs Flat due to indirect habitat changes and increased levels of anthropogenic disturbance are difficult to predict but are potentially significantly adverse, depending on the degree of intensification of built environments and / or an increase in visitor numbers.
- Works within the forested areas between Kiosk Creek and Te Huakaue / Knobs Flat campsite are of potential concern due to high indigenous forest and in-stream habitat values, but the proposals are limited to track creation and effects are likely to be able to be effectively minimised or managed.

The Masterplan concepts proposed for Kiosk Creek campsite are likely to result in significant adverse effects, due to high vegetation and habitat values (e.g., for pekapeka feeding) in open grassland and wetland habitats (in contrast, existing camping at Kiosk Creek is not considered to be of major concern). Whilst (depending on scale) the proposal may be technically feasible from an environmental impact perspective, we recommend that new impacts in this area are avoided. Consolidation of new development to Te Huakaue / Knobs Flat is preferred.

The Masterplan concepts located within the existing modified area at Knobs Flat, whilst quite feasible in terms of direct impacts, may potentially lead to indirect (and difficult to measure) adverse effects that are likely best addressed by avoiding intensification of visitor numbers, and consolidation of the existing modified area at Te Huakaue / Knobs Flat itself is recommended to leave more space at the forest edge. Otherwise, upfront, precautionary habitat enhancement / compensatory measures will be required to address impacts from disturbance to fauna (see Sections 6.0 and 7.0).

5.4 Node 3: Walking / Cycling Trail – Te Anau Downs to Ō-Tāpara Cascade Creek

5.4.1 Masterplan Concept / Proposal

Continuous shared cycling and walking trails are proposed to link between nodes and short stops in the Eglinton Valley for a new non-trafficked journey experience away from Milford Road. These aim to link in with community-initiated trails that are planned for development between Te Anau and Te Anau Downs, with an opportunity for them to continue alongside Milford Road to join the Te Rua-o-Te-Moko Fiordland National Park entrance. The trails will be split into two sections with day facilities at each node. The southern section will link Te Anau Downs to Te Huakaue Knobs Flat where additional accommodation and some hospitality would be available. The northern section will link the two accommodation and experience nodes from Te Huakaue Knobs Flat to Ō-Tāpara / Cascade Creek. A possible extension of the Masterplan concept including a cycleway from Ō-Tāpara / Cascade Creek to the Divide has also been proposed as part of MOP Stage 3.

The following assessment considers three variations of the proposal as discussed in the Walking & Cycling Experiences Feasibility report (Southern Land Ltd, 2024). For all variations, the proposed shared trails would be built to Easy Cycle Trail / Grade 2 cycling trail specifications, with an indicative track width of 1.5 m in forested areas and 2.2 m in open grasslands. If built for one-way use only, track widths could be reduced to 0.9-1.5 m (Tom Hopkins *pers. comm.* 2024). The variations:

- **'Proposed trail'** (i.e., 'Option 1' in Southern Land Ltd, 2024, excluding sections from Cascade Creek onwards). As described by Southern Land (2024), this would largely follow the true right of the Upokororo / Eglinton River, from the mouth to Black Creek above the East Eglinton confluence (two large bridges over the Upokororo / Eglinton River would be required). Thereafter it would largely follow the true left until crossing the river again upstream of Mistake Creek via a bridge, terminating at the Cascade Creek campsite.

  The proposed trail is c.62 km long (based on Table 4 in Southern Land Ltd, 2024). Three large bridges across the Upokororo / Eglinton River are required: near the mouth (125 m in length), above the East Eglinton confluence (60 m), and above the Mistake Creek confluence (72 m). In addition, numerous other small bridges (6-20 m in length), boardwalk sections (6-100 m in length), and a 75 m section of rock armour at the East Eglinton confluence would be built. Three toilets would be required at the c.10, 20, and 30 km mark. Viewing platforms could be installed at a 'Cryptic Lake' (opposite Mackay Creek on the true right of the Upokororo / Eglinton River) and at Ō-Tāpara / Lake Gunn (Southern Land Ltd, 2024).

- **'SH94 alternative'** (i.e., 'Option 2' in Southern Land Ltd, 2024). A variation on the proposed trail. To reach Black Creek, instead of largely following the true right, this would be largely parallel to SH94. The trail may deviate from SH94 to traverse a section of **tawai** / beech forest on the true left of the Upokororo / Eglinton River, from the Boyd Creek confluence. Otherwise, from Black Creek to Cascade Creek, the route follows the 'proposed trail.'

  The SH94 alternative is c.55 km long (c.30 km along SH94 to Black Creek, and c.25 km in common with the proposed trail). A bridge across the Upokororo / Eglinton River above the Mistake Creek confluence would still be required, along with a bridge over

the East Eglinton and numerous other small bridges and boardwalk. Additional toilets would be needed.

- **'Divide extension'** (i.e., the Cascade Creek to Ō-Tāpara Lake Gunn, and Ō-Tāpara Lake Gunn to The Divide sections in Southern Land Ltd, 2024) As an extension to either the 'proposed trail' or the 'SH94 alternative,' the route would be continued on the true right of Ō-Tāpara / Lake Gunn before traversing slopes near to SH94 west of Pupapa / Lake Fergus and Te Wai-o-Te-Unu / Lake Lochie before terminating at The Divide.

  The Divide extension adds a further c.9 km section of trail to connect the Ō-Tāpara / Cascade Creek node to The Divide. This section includes a bridge over Melita Creek and a lengthy (up to 1600 m) section of gantry(ies) to allow the trail to traverse very steep slopes on the true right of Ō-Tāpara / Lake Gunn. No additional toilets or other buildings would be required.

5.4.2 Existing Visitor Facilities / Infrastructure

From Te Anau Downs, the proposed trail follows an existing road to the Upokororo / Eglinton River mouth at Te Ana-au / Lake Te Anau, followed by a section of an existing cleared fence line on the Te Anau Downs Station / Fiordland National Park boundary[26]. Within Fiordland National Park, and except where the proposed trails follow near the SH94 alignment or incidentally cross existing tracks or campground areas, there are no existing facilities / infrastructure along the shared trails' alignments. A large grassland area on the true right of the Upokororo / Eglinton River (approximately opposite the Retford Stream and Dunton Creek confluences), which we understand is informally known as the 'Pig Farm', was grazed by cattle until shortly after the construction of the boundary fence in 2021.

The SH94 alternative would follow near the SH94 alignment and cross areas of private farmland with improved pastures, wetlands, and recently cleared scrub on Te Anau Downs Station.

The Divide extension would cross SH94 and terminate at the existing visitor carpark at The Divide, but otherwise there are there are no existing facilities / infrastructure along the route's alignment.

[26] Constructed in 2021. The fence does not follow the exact cadastral boundary, instead following the river largely near the top edge of a terrace, in a 'give and take' agreement between DOC and Te Anau Downs Station.

5.4.3 Description of the Existing Ecological Environment

Figure 13. Upokororo / Eglinton River near the Black Creek confluence, along the cycling trail alignment. Below (downstream of) Black Creek, variations of the proposal would generally follow either the true right of the river or SH94.

The following description is high level and based on desktop assessment and brief site observations at representative locations along the proposed trail alignment and SH94 alternative. The Node 3: Walking / Cycling Trail – Te Anau Downs to Ō-Tāpara / Cascade Creek area traverses a very wide variety of habitat types, and it is not possible nor practical to attempt to provide detailed descriptions in the absence of detailed site investigations and a standalone assessment.

Vegetation

Proposed trail: In terms of vegetation / habitat types, the proposed trail would follow:

- An existing road from Te Anau Downs to near the Upokororo / Eglinton River mouth at Te Ana-au / Lake Te Anau. Surrounding the road is **mānuka**[27]- dominated scrub and pockets of regenerating and remnant **tawai /** beech forest near Bog Lake. Infestations of weeds including cotoneaster, gorse, broom, and Himalayan honeysuckle are present in the vicinity of the road.
- An existing cleared fence line on the Te Anau Downs Station / Fiordland National Park boundary. The fence line passes largely through **mānuka**-dominated scrub with occasional bog pine and various broadleaved species, **aruhe** / bracken fernland, and pockets of regenerating and remnant **tawai /** beech forest, at the top of a terrace on the true left of the Upokororo / Eglinton River. On the terrace riser, riparian vegetation

[27] We acknowledge that the Ngāi Tahu Settlement Act 1998 recognises the full name as '**Mānuka Kahikātoa**'. For ease of recognition, we have referred to this taonga species in this report as '**mānuka**'.

includes mixed broadleaf forest / treeland (e.g., **kāpuka** / broadleaf, **kōhūhū**[28] / black mapou, makomako / wineberry, and other scattered emergent trees including **tī kōuka**, **horoeka** / lancewood, **tawai** / beech species, and small-leaved **kōwhai**), and areas of wetland (see also Ewans, 2016). The fence line has recently been herbicide-sprayed leaving a c.3-5 m wide corridor largely devoid of vegetation. Weeds (largely broom and Himalayan honeysuckle) are present in the vicinity of the fence.

- After crossing to the true right, the top of a river terrace. The alignment follows a narrow corridor of riparian **tawai** / beech forest skirting several very large and outstanding bog, fen, and swamp wetland areas. The alignment then bisects part of an area of extensive and intact bog pine – **mānuka** scrub ('wilderness'). 'Wilderness' habitat occurs only on strongly leached post-glacial terraces, and is classified nationally as a naturally uncommon and 'critically endangered' ecosystem type (Holdaway et al., 2012; Williams et al., 2007; it is named for a reserve on the Mossburn – Te Anau highway). The alignment then follows a hummocky habitat mosaic of mānuka scrub with scattered young **tawai** / beech trees (likely historically cleared and regenerating), and grassland pockets.
- Grassland on river flats (an area we understand is colloquially known as 'Pig Farm')[29] at the confluence of a large unnamed sinuous tributary draining End Peak. 'Pig Farm' grassland is dominated by exotic grasses but includes scattered indigenous herb, fern, and sedge species. Narrow terrace-toe wetlands occur at the interface of the grassland and adjoining **mānuka** scrub, and there is an extensive fen wetland upslope (outside the alignment). Indigenous grassland values along the alignment appear low but are likely recovering somewhat now that grazing has ceased. Exotic broom dominates the riparian margins of the large tributary and occurs in or at the margins of **mānuka** scrub particularly at the upstream end of the flats.
- River terraces and hillslopes downstream of the Upokororo / Eglinton River gorge. Vegetation types are generally **mānuka** scrub or **mānuka** – **tawai** treeland, with variable cover of emergent **tawai** / beech, as well as bog pine, **kōhūhū**, **korokio**, tumatakuru / matagouri, mikimiki (*Coprosma dumosa*) and scattered areas of dense broom. Pockets of wetland are generally present in the hummocky landform, as well as areas of 'wilderness' habitat that appear degraded by broom invasion, exotic grasses, and pig damage.
- Mixed **tawai** / beech forest (generally dominated by red beech) on the true right of the Upokororo / Eglinton River gorge.
- Grassland, shrubland, and wetlands on open river flats on the true right of the Upokororo / Eglinton River to approximately opposite the Tōtara Campsite. Grasslands are highly likely to contain At Risk species including **taramea** / grassland spaniard and matagouri (these species are abundant in similar nearby true-left habitats). Wetland areas include riparian marsh and a moderate sized and notably diverse palustrine fen / swamp (with spring-fed creeks) just above a stream draining Annick Peak.
- **Tawai** / mountain beech and red beech forest opposite the Tōtara Campsite to a 'Cryptic Lake[30]' located roughly opposite Mackay Creek.

[28] The Ngāi Tahu Settlement Act 1998 recognises **kōhūhū** as *Pittosporum tenuifolium*. **Kōhūhū** is used in this report to refer to *P. tenuifolium* and the closely related *P. colensoi*, which was until recently considered a subspecies.

[29] We also understand that area was grazed by cattle until c.2021, when a boundary fence opposite on the true left bank was completed.

[30] This informal name given by Southern Land (2024) has been adopted by this report for ease of recognition.

- The edge of the 'Cryptic Lake' comprising a sheltered, shallow water lake fringed by **tawai /** beech forest and areas of wetland vegetation, forming islands. This is an outstanding feature with intact indigenous macrophyte / charophyte beds (lakebed vegetation) and diverse shrublands. Unfortunately, Russell lupin and recent pig damage is extensive in grassland areas on the north side of the lake.
- Grassland and **tawai** / beech forest on steep slopes (with an area of eroding scarp) above the river, before crossing the river at the north end of the East Upokororo / Eglinton River fan (above the confluence).
- Grassland flats on the East Eglinton outwash fan, alongside Black Creek. Grassland areas have moderate-high values including **taramea** / grassland spaniard and diverse herb species. Weeds such as Russell lupin, broom, and ragwort are scarce on the main outwash fan, but Russell lupin is abundant in lower riverside areas.
- Close to SH94 in **tawai** / beech forest and scrub near Mirror Lakes and associated large fen / swamp / marsh wetlands, then through **tawai** / red beech forest until the regionally significant Deer Flat wetland. This large swamp and marsh complex receives occasional flood flows from the river, via a low channel which the cycleway would cross. Hummocks in the wetland (away from the alignment) are known to support rare shrubs (e.g., *Melicytis flexuosus*; Threatened – Nationally Vulnerable) and an At Risk – Declining dwarf mistletoe (*Korthalsella clavata*). It is possible that these species are also present on or near the track alignment, particularly in the vicinity of the channel. Large **tawai** / beech trees near the campsite and existing road support abundant red, scarlet, and yellow mistletoe. Unfortunately, however, marsh areas near the western campsite and along the proposed trail are degraded by exotic grasses, California thistle, and extensive Russell lupin.
- From Deer Flat, the route crosses the wetland at the west end and enters **tawai** / red beech forest on glacial kames and hummocks to Te Huakaue / Knobs Flat, before entering wetland (fen and marsh) and grassland areas north of Kiosk Creek (past the kame 'knobs' for which Te Huakaue / Knobs Flat was named), to Smithy Creek. Grasslands near Kiosk Creek support a rare dwarf broom *Carmichaelia uniflora*. Wetland areas are dominated either by *Carex* spp. sedges (marsh areas) or by plants such as sphagnum moss, alpine tangle fern, and lesser wire rush (fen areas); the latter are a typical flora of low-nutrient peat substrates. These wetlands also feature diverse indigenous herbs and scattered shrubs of mountain **toatoa**, *Dracophyllum* spp. and mikimiki (*Coprosma* spp.). The kames support sparse rare shrubs including *Coprosma wallii* (At Risk – Declining), and grassland vegetation values along the proposed trail in the Smithy Creek area are moderate-high.
- **Tawai** / red beech forest and grasslands from Smithy Creek to a crossing of the river above the Mistake Creek confluence then generally **tawai** / red beech forest all the way to Cascade Creek campground. Where grassland areas are flood-disturbed and / or have high moisture levels, there is a greater cover of exotic herbaceous weeds, and subsequent lower ecological values. The **tawai** / red beech forest section in the vicinity of the bridge includes the longest reach of the river where tall forest cover is present on both sides. Near Pt. 546 (as on Topo50 maps), the proposed trail crosses a large frost-flat with high values for grassland, shrubland, and wetland vegetation, but also an infestation of Russell lupin.

Overall, the proposed trail includes or passes close to a range of outstanding and very high value vegetation types. Intact **tawai** / red beech forests in the Eglinton Valley are perhaps the most obviously important habitat directly impacted by the proposal, although this habitat type is

relatively well represented locally and nationally. Less well-represented habitats nationally include extensive areas of 'wilderness' vegetation, and the series of very large wetlands near Te Anau Downs (and at Deer Flat), which are of regional and national importance for their size and general intactness. Aside from at Deer Flat, the proposed route does not notably bisect or traverse wetland features. Within the Eglinton Valley, glacial landforms, and local features such as kames, frost flats and frost hollows, and smaller wetlands provide distinct and intact habitat of exceptional local importance, with the proposed route passing through one notable frost hollow near Pt. 546. Frost flats / frost hollows and braided rivers are considered naturally uncommon ecosystems (Williams et al., 2007), and kames are also considered uncommon landforms. The extensive open grasslands, while generally dominated by exotic grass species in terms of cover, nevertheless support numerous indigenous grassland plants. Various Threatened and At Risk plant species are known to be present or are likely present along or in the vicinity of the proposed trail alignment, especially mistletoes and specialist shrub species adapted to frost flat and wetland areas.

In terms of the Threatened Environments Classification[31] (Walker et al., 2015), the proposed trail would traverse land environments with only 10-20% indigenous vegetation remaining nationally at 'Pig Farm' and near the 'Cryptic Lake.' Respectively, these are 'L1.1d' and 'Q4.1d' land environments (cool Southland gently undulating floodplains with well-draining and high fertility alluvial soils with warmer winter temperatures and lower water deficits; and southeastern hill country with very gently low rolling hills with well-draining moderately fertile soils; Landcare Research Ltd, 2012). Being severely reduced nationally, these land environments are a high priority for protection.

SH94 Alternative: In terms of vegetation / habitat types, the SH94 alternative would follow:

- Close to SH94 until near the Upokororo / Eglinton River gorge, in private farmland or on the road corridor. Habitats adjacent to the highway are largely regenerating **mānuka** scrub, improved pasture within paddocks, a large fen wetland west of SH94 between Retford Stream and Dunton Creek. A further large wetland is present on a terrace near the gorge c. 1 km east of Boyd Creek, just north of a prominent bend in SH94. Despite willow infestations in places (especially along streams), ecological values in these larger wetlands are high despite the presence of historic and recently upgraded drains. Ecological values in the **mānuka** scrub areas vary but are generally low-moderate (in the vicinity of SH94) depending on the degree of modifications including vegetation clearance, weed invasion, grazing, and general edge effects. West of the highway, infestations of broom and Darwin's barberry are present particularly in the regenerating scrub. East of the highway weeds including broom, Himalayan honeysuckle, and Douglas fir (wildings from plantation areas) are present.
- In the vicinity of the gorge, either:
    - Deviate from the highway and traverse **tawai** / red beech forest (within the National Park) before crossing Boyd Creek at the confluence and regaining the highway north of the Te Rua-o-Te-Moko Gateway (Node 1) area. Forest habitats are fenced off from the surrounding farmland and are generally intact and of high value.
    - Continue parallel to SH94 (generally on roadsides or adjacent pasture) passing through the Node 1 area before entering the National Park and **tawai** / red beech forest. *Coprosma* spp. – red tussock shrublands / tussocklands in the

[31] Other than Node 2 Eglinton Reveal, no other Masterplan nodes / locations include other land environments of notable rarity; therefore no further reference to the Threatened Environments Classification is made in this report.

vicinity of Boyd Creek are of moderate-high value, particularly east of the highway; otherwise, vegetation values are low.

- Grasslands, shrublands, and pockets of *Carex*. spp. sedgeland marsh wetlands (which are not extensive or of notable value) adjacent to SH94 in the vicinity of Walker Creek, to Tōtara Flat. The key values of this area are grasslands near Walker Creek with tūmatakuru / matagouri and large populations of **taramea** / grassland spaniard (see also Section 5.6), and a spring-fed wetland / stream where SH94 is hard up against bluffs.
- Through the large frost grassland and shrubland at Tōtara Campsite. This location is an outstanding example of naturally uncommon frost flat habitat (Williams et al., 2007), with large specimens of relatively frost-tolerant tōtara kotukutuku / Hall's tōtara creating islands of relative shelter for less frost-tolerant shrub species. Away from the shelter of trees and shrubs, grassland vegetation values are high (with similar species composition to the 'Option 3' area at Node 2 despite being a less sun-exposed site). Mistletoe species are common on the **tawai** / beech forest edges.
- Through **tawai** / beech forest then grasslands parallel to SH94 in the Node 2 area (see description in Section 5.2.3), then across the East Eglinton River and grasslands to Black Creek.
- Thereafter, the alignment follows the proposed trail.

Overall, the SH94 alternative includes a much greater proportion of modified roadside habitats compared to the proposed trail, largely between Te Anau Downs and the Te Rua-o-Te-Moko Gateway (Node 1) area. However, between the Node 1 area and Black Creek (and potentially on the true left of the gorge if it deviates from SH94 near Boyd Creek), it includes longer sections in **tawai** / red beech forest habitat compared to the proposed trail, notably on sunny aspects on fertile terrace areas of importance as bat habitat (see Terrestrial Fauna values below). The single most important feature (in terms of vegetation) of the SH94 alternative is likely the representative, rare, diverse, and distinct frost flat community at Tōtara Campsite.

In terms of the Threatened Environments Classification (Walker et al., 2015), the proposed trail would traverse land environments with only 10-20% indigenous vegetation remaining nationally between Retford Stream and Dunton Creek and in the Mackay Creek area. These are 'L1.1c' and 'L1.1d' and 'Q4.1d' land environments (Landcare Research Ltd, 2012) respectively, and a high priority for protection.

Divide extension: In terms of vegetation / habitat types, the Divide extension would continue from either the proposed trail or SH94 alternative at Ō-Tāpara / Lake Gunn and would follow:

- Steep **tawai** / beech forest clad slopes on the true right of Ō-Tāpara / Lake Gunn. These areas appear to be subject to periodic treeslide / landslide.
- Steep **tawai** / beech forest clad slopes on the true right of Pupapa / Lake Fergus and Te Wai-o-Te-Unu / Lake Lochie. In this area, in gullies and in the paths of periodic landslides / treeslides, seral forest / scrub dominated by pioneer species including **kōtukutuku** / tree fuchsia as well as **houhi** / mountain ribbonwood, makomako / wineberry, patē, tree tutu, and **koromiko**. This vegetation type (sometimes referred to as 'kākāpō gardens') is a highly productive seasonal food source for indigenous forest birds, especially **kākā**, **tūī**, and **korimako** (see Terrestrial Fauna values below).

Overall, the Divide extension includes areas of **tawai** / beech forest of generally high importance for fauna species, but most importantly includes extensive areas of 'kākāpō

gardens' for seasonal feeding; **kākā** congregate from the surrounding valleys in up to the hundreds when **kōtukutuku** / tree fuchsia flowers in late spring (T. Greene, *pers. comm.* 2023).

In terms of the Threatened Environments Classification[32] (Walker et al., 2015), all land environments in the Divide extension area are well represented and well protected nationally.

Terrestrial Fauna

All trail proposals generally include habitats that support nationally important populations of:

- **Tarapirohe** / black-fronted tern and tarāpuka / black-billed gull feeding and breeding on river gravels and terraces;
- Pekapeka / long-tailed and southern lesser short-tailed bat throughout **tawai** / beech forests along the Upokororo / Eglinton River (generally from upstream of the gorge);
- Wetland birds including koitareke / marsh crake, pūweto / spotless crake, **mātā** / fernbird (all three are At Risk – Declining), and matuku hūrepo / Australasian bittern (Threatened – Nationally Critical), which will permanently or periodically occupy virtually all suitable wetland and associated shrubland habitat in the area (Colin O'Donnell, *pers. comm.*, 2023);
- Waterfowl species including pāpango / scaup and tētē-moroiti / grey teal (and potentially **pārera** / grey duck; Threatened – Nationally Vulnerable) in shallow open water habitats, such as the 'Cryptic Lake,' which provides excellent waterfowl breeding habitat.
- Tree-cavity nesting forest birds including **kākā,** yellow-crowned **kākāriki** and **mohua**, which are generally present above Walker Creek and the East Upokororo / Eglinton River confluence respectively, but with kākā being most abundant year-round above about Mirror Lakes (Terry Greene and Colin O'Donnell, *pers. comm.*, 2023);
- Mokomoko species including southern grass skink (and potentially the newly described tussock skink) largely in grasslands, and geckos (likely korero gecko and Cascades gecko) predominantly in forest habitats.
- Broadly unknown but likely diverse assemblages of indigenous invertebrates adapted to **tawai** / beech forest, wetland, and mesic grassland habitats.

Freshwater Habitats and Fauna

The cycleway alignment is in the general vicinity of the Upokororo / Eglinton River and / or its tributaries over much of its extent. Whilst located primarily on the river flats and **tawai** / beech forest habitat adjacent to the Upokororo / Eglinton River, the cycleway crosses this river and its tributaries at points along the alignment. Upokororo / Eglinton River is a high value natural braided river draining a series of alpine and subalpine tributaries from the mountains to its east and west. Its form is highly dynamic and its major tributaries form meanders and will change path over time.

The alignment is also near to (or crosses) numerous tributaries, side braids and lateral habitats e.g., spring fed creeks) in places which often provide excellent habitat for a high diversity of high-value macroinvertebrate species (Gray & Harding, 2010) and spawning habitat for fish. The 'Cryptic Lake' contains a notable population of large kākahi / freshwater mussels (At Risk – Declining). There are numerous indigenous fish records (NZFFD) along the alignment.

[32] Other than Node 2 Eglinton Reveal discussed in Section 5.2, no other Masterplan nodes / locations include other land environments of notable rarity; therefore no further reference to the Threatened Environments Classification is made in this report.

Particularly, the Upokororo / Eglinton River has been recorded as supporting At Risk species kōaro and tuna / longfin eel (both At Risk – Declining), and gollum galaxias and southern flathead galaxias (Threatened – Nationally Vulnerable). The Upokororo / Eglinton River and its more stable, spring-fed tributaries likely provide nationally important habitat as these galaxiid species have a restricted distribution within Southland / Otago.

Overall

The proposed Te Anau Downs to Cascade Creek cycle trail traverses a wide range of intact indigenous habitat types including naturally uncommon ecosystems that provide habitat for an extensive range of nationally important fauna populations. The area is valuable not just for the extent and condition of these habitats, and large species populations, but because the area has received ongoing predator control for many decades, and because many important habitat areas are currently distant from and unaffected by visitors passing through the area via SH94.

Bog Lake near Te Anau Downs.

Te Anau Downs Station / Fiordland National Park boundary fence at the top of a terrace. Bog Lake at left, Upokororo / Eglinton River mouth at right.

Te Anau Downs Station / Fiordland National Park boundary fence, which the proposed cycle trail may follow.

'Wilderness' scrub vegetation and narrow riparian forest on the true right, upstream of a proposed bridge.

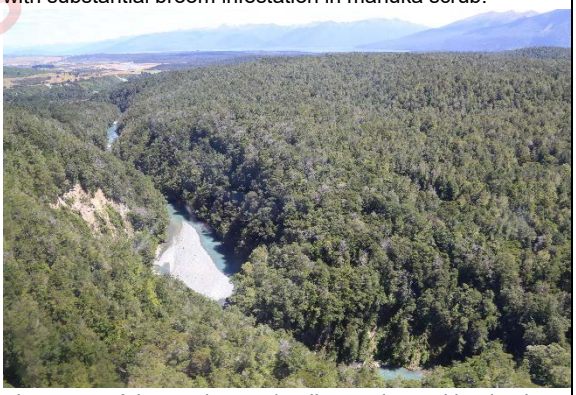
Regenerating scrub / grassland mosaic near 'Pig Farm' area on the true right, opposite Retford Stream confluence.

Unnamed stream and grassland ('Pig Farm') on the true right.

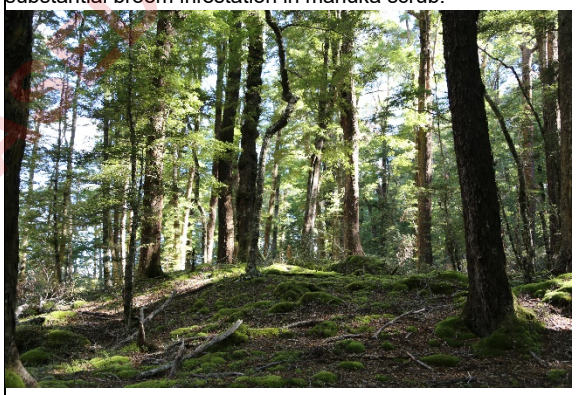
Unnamed stream (with broom infestation) and wetland at the 'Pig Farm' on the true right, opposite Dunton Creek.

Glacial deposit landform on the true right below the gorge, with substantial broom infestation in mānuka scrub.

River terrace on the true right just below the gorge, with substantial broom infestation in mānuka scrub.



The gorge of the Upokororo / Eglinton River, with mixed **tawai** / beech forests dominated by red beech.



Tall **tawai** / beech forest habitat.

River terrace on the true right above the Upokororo / Eglinton River gorge.

Intact wetland habitat on the true right below Annick Peak.

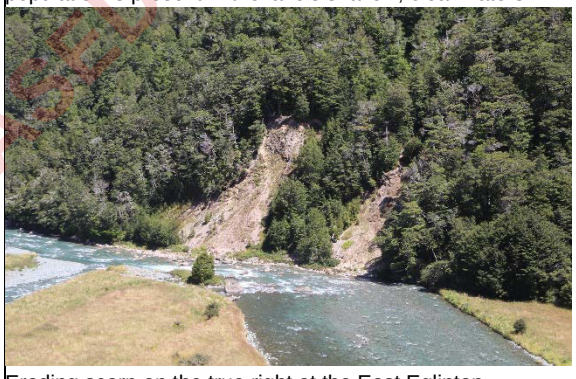
Outstanding water clarity in wetland / spring creek.

'Cryptic Lake' (opposite Mackay Creek on the true right) surrounded by forest, shrublands, and harakeke / flax.

Pig damage and Russell lupin infestation at 'Cryptic Lake.'

Impressive specimens of kakahi / freshwater mussel at 'Cryptic Lake.' An apparently very large and healthy population is present in the lake's shallow, clear waters.

Diverse frost flat shrubland community among indigenous grassland at Tōtara Flat, on the alternative SH94 cycleway alignment.



Eroding scarp on the true right at the East Eglinton confluence, downstream of the proposed bridge site.

Upokororo / Eglinton River at a proposed bridge site above the East Eglinton confluence.

Open grasslands in the Eglinton Valley.

Grassland spaniard (At Risk – Declining) near the East Eglinton confluence.

Outstanding and extensive wetland habitat on the true left near Mirror Lakes.

The 'Regionally Significant' Deer Flat wetland, which the proposed trail would cross at left.

Extensive Russell lupin is present in places at the Deer Flat wetland, in the vicinity of the proposed trail alignment.

Fen and marsh wetland habitat west of SH94 near Kiosk Creek. As proposed the trail would cross the fen.

Grassland and glacier-deposited kame landform ('knob') near Knobs Flat. The trail would skirt the kame.

Coprosma wallii (At Risk – Declining) and indigenous shrubs on kame near Smithy Creek.

Flood-disturbed and damp grassland near Upper Eglinton campsite, with largely exotic grasses and weedy herbs.

Frost flat wetland / shrubland on the true right near Pt. 546 (on Topo50 maps) near Cascade Creek.

Ō-Tāpara / Lake Gunn, and the outlet of Melita Creek.

Steep slopes on the western edge of Ō-Tāpara / Lake Gunn.

Mosaic of 'kākāpō gardens' and **tawai** / beech forest on slopes above of Pupapa / Lake Fergus and Te Wai-o-Te-Unu / Lake Lochie.

Example of switchback on the Routeburn Track near The Divide. On steeper terrain, the ability to avoid canopy trees via re-routing trail alignments is severely reduced.

Figure 14. Additional Node 4 photos taken along the general Cycling Trail alignment.

5.4.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at Node 3: Walking / Cycling Trail – Te Anau Downs to Cascade Creek that need to be considered include:

- A key effect of the proposal is direct vegetation clearance across a range of outstanding habitats. For the proposed trail, based on an approximate 62 km cycleway length (from the Upokororo / Eglinton River mouth to Cascade Creek) and up to 2.2 m wide construction corridor (to create a 1.5 m wide trail), this potentially equates to over 12 hectares of direct habitat clearance (somewhat less clearance would be required for a

one-way trail). Based on the current alignment, this will include at least some loss of wetland extent and loss of extent of naturally uncommon ecosystems, including 'wilderness' and frost flat vegetation. Considering the ecological values of the area, this equates to a significant adverse ecological effect.

    - For the proposed trail and the SH94 alternative, based on on-site discussions during visits to representative cycle trail locations with Tim Dennis (Southern Land Ltd), we understand that trail construction at Easy Cycle Trail / Grade 2 standard (and because of generally favourable underlying land contours) would likely allow for the vast majority of large (c.>150 mm DBH) / canopy trees to be avoided during trail construction. Key exceptions include where the trail would approach bridges, or where it would traverse / switchback on steep slopes (for the proposed trail, this latter situation would apply largely in the gorge area). It is estimated that c.100s (as opposed to 10s or 1000s) of canopy trees would be cleared to construct the proposed trail (Tim Dennis, *pers. comm*. 2024).
    - For the Divide extension, to build a 1.6 km gantry along the western edge of Lake Gunn, it is presumed that numerous **tawai** / beech trees would be cleared both in the footprint of the gantry and upslope (to prevent trees falling on the gantry). Whilst **tawai** / beech forest habitat on steep slopes is likely subject to periodic natural treefall, the cycle trail would need to be kept permanently clear. Construction of the trail through 'kākāpō gardens' habitat above Pupapa / Lake Fergus and Te Wai-o-Te-Unu / Lake Lochie would directly remove and further fragment a small portion of an important **kākā** (and other forest bird species) seasonal feeding area already impacted by SH94.

- A key effect of the proposal is degradation of habitats beyond the footprint of the trail, due to edge effects, weed introduction and spread, and likely spread of additional informal trails and wider visitor impacts.
    - Edge effects are likely to impact a range of habitat types bisected by the trail. In places, the result will be a loss of existing vegetation, and replacement with tolerant species, which (in open areas) will likely be largely exotic grasses, rushes, and herbs. Considered over the scale of a c.55-70 km trail (as above), this effect is cumulative with significantly adverse effects of direct clearance.
    - Due to shallow rooting systems, large **tawai** / red beech trees are potentially vulnerable to damage from soil compaction and / or track erosion along the track alignment. Therefore, even if trees are not felled, they may be gradually killed or weakened by nearby track construction.
    - Weeds could be introduced on machinery (a temporary risk during construction) or on an ongoing basis via mountain bikes. Considerable sources of several weed species occur along both the proposed trail and the SH94 alternative, especially in the Te Anau Downs area. These pose a serious threat to the integrity of vegetation and habitats in the Eglinton area of Te Rua-o-Te-Moko / Fiordland National Park. Large weed infestations in the Te Anau Downs area that have the potential to spread to suitable areas in the Eglinton (and beyond) include crack willow, grey willow, scotch broom, gorse, tree lupin, cotoneaster, Himalayan honeysuckle, Douglas fir, and Darwin's barberry. It is not known whether the trail will pass through any areas of these weeds, but this is possible. In general, mountain bikes and walkers are more likely to pick up and transport weed seeds than vehicles using SH94.

        - Russell lupin is already widespread in the Eglinton Valley but currently occurs largely near the active floodplain, but also at the 'Cryptic Lake' and the frost flat near Pt. 546; construction and use of the cycle trail may well spread this weed further to upper terraces and grasslands / wetlands distant from the river. Anecdotal / circumstantial evidence from numerous regions in New Zealand suggests that visitors deliberately spread Russell lupin for perceived scenic value.
        - Large broom infestations below the gorge are likely already being spread by pigs but do not appear to have reached extensive areas of 'wilderness' vegetation west of 'Pig Farm.' This critically endangered and naturally uncommon ecosystem includes naturally sparse vegetation with low-nutrient soils, it is therefore extremely vulnerable to invasion by broom (a nitrogen fixer that can readily invade sparsely vegetated areas).
        - The potential effects of weed introduction and spread are potentially significantly adverse and will require ongoing and potentially costly investment in weed control.
    - The SH94 alternative would likely have somewhat lower effects than the proposed trail in terms of weed introduction and spread. This is because large areas are already affected by weeds (SH94 south of the Node 1 area) and because the indigenous habitats affected (north of Node 1) include a greater proportion of tall **tawai** / red beech forest that is likely less vulnerable to invasion by weeds such as broom compared to e.g., 'wilderness' habitats on the proposed trail.
    - Informal trails and visitor impacts will inevitably spread beyond the formed trail, potentially exacerbating the above effects. This may range from short informal trails to a viewpoint in the vicinity of whichever cycle trail is constructed, to the fact the proposed trail would enable access to an enormous area of the Earl Mountains that is currently effectively inaccessible due to the presence of the river and the lack of existing tracks. Whilst it does not form part of the Masterplan concept, it is conceivable that the proposed trail may over time generate momentum for additional visitor facilities on the true right of the lower river, simply by 'opening up' this area to a wide range of users.

- A key effect of the proposal is disturbance to fauna across a range of outstanding habitats. International and local studies consistently highlight that visitors, especially walkers and cyclists, are typically more disruptive to fauna (particularly water birds and wetland birds) than vehicles (e.g., Glover et al., 2011; Pease et al., 2005), which will respond with vigilance behaviours or flight, reducing feeding rates and in the worst case leading to effective habitat loss (e.g., Steven et al., 2011). Cryptic, shy wetland birds (koitareke / marsh crake, pūweto / spotless crake, and matuku hūrepo / Australasian bittern) are likely the most important and vulnerable feature in the context of this impact for this proposal. A notable feature of the existing environment is the large range of suitable habitats for these species that are distant from and free of sources of anthropogenic disturbance. The cycle trail would pass through or near these habitats in various places (especially at 'Cryptic Lake' and at Deer Flat). Whilst these species are mobile, the Eglinton is one of the most intensively predator-controlled areas of habitat for these species. This means that displacement of populations of these species elsewhere from the Eglinton Valley would expose them to potentially lower quality

habitat and / or habitat with higher predator numbers. If the concept is pursued, effects on fauna from anthropogenic disturbance are likely to be significantly adverse.

- A key effect of the proposal relates to the prediction that tens of thousands of visitors would be expected to use the cycle trail annually (Tom Hopkins, *pers. comm*. 2024). Certain visitor behaviours may introduce impacts to sensitive habitats surrounding the footprint of the cycle trail. This generally includes informal trails and avifauna disturbance as noted above. Examples of specific concerns include:
    - Visitors swimming in sensitive waterbodies. For example, swimming in the 'Cryptic Lake' could conceivably release suspended sediments, adversely impacting sensitive lakebed vegetation and a large kākahi population.
    - Visitors approaching waterbodies such as the 'Cryptic Lake' and disturbing waterfowl and wetland birds, especially during breeding periods.
    - Creation of informal trails to viewpoints on the 'knobs' near Te Huakaue / Knobs Flat, where rare shrubs are present.
- A key effect of the proposal relates to the potential that the new track will create new corridors for pest movement. Increased movement of pigs (whilst typically shy / wary of humans) is a risk, given existing issues at 'Pig Farm' and at 'Cryptic Lake' and the presence of sensitive habitats nearby. This issue also applies for cats (cats readily use existing tracks especially compared to densely vegetated areas; Morgan et al., 2009; Recio et al., 2015). This may mean that the proposed new track facilitates pest movement along currently less-accessible areas of the c.55-70 km track corridor, including three new river crossings (the unbridged river is likely an existing barrier to or limiting factor on dispersal of some predators). On the other hand, the track also represents a logical opportunity to establish pest trapping / control along the track, mitigating this risk potentially to the point of a net gain (depending on control effort).
- An additional and temporary effect of the proposal is disturbance to river habitat and in-stream fauna within the high value Upokororo / Eglinton River. Multiple crossings / bridges over the river and / or its tributaries are required, some of which are likely to require in-stream work and possibly associated machinery access to the bridge site for construction. Any in-stream work within the river or its tributaries has the potential to affect the habitat of, or disturb, high value indigenous fish and fauna known to be present in the Upokororo / Eglinton River. Whilst natural flooding can also cause these issues (especially in the Fiordland context), the difference is that erosion and sediment runoff from construction often happens outside high river flow events meaning that fine silts (etc.) settle more easily and can cause adverse impacts to fauna.
- An additional effect of the proposal is localised disturbance to drainage patterns altering wetland hydrology, and fragmentation of habitats, due to replacement of existing natural vegetation cover with impermeable / semi permeable surfaces. These effects are inherent to the proposal.
- An additional effect of the proposal is the increased likelihood of exposed earth and disturbance due to new track construction and operation. This may result in a long length of the Upokororo / Eglinton River being exposed to an increased likelihood of being influenced by erosion / sedimentation effects, where the track is located close to the river edge, with the potential for cumulative effects (separate to natural flood inputs) along the length of the alignment.

5.4.5 Recommendations

5.4.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 4. Effects management measures recommended for Node 3 – Walking / Cycling Trail – Te Anau Downs to Ō-Tāpara Cascade Creek.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Vegetation clearance and direct habitat loss / fragmentation	Avoid & Minimise	The proposed vegetation clearance across c.55-70 km represents a large scale level of ecological effect (arising from vegetation clearance and additional indirect habitat loss) that would not be able to be effectively remedied or mitigated. It is unlikely that the proposed trail or SH94 alternative could be located in a way that avoids wetland habitat, as well as loss of type, amount, and condition of ecologically significant habitats, contrary to national policy direction. We note that the 'proposed trail' utilises existing cleared habitat on the Te Anau Downs / National Park border fence, and we support this approach wherever possible. If the cycle trail is pursued, clearance of large canopy **tawai** / beech trees providing habitat for numerous indigenous bat and bird species (including key taonga species) of very high conservation importance must be avoided. Because the 'Divide extension' option appears likely to lead to substantial loss of canopy trees (due to steep terrain), the 'Divide extension' option should be avoided. Prior to the resource consenting / approval stage, it is recommended that a walkover of any finalised trail alignment is undertaken by a botanist / ecologist in order to provide input into any necessary changes required to avoid small / localised higher value ecological features. In forest habitat, similar input from a bat expert is required to avoid known or potential roost trees. See also recommendations in Section 6.0.
Impacts to specific locations of ecological value	Avoid & Minimise	Special consideration will need to be given to: - Relocating the trail to follow the top of the river terrace to avoid 'wilderness' vegetation (between a proposed bridge and 'Pig Farm,' if the proposed trail option is pursued. - Ecological input and social science / visitor experience expert input into managing visitor behaviours at the 'Cryptic Lake', if the proposed trail option is not avoided. - Ecological project shaping input during detailed design to sensitively locate the trail through frost

		flat habitats near Pt. 546 / Cascade Creek, and at Tōtara Flat, if the SH94 alternative is pursued. - Providing side trails and managed viewpoints (with fences etc.) as an upfront measure (rather than letting ad hoc trails evolve) to obvious features of interest, such as 'Cryptic Lake' and the kame 'knobs' at near Te Huakaue / Knobs Flat. - Minimising impacts (e.g., via boardwalking) through a short stretch of wetland at Deer Flat. - Avoiding loss of 'kākāpō gardens' habitat in the vicinity of The Divide by avoiding the proposed 'Divide extension.'
Edge effects from trail construction	Remedy / Mitigate	Edge effects are an inherent issue with track formation, but opportunities to remedy / mitigate some impacts are available, such as: - Removing or hand-placing any blast rock (etc.), rather than leaving it strewn on track sides smothering existing vegetation / soils. - Carefully scraping and replacing duff / leaf litter where works extend to the sides of the final trail footprint, and generally avoiding side-casting subsoil or rock.
Weed introduction and spread along cycleway	Avoid / Mitigate	If the concept is pursued, 'clean check dry' measures for bicycles should be monitored and enforced at trail access points. Even if this is achieved, additional ongoing weed control will be required along the trail alignment, because of existing weed populations in places along all trail options.
General visitor impacts (disturbance) to sensitive fauna habitats	Avoid & Minimise / Mitigate	To minimise this risk, final trail routes should be re-routed to avoid wetland habitats that provide suitable habitat for cryptic wetland bird species. This may pose logistical challenges due to geographic constraints (see also recommendation above). However, the introduction of substantial new human disturbance to the general habitats on the true right of the river is an inherent element of the 'proposed trail' that cannot be avoided or adequately minimised.
Specific visitor impacts to fauna or habitats	Mitigate	Visitors accessing sensitive water bodies to swim or picnic may be able to be mitigated by high-quality interpretive signage (e.g. similar to that at Blue Lake, Nelson Lakes National Park), by the trail itself not facilitating access right to the edge of water bodies (e.g., by stopping short of the water by a few metres, with a fenced lookout point), and by leaving existing vegetated buffers on water body margins. Disturbance to waterfowl and wetland bird breeding in wetland and lake habitats can be mitigated by use of viewing hides and interpretative signage or similar approaches to 'manage' visitor behaviour.
Pest movement	Mitigate	As a direct response, implement comprehensive pest control and monitoring along the trail alignment, targeting predators and other important pests (e.g., pigs). This specific

		recommendation relates only to management of effects in the vicinity of the cycleway; much wider landscape scale control of pests (as discussed in Section 7.0) is also recommended as a positive opportunity for protecting conservation values generally.
Impacts to freshwater habitats		If the concept is pursued, refinement of final walking track alignments in riparian areas and waterway crossings and construction methodology should include input from a specialist freshwater ecologist. Input is recommended in relation to retaining appropriate vegetated buffers between the tracks and the waterways, and to determine the appropriate management for any proposed construction activity in, or in close proximity to, waterways (i.e., erosion and sediment controls, avoidance of working directly within the flowing channel). Any new permanent crossings proposed as part of the new tracks should be designed to minimise in-stream disturbance and piling, and allow for appropriate fish passage (i.e., bridge crossing with piles outside of the channel footprint).

Overall, the potential impacts in terms of general visitor disturbance to habitats and issues associated with weed and pest movement are of greatest concern on the presently undisturbed true right of the river (the 'proposed trail' option). For this reason, we recommend avoiding the 'proposed trail' and conclude that it is not environmentally feasible. The 'SH94 alternative,' whilst not without its own direct impacts, avoids the key concern of 'opening up' a vast new area to human impacts, and is more likely to be environmentally feasible. Additionally, we find that the 'Divide extension' is not feasible due to likely direct impacts associated with vegetation clearance on steep slopes.

Additionally, whether the cycle trail is constructed as a 2-way route (wider footprint) or a 1-way route changes the quantum of direct habitat loss, but ultimately is immaterial to our conclusions regarding environmental feasibility. The broader implications of the cycle trail proposal are generally of more environmental concern than the precise physical footprint of the trail.

In recommending that the 'proposed trail' section from the Upokororo / Eglinton River mouth to Black Creek (i.e., the section largely on the true right) should be avoided, it should be noted:

- Serious and visible habitat degradation from existing pest impacts (from pigs, Russell lupin, and broom) was revealed during site surveys (e.g., at the regionally significant Deer Flat wetland, the outstanding 'Cryptic Lake' feature, and throughout the true right of the Upokororo / Eglinton River below the gorge). These impacts appear generally unmanaged.
- In light of this, we gave considerable thought to the opportunity to leverage the cycleway proposal to better tackle these existing issues. Certainly, should the 'proposed trail' be built through these areas, this is the logical and pressing need. However, we are ultimately of the view that the existing impacts are reversible and manageable with only modest additional budgets for DOC's biodiversity / pest management, and creation of a new trail with the potential for significant additional impacts is not an appropriate trade off.
- Consideration was also given to whether or not impacts to particular high value ecological features (e.g., the 'Cryptic Lake') could simply be avoided by re-routing the proposed trail away from them. This is possible for some features, such as naturally

uncommon ‘wilderness’ vegetation in the lower river, because the terrain provides scope and because typical visitors may not seek out obscure ‘wilderness’ vegetation as an obvious point of interest. This is less the case for the ‘Cryptic Lake,’ or the kame ‘knobs’ at near Te Huakaue / Knobs Flat, which may well be desirable locations sought out by nearby trail users. In summary, we are not confident that ‘avoiding’ such features will be effective at preventing impacts.

5.4.5.2 Further Investigations

- If the concept is pursued, appropriate measures to offset or compensate adverse effects (that cannot be avoided or minimised as above) will be required; the type and quantum of these measures will be reliant on further ecological assessment along the trail alignment to better determine the values potentially impacted.

5.4.6 Conclusion – Node 3: Walking / Cycling Trail – Te Anau Downs To Ō-Tāpara Cascade Creek

- The Te Anau Downs to Cascade Creek cycling trail concept involves direct habitat impacts over up to c.55-70 km of presently intact ecosystems.
- Another significant effect is the facilitation of indirect effects associated with ‘opening up’ large areas of the true right of the Upokororo / Eglinton River catchment to anthropogenic impacts including fauna disturbance and weed introduction / spread.

Based on these impacts, the ‘proposed trail’ is likely to result in significant adverse impacts that are very unlikely to be able to be managed to an appropriate level. On this basis, we conclude that the ‘proposed trail’ is not technically feasible from an environmental impact perspective.

The ‘SH94 alternative,’ whilst not without its own direct impacts, avoids the key concern of ‘opening up’ a large new area to human impacts, and is more likely to be technically feasible.

Additionally, we find that the ‘Divide extension’ is not technically feasible due to likely direct impacts associated primarily with vegetation clearance on steep slopes, as well as habitat loss and fragmentation in a key fauna feeding area.

If any of the options are pursued, substantial measures to offset or compensate adverse effects (that cannot be avoided or minimised as above) will be required.

5.5 Node 4: Ō-Tāpara Cascade Creek

5.5.1 Masterplan Concept / Proposal

The proposed development within this node is broadly split into two areas; the southern shore of Ō-Tāpara / Lake Gunn, and an existing campsite at Cascade Creek. The node is located at the end of the walking and cycling trail between the Upokororo / Eglinton Valley and Cascade Creek and accessed as part of the hop on / hop off bus service.

The proposal includes a small level of development within the footprint of the existing campsite to upgrade the campsite grounds and facilities. This will include the formalised designation of campervan and camping sites, construction of shelters, and toilet facilities, and the construction of a stop bank for flood protection from Cascade Creek. Campervan and camping sites will be formed and improved through the planting of native vegetation within the campsite, to soften and screen the sites. The campsite will also become a base for recreational opportunities at Ō-Tāpara / Lake Gunn, including walking, packrafting, and kayaking, and will provide jetties, boat storage and Wi-Fi to facilitate these activities. The Gunn Lake Nature Walk may be used to provide access to Ō-Tāpara / Lake Gunn for kayakers and pack rafters. As part of flood protection from Cascade Creek, the Masterplan proposes a stop bank extending the length of the campsite on the true right of the creek, and partially extending north-east along Upokororo / Eglinton River West Branch.

Figure 15. Node 4 – Ō-Tāpara Cascade Creek.

5.5.2 Existing Visitor Facilities / Infrastructure

There is an existing campground with approximately 120 sites, a gravel access road and vehicle parking, along with toilets and shelter facilities. The existing Lake Gunn Nature Walk track is located directly north of the campground under the forested canopy between the campground and Ō-Tāpara / Lake Gunn. The Milford Road Alliance operate a large gravel stockpile on the true right of Upokororo / Eglinton River with material extracted from an unnamed ephemeral waterway draining Melita Peak.

5.5.3 Description of the Existing Ecological Environment

Figure 16. Cascade Creek campground, with Upokororo / Eglinton River draining Ō-Tāpara / Lake Gunn at left and Cascade Creek at right. Part of a gravel extraction / stockpile area is visible lower left.

The Node 4 – Ō-Tāpara Cascade Creek[33] area comprises a substantial footprint of cleared gravel and exotic grassland camping areas, river / floodplain habitat and an area of tall **tawai** / silver beech and red beech forest located between Ō-Tāpara / Lake Gunn and the Cascade Creek campground. Ō-Tāpara / Lake Gunn is surrounded by intact sequences of lake edge vegetation from turf to forest.

Vegetation

Existing campground areas have been cleared and gravelled, creating bunds and narrow areas of recent plantings. This area is highly modified and of little ecological value.

[33] Kā Huru Manu (https://kahurumanu.co.nz/atlas) recognizes Ō-Tāpara as the traditional name for Lake Gunn.

Forest edges and shrublands along the Upokororo / Eglinton River at the immediate margins of the campground are more intact. Immediately adjacent to the developed campground, to the south, a grassland terrace largely comprises exotic grass and Russell lupin. Some areas of more representative and higher value short tussock grassland species remain, including indigenous mosses, herbs, ferns, and sedges. Russell lupin are a significant weed problem; this noxious weed is extensive along Cascade Creek and along downstream river edges and terraces of the Upokororo / Eglinton River, Near the campsite, occasional fruit trees are establishing, presumably from discarded food, and isolated gorse bushes are present. A patch of raspberry (or similar) is located on the eastern side of SH94 just south of the creek, in an area where accommodation huts were present some decades ago.

The **tawai** / silver beech and red beech forest between the campground and Ō-Tāpara / Lake Gunn is highly intact, and an excellent example of alluvial forest. Near Ō-Tāpara / Lake Gunn, it is more diverse, with pōkākā, **miro**, tōtara kotukutuku / Hall's tōtara, **horoeka** / lancewood, and **tawai** / mountain beech. Ō-Tāpara / Lake Gunn supports intact sequences of lake edge vegetation ranging from diverse lacustrine turfs / herbfields to fringing tussocks and shrubs (including **mānuka** and tree daisy species), to forest. The forest includes healthy populations of mistletoe species.

Terrestrial Fauna

The Node 4 area contains a variety of fauna habitats due to the mosaic of tall forest, braided river / floodplain, riparian forest, and lake habitats. Tall old trees provide ideal habitat for cavity-nesting bird species, with **kākā** and yellow-crowned **kākāriki** heard during a brief field survey and **mohua** also known from the area. Numerous other forest bird species are permanently or seasonally present, and **kea** and **kōwhiowhio** are occasional visitors to the area (C. O'Donnell *pers. comm.* 2023). The grassy terraces encompassing the Node 4 area provide foraging habitat for **tarapirohe**. A large wetland area opposite the campground provides suitable habitat for a range of wetland birds, with recent records of **mātā** / fernbird from the wetland area. Western **weka** opportunistically scavenge for food in the existing campground area; the modified campground area itself does not otherwise provide bird habitat of note.

The forest and forest edge habitat in the Node 4 area is highly suitable bat habitat, with pekapeka / long-tailed and lesser short-tailed bat roosts known from the area. Grassland areas provide likely habitat for southern grass skink, and forest areas potentially support gecko species.

Creeping pōhuehue and indigenous tussocks throughout grasslands on river terrace areas are likely to support indigenous lepidoptera (moths and butterflies), although these areas are generally modified by exotic grasses and herbs and habitat quality does not appear to be high. No desktop information about indigenous terrestrial invertebrate values was found for the area.

Freshwater Habitats and Fauna

The 4th order Upokororo / Eglinton River West Branch (a major river fed by numerous subalpine and alpine river tributaries) and the 3rd order Cascade Creek (fed by rainfall and snowmelt from the eastern Livingstone Mountain range) are both perennial braided rivers. The confluence of these two rivers is at the southern edge of the existing Cascade Creek Campground in the Node 4 - Cascade Creek area. The existing Lake Gunn Nature Walk follows the true right of Upokororo / Eglinton River between the campground and outlet and various loop options are available either along the lake edge or through the forest. There is a road bridge across Cascade Creek at SH94 and across Upokororo / Eglinton River at the western edge of the campground. There are no artificial structures in the Node 4 area that would limit upstream fish passage or ecological connectivity.

There is a habitat transition in Upokororo / Eglinton River from under the forested canopy near Ō-Tāpara / Lake Gunn outlet where there is a riffle-run-pool sequence with meanders (and associated substrate size transition from large cobbles to smaller gravel substrates near the lake outlet), to a predominantly riffle-fast run habitat with a substantial area of didymo near the gravel extraction area across Upokororo / Eglinton River from the campground (see Figure 16).

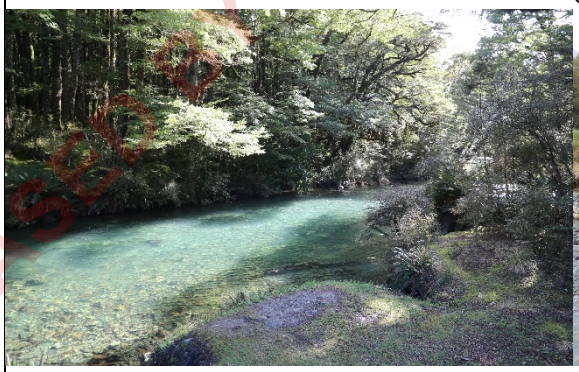
Except at the campground, the Cascade Creek riparian area is forested. Both rivers are likely suitable habitats for sensitive macroinvertebrate taxa that are tolerant of faster flows, such as some species of stoneflies, grazing mayflies, cased caddisflies, and riffle beetles. There is a record of kōaro (historic) in Cascade Creek. The fast rapids in the creek likely provide kōaro habitat and there is suitable spawning habitat at the forested margins. Rainbow and brown trout have been recorded in both Cascade Creek and Upokororo / Eglinton River, and indeed the area is an extremely popular sports fishery. There are also historic records of common bully, kōaro, and longfin eel in Upokororo / Eglinton River near Ō-Tāpara / Lake Gunn outlet.

Overall

The overall Node 4 – Cascade Creek area supports very high value forest and lake edge habitats. Grassland habitats adjacent to the campground are of lower value but provide foraging habitat for bird species (including a few key taonga species) and potentially skinks. The campground footprint itself is highly modified and not of importance for flora or fauna.

Cascade Creek campground.

Upokororo / Eglinton River at the outlet of Ō-Tāpara / Lake Gunn.



Upokororo / Eglinton River at the northern edge of Cascade Creek campground below the outlet from Ō-Tāpara / Lake Gunn.

Cascade Creek at the SH94 bridge crossing.

Grassland with indigenous shrubs on a low terrace / occasional floodplain on the true right of Cascade Creek.

Existing walking track to Ō-Tāpara / Lake Gunn from Cascade Creek campground.

Large **tawai** / red beech tree near the lake edge.

Lake edge vegetation at the head of the Upokororo / Eglinton River at Ō-Tāpara / Lake Gunn.

Yellow mistletoe on the lake edge.

Shrubs form a largely continuous riparian margin to the Upokororo / Eglinton River above the gravel pit bridge.

Figure 17. Additional Node 4 photos at the Ō-Tāpara Cascade Creek area.

5.5.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at Node 4 – Ō-Tāpara Cascade Creek that need to be considered are listed below:

- A key effect of the proposal is vegetation clearance and ongoing modification to habitat resulting from the construction of a jetty structure (or jetties) in Ō-Tāpara / Lake Gunn, which is currently absent of any existing structures / modifications[34].

[34] There were previously jetties elsewhere in Lake Gunn, which serviced a tourist walk to Melita Falls. They were removed sometime around the late 1980s, and the Melita Falls track is disused.

- Any jetty may possibly have to extend a long way into Ō-Tāpara / Lake Gunn, especially if it is intended to enable motorised watercraft[35] mooring (we note the Masterplan refers only to kayaks, but it is unclear why kayak launching would require a jetty) given the shallow water depth (c.1 m deep for >20 m from lakeshore). Construction of a jetty is likely to require substantial works within Ō-Tāpara / Lake Gunn's freshwater habitat.
- In addition to direct loss, there would be ongoing / indirect effects to fragile lacustrine turf and other lake edge / lake bed vegetation from foot traffic, damage from boat hulls being dragged across the lakebed and shore, and damage from boats powering up close to shore when landing).
- Proposed boat sheds or similar structures at the Ō-Tāpara / Lake Gunn edge are likely to require clearance of lake shore scrub or forest of very high ecological value, with the size and specification of these works currently unknown. It is conceivable that such works would result in the loss of large canopy trees that may have At Risk mistletoe species and / or provide habitat for fauna including mohua, **kākā**, and pekapeka / bat species.
- Vegetation clearance at the lake edge is likely to have magnified impact due to 'edge effects' whereby wind or wave damage etc. can impact areas deeper into the forest due to the loss of protective vegetation cover.
- Overall, construction of a jetty would enable a substantial change in the scale and intensity of use of Ō-Tāpara / Lake Gunn, including increased visitor numbers and associated impacts (fauna disturbance and lake shore damage).

- An additional effect of the proposal is potential for introduction and / or spread of new freshwater (plant and animal) pests to Ō-Tāpara / Lake Gunn. While this is an existing risk, it would be magnified by increased use and by construction works.
- An additional effect of the proposal is the potential for runoff of fine sediment to Upokororo / Eglinton River or Ō-Tāpara / Lake Gunn from any track upgrade or jetty construction works. New impermeable / semi-permeable track surfaces surface may convey water (and provide a new pathway to convey sediment into Ō-Tāpara / Lake Gunn) during rainfall events since existing bare earth areas near the lake are minimal.
- An additional effect of the proposal is potential further vegetation loss due to campground and walking track upgrades, but this may be able to be avoided. The proposed campground upgrades appear to be contained within the large existing cleared gravel / modified areas and are unlikely to require any further indigenous vegetation clearance. Likewise, any upgrade of existing tracks in the immediate area is likely to have limited effects, as they are already constructed to a very high standard. The open nature of the forest means that no canopy tree clearance ought to be necessary.
- An additional effect of the proposal relates to earthworks and vegetation clearance to construct a stop bank for flood protection alongside the true right of Ō-Tāpara Cascade Creek. The footprint (location and extent) of flood protection works is uncertain, but if this extends upstream of the campsite it is likely that this would require the clearance of

[35] To our knowledge, motorised watercraft seldom use the lake at present, but recreational use of motorboats is permitted in the Fiordland National Park Management Plan, and they can be readily launched from the north end of the lake. While MOP does not intend for the proposal to facilitate increased motorised boat use on the lake (T Hopkins, *pers. comm*. 2023), we have precautionarily considered that motored craft are likely to use infrastructure if provided, potentially leading to unintended consequences of the proposed jetty / lake shore developments.

riparian trees including trees providing habitat for hole-nesting bird species. Depending on its location, construction of any stopbank may result in runoff of fine sediment into the creek during the construction phase and may require operation of machinery near the creek. The stop bank (again, depending on alignment) may also disrupt the natural meander of the creek channel and natural flood processes (including the ability of Cascade Creek to re-work its floodplain and adjacent terraces), which whilst unlikely to be a substantial effect may alter velocities within the channel particularly during high-flow events.

- An additional effect of the proposal is the potential to disturb kōaro spawning habitat if areas of riparian margin vegetation is cleared. However, the degree / type of clearance is yet unknown, and disturbance to kōaro spawning habitat would only be likely if there was substantive riparian vegetation clearance at the immediate river or lake margin. As such, it appears the proposed works could easily be designed to avoid areas of likely kōaro spawning habitat.
- We have considered the possibility for increased anthropogenic disturbance to braided river and wetland bird species in the vicinity of the campsite. However, this issue likely already exists. Although the proposal appears likely to increase overall usage of the area, it is already very busy for prolonged summer periods, and we do not consider that the proposal would markedly increase the scale and intensity of this existing effect.

5.5.5 Recommendations

5.5.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 5. Effects management measures recommended for Node 4 – Ō-Tāpara Cascade Creek.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Vegetation clearance / loss of habitat in campsite area and on walking tracks	Avoid	Avoid new clearance of indigenous vegetation in forest and river terrace areas by confining all track upgrades, campground upgrades, and flood protection works to areas where existing habitats have already been cleared. The stop bank should be constructed within this existing cleared area rather than encroaching further into the Cascade Creek floodplain / adjacent terraces / riparian shrubland / forest. This would minimise impacts to natural river processes and minimise loss of grassland / floodplain foraging habitat for **tarapirohe** and other fauna.
Loss of canopy trees providing fauna habitat	Avoid	Large / canopy tree clearance should be avoided fully. If this cannot be avoided, a survey for nesting birds (forest - **kākā**, **mohua**, **kākāriki**) and bat roosts should be undertaken (and suitable mitigation actions implemented) prior to clearance of any trees that may provide nesting / roosting habitat.
Impacts to Ō-Tāpara / Lake Gunn especially	Avoid	It is recommended that provision of a jetty is avoided, and that the provision of structures (boat storage etc.) at or near the lake edge is reconsidered or limited only to small (ideally mobile / relocatable) structures that can be accommodated

lake edge and lakebed habitats		within existing forest gaps (i.e., fully avoiding canopy tree clearance). If the masterplan proposal is pursued, it will be necessary to minimise the impacts of jetty construction (etc.) by confining the scale and scope of works to enable e.g., kayak use only (not motorised craft). Whilst visitors that bring their own watercraft (packrafts etc.) are already broadly able to launch and land at any point of the shore (given the area is a publicly accessible National Park), any service offering kayak rental etc. should require visitors (e.g., under conditions of DOC concessions) to use a limited number of launching and landing locations to minimise more widespread visitor impacts. This should also include check, clean, dry practices to reduce spread of freshwater pests. Any boatshed should be built within existing forest gaps and if this is not possible then the provision of a boatshed should be reconsidered; clearance of canopy trees would represent a substantial ecological impact that is difficult to justify for a new visitor amenity of this nature. Refinement of the design and construction of any new permanent river crossings or structures within the water (particularly any jetty, if this is not avoided) should minimise disturbance / piling in the river / lakebed, and to surrounding habitats as much as practicable. The construction methodology for any jetty and any other structures should include input from a specialist freshwater ecologist to minimise (and avoid where possible) adverse effects to the lakebed and habitat.
Introduction of freshwater pests	Avoid / Mitigate	The 'clean, check, dry' practices need to be strictly adhered to when undertaking construction works in and adjacent to waterbodies.
Adverse effects to freshwater habitats	Avoid / Mitigate	Construction or upgrades to existing facilities should consider proximity to Upokororo / Eglinton River, Cascade Creek, and Ō-Tāpara / Lake Gunn. Care should be taken to minimise erosion and direct sediment runoff during construction, and from any increased impervious surfaces and increased visitor vehicle traffic (i.e., by allowing a vegetated buffers to remain between hardstand and the adjacent river / lake). Any vegetation clearance within riparian areas should be avoided as much as practicable to help protect waterways from sediment runoff. The construction or upgrading of facilities should be located with a buffer (ideally 10s of metres) between Upokororo / Eglinton River or Cascade Creek and any of these works. Refinement of the construction methodology for any construction or upgrades to facilities and the Cascade Creek stopbank should include input from a specialist freshwater ecologist to determine the appropriate management for any proposed construction activity in, or in close proximity to the rivers or lake (e.g., erosion and sediment controls, avoidance / minimisation of work and machinery in the water).

5.5.5.2 Further Investigations

- If works with the potential to cause lizard injury or mortality are likely to occur in grassland areas that provide suitable lizard habitat, further investigations to determine which if any species are present and / or lizard management (salvage during construction) will be required.

5.5.6 Conclusion – Node 4 Ō-Tāpara Cascade Creek

- Node 4 is located at an intersection of three waterbodies with high value habitats and intact riparian forest near the outlet and margins of Ō-Tāpara / Lake Gunn. Impacts to Ō-Tāpara / Lake Gunn (including lacustrine vegetation and lake edge forest) due to proposed boat launching facilities and associated increased levels of anthropogenic disturbance are difficult to predict but are potentially significantly adverse.
- Provision of some visitor amenities (e.g., a jetty, boat shed) likely to cause greatest direct and indirect impacts should be reconsidered.
- Works within the immediate campground area and existing tracks, including stop bank construction (depending on location), are unlikely to be of ecological concern.

Therefore, while some aspects of the Masterplan proposal are largely benign when considered against existing use and, overall, the concept is largely feasible, some aspects, such as a jetty and boat storage at Ō-Tāpara / Lake Gunn, are not considered environmentally appropriate.

5.6 Node 4: Overnight Walk – Countess Range (Alternative Proposal)

5.6.1 Masterplan Concept / Proposal

The Masterplan proposes an overnight walk in Mistake Creek near the western head of the Eglinton Valley in the Earl Mountains. Following discussions with New Zealand Alpine Club (Inc.), MOP is investigating an alternative overnight walk lower on the east side of the Eglinton Valley on the Countess Range. It will be accessed from SH94 near Walker Creek and Mackay Creek Campsites, with the indicative location for a carpark being an open area east of SH94 in the vicinity of 30 Mile Creek (T Hopkins, *pers*. *comm*. 2023). The alternative proposal is a tramping track that will follow both the Walker Creek and Mackay Creek valleys to the treeline before traversing the upper slopes of the Countess Range. A hut is also proposed on the upper slopes of the Countess Range to provide accommodation for walkers. This would either be a serviced <20 bunk hut accessed via a c.11 km 'Tramping Track' standard (advanced, no minimum width, unformed surface) track, or a <44 bunk hut accessed via a c.12 km 'Easy Tramping Track' standard track.

Figure 18. Node 4 Overnight Walk – Countess Range – carpark.

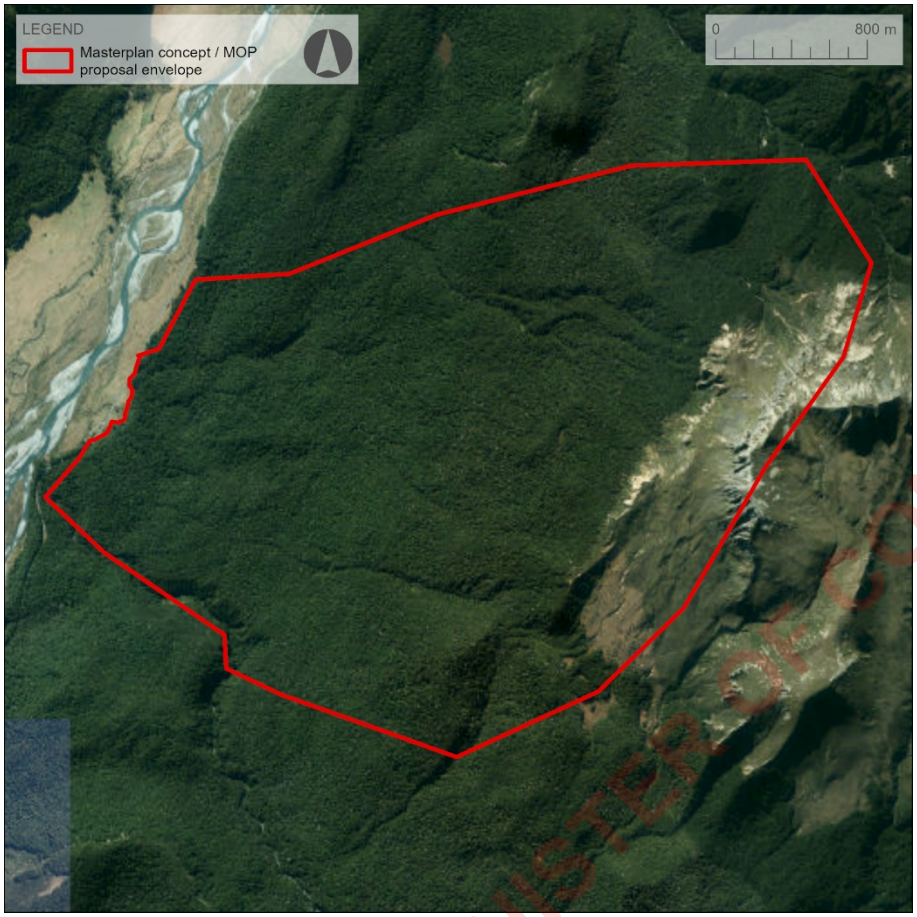


Figure 19. Node 4 Overnight Walk – Countess Range – track overview.

5.6.2 Existing Visitor Facilities / Infrastructure

There is an existing unpowered campsite with a gravelled access road (and an additional trout fishing access road) on the western side of SH94 between the highway and Upokororo / Eglinton River ('Walker Creek Campsite'). The Boyd Creek track provides access to the Countess Range some distance south of the proposed new track, but there are otherwise no walking tracks in the area.

5.6.3 Description of the Existing Ecological Environment

Figure 20. Ledge system where the proposed hut would be located, above a band of orange sandstone / mudstone bluffs.

The Node 4 Overnight Walk – Countess Range comprises **tawai** / beech forest, alpine areas and a broad ledge system on the western slopes of the Countess Range above the Upokororo / Eglinton River. During this study a proposed carpark area was surveyed, and the proposed hut location was visited briefly via helicopter. No ecological site investigations have been undertaken along the walking track alignment.

Vegetation

The proposed carpark area to the east of SH94 comprises a grassland / sedgeland with scattered pockets of trees, shrubs, indigenous vine species, and ferns. The area has been recently disturbed by a stream blowout, with gravels spread widely and areas of smothered vegetation. Based on the abundance of rautahi sedges, essentially the entire proposed carpark (open areas in the vicinity of 30 Mile Creek) is a wetland in terms of the national Wetland Delineation Protocols (Ministry for the Environment, 2022). It is a palustrine rautahi grassland / sedgeland marsh, with pockets of purei tussockland swamp. Whilst being a wetland, the grassland / sedgeland area is of relatively low value, with exotic grass and herb species providing substantial cover, and little cover or diversity of indigenous wetland species other than a sward of rautahi.

From the proposed carpark, the indicative track alignment would primarily pass through intact **tawai** / red and silver beech forest with very high vegetation and habitat values. Walker Creek includes areas of tall stature **tawai** / red beech forest on terraces.

Above the bush line, on the ledge system where the proposed hut would be located, alpine shrubland blends into tussockland interspersed with alpine shrubland, wetland, and boulderfield habitat. All of these vegetation types are generally unmodified and appear to provide typical habitat comprising generally widespread and common alpine vegetation types. Sandstone /

mudstone bluffs and outcroppings (Boyd Creek formation) in bands both above and below the proposed hut occur against a backdrop of more typical gneissic / granitic rocks in the surrounds; this somewhat unusual geology may mean these areas provide localised distinct habitats and vegetation.

Terrestrial Fauna

The proposed carpark area provides general forest edge feeding habitat for long-tailed bat, but is not otherwise a notable terrestrial fauna habitat. The tall **tawai** / beech forest provides core roosting habitat for long-tailed bat, with Walker Creek an important monitoring area for this species. Forests in the Walker Creek area also provide habitat for various Threatened and At Risk indigenous bird species, such as **kākā**[36] and yellow-crowned **kākāriki**. Alpine areas (especially boulderfields near the proposed hut) may provide suitable habitat for pīwauwau / rock wren (DOC experts have advised that no records are available, but also that no surveys for pīwauwau / rock wren are likely to have occurred in the area; K Weston, *pers. comm.* 2023). **Kea** are present in the Countess Range (J. McAulay, *pers. comm*. 2023), but are more often found in upper and western areas of the Eglinton than lower eastern areas.

Above the treeline, grasslands and rocky alpine areas provide habitat for indigenous lizards, with a potential record of Eyres skink (At Risk - Declining) in boulderfield habitat on a nearby part of the Countess Range. Forest areas support indigenous gecko species, with a nearby record of korero gecko[37] (At Risk – Declining). The proposed carpark area contains suitable habitat for southern grass skink.

Forests and alpine shrublands / tussocklands are likely to support diverse and intact invertebrate communities.

Freshwater Habitats and Fauna

SH94 crosses Walker Creek immediately south of the Walker Creek campsite and upstream of its confluence with Upokororo / Eglinton River. Walker Creek is a perennial 3rd order river, fed by multiple tributaries in the alpine and subalpine area that drain the southwestern slopes of the Countess Range. 30 Mile Creek (unnamed on topomaps) bisects the proposed carpark area, and merges with Walker Creek immediately prior to its discharge to Upokororo / Eglinton River. Near SH94 the riparian margins of 30 Mile Creek are surrounded by grasses, ferns, and shrubs with some areas where the bank is slumping into the creek. As noted above, upstream (east) of SH94 areas of recent blowout / overland flow are evident at bush edges; further upstream the creek is fully surrounded by forest.

There are records of kōaro within Walker Creek (as well brown and rainbow trout), and records of tuna / longfin eel and southern flathead galaxias from tributaries of the Upokororo / Eglinton River within the Node 4 area. 30 Mile Creek has a predominantly fast run, cobble bottomed habitat with some sections with fine sediments and is likely to provide suitable habitat for multiple sensitive macroinvertebrates (especially those tolerant of faster flows), such as some species of stoneflies, grazing mayflies, cased caddisflies, and riffle beetles.

Overall

The proposed Countess Range walking track would traverse presently unmodified and intact indigenous habitats, including an area of tall **tawai** / red beech forest used for monitoring of an important population of pekapeka / long-tailed bat. Alpine vegetation is also intact, but fauna values are generally unknown and may include rare lizard species and pīwauwau / rock wren.

[36] Walker Creek is the approximate southern limit of **kākā** in the Eglinton area (T Greene, *pers. comm.* 2023).

[37] Korero gecko are taxonomically unresolved, with the species in the area being either *Woodworthia* "Otago/Southland large" or *Woodworthia* "southwestern" (https://nztcs.org.nz/assessments/123957; accessed 24 November 2023).

The proposed carpark area east of SH94 comprises wetland habitat that appears to be modified by disturbance from stream overflow events from 30 Mile Creek.

30 Mile Creek in the vicinity of the Walker Creek campground and a proposed carpark for a walking track.

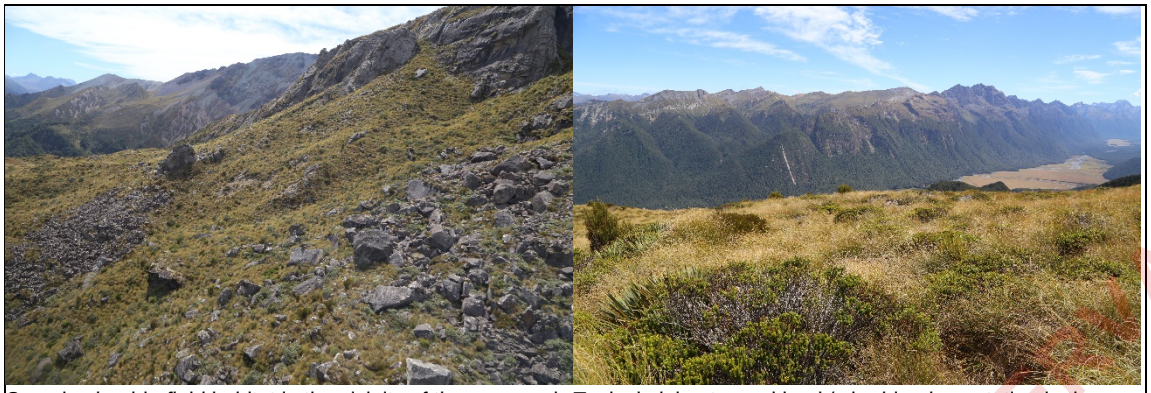
Tawai / red beech forest adjacent to the proposed track start.

30 Mile Creek at SH94 (concrete box culvert).

Area of sedgeland / grassland with recent stream blowout in proposed carpark area.

The ridge / ledge currently proposed for the new track, with Te Ana-au / Lake Te Anau behind.

SH94 and 30 Mile Creek in the vicinity of the Walker Creek campground and a proposed carpark for a Countess Range walking track.



Complex boulderfield habitat in the vicinity of the proposed hut site appears suitable for pīwauwau / rock wren.

Typical alpine tussockland / shrubland vegetation in the vicinity of the proposed hut site, looking northwest.

Figure 21: Additional Node 4 photos for Countess Range overnight walk option taken near Walker Creek, and on a reconnaissance trip by MOP to the Countess Range by helicopter.

5.6.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at the Node 4 - Countess Range overnight walk option are:

- A key effect of the proposal is vegetation clearance. The construction of the overnight walk and hut will require vegetation clearance along the track corridor and at the hut site. The amount of vegetation clearance for the alignment of the overnight walking tracks up the Countess Range is dependent on the proposed track standard, which is yet to be confirmed. The indicative c.11-12 km long loop track route follows the margins of Walker Creek for just over a kilometre before cutting up a slope to a ridge running parallel along the base of a series of bluffs. The track would then drop back down into the forest and sidle back almost to the start, crossing 2-3 streams. If the track is constructed to 'Easy Tramping Track' standard, these may require bridges (and bridges may in turn require felling canopy trees). When considered against the scale of the surrounding landscape, this vegetation clearance would be negligible, but it nevertheless represents a deliberate choice to impact indigenous habitat. Additional indirect effects to vegetation and habitat may also arise if informal trails proliferate in the vicinity of the hut, especially if trampers informally establish a loop track to the existing Boyd Creek tops track (this is a logical opportunity).
- An additional effect of the proposal relates to the potential that the new track will create new corridors for pest movement, particularly for cats (cats readily use existing tracks especially compared to densely vegetated areas; (Morgan et al., 2009; Recio et al., 2015). This may mean that the proposed new track facilitates predator movement into alpine areas from lowland areas, and vice versa. On the other hand, the track also represents a logical opportunity to establish predator trapping along the track, mitigating this risk potentially to the point of a net gain (depending on control effort).
- An additional potential effect of the proposal is the creation of a new area where kea may habituate to human presence and feeding, and if not managed, the hut could become a kea scrounging site (see Section 5.9.4 for further discussion).
- An additional effect of the proposal may be impacts to pīwauwau / rock wren (if this species is present in alpine areas) and / or indigenous lizard species, such as Eyres skink. The indicative alignment passes alongside an area of complex boulderfield habitat that appears to provide suitable pīwauwau / rock wren and lizard habitat that

appears to be otherwise absent from this part of the Countess Range. This means that the track may facilitate disturbance and could facilitate increased pest access with adverse impacts to these species. On the other hand, the track provides an opportunity to better study fauna in the area, and potential pest impacts are likely manageable with predator control.

- An additional effect of the proposal is carpark construction at the indicative location in an open area east of SH94 in the vicinity of 30 Mile Creek. Carpark construction / expansion in this location may directly affect 30 Mile Creek by increasing the area of impervious surface immediately adjacent to the creek. Whilst the expansion direction and extent is as yet unknown, effects of the impervious surface near the creek include increased flashiness (immediate conveyance of water runoff) from the carpark to the river during rainfall events and an increase in conveyance of vehicle-derived contaminants to the creek during rainfall events.

5.6.5 Recommendations

5.6.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 6. Effects management measures recommended for Node 4 – Overnight Walk – Countess Range.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Vegetation clearance along track alignment	Avoid & Minimise	Minimisation of track length and footprint (width / degree of earthworks) while fully avoiding clearance of canopy trees is the clearest way to minimise effects; in this case a 'Tramping Track' standard track is considered most appropriate. If constructed to 'Easy Tramping Track' standard (i.e., including a wider / formed track), then prior to the resource consenting / approval stage, it is recommended that a walkover of the proposed track alignment is undertaken by a botanist / ecologist in order to provide input into any necessary changes required to avoid higher value localised ecological features, particularly wetlands or mudstone outcrops potentially supporting distinctive vegetation. Impacts to any wetlands within forest and alpine areas should be avoided via the track alignment, or board-walked where this is not practicable. In either case ('Tramping Track' or 'Easy Tramping Track' standard), canopy tree clearance must be avoided, and this is especially important in lower **tawai** / red beech forest areas supporting pekapeka / long-tailed bat.
Loss of wetland extent in carpark area	Avoid & Minimise	Clearance of wetland areas east of SH94[38] in the proposed carpark area can be avoided by using the existing Walker Creek campground to service the walking track. If this is

[38] Whilst outside the scope of survey, it was noted that a hypothetical alternative carpark location (grassland areas east of SH94 but c.400 m north of the proposed carpark at 30 Mile Creek) is likely unsuitable for development, due to the presence of a very large and important population of an At Risk **taramea** / spaniard species, grassland spaniard.

		option is not feasible, the size and footprint of the carpark must be minimised, and suitable remedial / compensation measures to address the loss of a relatively low-quality wetland (and likely skink habitat) will be required.
Adverse effects to kea	Mitigate	Hut construction using **kea**-safe building practices is required. This includes the use of un-perchable roof caps.
Adverse effects to freshwater habitats	Avoid / Mitigate	Refinement of the direction and extent of the proposed carpark expansion, and the construction methodology for any final walking track should include input from a specialist freshwater ecologist to determine the appropriate management for any proposed construction activity in, or in close proximity to Walker, 30 Mile Creek, and the nearby Upokororo / Eglinton River (e.g., proximity of works to waterways, erosion and sediment controls, avoidance / minimise work in the flowing channel). Care should be taken to design the area of carpark expansion to minimise the likelihood of direct rainfall runoff from the sealed carpark to 30 Mile Creek (i.e., where possible by allowing for a vegetated buffer to remain between the carpark and the creek edge). It is possible the southern flathead galaxias is present at this node, which select spawning habitat behind boulders / cobbles in fast-flowing riffles. If any new permanent river crossings are proposed as part of the overnight track, these should be designed to minimise in-stream disturbance and piling, and allow for fish passage (i.e., locate bridge piles outside of the wetted channel footprint).
Increased mobility of predators due to track	Mitigate	Establish and maintain predator control (including for cats) along the track alignment and in the vicinity of the hut. If pīwauwau / rock wren is present, a network / grid of traps to protect their habitat will be required.

5.6.5.2 Further Investigations

- Prior to the resource consenting / approval stage, and once the land area required for the SH94 carpark is known, input from a botanist / wetland ecologist to delineate wetland areas and to avoid and minimise their loss will be needed. This survey should also consider (with additional expertise as necessary) whether the carpark area provides lizard habitat and if so what further impact management measures are required. Based on typical track construction standards for 'Tramping Track' standard tracks, it is not expected that track construction would pose substantial risks to lizards, but 'Easy Tramping Track' standard track construction is more likely to pose a risk.
- Investigate whether pīwauwau / rock wren is present in boulderfield habitats near the proposed hut, and if found to be present seek input from a specialist ornithologist on recommended changes to the proposal, if any, such as re-routing the track alignment to avoid boulderfields.

5.6.6 Conclusion – Node 4 Overnight Walk – Countess Range

- The adverse effects of the proposed Countess Range walking track are limited in physical scale (particularly if a 'Tramping Track' standard track and smaller hut option is chosen) but are magnified by the fact that the proposed hut area provides intact but unknown and likely important fauna habitat, and the track route traverses key pekapeka / bat habitat.
- If built to an 'Easy Tramping Track' standard, not all impacts may be able to be avoided, remedied, or mitigated to acceptable levels, and the proposal may require offset / compensatory measures (see Section 7.0), especially in respect of vegetation clearance and habitat loss.

Adverse effects at Node 4 – Overnight Walk – Countess Range in relation to vegetation clearance, introduction of disturbance to a new area, and potentially increased predator movements, and wetland impacts will need to be carefully avoided and minimised, or otherwise offset / compensated, but are likely to be overall manageable, and the proposal is considered technically feasible from an environmental impact perspective.

5.7 Node 5: Whakatipu Trails Head

5.7.1 Masterplan Concept / Proposal

This proposal involves the expansion and development of the Hinepipiwai / Lake Marian Track carpark within the Hollyford Valley. The trail head will include several tourist amenities and will cater to a variety of visitors. These facilities will include observation points, interpretive displays, track information, shelters, vaulted toilets, car parking, and a hop on / hop off bus stop. In addition, the trail head will act as a base for the more advanced tramps within the Hollyford Valley, connections to The Divide and Hunaiti / Lake Howden, and provide for day walkers wishing to walk the Hinepipiwai / Lake Marian track. The proposed tracks under consideration are as follows (Southern Land Ltd, 2024):

- Upgrade the existing Hinepipiwai / Lake Marian Track – upgrade waterfalls section with gantry from 'Easy Tramping Track' to 'Short Walk' standard (750 m). Existing tracks / structures would be widened to 1.5 m. Upgrade the remainder of the existing track to Hinepipiwai / Lake Marian from 'Tramping Track' to 'Easy Tramping Track' standard (2.4 km).
- Create a new loop track to return from Hinepipiwai / Lake Marian – create loop on true left at 'Easy Tramping Track' standard (3.2 km). Requires a bridge over lower Marian Creek.
- Create a 'Covered Nature Loop' walk in the carpark area at 'Short Walk' / accessible standard (500 m). The proposed track would be roofed and requires a new larger bridge over the Whakatipu-ka-tuku / Hollyford River and a viewing platform. New toilets are already planned for the existing carpark.
- Create a 'Divide Creek Link Track' at 'Easy Tramping Track' standard (2.7 km). Requires bridge over Divide Creek.
- Create a 'Pass Creek Link Track' at 'Easy Tramping Track' standard (3.0 km). A viewing tower is also proposed, and the track requires three short bridges.
- Upgrade the existing Pass Creek Track from 'Tramping Track' to 'Easy Tramping Track' standard (3.2 km). Requires short boardwalk sections.

In addition to the tracks under consideration above, and due to the significance of this node to mana whenua, as part of the Masterplan the Whakatipu Trails Head node will include a wānanga / living classroom. The wānanga space (c.200 m^2) is to be constructed primarily for Ngāi Tahu rangatahi (youth) to learn about the cultural heritage of Ngāi Tahu, with opportunities for a tourism aspect to the structure for visitors to learn about the connection mana whenua have to the area.

The Stage 2 Infrastructure report (Stantec NZ Ltd, 2021) anticipates a 500 m^2 upgrade / expansion of the existing Hinepipiwai / Lake Marian Track carpark area. It also anticipates that visitor facilities at the Trails Head area would require a hydro power scheme, but no details are available, and this aspect of the proposal is not assessed below.

Upgrades to the carpark at the western end of the Routeburn Track (the Divide) are proposed. This includes the addition of a hop on / hop off bus stop and areas for express coaches and short-term vehicle parking. A weather / bus shelter, interpretative displays and toilet facilities would be added or upgraded.

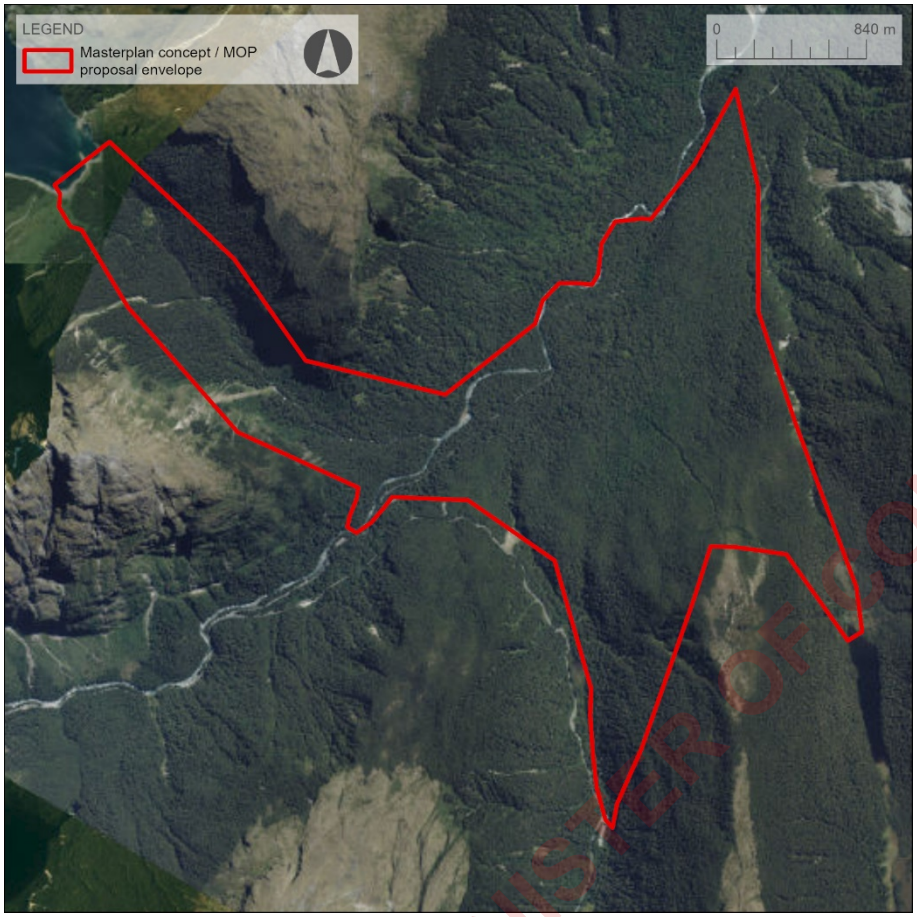


Figure 22. Node 5 – Whakatipu Trails Head.

5.7.2 Existing Visitor Facilities / Infrastructure

There is an existing sealed carpark access from SH94 that provides parking for vehicles and serves as the starting point for the Lake Marian Track and Lake Marian Falls walks, which follow the true right of Marian Creek. This existing walking track includes a footbridge across the perennial Whakatipu-ka-tuku / Hollyford River. There are limited modifications within the broader area with the exception of SH94 and Hollyford Road and associated infrastructure including viewing points and nature walks. The existing carpark was expanded in the past c.5 years by retaining canopy trees but clearing / infilling around them with gravel.

There is an existing carpark at the Divide on the eastern side of SH94 at the western end of the Routeburn Track. The carpark currently contains a large shelter capable of seating at least 30 people, and basic toilet facilities.

5.7.3 Description of the Existing Ecological Environment

Figure 23: Whakatipu-ka-tuku / Hollyford River.

The Node 5 area, including the Hinepipiwai / Lake Marian track carpark and Lake Marian track, comprises **tawai** / silver beech forest fringing an important river habitat for **kōwhiowhio** / blue duck. At the Divide Carpark, tall red, mountain, and **tawai** / silver beech forest surrounds seral forest and an existing carpark.

Vegetation

Tawai / silver beech forest is the dominant vegetation cover in the vicinity of Marian Creek and Whakatipu-ka-tuku / Hollyford River. Vegetation on the immediate riverbanks is clearly frequently affected by flood events and is dominated by moss and lichen. Riparian forest vegetation comprises a fern understory with tall, **tawai** / silver beech forest with numerous podocarps that forms largely uninterrupted habitat on the true left riverbank, and with only the road interrupting habitats on the true right. On the riverbank and adjacent to active stream channels, canopy / mid-canopy species include patē and kotukutuku / tree fuchsia. The existing carpark includes a recently (within the last <5 years) cleared area where canopy **tawai** / beech trees have been partially retained.

At the Divide Carpark, **tawai** / beech forest on the slopes leading to Key Summit gives way to **kōtukutuku** / tree fuchsia-dominated seral forest on the valley floor around lakes, waterways, and generally immediately west of the road. The existing carpark includes a cleared area with scattered retained trees.

Terrestrial Fauna

The Node 5 area in the vicinity of Marian Creek contains a variety of forest and alpine bird species, including **kea**, **kākā**, and yellow-crowned **kākāriki**. Various other forest bird species are present, including **koekoeā** / long-tailed cuckoo (Threatened – Nationally Vulnerable) and **miromiro** / South Island tomtit. However, the most important avifauna value of this specific area

is a population of **kōwhiowhio** / blue duck in the river (the Whakatipu-ka-tuku / Hollyford River is part of the 'Northern Fiordland Security Site' for this species).

Similar bird species (but not **kōwhiowhio**) are present at The Divide. At this location, a key avifauna value is seasonal feeding habitat for **kākā**, which congregate from the surrounding valleys in up to the hundreds when **kōtukutuku** / tree fuchsia flowers in late spring (T. Greene, *pers. comm.* 2023).

Pekapeka / long-tailed bats may be present throughout the Node 5 area, but no recent records (post-2002) were found during this study. No desktop information about indigenous terrestrial lizard[39] or invertebrate values was found for the area.

Freshwater Habitats and Fauna

The 4th order Whakatipu-ka-tuku / Hollyford River is located immediately west of SH94 and Node 5 at the Hinepipiwai / Lake Marian track carpark. The existing Lake Marian Track follows the true right of Marian Creek, which is a 3rd order river that joins with Whakatipu-ka-tuku / Hollyford River c. 450 m downstream of the carpark. Marian Creek itself is fed by a series of tributaries and Lake Marian which sits at 700 m elevation.

Swift riffle-run flows and clean gravel, cobble, and boulder substrates in Whakatipu-ka-tuku / Hollyford River are likely suitable habitats for sensitive macroinvertebrate taxa tolerant of faster flows, such as some species of stoneflies, grazing mayflies, cased caddisflies, and riffle beetles. There are records of kōaro, both upstream near Lake Marian (although relatively historic) and upstream in Whakatipu-ka-tuku / Hollyford River. Whakatipu-ka-tuku / Hollyford River at Lake Marian Carpark Node 5 provides suitable habitat (high-velocity rapids) for kōaro and potential kōaro spawning habitat in the forested margins.

Overall

The overall Node 5 – Whakatipu Trails Head area supports highly intact and very high value vegetation and freshwater habitats, despite recent expansion of a substantial carpark. Likewise, the Divide carpark is surrounded by intact indigenous vegetation, providing important **kākā** feeding habitat.

View of the Lake Marian carpark and proposed location of the Whakatipu Trails Head.

Likely undescribed spider orchid species growing on the riverbank.

[39] Whilst a database record exists of barrier skink in forest nearby, this 1960s record is inaccurate. It refers to Students Peak, far from the Node 5 area.

Upstream view of Whakatipu-ka-tuku / Hollyford River from the suspension bridge.

Suspension bridge over Whakatipu-ka-tuku / Hollyford River at the start of the Lake Marian Track.

The Divide carpark.

Marian Creek near the existing viewing gantry.

Figure 24: Additional Node 5 - Whakatipu Trails Head photos.

5.7.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at Node 5 – Whakatipu Trails Head that need to be considered are listed below:

- A key effect of the proposal is vegetation clearance. Approximately 16 km of new and upgraded tracks are proposed. While these will be built to varying standards, most are to 'Easy Tramping Track' standard (requiring vegetation clearance and surface formation, compared to 'Tramping Track' standard) and short sections would be accessible 'Short Walk' standard. For higher standard tracks (especially in steep areas) and to approach bridges, canopy tree clearance (and clearance of branches overhanging the covered walkway) will be required, and understory forest clearance may be substantial in the local context. The expansion of the Hinepipiwai / Lake Marian Track carpark and associated facilities may require further canopy and understory clearance. Whilst recent carpark expansions have occurred without clearing some large trees, we note that the trees left behind now have little chance to regenerate naturally and the carpark will eventually lack a canopy (once the remaining trees reach their end of life).
- Whilst direct adverse effects to **kōwhiowhio** are unlikely, the sheer number of tracks (and associated visitor presence) in the Node 5 area will likely increase human disturbance and make the riverbanks in the immediate carpark / nature loop vicinity less attractive as nesting habitat.

- If all proposed tracks are built, it is likely that local cumulative effects in terms of vegetation clearance and fauna disturbance would arise from the network of built tracks and reduction in undisturbed forest and waterway habitats in the 'triangle' between Divide Creek, Pass Creek, and Marian Creek.
- At The Divide, if there is any expansion of the existing carpark area (as part of proposed facility upgrades) this would result in further loss of a seasonally important **kākā** feeding habitat, as well as habitat for other indigenous fauna species.
- An additional effect of the proposals is a possible 500 m^2 increase in the area of carparking at the Hinepipiwai / Lake Marian track carpark. This expansion would increase the area of impervious surface immediately adjacent to Whakatipu-ka-tuku / Hollyford River. Potential effects of the impervious surface near the river include increased localised flashiness (immediate conveyance of water runoff) from the carpark to the river during rainfall events and an increase in conveyance of contaminants from parked vehicles into the river during rainfall.

5.7.5 Recommendations

5.7.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 7. Effects management measures recommended for Node 5 – Whakatipu Trails Head.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Vegetation clearance along proposed / upgraded tracks' alignments	Avoid & Minimise	Track construction is a deliberate choice to impact ecologically valuable and intact habitat. Minimisation of track length and footprint (width / degree of earthworks) while fully avoiding clearance of canopy trees is the clearest way to minimise effects. At present, the proposal contemplates numerous tracks with apparent duplication in terms of visitor offering. The proposal should be scaled back, with the most obvious options being to: - Avoid creating a loop track to Hinepipiwai / Lake Marian (saving substantial vegetation clearance and a new bridge, for no real change in the visitor offering); upgrading the existing track would have substantially less impact; - Consider either the Divide Creek Link Track **or** the Pass Creek Link and Pass Creek Track upgrade, but not both; and - Avoid construction of a covered walkway within forest habitat (due to likely ongoing tree / branch clearance requirements).
Vegetation clearance in Hinepipiwai / Lake Marian carpark area	Avoid & Minimise	Avoid further forest clearance or otherwise minimise loss of canopy trees during construction of the Hinepipiwai / Lake Marian carpark expansion and associated visitor facilities. If this cannot be avoided in the context of the proposal, any

		impacts to canopy **tawai** / beech trees will need to be accompanied by suitable protocols to avoid impacts (injury / mortality) to pekapeka / long-tailed bat and cavity-nesting birds, which may be present. In addition, suitable measures to offset / compensate loss of forest / bat habitat will likely be required, with general opportunities (e.g., landscape-scale pest control) discussed in Section 7.0.
Vegetation clearance in The Divide carpark area	Avoid	Any expansion of the existing carpark at The Divide (as part of redevelopment) should be avoided, to avoid vegetation clearance and loss of important **kākā** feeding habitat. The proposed redevelopment of the carpark should instead consolidate (reduce) hardstand / cleared areas, enabling expansion of **kotukutuku** / tree fuchsia and other seral tree species.
Adverse effects to freshwater habitats	Avoid / Mitigate	Refinement of the alignment of any final walking track(s) (as above) should consider proximity to Whakatipu-ka-tuku / Hollyford River and other waterways. Care should be taken to select a pathway location that minimises riparian vegetation clearance, erosion, and direct sediment runoff from the proposed new tracks and increased visitor foot traffic. Proposed construction of a new, wider bridge over the river (and other bridges e.g., over lower Marian Creek) may make some of these impacts inevitable and not able to be avoided, remedied, or mitigated. Redevelopment / expansion of the Lake Marian carpark should consider proximity to Whakatipu-ka-tuku / Hollyford River and other waterways. Care should be taken to design any area of carpark expansion to minimise the likelihood of direct rainfall runoff from the carpark to Whakatipu-ka-tuku / Hollyford River (i.e., by allowing for a vegetated buffer to remain between the carpark and the river edge). Refinement of the construction methodology for any final walking track(s) or sealed carpark expansion should include input from a specialist freshwater ecologist to determine the appropriate management for any proposed construction activity in, or in close proximity to Whakatipu-ka-tuku / Hollyford River (e.g., erosion and sediment controls, avoidance / minimise work in the flowing channel). New permanent river / stream crossings should be designed to avoid in-stream disturbance and piling and allow for appropriate fish passage.

5.7.5.2 Further Investigations

- Further assessment and recommendations are likely to apply, dependent on further refinement of the Masterplan concept, in particular the scale of buildings proposed and associated infrastructure requirements, such as a hydro scheme.

5.7.6 Conclusion – Node 5 Whakatipu Trails Head

- Known impacts of the Masterplan concepts include works within intact forest areas to create new tracks (including highly accessible track presumably with a relatively large

built footprint). Because the proposals are generally ‘Short Walk’ or ‘Easy Tramping Track’ tracks (i.e., generally high built standard), substantial vegetation clearance will be required if all tracks are constructed. There is duplication in the proposed tracks and the proposal should be consolidated.

- Expansion of the existing carpark footprint at The Divide is not supported, due to surrounding habitat values; and the site would better be consolidated.
- Expansion of the existing carpark footprint at Marian Creek should avoid further loss of canopy trees. If this is not possible, remedial, or offset / compensation measures will be required.
- Even if the proposed tracks are consolidated, not all impacts may be able to be avoided, remedied, or mitigated, and the proposals at Node 5 are likely to require offset / compensatory measures (see Section 7.0), especially in respect of vegetation clearance and habitat loss.

Adverse effects from proposed developments at Node 5 Whakatipu Trails Head in relation to vegetation clearance need to be minimised and residual effects should otherwise be offset / compensated. Local cumulative effects are possible if all proposed tracks are built. If consolidated to a smaller selection of new / upgraded tracks as outlined above, the proposal is likely to be environmentally feasible.

5.8 Node 5: Key Summit to Ō-Tāpara Cascade Creek

5.8.1 Masterplan Concept / Proposal

The proposed Key Summit to Cascade Creek track was not detailed in the Masterplan but was instead indicated generally in a conceptual diagram in the Masterplan. It is understood to include a 1-day walking route accessed from the Divide and / or Whakatipu Trails Head. A new track would be built from Key Summit along the ridge to Cascade Creek; it would be either a c.19 km 'Easy Tramping Track' standard track or a c.17 km 'Tramping Track' standard track. To construct to 'Easy Tramping Track' standard, "considerable" amounts of benching (i.e., intensive machine-built track formation / earthworks, over c.2.5 km) and two footbridges would be required in the Cascade Creek area (Southern Land Ltd, 2024). A new toilet somewhere along the route would likely be required. A 'Tramping Track' standard track would require two three wire bridges over Cascade Creek.

An additional option under consideration as part of MOP Stage 3 is an alternative c.8.5 km 'Easy Tramping Track' standard 'short loop' from Key Summit south to Pt. 1086 (as on Topo50 maps) that then descends to The Divide, creating a loop. The 'short loop' is considered in the Walking & Cycling Experiences Feasibility report (Southern Land Ltd, 2024).

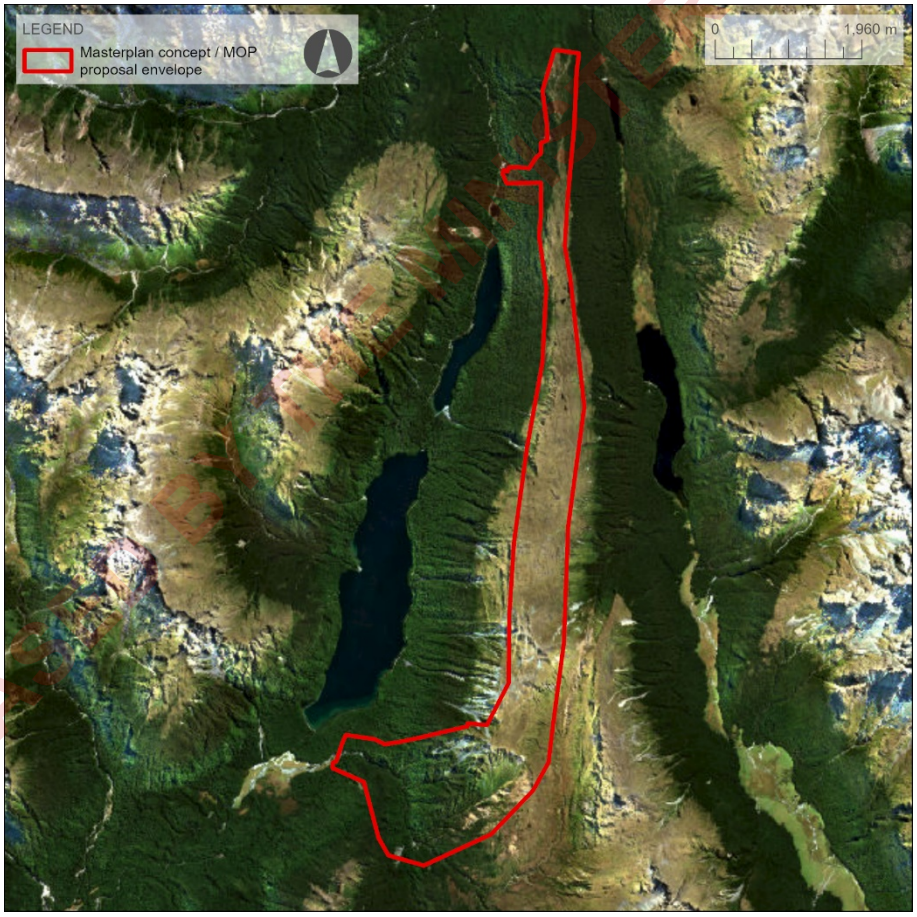


Figure 25. Node 5 – Key Summit to Ō-Tāpara Cascade Creek.

5.8.2 Existing Visitor Facilities / Infrastructure

The Routeburn Great Walk includes an existing side-track of 'Easy Tramping Track' standard to the top of Key Summit, where the proposed track would commence. An informal trail continues along the range to the south, with an obvious ground trail reaching Pt. 1086 and a less obvious trail beyond. No other tracks or facilities are present along the proposed track alignment.

5.8.3 Description of the Existing Ecological Environment

Figure 26. Livingstone Range tops from Pt. 1086 area, with notable faultline scars.

The Node 5 – Key Summit to Ō-Tāpara Cascade Creek area is largely alpine tussocklands and shrublands but includes **tawai** / beech forests where proposed tracks descend from the treeline to Cascade Creek or to the Divide Carpark from Pt. 1086 (as on Topo50 maps).

Vegetation

Briefly, this proposed track departs from the existing Key Summit track and would follow an existing (albeit informal) foot trail south along the Livingstone Range, through alpine tussockland, shrubland, and a sequence of wetlands and tarns with 'cushion bog' vegetation. The cushion bogs are diverse and intact, except where they are crossed by the informal trail.

The area is distinct for the presence of a number of surface faultline scars reflecting abrupt changes in underlying geology near Pt 1086. Generally steep slopes with occasional terraces and screes then extend south to the headwaters of Ō-Tāpara Cascade Creek. The route then descends through steep **tawai** / red and silver beech forest to SH94, either via a spur or via a head basin with shrubland extending beyond the treeline. In many places along the west-facing slopes of the Livingstone Mountains towards Lake Gunn / Ō-Tāpara Cascade Creek, active screes and gravels extend a long way downslope through the forest into subalpine areas, including beneath the tall **tawai** / beech canopy.

The return portion of the alternative 'short loop' descends from alpine tussockland / shrubland through **tawai** / silver beech forest to The Divide. A seepage / flush wetland is present on a

terrace at treeline, approximately where the indicative route for the 'short loop' would re-enter the forest.

Terrestrial Fauna

The Node 5 Key Summit to Cascade Creek area is likely to generally support alpine fauna including **kea, pihoihoi** / New Zealand pipit and possibly pīwauwau / rock wren. Forest areas of Cascade Creek and the slopes above The Divide generally support forest bird species (e.g., **kākā**) and very likely support pekapeka (long-tailed and possibly southern lesser short-tailed bat). The lizard fauna of the Node 5 area is largely unknown, aside from a single record for the immediate area of short-toed gecko (At Risk – Declining). Suitable habitat for skink and other gecko species is present along the range, with likely / possible species including Eyres and cryptic skink (both At Risk – Declining), barrier skink (Threatened – Nationally Endangered), as well as Takitimu gecko (Threatened – Nationally Vulnerable).

Forests and alpine shrublands / tussocklands are likely to support diverse and intact invertebrate communities.

Freshwater Habitats and Fauna

Freshwater habitats in Cascade Creek are generally described (for areas near SH94) in Section 5.5 above. No other freshwater habitats (aside from wetlands) are relevant to the proposal, other than the uppermost headwaters of small tributaries to the Greenstone and Upokororo / Eglinton Rivers (depending on route alignment). There are no records of indigenous fish species available for Cascade Creek upstream of SH94, but this does not mean an absence of fish species.

Overall

The proposed Key Summit to Cascade Creek walking track would utilise an existing informal trail to approx. Pt 1086 (on Topo50 maps) before traversing alpine tussock tops with extensive screes and gravels. Habitat values are not well known but are likely well represented in the area; they appear typical of the Livingstone Mountains and Eglinton and Greenstone Valley catchment. The most notable and valuable features are the sequence of fragile cushion bog wetlands and tarns near Key Summit occupying depressions, and a series of fault scars that contribute to tussockland / shrubland habitat mosaics in the alpine.

Fragile alpine bog / wetland habitat near Key Summit.

Existing informal track through wetland habitat beyond the 'official' Key Summit trail.

Existing informal track through forest habitat beyond the 'official' Key Summit trail.

Existing informal track through alpine scrub / tussockland habitat beyond the 'official' Key Summit trail.

Shrubland and flush wetland on a ledge system at treeline, where the return track to the Divide would descend.

Cascade Creek headwaters seen from the air.

Figure 27: Additional Node 5 – Key Summit to Cascade Creek photos.

5.8.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at Node 5 Key Summit to Cascade Creek that need to be considered are listed below:

- A key effect of the proposal is vegetation clearance.
    - To create the Key Summit to Cascade Creek track at 'Easy Tramping Track' standard would require vegetation clearance and earthworks over a c.2.5 km corridor to create a benched track in Cascade Creek. Two large bridges will likely require tree clearance. Along the alpine tussockland section, while benching or major earthworks are unnecessary (because of favourable ground conditions), clearance of a corridor of tussock and shrubs would be required. Overall, the 'Easy Tramping Track' track option is likely to lead to significant adverse effects.
    - To create the Key Summit to Cascade Creek track at 'Tramping Track' standard would likely require little vegetation clearance, other than branch trimming and cutting of understory vegetation in forested areas. The 'Tramping Track' standard track option is preferable to the 'Easy Tramping Track' option.
    - Because there is a very well-worn trail from Key Summit to Pt 1086 already, additional impacts to cushion bog wetlands from track upgrade along this section would be minimal, but some areas currently lack boardwalks. This means that for both the Key Summit to Cascade Creek track and the 'short

loop', creation of a formal track provides an opportunity to better manage existing impacts and to prevent further damage.

  - For the 'short loop' option, vegetation clearance will be required in **tawai** / silver beech forest areas above The Divide. Due to steep slopes, it may not be possible to avoid clearance of large / canopy trees, particularly if switchbacks or structures (stairs / gantry) are required to achieve the intended 'Easy Tramping Track' track standard. As the slopes east of The Divide are generally pure **tawai** / beech forests, the short loop option avoids 'kākāpō gardens' vegetation (i.e., areas with **kōtukutuku** / tree fuchsia etc.) except possibly for a short section (c.70 m) at The Divide carpark.

- An additional effect of the Key Summit to Cascade Creek track is the potential for indirect impacts from trampers establishing campsites along the route. Because the track would be c.17-19 km long and involve substantial height gain, users may conceivably choose to camp part way. This has the potential to create issues with human waste (unless users camp near the proposed mid-way toilet) and kea scrounging (see Section 5.9.4).

5.8.5 Recommendations

5.8.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 8. Effects management measures recommended for Node 5 – Key Summit to Cascade Creek.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Vegetation clearance – Key Summit to Cascade Creek track ('Easy Tramping Track' standard)	Avoid	Avoid track construction to 'Easy Tramping Track' standard. This would avoid the need to bench 2.5 km of track in Cascade Creek, a generally large degree of vegetation clearance, and the need to construct two footbridges (which generally require greater canopy tree clearance than 3-wire bridges suitable for 'Tramping Track' standard tracks).
Vegetation clearance – Key Summit to Cascade Creek track ('Tramping Track' standard)	Avoid & Minimise	Avoid clearance of large / canopy trees in forested sections. If this cannot be avoided, any impacts to canopy **tawai** / beech trees will need to be accompanied by suitable protocols to avoid impacts (injury / mortality) to pekapeka / long-tailed bat and cavity-nesting birds, which may be present. In addition, suitable measures to offset / compensate loss of forest / bat habitat will likely be required, with general opportunities (e.g., landscape-scale pest control) discussed in Section 7.0.
Vegetation clearance – 'Short Loop'	Avoid & Minimise	The indicative track alignment currently includes a section where two parallel tracks (on the ridge crest and one on a western terrace) would be built above treeline. The parallel section is from Pt. 1086 north for c.800 m to where the 'short loop' would enter the forest (forest entry options are limited by steep terrain). This duplication should be avoided by making a shorter loop and constructing the final track section

		to Pt.1086 as a short out-and-back section. In doing so, it will be important to avoid impacts to the flush wetland on the terrace at the treeline. Avoid clearance of large / canopy trees in forested sections. If this cannot be avoided (e.g., because of a need for a gantry), any impacts to canopy **tawai** / beech trees will need to be accompanied by suitable protocols to avoid impacts (injury / mortality) to pekapeka / long-tailed bat and cavity-nesting birds, which may be present. In addition, suitable measures to offset / compensate loss of forest / bat habitat will likely be required, with general opportunities (e.g., landscape-scale pest control) discussed in Section 7.0.
All options – wetland trampling and damage	Avoid / Mitigate	Avoid wetlands via track alignment, except where existing informal tracks are already present, such as near Key Summit. In these areas, provide suitable boardwalks.
Key Summit to Cascade Creek track (either standard) – Indirect effects from camping including **kea** scrounging and waste from camping	Mitigate	Provide toilets in a suitable camping location along the route. Use signage and other social science methods to improve **kea** awareness and to discourage **kea** feeding (see Section 5.9.4 and Section 6.0)

5.8.5.2 Further Investigations

- None recommended at this time. However, if the Key Summit to Cascade Creek track is pursued as an 'Easy Tramping Track' standard track, it is likely that detailed surveys will be required to better understand the (currently largely unknown) lizard fauna in alpine areas of the Livingstone Range and to manage potential impacts.

5.8.6 Conclusion – Node 5 Key Summit to Cascade Creek

The adverse effects of the proposed Key Summit to Cascade Creek walking track are limited in physical scale if built at 'Easy Tramping Track' standard. Building to 'Easy Tramping Track' standard also creates an opportunity to better manage an existing informal trail through fragile alpine wetland habitats near Key Summit. This option is considered environmentally feasible.

On the other hand, if the track is built to 'Tramping Track' standard, adverse effects of vegetation clearance (particularly in forested habitats in Cascade Creek) cannot be avoided. This option is likely to have significant impacts and is much less likely to be environmentally feasible.

For the proposed 'short loop,' it is likely that loss of some canopy **tawai** / beech trees on steep slopes will occur, and wetland impacts will need to be carefully avoided. In alpine habitats, the track utilises an already well-formed trail and overall this option is considered environmentally feasible.

5.9 Node 6: Gertrude Valley

5.9.1 Masterplan Concept / Proposal

The proposed development at this node includes trail head facilities such as the construction of a hop on / hop off bus stop, car parking, a visitor shelter with information and toilets, and observation areas to view the Gertrude Valley. Bunding and a refuge may be constructed to provide protection for internal and external viewing areas where flooding, rockfall or avalanches are a risk. In addition, the construction of a looped nature walk is proposed to replace the former (now closed due to rockfall) Homer Tunnel Nature Walk. The new loop track would be c.1.8 km in length and built to 'Short Walk' standard; it would extend to about the uppermost forest margin of the Gertrude Valley on the true left.

Figure 28. Node 6.

5.9.2 Existing Visitor Facilities / Infrastructure

An existing gravel parking lot accessed from SH94 provides parking for vehicles and serves as the starting point for the generally unformed, but marked, Gertrude Saddle walking route. The existing walking route, within Node 6, includes various signage and a footbridge over the Gertrude Valley branch of a frequently dry reach of the upper Whakatipu-ka-tuku / Hollyford River. It also provides access to the New Zealand Alpine Club's Homer Hut which occupies a

small clearing nearby. Relatively unobtrusive rock armouring (built using large boulders from the ephemeral riverbed) protects the carpark and Homer Hut from occasional flood events. Nearby, but outside of the Node 6 area (closer to Homer Tunnel), the Milford Road Alliance operates a large compound including a prominent roadside building from which road maintenance activities are based.

5.9.3 Description of the Existing Ecological Environment

Figure 29. Existing Gertrude Saddle carpark (right of centre) and walking track (lower foreground), where the proposed Node 6 development would occur. Photo looking down-valley to the main upper Hollyford Valley. Note the footbridge (at centre) over an ephemeral branch of Whakatipu-ka-tuku / Hollyford River, and a corner of Homer Hut is partly visible at right.

The Node 6 area comprises a mosaic of subalpine forest, scrub, boulderfield and riverbed habitats, and alpine shrubland, tussockland, and boulderfield areas at the confluence of two upper reaches of Whakatipu-ka-tuku / Hollyford River draining Gertrude Saddle to the east and Homer Saddle to the west. The vegetation mosaic reflects the transition from forest to alpine habitats, and is established by frequent disturbance from avalanches, the presence of large boulderfields; these as well as climatic factors influence the location of the forest treeline. It comprises highly intact, representative, and diverse indigenous habitat of importance for numerous fauna species including perhaps the most easily accessible and highest density pīwauwau / rock wren population known, unique lizard species, invertebrates, and **kea**.

Vegetation

Mature **tawai** / silver beech forest occupies lower areas beyond the typical runout from avalanches and rockfall. **Tawai** / silver beech is the dominant canopy species. The forest is highly intact, with an understory of mountain five finger, *Coprosma* spp. shrubs, bush flax, and

pūniu / prickly shield fern. Lush, dense mosses, lichens, and filmy ferns generally cloak the uneven forest floor, which includes numerous large boulders.

Upslope of the forest edges, low-stature alpine scrub occupies areas beyond the natural treeline and where periodic avalanche / rockfall disturbance prevents forest establishment. Again, these areas are typically bouldery and include highly intact indigenous shrub assemblages, with key species including snow tōtara, mountain **toatoa**, and īnaka / turpentine scrub (*Dracophyllum* spp). Boulderfields are a naturally uncommon ecosystem (Williams et al., 2007).

Surrounding the ephemeral reaches of the upper Whakatipu-ka-tuku, tussockland and shrubland dominated by snow tussocks (*Chionochloa* spp.) and shrubs (particularly a hebe *Veronica subalpina*) includes diverse indigenous herb and grass species. Some riparian margins, as well as boulderfield areas, have a notable cover of **houhi** / mountain ribbonwood and / or scattered large **tawai** / silver beech.

Small areas surrounding the existing carpark and Homer Hut have been historically cleared of forest and contain gravel (parking areas) or small areas of grassland. Grasslands are more modified and contain exotic grass and herb species, but indigenous herbs, grasses, and mosses remain notable.

Terrestrial Fauna

The Node 6 area is important as a core feeding and breeding habitat for both **kea** (throughout) and pīwauwau / rock wren (in boulderfields, especially in upper areas). **Kea** are frequent visitors to the existing carpark and Homer Hut area, likely to opportunistically obtain human food. The area also contains important natural food sources for **kea** including numerous fruiting shrub and tree species. A small number of resident western **weka** and occasional visits by South Island **kākā** in the area are also notable. Forest habitats support generally healthy populations of various forest bird species.

The Node 6 area is known to support a diverse and representative range of indigenous subalpine and alpine invertebrate species including ground wētā (Anostostomatidae), wolf spiders (Lycosidae) and various beetles (Carabidae) such as tiger beetles, chafer beetles and platynini (T. Scott-Fyfe, *pers. comm.* 2023; based on unpublished postgraduate research).

No specific information regarding the presence of indigenous lizards within the Node 6 area was obtained during this study. Recent lizard surveys that partly included the Node 6 area were targeted specifically at possible habitat for Awakopaka skink but did not detect any indigenous lizards within the Node 6 areas surveyed (Wildland Consultants Ltd, 2023). Boulderfields and shrublands particularly on sunny aspects below Mt Crosscut appear to provide good lizard habitat, and several nationally Threatened and At Risk lizard species are known from the surrounding area (Cascades gecko, Awakopaka skink, and barrier skink). Of these, Cascades gecko and barrier skink are most likely to be present.

Freshwater Habitats and Fauna

The upper reaches of Whakatipu-ka-tuku / Hollyford River within Node 6 is fed by two 3rd order branches, a northern branch from the Gertrude saddle which the existing walking route crosses multiple times, and a second western branch from the Homer Saddle branch adjacent to SH94. The confluence of these two waterways is east of the existing carpark. The upper Whakatipu-ka-tuku / Hollyford River channel generally only flows with substantial rainfall and during snowmelt. There is more consistent water flow from c. 500 m downstream, at the second bridge crossing of SH94 south of the existing Node 6 carpark. There are no artificial structures between this crossing and Node 6 which would limit upstream fish passage or connectivity.

There is a large variability in substrate size in the channel at Node 6, ranging from sand to large boulders demonstrating active transport of substrate occurs at certain periods. Bank slumping was observed at multiple points along the channel from the carpark upstream. These are not homogeneously spread, there are sections of predominantly sand and cobbles and sections with large boulders (possibly historic avalanche debris) within the channel.

There are kōaro records downstream in the main Whakatipu-ka-tuku / Hollyford River, but it is unlikely the channel at Node 6 provides suitable habitat for fish and freshwater invertebrates year-round, as the channel only flows after substantial rainfall or during snowmelt. There are no other fish records nearby, including upstream of Node 6.

Overall

The overall Node 6 – Gertrude Valley area supports very high ecological values associated with montane forest – shrubland / tussockland habitat sequence; there are also a few key taonga species present. The existing Gertrude Saddle route is largely unformed and currently has a negligible footprint within these habitats. Aside from SH94, modified areas are limited to the small existing carpark and the footprint of (and immediate surrounds) of Homer Hut.

Tawai / silver beech forest and boulderfields surrounding tussocklands and an ephemeral branch of Whakatipu-ka-tuku / Hollyford River draining Gertrude Saddle.

Chionochloa spp. tussockland and *Veronica subalpina* shrubland.

Mountain five finger, bush flax, hanging spleenwort, and *Coprosma* spp. shrubs dominate the lush forest interior.

View of the 'Psychopath Wall' below Mt Talbot, as seen from the upper **tawai** / beech forest.

The frequently dry riverbed of the upper Whakatipu-ka-tuku / Hollyford River within the Node 6 area.

Surface water present in the upper Whakatipu-ka-tuku/ Hollyford River following rain and snowmelt, with fringing mountain ribbonwood and boulderfields.

Figure 30. Additional Node 6 photos.

5.9.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at Node 6 – Gertrude Valley that need to be considered are listed below:

- A key effect of the proposal is impacts to **kea**, which would arise in the following ways:
    - Existing **visitor** interactions with **kea** at this location are unmanaged (other than via signage), with problems including deliberate / accidental feeding and **kea** lingering around vehicles. This contributes to area-wide issues of **kea** death / injury from vehicles and ingestion of human food, rubbish, or vehicle parts. Increasing visitor numbers at this location by provision of greater visitor facilities including an accessible new loop track could exacerbate these issues. In addition, even when **kea** scrounging is not directly or immediately harmful, it is known to increase the risk of death from other anthropogenic sources such as toxins, predator traps, and lead building materials (e.g.; Kemp et al., 2018; Weston et al., 2023).
    - As well as at the existing Gertrude carpark, **kea** scrounging and feeding is already an issue nearby at the Homer Tunnel portal and especially downstream at nearby Monkey Creek. Depending on whether the Masterplan proposal is implemented in tandem with a closure of the Monkey Creek carpark, scrounging **kea** may spend more time in the Node 6 area. However, consolidation of visitor stopping points is in general an important and positive opportunity to better manage and minimise adverse human-**kea** interactions.
    - A new loop track is also likely to lead to visitors walking through and lingering within natural **kea** feeding habitats, such as areas of snow tōtara on forest margins. Whereas existing users of the Gertrude Saddle route are more likely to pass more rapidly through these areas.
    - A new loop track would introduce visitors to currently undisturbed areas of good quality bird breeding habitat. Importantly, the new loop track may increase visitation during the winter-spring breeding season when the Gertrude Saddle route is typically less accessible (and generally discouraged by DOC) for walkers. In the worst case, this may make affected areas less attractive as potential bird breeding habitat and could cause displacement or even future nest failures.

- A key effect of the proposal is local cumulative impacts, in the context of historic, larger scale works in the area to create SH94. Track creation works would occur within highly intact Gertrude Valley habitats that to date have fully retained their natural processes with very little anthropogenic footprint, representing an overall increase encroachment of visitor infrastructure and visitor numbers into both forks of the upper Hollyford Valley, compared to the existing situation where impacts are concentrated around SH94 and the Homer Tunnel fork. Forest areas in the upper valley are naturally small and potentially vulnerable to loss from extreme avalanche or rockfall events; in this context, human impacts are considered to have a greater magnitude of ecological effect.
- An additional effect of the proposals is vegetation clearance. Masterplan concept diagrams suggest that the proposed carpark redevelopment, additional signage, and shelter structures at Node 6 can be contained within existing cleared gravel carpark areas; if correct, this would avoid any canopy vegetation clearance. However, experience on the ground suggests this scenario is unlikely (for example, a bus could not easily use the existing gravel road nor easily turn within the existing carpark, with the forest and river being constraints to the existing gravel road). The amount of further clearance of forest / habitat that may therefore be required is unknown. The degree / type of vegetation clearance to construct the loop track is likely in the vicinity of c.0.4 ha (based on 1.9 km of track at approx. 2 m width). Based on site investigations, it appears likely that the indicative alignment for the new loop track could feasibly be constructed without the need to clear large **tawai** / silver beech trees within forest areas, meaning that clearance within forest areas would likely be limited to sub-canopy shrubs and forest floor species.
- The vegetation clearance (described above) to construct the loop track is expected to occur with a vegetated buffer remaining between the upper Whakatipu-ka-tuku / Hollyford River channel and the track alignment. As such there is limited effect of this proposal on the upper Whakatipu-ka-tuku / Hollyford River channel, both during the track construction stage and going forwards. Depending on the type of crossing and the construction methodology, a temporary effect that could directly affect the upper Whakatipu-ka-tuku / Hollyford River channel is potential construction work within the channel to construct a crossing for the loop track, directly adjacent to the existing carpark.
- An additional effect of the proposals is habitat fragmentation. The existing carpark area includes an existing unvegetated area, which may be enlarged by upgraded / additional development if this occurs beyond the existing footprint. Works to construct a new loop track would cause a small degree of habitat fragmentation primarily for poorly dispersing fauna species (e.g., invertebrates) and low-stature vegetation types.

5.9.5 Recommendations

5.9.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 9. Effects management measures recommended for Node 6 – Gertrude Valley.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Impacts to **kea**	Avoid / Mitigate	Dedicated resource (likely a combination of personnel, signage, and enforcement) is required to educate visitors about the impacts of interacting with, and feeding, **kea**, coupled with enforcement of 'no feeding' rules (e.g., based on Wildlife Act 1953 provisions, or specific local bylaw as required). Input from social scientists to find effective ways to convey the 'never feed a **kea**' message is also necessary, and we understand that research in this area is ongoing. Whilst other jurisdictions (e.g., national parks overseas) also suffer from adverse human-wildlife interactions from tourism, education and enforcement in New Zealand and in the SH94 area is substantially under-resourced when considered against the precarious state of wild **kea** populations. Construction using **kea**-safe building practices is required. This includes the use of inaccessible rubbish bins, un-perchable roof caps, and no exposed moving parts or electrical wires that could cause injury or electrocution.
Vegetation clearance and habitat loss – carpark area	Avoid	The proposed carpark redevelopment, additional signage, and shelter structures should be contained within the existing modified gravel carpark areas to avoid clearance of habitat. If elements of the Masterplan proposal cannot be contained within the constrained space available (such as a bus pull-in), consider whether project objectives could be met by using already modified / cleared space on the immediate edge of SH94 or else nearby at the Milford Road Alliance compound ('the Chapel'). Use vault toilets (or similar) in order to avoid the need for soakage areas or other similarly large wastewater treatment infrastructure in sensitive river headwaters.
Vegetation clearance and habitat loss – walking track	Avoid & Minimise	Track construction is a deliberate choice to impact ecologically valuable and intact habitat. Minimisation of track length and footprint (width / degree of earthworks) while fully avoiding clearance of canopy trees is the clearest way to minimise effects. Whilst no vegetation type in the Node 6 area is specifically considered more ecologically valuable than any other, this is because all are of very high ecological value. Prior to the resource consenting / approval stage, it is recommended that a walkover of the proposed track alignment is undertaken by a botanist / ecologist in order to provide input into any necessary changes required to avoid localised ecological features of particularly high ecological value.
Impacts to bird breeding habitat	Avoid	Refinement of any final walking track alignment prior to the resource consenting / approval stage should include input from an ornithologist with specialist knowledge of kea (and pīwauwau / rock wren if the walking track route traverses upper bouldery habitats). Whilst not known to be a current kea breeding site, much of the proposed track area comprises pīwauwau / rock wren breeding habitat (K.

		Weston pers. comm. 2023). If undertaken during the nesting season for kea and pīwauwau / rock wren, works should be subject to a survey for nesting kea and pīwauwau / rock wren and application of appropriate nest setbacks if required.
Impacts to lizards	Avoid / Mitigate	Refinement of any final walking track alignment and construction methodology (as above) should include input from a specialist herpetologist in relation to lizard management (e.g., salvage) that may be required.
Adverse impacts to freshwater habitat	Avoid & Minimise	Any new permanent waterway crossings proposed as part of the loop track should be designed to minimise in-stream disturbance and piling and allow for appropriate fish passage (i.e., build a bridge crossing, outside of the channel footprint). Final walking track construction methodology should include input from a specialist freshwater ecologist to determine the appropriate management for any proposed construction activity in, or in close proximity to, the upper Whakatipu-ka-tuku / Hollyford River channel (e.g., erosion and sediment controls, avoidance of working directly within the channel when it is flowing).

5.9.5.2 Further Investigations

- Works with the potential to cause lizard injury or mortality are likely to occur in suitable lizard habitat. Further investigations to determine which if any species are present and / or lizard management (salvage during construction) will be required.

5.9.6 Conclusion – Node 6 Gertrude Valley

- The direct impacts of the proposed works are relatively small-scale, and many works would be confined to an existing modified carpark area. However, any expansion of an existing carpark and clearance of canopy **tawai** / silver beech trees should be avoided.
- Management options are available for some impacts, such as options to carefully locate a new loop track alignment to avoid clearance of canopy **tawai** / silver beech trees and avoid direct runoff of sediment from the unvegetated track into the upper Whakatipu-ka-tuku / Hollyford River channel.
- Exacerbation of existing impacts to **kea**, and cumulative effects due to encroachment of visitor infrastructure and an associated increase in anthropogenic disturbance into a new fork of the upper Hollyford Valley are both difficult to quantify and are inherent to the proposal. In this context, to be acceptable, it will be essential to minimise and carefully locate the footprint of any walking track, and for increased resources to be deployed to manage human **kea** interactions.
- Taken in isolation, ecological impacts of Masterplan proposals at Node 6 – Gertrude Valley are likely to be able to be managed to acceptable levels, but some aspects may need to be relocated or modified to be contained within the limited already modified space available.

5.10 Node 7: Cleddau Cirque

5.10.1 Masterplan Concept / Proposal

The proposed Cleddau Cirque node is located at an existing gravel pull-in bay on the second corner of the road after the Homer Tunnel which is shielded by a rockfall barrier and bund. The proposal is to create a more formal observation point and hop on / hop off and express coach bus stop with limited carparking for visitors to appreciate the surrounding landscape. The stop is designed to be a short stop after the Homer Tunnel before the descent into Milford Sound Piopiotahi and will act as an observation point for visitors. As the node is located within an area prone to rockfall and avalanche risk, the proposal includes a refuge structure accommodating one to two coach loads at a time (45 to 90 people).

The Stage 2 Infrastructure report (Stantec NZ Ltd, 2021) anticipates a 900 m^2 park, a 'robust shelter' and 75 m of retaining wall. As the existing carpark is c.750 m^2, it is therefore assumed that the proposal would be largely contained within the existing sealed area, but with up to c.10 m westward encroachment into alpine scrub (based on the indicative node extent and area requirements).

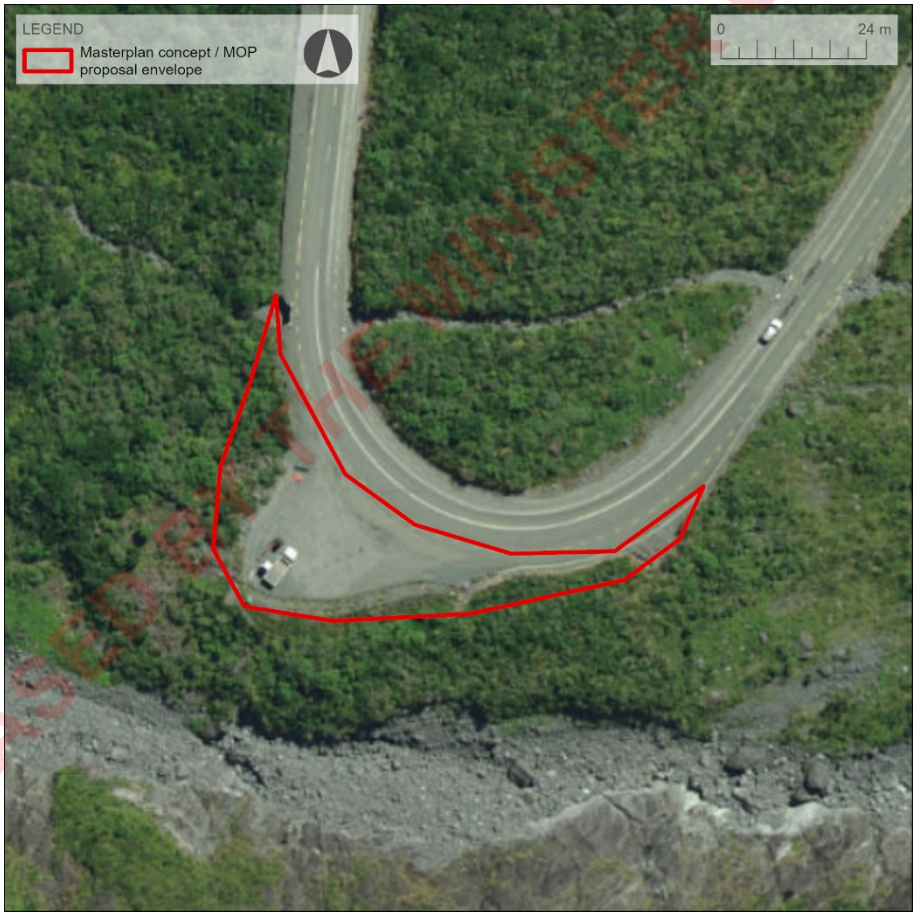


Figure 31. Node 7.

5.10.2 Existing Visitor Facilities / Infrastructure

The Node 7 area is an existing sealed carpark with a rockfall protection bund, surrounded by alpine scrub.

5.10.3 Description of the Existing Ecological Environment

Vegetation

The rockfall protection bund has sparse naturally establishing native species, and exotic grasses. Surrounding alpine scrub is dominated by **koromiko**, mountain holly, with frequent broadleaf, prickly shield fern, mikimiki (*Coprosma rugosa*), hunangamoho / broad-leaved bush tussock, and **kōtukutuku** / tree fuchsia. It is typical alpine scrub for the area but is located below the natural treeline; it is likely that forest succession in this area is supressed by infrequent disturbance from rockfall / avalanches.

Terrestrial Fauna

Kea are frequent occupants of the carpark, where they scavenge for food provided by road users that stop to photograph the view. Western **weka** are also present from time to time. The carpark is not otherwise a notable fauna habitat, but alpine scrub in the immediate vicinity supports additional species including **korimako** / bellbird[40], **tui**, and **miromiro** / South Island tomtit. Whilst the wider Cleddau Cirque provides excellent pīwauwau / rock wren habitat, and they may possibly visit the Node 7 area on occasion, none are known to have been observed within the proposed Node 7 area (based on multiple visits by an author over many years).

Freshwater Habitats and Fauna

The ephemeral, snow melt-fed headwaters of Waipāteke / Cleddau River sit adjacent to the proposed footprint for the Cleddau Cirque. The riverbed, dominated by boulders and cobbles, is down a steep slope vegetated with native shrubs to the south of the existing carpark. There are no records of macroinvertebrates or fish, but equally there are no records of surveys in these headwaters. Nevertheless, due to the ephemeral and flashy nature of the waterway it is unlikely to provide important habitat for freshwater fauna.

Overall

The Node 7 area is largely modified, but works may extend into alpine scrub, and the area is frequented by **kea** that are at risk from visitor impacts.

[40] We acknowledge that the Ngāi Tahu Settlement Act 1998 recognises the full name as '**kōparapara / korimako**'. For ease of recognition, we have referred to this taonga species in the report as **korimako**.

Rockfall protection bund and Node 7 area beside SH94.

Rockfall protection bund with establishing native plants.

Vehicles using existing Node 7 carpark / pull-in bay.

'Skottee' the **kea** investigates a parked vehicle.

Scrub below carpark, where development may encroach.

Scrub and carpark edge..

Figure 32. Node 7 photos.

5.10.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at Node 7 – Cleddau Loop that need to be considered are listed below:

- The key potential adverse effect of the Masterplan concept at Node 7 is impacts to **kea**. Existing visitor interactions with **kea** at this location are unmanaged, including deliberate / accidental feeding and **kea** lingering around vehicles. This contributes to area-wide issues of **kea** death / injury from vehicles and ingestion of human food, rubbish, or vehicle parts (e.g.; Kemp et al., 2018; Weston et al., 2023). Increasing visitor numbers at this location and the duration of their stay by provision of a refuge would likely exacerbate these issues.

- An additional effect of the proposals is vegetation clearance. Whilst much of the proposal can be contained within the existing cleared area, several hundred m^2 of new vegetation clearance will likely be required within an area of indigenous alpine scrub. This scrub is dominated by typical seral plant species for the area; while none are known to be notably rare, the vegetation is nevertheless reasonably intact despite edge effects from the surrounding road corridor. The scrub provides habitat for various bird species, but the amount of clearance required is unlikely to appreciably alter habitat availability for these species.

5.10.5 Recommendations

5.10.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 10. Effects management measures recommended for Node 7 – Cleddau Cirque.

Environmental Effect / Impact	**Effects Management Hierarchy Approach**	**Recommendation**
Vegetation clearance and habitat loss	Avoid & Minimise / Remedy	Contain works to the existing cleared area and avoid additional vegetation clearance. If this cannot be achieved, clearance should be minimised e.g., by cantilevering structures from the existing cleared area, and / or by rehabilitating temporarily cleared areas following construction.
Impacts to **kea**	Mitigate	Dedicated resource (likely a combination of personnel, signage, and enforcement) is required to educate visitors about the impacts of interacting with, and feeding, **kea**, coupled with enforcement of 'no feeding' rules (e.g., based on Wildlife Act 1953 provisions, or specific local bylaw as required). Input from social scientists to find effective ways to convey the 'never feed a **kea**' message is also necessary, and we understand that research in this area is ongoing. Whilst other jurisdictions (e.g., national parks overseas) also suffer from adverse human-wildlife interactions from tourism, education and enforcement in New Zealand and in the SH94 area is substantially under-resourced when considered against the precarious state of wild **kea** populations. Construction using **kea**-safe building practices is required. This includes the use of inaccessible rubbish bins, un-perchable roof caps, and no exposed moving parts or electrical wires that could cause injury or electrocution.

5.10.5.2 Further Investigations

- None recommended at this time.

5.10.6 Conclusion – Node 7 Cleddau Cirque

- The potential for the proposal to exacerbate existing impacts to **kea** means that resources should be deployed to manage human-**kea** interactions at Node 7.
- Construction using **kea**-safe building practices is required. This includes the use of inaccessible rubbish bins, un-perchable roof caps, and no exposed moving parts or electrical wires that could cause injury or electrocution.
- Permanent loss of an area of scrub would be required to expand the existing carpark and to provide a shelter; if possible, works should be contained to existing cleared areas.

Taking into account the above recommendations, ecological impacts of the Masterplan concept at Node 7 are generally likely to be able to be managed to acceptable levels, and the proposal is technically feasible from an environmental impact perspective.

5.11 Piopiotahi Milford Sound Village: Various Proposals

The following descriptions relate to various proposals in the existing Milford Sound Piopiotahi Village area. In general, these proposals relate to new infrastructure or upgrades to buildings and visitor amenity that would be constructed / redeveloped on existing built areas where indigenous vegetation and habitats have already been cleared for many decades[41].

Figure 33. Piopiotahi Milford Sound Village proposals envelope.

5.11.1 Masterplan Concepts / Proposals

For Piopiotahi Milford Sound Village, various Masterplan proposals include removal of existing buildings and structures, and their replacement with new facilities. In preparing this report we have reviewed indicative building sizes in the MOP Stage 2 Infrastructure Report Appendix 2 (Stantec NZ Ltd, 2021) but have not included these specifications below. We understand that the intention for these Masterplan Concepts / Proposals is generally to work within existing c.30 ha modified footprint and to consolidate this where possible.

[41] Note that the discussion in this section largely addresses the ecological impacts of the construction of proposed buildings, but some aspects of their hypothetical operation (i.e., how a Marine Centre might handle marine species) are not and cannot practically be assessed at this time.

5.11.1.1 Piopiotahi Visitors Hub

New Access Road and Bus Terminal

Inbound traffic will be diverted onto a one-way system along the current aerodrome taxiway and the new bus terminal will centralise the hop on / hop off and coach services. A covered walkway (c.170 m long)[42] will link the bus terminal to the visitor centre.

New Visitor and Interpretive Marine Centre

The co-located visitor and marine research centres will be built on the existing raised hotel site. This will be a robust, multi-storey structure with a rooftop helipad.

New Visitor and Staff Accommodation

The accommodation will be above the visitor and marine research centres and would be orientated to the north-west towards Mitre Peak with carparking to the east. This layout may include a service lane for service vehicles, and parking for staff on the southern side of the visitor and marine centres, between that and the Barren Peak spur.

Staff accommodation will be relocated from Cleddau Village into a new multi storey development adjacent to the hotel. It will have a mix of unit types, including communal indoor and outdoor spaces.

Foreshore Enhancements

The Piopiotahi Visitors' Hub will include landscaping / enhancements to the foreshore providing better access and amenity to the waterfront. The public carpark will be relocated to the existing staff accommodation area at the Cleddau Delta, and the existing foreshore walk will be realigned to connect the visitor centre and the boardwalk to Freshwater Basin. This will include the construction of a water-based viewing deck to the north-west of the hub within Freshwater Basin. Existing hardstand areas including parts of the Milford Road, will be upgraded to shared surfaces. Some larger areas will be kept as gathering or recreational areas, and the remainder will be revegetated. Areas between the foreshore and visitors centre will be planted with low-level vegetation to maintain views.

5.11.1.2 Freshwater Basin Node

Nature Loop Walk

To complement the existing foreshore boardwalk a new nature trail is proposed to create a return loop through **tawai** / beech forest. This is intended to provide a short walk experience, or alternative to the shuttle bus, for all ages and abilities with interpretive signage along the route.

5.11.1.3 Cleddau Delta Node

Milford Aerodrome / Regenerative Landscape Spine

The c.1.6 ha existing runway is proposed to be decommissioned and redeveloped into a 'Regenerative Spine'. Impervious surfaces will be reduced, and boulder habitats will be expanded with shrublands established on the edges of the forest, while retaining views. An access route will be maintained to the Mitre Peak viewpoint, with pause points and interpretive signage between the river and estuary. A water-based viewing deck and a boardwalk extension will offer views across Freshwater Basin.

Iconic Refuges

[42] Detailed specifications in this section are based on Appendix 2. in the MOP stage 2 infrastructure report (Stantec NZ Ltd, 2021).

Similar to the Freshwater Basin Node, the Cleddau Delta Node will also include two refuges in low lying areas of the delta, and these will be built to provide general shelter and refuge from tsunamis. Interpretative displays and information on natural hazards will also be provided.

5.11.1.4 Deepwater Basin Node

Heliport

This is proposed to be on raised ground near the existing staff accommodation in Cleddau Village. Pembroke Drive will provide a service road. It is understood that this will cater to a similar level of usage to what currently occurs, i.e., c.10 helicopter parking stands and similar levels of air traffic (Tom Hopkins *pers. comm*. 2024). Based on preliminary advice from WSP Consultants to MOP (30 January 2024, provided to Boffa Miskell by Tom Hopkins), this would require around 2.2 ha of land.

5.11.2 Existing Visitor Facilities / Infrastructure

The existing Milford Sound Piopiotahi Village area has a roughly 30 ha built footprint centred on Freshwater Basin and Deepwater Basin at the delta of the Waipāteke / Cleddau River. The developed area of Freshwater Basin hosts a tourist boat terminal, carparking, and other visitor facilities. Adjacent to Deepwater Basin accommodation facilities, an aerodrome, and a boat terminal that primarily services fishing vessels abuts flood protection infrastructure.

5.11.3 Description of the Existing Ecological Environment

Figure 34. Milford Sound Piopiotahi Village seen from above. Deepwater Basin at left, aerodrome at centre, and Freshwater Basin (partly in shadow) at right.

The Milford Sound Piopiotahi Village area comprises a built and modified area tucked onto the lower slopes of Barren Peak and the delta of the Waipāteke / Cleddau River. It includes important lowland forest areas fringed by saltmarsh vegetation. Because of the presence of a freshwater layer in the fiord, both marine and freshwater species / ecosystems are associated with tidal land margins.

Vegetation

The developed area of Milford Sound Piopiotahi Village has been historically cleared of vegetation, modified by development, and has low vegetation values (particularly relative to surrounding unmodified areas). It is surrounded by **tawai** / silver beech and mountain beech forests of varying composition, dependent on landform and slope angle. In general, **tawai** / mountain beech, tōtara kōtukutuku / Hall's tōtara and southern **rātā** are more common on steeper faces, whereas **tawai** / silver beech forest (with **kāmahi**, **rimu**, **kahikatea**, and **miro** occurs on lower slopes especially alluvial surfaces adjacent to the Waipāteke / Cleddau River delta. Shrubland and grassland characterise the edges of hardstand and deliberately cleared areas. Typical shrub species include fast growing species such as makomako / wineberry, *Coprosma* spp., **kāmahi**, and **harakeke** / lowland flax. A small number of weeds include scattered gorse (near tracks in coastal areas), montbretia, blackberry, and tutsan.

On the foreshore, diverse and generally intact saltmarsh rushland and turfland occupies the broad intertidal area and coastal fringe. In tidal areas, often on sandy mounds, saltmeadow (i.e., prostrate saltmarsh vegetation) of sea primrose, slender clubrush and remuremu / bonking grass forms a low turf with occasional shore stonecrop, shore buttercup, and shore celery. Higher up, rushlands are dominated by oioi / jointed rush with occasional tussocks of sea sedge (At Risk – Declining) and *Carex pleiostachys* (At Risk – Naturally Uncommon) likely present.

Terrestrial Fauna

In terms of indigenous fauna in the Village area (excluding marine species and those using freshwater habitats), several Threatened and At-Risk species are present. **Kea**, South Island **kākā**, **koekoeā,** northern Fiordland **tokoeka**, and yellow-crowned **kākāriki** utilise terrestrial forest habitats near or in the Village (and Lodge) area from time to time. Western **weka** and a range of other relatively widespread (i.e., Not Threatened) indigenous forest bird species are also present, including yellow-fronted **kākāriki**, **tītipounamu** / rifleman, **miromiro** / South Island tomtit, pīpipi / brown creeper, **ruru** / morepork, **pīpīwharauroa** / shining cuckoo, **tūī**, **korimako** / bellbird and **kererū**[43]. In marine and freshwater areas, tarāpunga / red-billed gull (At Risk – Declining), tōrea pango / variable oystercatcher, various **kōau** / shag species (including At Risk species), waterfowl species (e.g., **pūtakitaki** / paradise shelduck), and **tara** / white-fronted tern; At Risk – Declining) use habitats adjacent to the Village area, especially foreshore areas.

Milford Sound Piopiotahi is notable as the only known site for the Milford boulder butterfly (*Lycaena ianthina*, Threatened – Nationally Critical), which has been found in just two places, one at Little Tahiti and the other on roadside and open areas at Deepwater Basin Road (Patrick 2017). This species is entirely dependent on open areas that support its host plant creeping pōhuehue. Natural areas of creeping pōhuehue likely occurred previously on river flood channels and banks, but due to general development of these areas, open modified sites in the vicinity of the Village are now likely critical to the survival of the species. Based on the most recent known report on the species (Patrick 2017), it appears to have last been definitively observed in 2010 but searches since that time are unlikely to have been comprehensive.

[43] We acknowledge that the Ngāi Tahu Settlement Act 1998 recognises the full name as '**kūkupa / kererū**'. For ease of recognition, we have referred to this taonga species in the report as **kererū**.

The mokomoko (skink / gecko) fauna of the Milford Sound Piopiotahi Village area is essentially unknown. While this may simply reflect a lack of suitable habitat, especially for relatively more readily observable species such as skinks, forest areas have potential to support geckos (which are likely to be extremely difficult to detect). An intriguing record exists of an unknown *Naultinus* sp. (green gecko) from the Village in 1980, but to our knowledge green geckos have not been observed since (and indeed are largely unknown in the Fiordland / western Southland area).

Freshwater Habitats and Fauna

The footprints of these proposed Masterplan concepts (being largely existing built infrastructure) generally do not contain freshwater habitats.

In terms of potential receiving environments (other than the fiord / marine area):

- Foreshore Enhancements: There is one waterway within the proposed foreshore enhancement footprint, a 1st order stream to the north of the existing visitor centre carpark. In-stream substrates were dominated by gravel, pebbles, and cobbles, with little to no fine sediments. There was an absence of macrophytes on our site visit, but substrates were covered by thin algae. Cased caddisflies were observed on the underside of in-stream cobbles, and the waterways likely support other sensitive macroinvertebrate taxa (e.g., mayflies and stoneflies). NZFFD records from 2021 show redfin bully, banded kokopu, tuna / longfin eel, kōaro, īnaka (At Risk – Declining), and brown trout. The freshwater inversion layer in Milford Sound Piopiotahi means that it is feasible that īnaka could spawn in this tidally influenced waterway. Īnaka spawn in riparian vegetation that is inundated during spring high tides close to the upstream limit of salt-water intrusion. Moreover, the same spawning sites may be used year after year (Richardson & Taylor, 2004), and it is therefore important to protect, enhance, and restore riparian areas (including appropriate vegetation) in spawning areas.

Marine Habitats and Species

The footprints of these proposed Masterplan concepts (being largely existing built infrastructure) generally do not contain marine habitats. The exceptions to this are:

- Foreshore Enhancements (viewing deck): A new water-based viewing deck within the Coastal Marine Area (CMA) is proposed to the north-west of the hub within Freshwater Basin. The intertidal area which would be affected by this new structure is characterised by a sandy substrate with scattered cobbles and empty bivalve shells (mostly **pipi**). Shallow excavation of the sandy substrate (up to 5 cm beneath the surface of the seabed) did not reveal the presence of live bivalves or of any other large benthic invertebrates within the specific area surveyed, but they are likely be present in the wider area generally. The area is characterized by a sparse cover of saltmarsh vegetation (oioi / jointed rush) which is distributed in a thin band surrounding a large patch (c. 400 m^2) of unvegetated seabed. There are no other marine organisms on the surface of the seabed.
- Milford Aerodrome / Regenerative Landscape Spine (viewing deck): A new water-based viewing deck within the CMA is proposed at the northern end of the aerodrome. The intertidal habitat which would be affected by this new structure consists of a sandy substrate flanked by an artificial rock revetment along the northern boundary of the aerodrome. The revetment does not support marine life with the exception of a very sparse cover of barnacles (*Austrominius modestus*) on the rock material, while the sandy substrate is colonized by patches of low-lying saltmarsh vegetation (sea primrose). The saltmarsh vegetation is concentrated along the eastern half of the revetment. Some of the revetment material which has washed onto the sandy habitat

has been colonised by a mix of brown, green and red algae typical of brackish environments (e.g., *Cladophora* spp., *Ulva* spp., *Ectocarpus* spp., *Bostrychia* spp.). Shallow excavation of the sandy substrate (up to 5 cm beneath the surface of the seabed) did not reveal the presence of large benthic invertebrates.

- Foreshore Enhancements / Milford Aerodrome / Regenerative Landscape Spine (boardwalk): A further addition within the CMA is a boardwalk extension crossing the tidal channel along the eastern side of the aerodrome. The bed of the channel is unvegetated and occupied by coarse sand, cobbles, and small boulders. Barnacles (*Austrominius modestus*) and a few **whetiko** / pulmonate mud snail**s** are present within the cobble/boulder habitat. Saltmarsh vegetation (a mix of oioi / jointed rush and sea primrose) is present along both banks. Crab holes are present in the muddy substrate colonised by the saltmarsh. Freshwater fish (bullies, *Gobiomorphus* spp.) were observed in the channel at the proposed boardwalk crossing site. Īnaka were not observed in this channel but were observed throughout other adjacent waterways and are likely to use the salt marsh vegetation fringing the channel as spawning habitat.

Overall

The Milford Sound Piopiotahi Village area comprises largely modified built areas, but these are fringed by intact coastal / lowland forests and excellent saltmarshes of very high ecological value. Numerous forest bird and estuarine / water bird species are present, many of which are listed taonga species under the NTCSA.

Milford Sound Piopiotahi and the mouth of the Waipāteke / Cleddau River.

Airport runway from near the foreshore.

Stream near existing tourist carpark with potential īnaka spawning habitat.

Thin band of saltmarsh vegetation surrounding a zone of unvegetated seabed in the intertidal area identified for the installation of a new viewing deck to the north-west of the hub within Freshwater Basin.

Saltmarsh near the airport.

Artificial rock revetment giving way to sandy seabed (with saltmarsh in the foreground) in the intertidal area identified for a viewing deck at the northern end of the aerodrome.

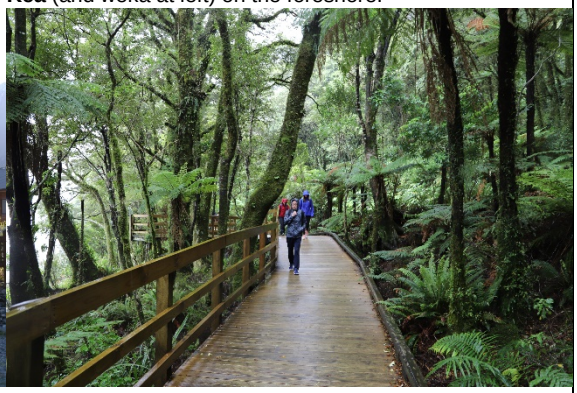
Tidal channel flanked by saltmarsh vegetation in the areas identified for a boardwalk east of the aerodrome.

Foreshore seen from Barren Spur.

Existing foreshore walkway.

Kea (and weka at left) on the foreshore.

Existing staff accommodation area, Deepwater Basin.



Existing boardwalk track to the ferry terminal.

Figure 35. Additional Milford Sound Piopiotahi photos.

5.11.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts that need to be considered are listed below:

- Vegetation clearance to construct the loop walk would result in the loss of diverse indigenous understory plant species, and further fragment **tawai** / beech forest floor habitat already impacted by the existing boardwalk track and road to the ferry terminal.
- The 'Regenerative Spine' proposal represents a substantial positive effect in the local context, removing areas of hardstand and replacing them with indigenous vegetation.
- Increased access to the intertidal area: foreshore enhancements, boardwalks, and viewing platforms are likely to generally increase the volume of visitors accessing the seabed at low tide. As a result, there could be generally increased trampling and harvesting of marine organisms, such as bivalve (e.g., pipi) beds that are present in some areas. Areas of saltmeadow would be particularly vulnerable to increased foot traffic on the foreshore. These impacts will need to be further investigated and managed through education and signage and by design solutions that channel foot traffic away from sensitive areas.
- Provided that the new foreshore developments (e.g., boardwalk, viewing decks) are installed into unvegetated seabed (see Section 5.11.5.1), the main impacts on marine habitats and species will include permanent occupation of the seabed by piles or other structures supporting the deck, as well as shading of the seabed under the deck. Given the small footprint of the structure (based on the Masterplan) and the low diversity of marine life in the area proposed for its installation, these effects are unlikely to be of ecological concern.
- The disturbance of saltmarsh habitat due to new installations at the coastal edge (e.g., tracks, including construction of boardwalks) may result in a reduction in the quality and / or quantity of potential īnaka spawning habitat. As such, the layout of access points to the foreshore and boardwalks should be designed to avoid areas of potential īnaka spawning habitat (i.e., rushlands in upper intertidal areas and along tidal channels) and minimise impacts where this is not possible.
- In any areas left bare following earthworks and soil disturbance, woody weed control will be necessary, as these works will create opportunities for species such as blackberry and tutsan to establish.
- Increased access to the foreshore (by more visitors and / or in more locations) would likely lead to increase avifauna disturbance for estuarine species using intertidal habitats. Dependent on implementation, other MOP concepts (e.g., Cleddau Bush tracks) there is a potential that localised cumulative effects (because very few intertidal areas may be unaffected) reach a threshold of ecological concern.
- Potential noise impacts to fauna associated with the heliport relocation have been considered but are unlikely to be substantially different from existing levels.

The potential positive effects of the Masterplan concepts are listed below:

- Redevelopments within the built footprint of the Village represents a positive opportunity to consolidate buildings and infrastructure, and to allow recovery of forest edge habitats impacted by historic clearance.

- Redevelopment is also a positive opportunity to upgrade existing external lighting (on buildings, and any streetlights). Existing lighting is likely to be having a range of generally adverse effects to sensitive fauna species (particularly invertebrates).

5.11.5 Recommendations

5.11.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 11. Effects management measures recommended for Piopiotahi Milford Sound Village Various Projects.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Vegetation clearance during track construction	Avoid & Minimise	Track construction for the loop track is a deliberate choice to impact ecologically valuable forest habitat in a location where a parallel existing walking track and the road already exists. Minimising track length and footprint (width / degree of earthworks) while avoiding clearance of canopy trees is the clearest way to minimise effects. If the additional track is found to be necessary, then boardwalking is likely to be the best approach, to minimise effects on the understorey and habitat fragmentation.
Reclamation or permanent occupation of the CMA (loss of intertidal habitats), damage to intertidal mudflat habitats	Avoid & Minimise	As far as practicable, minimise the footprint of proposed structures within the CMA. Install structures into unvegetated seabed / foreshore and avoid areas occupied by saltmarsh vegetation, both to avoid loss of saltmarsh (wetland) habitat and to avoid associated impacts to īnaka spawning. Minor remedial / compensation measures (e.g., replanting oioi, or removing exotic tall fescue grass) to address the loss of (likely) relatively small areas of currently intact saltmarsh may be required.
Disturbance of sensitive avifauna	Avoid & Minimise	To minimise impacts to saltmeadow vegetation and to minimise avifauna disturbance, design boardwalks and viewing platforms in a way that discourages visitors to stray onto the foreshore. Use of careful design, including barriers, interpretive signage, or viewing hides (for wildlife) may be appropriate.
Enhancement opportunity: Ensuring that existing aerodrome areas are appropriately restored and enhanced following runway removal	n/a (Habitat Enhancement)	Avoid unnecessary plantings in the foreshore and 'Regenerative Spine' area by instead facilitating natural regeneration. In particular, where the runway is removed, indigenous plantings are generally unnecessary provided that exotic woody weeds (e.g., blackberry, broom, gorse, tutsan) are controlled. An interim (several year) phase of regeneration may well involve a substantial cover of exotic herbaceous weeds (e.g., foxglove, montbretia) and will be unsightly, but should be tolerated. Raking to break up compacted soils and spreading of e.g., forest duff / rotting logs (in places, not at a large scale) will likely accelerate indigenous plant re-establishment. Appropriate species will regenerate naturally, saving significant cost and achieving a

		far superior outcome. Where plantings are necessary, these should be locally eco-sourced. Unfortunately, previous plantings along the foreshore in recent years have included species that are locally inappropriate ecologically, such as whauwhaupaku / five finger (*Pseudopanax arboreus*) and tauhinu. Despite the above, it is strongly recommended that the 'Regenerative Spine' proposal includes open and sunny (north facing) areas deliberately established and maintained for Milford boulder butterfly, including complex habitat (e.g., boulder piles) with creeping pōhuehue and opportunities for basking[44].
Adverse ecological effects of outdoor lighting	Avoid & Minimise	New outdoor lighting should be avoided in the first instance. Where it is considered essential to provide lighting on new or upgraded visitor facilities (e.g., for critical visitor safety reasons), these should be operated via motion sensor (not always-on) and must use warm-spectrum, hooded, and downward-pointing lights of the minimum brightness required to serve their purpose, and that are designed and installed to minimise spill.

5.11.5.2 Further Investigations

- None recommended at this time.

5.11.6 Conclusion – Various Proposals:

The various proposals within the built and foreshore areas of Milford Sound Piopiotahi Village include ecological opportunities (removal / consolidation of built structures and hardstand) but also the potential for local cumulative effects to foreshore saltmarsh habitat and avifauna species. These potential adverse impacts should be carefully minimised in order to maintain the integrity of existing high value foreshore habitats, but all proposals are considered technically feasible from an environmental impact perspective.

[44] The Masterplan (page 60) recommended this approach for the regenerative landscape spine: *"A key part of the landscape approach seeks to reduce the total area of impervious surfaces and expand areas of open, boulder habitat that are of importance for rare species, such as the threatened and nationally critical Milford boulder butterfly."*

5.12 Piopiotahi Visitors Hub: Barren Peak Spur Walk and Viewing Structure

5.12.1 Masterplan Concept / Proposal

A bridge link will be provided behind the proposed visitor centre to cross the proposed service lane. The proposal will form an extension to the existing track and will follow the ridge of the spur within the forest. The existing track will be upgraded to 'Short Walk' standard, with 50 m of stairs up a rock face to provide access to 1-2 new viewing structures at c.80 masl, and c.470 m of track in total. The viewing structures are intended to require minimal removal of mature **tawai** / beech forest and will screen the built infrastructure of the visitor hub below.

5.12.2 Existing Visitor Facilities / Infrastructure

An existing formed track and viewing structure already exist. Above the existing viewing structure, water tanks and various pipes occupy small, cleared areas.

5.12.3 Description of the Existing Ecological Environment

Figure 36. Milford Sound Piopiotahi from the existing Barren Peak Spur Walk.

Vegetation

Diverse **tawai** / mountain beech forest covers the steep north facing slopes surrounding the existing walking track. Despite the general high rainfall of the area, this forest contains elements of relatively open, drier forests typical of thin / poorly developed soils, with upper areas (above the existing viewing structure) supporting frequent tōtara kōtukutuku / Hall's tōtara, southern **rātā**, **mountain toatoa**, and occasional yellow silver pine, pōkākā, and īnaka. This forest type is

considered distinct and not well represented in the local context. The diverse understory includes numerous fern, orchid, herb, monocot, and understory shrub species, with over 80 indigenous vascular species recorded during a brief site survey.

Terrestrial Fauna

Numerous forest bird species are present, as listed in Section 5.11.3.

Freshwater Habitats and Fauna

The proposed Barren Peak Spur Walk, and platform area does not contain freshwater habitat.

Overall

The Barren Peak spur contains a diverse and locally distinct forest type supporting numerous avifauna species.

Existing view point on Barren Peak spur.

Existing walkway to a view point on Barren Peak spur.

Various water pipes, some apparently disused, clutter the forest above the existing view point.

View of Barren Peak from the spur.

Diverse forest on Barren Peak spur.

Existing high-standard track on Barren Peak spur.

Figure 37. Additional Barren Peak Spur Walk and viewing structure photos.

5.12.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at the Piopiotahi Visitors Hub – Barren Peak Spur Walk and Viewing Structure that need to be considered are listed below:

- The degree of permanent vegetation clearance required to upgrade the existing track and extend it in order to access newer viewing structures is likely in the vicinity of 940 m^2 (based on 470 m length at 'Short Walk' standard of up to 2 m width). Approximately 250 m^2 of this amount includes the existing track footprint. Extending the track uphill to new viewing structures utilising natural forest gaps is preferred, or else construction of a treetop platform (as suggested in the Masterplan) could logically occupy the footprint of an existing water tank.
- Track development is an opportunity to upgrade or remove the existing water tank and pipe infrastructure above the existing viewing structure. At present, various disused pipes and other debris litter the forest floor in this area.

5.12.5 Recommendations

5.12.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 12. Effects management measures recommended for Piopiotahi Visitors Hub: Barren Peak Spur Walk and Viewing Structure.

Environmental Effect / Impact	**Effects Management Hierarchy Approach**	**Recommendation**
Vegetation clearance	Avoid & Minimise	Minimisation of track length and footprint (width / degree of earthworks) while fully avoiding clearance of canopy trees is the clearest way to minimise effects. Avoid / minimise further vegetation clearance by considering whether it is necessary to extend the existing track: if not, track upgrades should, as far as possible, occur within the existing footprint. If the track extends beyond the existing footprint, upgrades should ideally utilise areas already modified by the existing water tank infrastructure.
Enhancement opportunity: Remediate existing habitat	n/a (Habitat Enhancement)	Remove building waste (derelict pipes etc.) from the existing water tank area.

5.12.5.2 Further Investigations

- None recommended at this time.

5.12.6 Conclusion – Barren Peak Spur Walk and Viewpoint:

Dependent on the scale of track works, and ability to utilise (and even to tidy up) the existing track and water tank area, it is likely that the adverse effects of this Masterplan concept, taken in isolation, are manageable and environmentally acceptable / feasible.

5.13 Freshwater Basin Node: Hine-te-awa Bowen Falls Experiences Including Lower Pontoon Walkway and Top Links

5.13.1 Masterplan Concept / Proposal

A new walkway to 'Short Walk' standard (c. 450 m in length) with a floating pontoon or gantry[45] is proposed to link the most northern jetty of the boat terminal with the Hine-te-awa Bowen Falls Delta[46] ('Lower Pontoon Walkway'). It will connect to the existing track that takes visitors through the forest to Cemetery Point. This concept includes the addition of a boardwalk and lookout structure near the base of Hine-te-awa Bowen Falls.

The Masterplan proposes a fixed cable car on the slopes immediately above the terminal to provide access to the top of Hine-te-awa Bowen Falls ('Top Links' proposal). This would be via a nature walk built to 'Short Walk' standard along the ridge to the top of the falls, where there would be a cantilevered lookout structure, and a longer tramping track to the upper Bowen Valley is also proposed (c.1 km of new track at a mix of 'Short Walk' and 'Easy Tramping Track' standard; Southern Land Ltd, 2024). The alignment of the cable car will approximately follow an existing penstock alignment which extends from above the terminal to Freshwater Basin below and is used to generate hydro power for Milford Sound Piopiotahi.

A variation that combines elements of the above two concepts (a 'Lower Viewpoint' option) has also been considered in the Walking & Cycling Experiences Feasibility report (Southern Land Ltd, 2024). It is described as a possible gantry with stairs that would be built from the boardwalk and lookout structure near the base of Hine-te-awa Bowen Falls, rising 60 m to a 'mid falls' viewing platform on a steep rock bluff on the true left of the falls.

5.13.2 Existing Visitor Facilities / Infrastructure

A former walkway from the boat harbour to Bowen Falls has been largely disestablished due to tree / landslide risk. A pontoon near the Falls (accessible by boat only) provides access to the base of the Falls via a short track that has been constructed and gravelled to a high standard. There are no structures at the base of the Falls.

A penstock for hydroelectric power runs from an intake in Bowen Valley via a steep penstock to a powerhouse near the boat harbour in Freshwater Basin. It is accessed by a steep foot track also used to access predator traps in the Bowen Valley. Other than the hydro intake and ancillary structures, the penstock, and the track used to access predator traps, there is no built infrastructure in the Bowen Valley.

[45] The engineering workstream will confirm the type of structure used to provide access to Bowen Falls (floating pontoon or gantry with rockfall protection shelter), but this information was not available at the time this draft report was completed.

[46] The bilingual place name 'Hine-te-awa Bowen Falls' as referred to in the MOP Masterplan and previous reports requires confirmation from mana whenua, as a traditional name for Bowen River does not appear on Kā Huru Manu (https://kahurumanu.co.nz/atlas).

5.13.3 Description of the Existing Ecological Environment

Figure 38. Hine-te-awa Bowen Falls from the foreshore near the airport.

Vegetation

The steep slopes leading to the Bowen Valley comprise **tawai** / silver beech – **kāmahi** forest on lower elevation areas and **tawai** / silver beech – mountain beech forests in higher areas, dependent on landform and slope angle. In general, **tawai** / mountain beech, tōtara kotukutuku / Hall's tōtara and southern **rātā** are more common on steeper faces, whereas **tawai** / silver beech forest (with **kāmahi**, **rimu**, **kahikatea**, and **miro** occurs on lower slopes near Freshwater Basin, with ground cover of diverse, lush ferns, and vines including puawananga / white clematis and **karaeopirita** / supplejack.

Along the cleared corridor of the existing penstock leading to the Bowen Valley, kiokio, bush rice grass, various indigenous herbs and juvenile **kāmahi** dominate the managed, low stature vegetation cover.

From the 'blast zone' at the toe of Hine-te-awa Bowen Falls to the existing pontoon at Freshwater Basin, a distinct sequence of vegetation is present. Near the Falls, a mikimiki (*Coprosma rugosa*) – **toetoe** shrubland includes areas of exotic Yorkshire fog grass and diverse indigenous herbs. In addition, on a steep rock bluff beside (on the true left of) the falls, diverse low vegetation (largely scrub) is dominated by mountain five finger, mountain akeake, **whaririki** / mountain flax, **kāpuka** / broadleaf, southern **rātā**, climbing **rātā** species, and diverse indigenous grasses, ferns, and herbs. Seral alluvial forest of mahoe, kaikomako and patē / seven finger surrounds the shrubland and at the toe of the bluff. Beyond this, extending to the water's edge at Freshwater Basin, a narrow forest includes large **tawai** / silver beech and large podocarps that are festooned with epiphytes.

Terrestrial Fauna

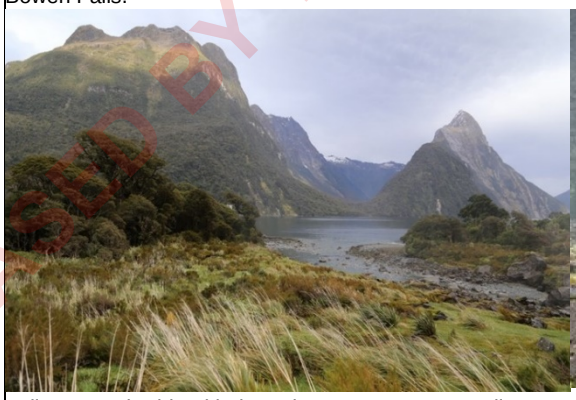
Lowland forest areas support diverse forest bird species, as listed in Section 5.11. The upper Bowen Valley is a notable habitat for **kōwhiowhio** / blue duck (Threatened – Nationally Vulnerable), but this species is unlikely to occupy areas in the immediate vicinity of the falls themselves.

Freshwater Habitats and Fauna

The Bowen River is a 3rd order mountain-fed river. The riparian margins are dominated by native forest, until Bowen Falls, where margins become dominated by boulders on the lower banks and native shrubs on the upper banks. The riverbed below Bowen Falls is dominated by cobbles and boulders with very few, or no fine sediments present. Bowen River likely provides suitable habitats for sensitive macroinvertebrate taxa which are tolerant of faster flows, such as some species of stoneflies, grazing mayflies, cased caddisflies, and riffle beetles. The upper river contains various debris (largely rusting steel) washed downriver from previously flood damaged water pipeline intake structures. There are no records of fish or fish surveys in Bowen River, and Hine-te-awa Bowen Falls would act as a barrier preventing fish movement upstream. However, based on habitat conditions and records from adjacent waterways, the short reach of Bowen River from Milford Sound Piopiotahi to Bowen Falls (c. 200 m of stream habitat) likely provides habitat for indigenous and exotic fish, including īnaka, tuna / eels, and trout.

Pontoon servicing existing walking track to Hine-te-awa Bowen Falls.

Existing track to Hine-te-awa Bowen Falls.



Indigenous shrubland below Hine-te-awa Bowen Falls

Outlet of Hine-te-awa Bowen Falls at Cemetery Point.

Bowen River in the upper hanging valley.

Cemetery Point and Hine-te-awa Bowen Falls outlet from the top of the falls.

Existing penstock for the hydro scheme.

Hine-te-awa Bowen Falls.

Hine-te-awa Bowen Falls and rocky bluff where the 'lower viewpoint' may be located.

Lower bluff where the 'lower viewpoint' may be located, showing 'blast zone' shrubland and diverse fern, grass, vine and shrub species on rock bluffs.

Figure 39. Additional Hine-te-awa Bowen Falls photos.

Marine Habitats and Species

A floating pontoon or gantry is proposed along the northern shoreline of the boat terminal basin. The pontoon would start from the most northern jetty of the terminal and span c.100 m to reach a small beach located opposite the terminal on the Bowen River Delta. A new jetty connecting to the floating pontoon would be built on the intertidal beach.

The marine habitat in the 100 m stretch of shoreline between the boat terminal and the beach consists of a steep rocky reef located at the base of a tall cliff. At a depth of c.2-3 m below the low tide line, the reef gives way to a sandy bottom, which remains at depths between c.3-5 m in the area identified for the installation of the floating pontoon.

The rocky reef substrate is covered mainly by filamentous green and brown algae commonly found in brackish waters (e.g., *Cladophora* spp., *Ulva* spp., *Ectocarpus* sp.). These are generally small and provide little habitat complexity. Below the low tide line, common benthic invertebrates are present in low abundances, including blue mussels (*Mytilus* sp.), barnacles (*Austrominius modestus*) and tube worms (*Spirobranchus cariniferus*). One elven-armed sea star (*Coscinasterias muricata*) was also recorded in the subtidal portion of the reef during the site visit.

The subtidal sandy bottom flanking the rocky reef habitat is dotted with empty bivalve shells (mostly **cockles**). Living **cockles** are also occasionally present on the surface of the seabed and are likely to be more abundant below the surface. The subtidal sandy bottom is unvegetated aside from the occasional presence of the common estuarine red alga *Agarophyton chilense* growing on **cockle** shells in proximity to the beach opposite the ferry terminal.

The intertidal habitat on the beach opposite the ferry terminal is characterised by a mix of sand and cobbles and by the presence of organisms typical of brackish environments such as barnacles, small snails (*Eatoniella* sp.) and filamentous brown, green and red algae (e.g., *Cladophora* spp., *Ulva* spp., *Ectocarpus* sp., *Bostrychia* spp.).

Fish species encountered during the site visit included low numbers of common reef fishes (spotties and a marble fish), as well as a small carpet shark.

Coastal bird species are likely to use the existing pontoon and boat terminal area, including **kōau** / shag species such as little shag (At Risk – Recovering), tōrea pango / variable oystercatcher (At Risk – Recovering), **tara** / white-fronted tern, and gull species. It is possible that **tawaki** / Fiordland crested penguin (which have permanent colonies elsewhere in the Sound) are occasional visitors.

Bottlenose dolphins and other marine mammals are also likely to occasionally visit the boat terminal area or surrounds (J. McAulay, *pers. comm*. 2023).

Intertidal rocky reef habitat.

Subtidal rocky reef habitat.

Subtidal sandy bottom habitat.

Intertidal beach habitat.

Figure 40. Marine habitat types in the area identified for the installation of a floating pontoon in the boat terminal basin.

5.13.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at the Freshwater Basin Node – Hine-te-awa Bowen Falls Experiences including Lower Pontoon Walkway and Top Links that need to be considered are listed below:

Lower Pontoon Walkway

- Vegetation clearance is likely to be of minimal and of negligible ecological effect, as there is an existing walking track to a viewpoint below the Falls that is already constructed to a high standard.
- The main effect on marine habitats and species associated with the installation of the floating pontoon will be shading of the underlying benthic habitat. Some additional shading and permanent occupation of the seabed will occur on the beach opposite the ferry terminal as a result of the construction of a new jetty connected to the pontoon. On the beach, there will also be an increase in the volume of visitors accessing the seabed at low tide. Given the existing physical environment (the area along the northern shoreline of the boat terminal is naturally shady because of the overhanging cliff) and the low diversity of marine life in the area proposed for the installation of these new structures, these impacts are unlikely to be of ecological concern.
- Given the very high degree of existing usage of the existing pontoon and boat terminal area, ongoing disturbance to fauna species such as coastal birds and marine mammals is of less concern. However, if peak / long duration construction noise (including underwater noise) substantially exceeds the noise already generated by boat traffic, there may be some minor temporary displacement of fauna from the area.

Top Links

- The Top Links concept is understood to involve the construction of a cable car or similar means to access the top of Bowen Falls. Whilst no details are available regarding its specification, the concept would presumably require earthworks (rock scaling / anchoring) and vegetation clearance.

- To minimise clearance of mature forest, the cable car is proposed to follow an existing narrow (c. <5 m wide) penstock corridor to the upper Bowen Valley. However, we assume (based on ecological site observations, but without input from engineers and other workstreams at this time) the corridor would need to be widened to construct both a cable car and a newly upgraded penstock. Further, the existing penstock alignment is at least c.250 m from the top of the Falls (at the closest point), requiring clearance of an additional corridor of forest for a 'Short Walk' standard walking track (to cater to a wide range of visitors) from any cable car terminus at the top of the slope. A small wetland area in the forest beneath an existing level area of penstock would likely need to be avoided.
- Clearance would affect diverse indigenous forest of very high ecological value, and an existing modified corridor of lower value (but which is nonetheless covered fully in indigenous species). Whilst natural treeslides occur in the area (stripping forest from steep slopes), these bare slopes are rapidly colonised via natural forest succession, whereas a cable car corridor would be kept clear permanently. The corridor of permanent vegetation clearance would likely exceed the area currently kept clear for the existing penstock.
- The amount / type of vegetation clearance to construct any viewing platforms or other structures is unknown but would be additional to the above.

- In addition to direct clearance, substantial habitat fragmentation and edge effects are likely, and this would likely greatly exceed existing impacts from the penstock corridor.
- Impacts to fauna (loss of habitat, construction related disturbance, and ongoing disturbance) would also occur, and would likely be significantly adverse in the local context. DOC staff have raised the possibility of **kea** (especially juveniles) interacting with moving parts / wires on the cable car structures and being injured or killed; we agree that this is a possible concern and note that similar **kea** fatalities from electrocution (etc.) have occurred, e.g., with ski field infrastructure (Weston et al., 2023).
- The cable car would facilitate access into the presently remote Bowen Valley, and a 'longer walking track' further up valley is proposed in the Masterplan, spreading anthropogenic impacts into a currently little-modified (and visited) valley (apart from the hydro intake). These effects would be substantially elevated above existing levels and ongoing.

Lower Viewpoint

- Construction of a lower viewpoint would involve impacts to or loss of diverse rock bluff vegetation that currently clings to cliffs in the moist spray zone of the falls. It is assumed stairs (or similar) would be fixed to the existing bluffs. Whilst there are areas of sparse / lower stature vegetation on the bluff where a structure could be fixed with little direct impact to vegetation, these areas exist because of occasional blasting from the waterfall and are presumably a poor building location. Construction in safer areas distant from the blast zone will presumably require clearance of larger trees / shrubs such as southern **rātā** and **kāpuka** / broadleaf, but the construction footprint is unlikely to be substantial.

5.13.5 Recommendations

5.13.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 13. Effects management measures recommended for Freshwater Basin Node: Hine-te-awa Bowen Falls Experiences Including Lower Pontoon Walkway, Top Links and Lower Viewpoint.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Earthworks and vegetation clearance leading to habitat loss / fragmentation – Top Links option	Avoid	Whilst developed designs are not available, and hence the proposal cannot be evaluated with complete certainty, the adverse effects of the 'Top Falls Link' are likely to be large scale, significantly adverse, and unable to be appropriately managed. We recommend that this aspect of the Masterplan concept be fully avoided.
Vegetation clearance and reclamation or permanent occupation of the CMA (loss of intertidal habitats) – Pontoon Walkway	Avoid & Minimise	Minimise the footprint of the new structures within the CMA (the floating pontoon and jetty) and connect the floating pontoon / jetty to the existing built track, limiting further vegetation clearance near the base of the Falls.
Vegetation clearance – Lower Viewpoint option	Avoid & Minimise	If the 'Lower Viewpoint' option is pursued, design and install any stairs (etc.) using anchor points deliberately selected to utilise existing exposed rock (where possible) and minimising clearance of larger trees / shrubs. Away from the anchor points, existing vegetation cover (grasses, ferns, mosses etc.) should be left in situ where possible.
Marine biosecurity issues	Mitigate (Monitor)	Include the new structures within the CMA in any current or future marine biosecurity monitoring program carried out within the boat terminal basin (although this is currently not an issue in Milford Sound Piopiotahi, artificial structures within ports and marinas are prone to invasion by unwanted organisms).

5.13.5.2 Further Investigations

- None required at this time if 'Top Links' concept is not pursued.
- If the 'Top Links' concept is pursued, extensive project shaping input from expert ecologists with botanical, and avifauna expertise (and potentially freshwater ecology and other speciality areas) will be needed. Following further development of the concept (i.e., general works types, and spatial extent of works), detailed survey of the proposed construction corridor will be necessary in order to quantify, avoid, and minimise adverse effects, and to devise appropriate options (likely at a reasonably large scale) to remedy, offset, or compensate effects.

5.13.6 Conclusion – Hine-te-awa Bowen Falls Experiences Including Lower Pontoon Walkway and Top Links:

- The Hine-te-awa Bowen Falls Masterplan concept (Lower Pontoon Walkway) would have limited direct adverse impacts. The adverse effects of this aspect of the Masterplan concept are manageable and environmentally acceptable / feasible. Likewise, a 'Lower Viewpoint' option that has emerged during MOP Stage 3 is likely to have generally minor impacts and is environmentally acceptable / feasible.
- The 'Top Links' Masterplan concept would likely involve significant and permanent vegetation clearance to construct new infrastructure with resulting major adverse impacts to indigenous habitats and fauna that cannot be avoided, including habitat fragmentation, edge effects, and ongoing disturbance to fauna.

Based on these likely effects, the 'Top Links' concept is likely to result in significant adverse ecological effects that are unlikely to be able to be managed to an appropriate level, and it is not considered technically feasible from an environmental impact perspective.

Whilst the 'Lower Viewpoint' option would still lead to some adverse effects, this option is vastly preferred compared to the 'Top Links' concept.

The 'Lower Pontoon Walkway' is considered environmentally feasible.

5.14 Cleddau Delta Node: Cleddau Bush Tracks

5.14.1 Masterplan Concept / Proposal

Several walkways of 'Short Walk' standard (up to 3.5 km in length in total; Southern Land Ltd, 2024) are proposed throughout an area of forest at the Cleddau Delta ('Cleddau Bush') providing views towards Mitre Peak. Some or all will have wheelchair access. One track will link observation points along the foreshore and the other will be a nature trail through the forest. This concept will also include connecting the visitors' centre and boat terminal to Deepwater Basin to the south, which is currently severed by the runway infrastructure. Both tracks are proposed to follow existing predator traplines to minimise additional vegetation clearance and disturbance.

5.14.2 Existing Visitor Facilities / Infrastructure

The only existing modifications to the Cleddau Bush are a network of predator traps serviced by lightly cut and marked tracks.

5.14.3 Description of the Existing Ecological Environment

Figure 41. Outstanding and intact forest in the Waipāteke / Cleddau River delta forest (Cleddau Bush).

Vegetation

Cleddau Bush occupies alluvial surfaces on the delta of the Waipāteke / Cleddau River. It is a mature, tall, and diverse forest dominated by **tawai** / silver beech but with **kāmahi** and numerous podocarps (**kahikatea**, **rimu**, **miro**, and tōtara kōtukutuku / Hall's tōtara) reaching the canopy, along with tree tutu and small-leaved **kōwhai** on coastal edges. Coastal small trees

and shrubs include kōkōmuka / shore hebe, **kōhūhū** (*Pittosporum colensoi*), and yellow silver pine. Over 120 indigenous vascular plant species were recorded in a brief survey, compared to small numbers of only c.5 exotic species. Notable species include tētēaweka / leatherwood (At Risk – Naturally Uncommon), and diverse saltmarsh species already referenced in Section 5.11. Numerous tidal channels and estuarine / swamp areas are often concealed beneath the canopy, with some areas of forest essentially becoming islands at high tide.

Terrestrial Fauna

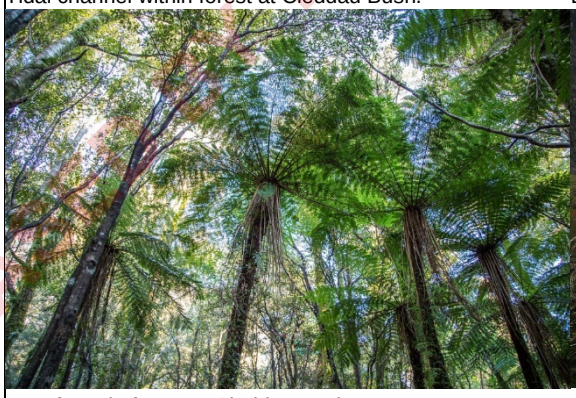
Numerous forest bird species are present, as listed in Section 5.11. This large lowland forest patch provides excellent bird habitat protected by ongoing predator trapping. Saltmarsh and wetland areas provide ideal habitat for cryptic wetland bird species (koitareke / marsh crake, pūweto / spotless crake, and matuku hūrepo / Australasian bittern), and **pāteke** / brown teal have been anecdotally observed in the area. **Kōau** / shag species including a small breeding colony of little shag and a little black shag (At Risk – Naturally Uncommon) roost were observed on trees overhanging the channel adjacent to the existing wastewater treatment plant.

Marine / Freshwater Habitats and Fauna

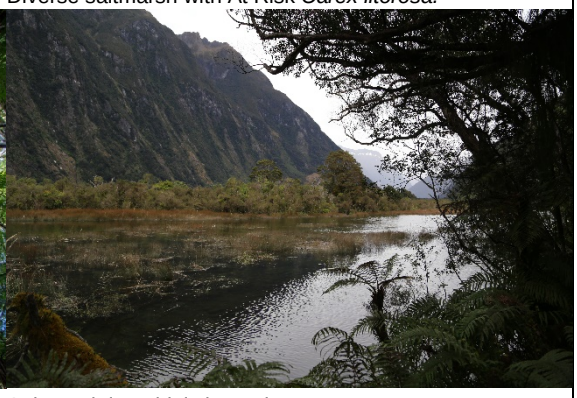
The tidally influenced channels within the Waipāteke / Cleddau River delta forest likely provide extensive and very high-quality spawning habitats for īnaka. There are no NZFFD records of fish or fish surveys in the area.

Tidal channel within forest at Cleddau Bush.

Diverse saltmarsh with At Risk *Carex litorosa.*

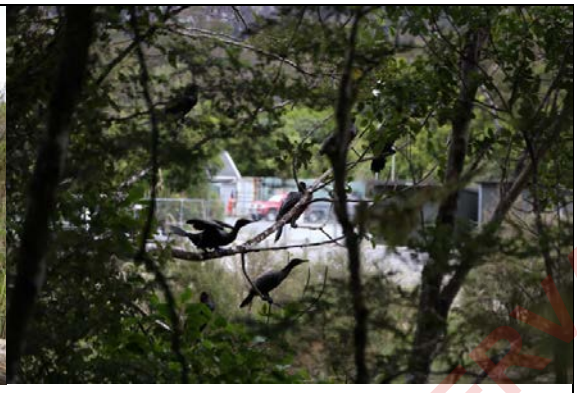


Tree ferns in forest at Cleddau Bush.



Saltmarsh in a tidal channel.

Saltmarsh and coastal scrub fringes forest.



Kōau / little black shag roost in Cleddau Bush, opposite the wastewater treatment area.

Tidal channel within forest.

Wetland channels in the Cleddau Bush.

Figure 42. Additional Cleddau Bush photos.

5.14.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at the Cleddau Delta Node – Cleddau Bush Tracks that need to be considered are listed below:

- Vegetation clearance in forest areas to construct the walking tracks would result in the loss of diverse indigenous understory plant species, to a potentially significant degree if multiple tracks are installed to a wheelchair-accessible standard.
- Vegetation clearance due to new installations at the coastal edge (e.g., tracks, including construction of boardwalks) and indirect effects (e.g., from increased trampling) may result in permanent loss of saltmarsh habitat, and an associated reduction in the quality and / or quantity of īnaka spawning habitat. As such, the layout of access points to the foreshore and boardwalks should be designed to avoid areas of potential īnaka spawning habitat (i.e., rushlands in upper intertidal areas and along tidal channels) and minimise impacts where this is not possible.
- Increased access to the foreshore (by more visitors and / or in more locations) would likely lead to increased avifauna disturbance for estuarine / water bird species using intertidal habitats (likely including sensitive species including cryptic wetland bird species and **pāteke**).
    - Dependent on the implementation of other MOP concepts (e.g., 'Foreshore Enhancement' / 'Regenerative Spine' tracks) there is a potential that localised cumulative effects (because very few intertidal areas may be unaffected) reach a threshold of ecological concern. It is noted that the indicative route largely

avoids saltmarsh habitat; to minimise the risk identified above, formalised viewing opportunities, with barriers in appropriate locations, should be provided to avoid informal tracks created by visitors 'seeking a view'.

- High-tide roosting habitats on the coastal edge for avifauna would likely be affected by a 'squeeze' due to cumulative effects from existing kayakers (etc.) and visitors using walking tracks adjacent to the water. This may result in effective displacement from a high-quality habitat.
- The current indicative track alignments involve a track circumnavigating the entire Cleddau Bush patch, as well as links to other proposed foreshore tracks near the existing airstrip. In this context, reducing the number of new tracks and avoiding the western area that provides secluded bird habitat and extensive īnaka spawning habitat is important to reduce effects to acceptable levels.

5.14.5 Recommendations

5.14.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 14. Effects management measures recommended for Cleddau Delta Node: Cleddau Bush Tracks.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Vegetation clearance, fauna disturbance, and local cumulative effects arising from construction of multiple walking tracks	Avoid & Minimise	Consolidation of the number of tracks is required to reduce adverse effects (vegetation clearance, fauna disturbance and local cumulative effects) to acceptable levels. A track following the existing predator trap line (from the end of Sinbad Drive, parallel to the existing runway) that links to a proposed new foreshore viewing deck at the north end of the runway, then connects to the existing foreshore track at Freshwater Basin may be sufficient to create a new longer track for visitors. This would also create a logical connection between Freshwater Basin and Deepwater Basin but would avoid impacts to western areas of Cleddau Bush and minimise overall impacts to this forest area.
Impacts to estuarine wetlands and natural processes	Avoid & Minimise / Remedy	Boardwalking the track is likely the most acceptable way to install a wheelchair-standard track, compared to the extensive ground disturbance and compacted hard surfaces required otherwise. Boardwalks may limit movement of currently extensive floating woody debris (a notable aspect of the natural processes of the coastal edge in this area, which is likely important for nutrient cycling and invertebrate habitat) and block tidal channels, meaning that they may need to be elevated or on well-spaced piles to minimise this effect in these areas. Remedial measures to address loss of saltmarsh due to installation of boardwalks in saltmarsh areas / channel may be required.

5.14.5.2 Further Investigations

- None recommended at this time.

5.14.6 Conclusion – Cleddau Delta Node: Cleddau Bush Tracks

Whilst the direct impacts of the proposed track works are not large-scale, and existing predator trap lines would be used, direct vegetation clearance (due to the high track standard proposed) and cumulative effects to indigenous fauna (due to encroachment of visitor activities throughout the delta area) are difficult to quantify, but potentially substantial and inherent to the proposal. In this context, we strongly recommend minimising the number of tracks. If options are consolidated, leaving large undisturbed areas for fauna, ecological impacts of the Masterplan concept are likely to be able to be acceptably managed to the point of being feasible from an environment impact perspective.

5.15 Deepwater Basin Node: Recreational Boat Ramp and Trailer Parking

5.15.1 Masterplan Concept / Proposal

The existing concrete dual access boat ramp will be upgraded, with access and manoeuvring areas adjusted to reduce conflict between activities. Boat trailer parking areas will be formalised, as well as dedicated short-term parking, and long-term parking along Gravel Pit Lane.

5.15.2 Existing Visitor Facilities / Infrastructure

An existing boat ramp and large gravel carpark is present. Wharves and buildings are located nearby.

5.15.3 Description of the Existing Ecological Environment

Marine Habitats and Species

An assessment of environmental effects for the upgrade of the Deepwater Basin Boat Ramp has been completed by DOC (2023). That assessment shows that small green algae commonly found in brackish environments (e.g., *Cladophora* spp., *Ulva* spp.) are the only organisms present on the surface of the seabed in the intertidal and shallow subtidal area which would be affected by the upgrade of the boat ramp. According to DOC's assessment, there is no visible epifauna and sparse polychaete burrows are the only evidence of infauna.

Our site visit confirmed these observations, and we agree with DOC's conclusion that the species present in the area are not particularly rare or of conservation significance.

Existing boat ramp near fishing boat wharves. Foreshore near existing boat ramp.

Figure 43. Recreational Boat Ramp photos.

5.15.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at the Deepwater Basin Node – Recreational Boat Ramp and Trailer Parking that need to be considered are listed below:

- According to the assessment of environmental effects carried out by DOC (2023), potential impacts on marine habitats and species and minimal, but will include:

- Permanent loss of subtidal benthic habitat because of the larger footprint of the new boat ramp compared to the existing one;
- Temporary disturbance of intertidal and subtidal benthic habitat because of the installation of a temporary coffer dam during construction. The area enclosed within the dam kept in the dry for several weeks, resulting in the mortality of all marine organisms.

Given the small increase in the footprint of the structure, the already modified nature of the area that would be converted to boat ramp (because of the impact of intense boat traffic) and considering the low diversity of marine life in the boat ramp area, we agree with DOC's conclusion that the very localised impact on common marine flora and fauna is not of ecological concern.

5.15.5 Recommendations

5.15.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 15. Effects management measures recommended for Deepwater Basin Node: Recreational Boat Ramp and Trailer Parking.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Mortality of aquatic fauna	Avoid	Follow best practice construction, and erosion and sediment control methods to avoid any impact outside of the area enclosed within the coffer dam. Ensure that there are no fish (e.g., īnaka) trapped inside the coffer dam once the water is removed.

5.15.5.2 Further Investigations

- None recommended at this time.

5.15.6 Conclusion – Deepwater Basin Node: Recreational Boat Ramp and Trailer Parking

The adverse ecological effects of the Masterplan concept are likely to be relatively minor and able to be managed to a sufficient level. The footprint of proposed works is small, and the marine habitats affected are neither diverse nor of conservation importance. The proposal is environmentally feasible.

5.16 Deepwater Basin Node: Dedicated Sea Kayak Area

5.16.1 Masterplan Concept / Proposal

A dedicated ramp / service area for sea kayaking, including boat storage, will provide a more sheltered location for put-ins and avoid commercial / large boats. This proposal would require dredging of the intertidal channel at this location to facilitate the kayaking operations.

5.16.2 Existing Visitor Facilities / Infrastructure

The proposed kayak launching area is a shallow channel on the north side of a commercial fishing wharf / carpark / storage area. The shallow channel is separated from a deeper channel (north of a reclaimed breakwater) by an intertidal isthmus. Fishing vessels moor on the south side of the breakwater, but there are no structures within the proposed kayak launching channel itself.

5.16.3 Description of the Existing Ecological Environment

Figure 44. Tidal channel flanked by saltmarsh vegetation in the dedicated sea kayak area. Dredging of the channel is proposed to facilitate the kayaking operations.

Terrestrial Fauna

A range of wetland and water birds including waterfowl and **kōau** / shag species (e.g., little black shag, little shag) are likely to feed in the channel or feed / roost along its edges.

Marine Habitats and Species

The intertidal channel where dredging is proposed to facilitate kayaking operations is characterised by a muddy benthic substrate inhabited by **whetiko** / pulmonate mud snail and with a sparse cover of filamentous brown and green algae commonly found in brackish environments (e.g., *Cladophora* spp., *Ulva* spp., *Ectocarpus* sp.). Polychaete and crab burrows are visible on the surface of the seabed. Given the muddy nature of the substrate, infauna communities are likely to be dominated by common stress-tolerant organisms. Large bivalves (e.g., **tuaki** / **cockle**, **pipi**) are unlikely to be abundant in this substrate and during the site visit bivalve shells were not visible on the surface of the seabed or immediately below (up to 5 cm beneath the surface of the seabed).

There is abundant saltmarsh vegetation (jointed rush and **toetoe**) on both sides of the channel. A narrow strip of shrubs / small trees (e.g., tree tutu) divides the parking / storage area and the saltmarsh. Further discussion of saltmarsh and coastal vegetation in the general area is provided in Section 5.14. The shallow channel terminates with a narrow isthmus connecting it to a wider and deeper tidal channel (where dredging will not be required) immediately north of the breakwater. In the area of the isthmus there is a rocky substrate dominated by cobbles. This cobble habitat supports a sparse cover of filamentous green/brown algae and a few oioi / jointed rush plants.

Notably, īnaka, which spend their adult life in freshwater systems, were observed in the intertidal channel. Due to the freshwater inversion layer in Milford Sound Piopiotahi, it may be feasible that īnaka could use the riparian margins of this intertidal channel as spawning habitat.

Overall

The proposed sea kayaking launch channel comprises a typical but intact and representative estuarine saltmarsh habitat, providing **īnaka** habitat (including spawning habitat).

Muddy benthic substrate of the tidal channel populated by **whetiko** / pulmonate mud snails.

Cobble habitat with saltmarsh in the isthmus at the head of the tidal channel.

Figure 45. Additional Sea Kayak Area photos.

5.16.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at the Deepwater Basin Node – Dedicated Sea Kayak Area that need to be considered are listed below:

- The fine sediment material present on the channel bed would be easily mobilised by dredging and re-suspended into the water column. Without appropriate sediment control measures (see Section 5.16.5), the re-suspended sediment could impact the saltmarsh vegetation surrounding the channel. In addition, far-reaching impacts on marine life could occur if the resuspended sediment is transported to adjacent inter-tidal and marine habitats.
- Provided that impacts on the saltmarsh vegetation surrounding the channel and sediment transport to the adjacent inter-tidal and marine habitats can be avoided / minimised (see Section 5.16.5), the main impact of dredging on marine habitats and species will be the mortality of the benthic organisms which will be removed along with the dredged material. This is based on the assumption that the dredged material will not be returned to the marine environment (in which case there would also be adverse effects at the receiving site). Given the low diversity of marine life in the area proposed for dredging (with very few organisms visible on the surface of the seabed and infauna communities likely to be dominated by common, stress-tolerant macroinvertebrates) and considering that post-dredging the seabed will likely be recolonised by the same organisms which are currently present, the impact of dredging is likely to be able to be managed to a sufficient level (but note that dredging will impact the taonga species **whetiko** / pulmonate mud snail; see also Section 5.16.5 recommendations regarding the need to avoid / minimise impacts on adjacent saltmarsh vegetation and the surrounding water bodies).
- The impact of dredging on saltmarsh vegetation may have adverse effects on potential īnaka spawning habitat. Dredging can re-suspend fine sediments (silt and sand) into the water column, where, on high tides, this may then be dispersed and settle onto riparian vegetation and smother potential egg development habitat.

5.16.5 Recommendations

5.16.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 16. Effects management measures recommended for Deepwater Basin Node: Dedicated Sea Kayak Area.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Reclamation or permanent occupation of the CMA (loss of intertidal habitats), damage to intertidal mudflat habitats	Avoid & Minimise / Mitigate	Minimise the built footprint of any kayak launching ramp in order to minimise clearance of saltmarsh and fringing vegetation and limit the construction of boat storage / other ancillary structures to existing modified areas. Minor remedial / compensation measures to address the loss of (likely) relatively small areas of currently intact saltmarsh may be required.

Erosion and sedimentation of intertidal habitats, estuarine vegetation clearance, mortality of aquatic fauna	Avoid	Limit dredging to the central part of the channel to avoid any further direct effects on saltmarsh vegetation (although the removal of some oioi / jointed rush plants in the isthmus area connecting the channel to the adjacent tidal inlet may be unavoidable: see the recommendation above). Dredging at low tide and / or using a coffer dam, silt curtains or similar sediment control devices to avoid / minimise the transport of sediment outside of the dredging area. Potentially, some sediment control devices (e.g., a coffer dam) would require fish management measures. Dredging should occur outside of critical īnaka spawning periods (March-June, inclusive) and any īnaka spawning habitat lost must be remedied. Dispose of the dredged material outside of the CMA.

5.16.5.2 Further Investigations

- None recommended at this time.

5.16.6 Conclusion – Deepwater Basin Node: Dedicated Sea Kayak Area

The adverse ecological effects of the Masterplan concept are likely to be relatively minor and able to be managed to a sufficient level. The proposal is environmentally feasible.

5.17 Deepwater Basin Node: Wastewater Treatment Plant

5.17.1 Masterplan Concept / Proposal

There is no information in the Masterplan on the Wastewater Treatment Plant. The existing Wastewater Treatment Plant and network, including the outfall pipe, may need to be upgraded or replaced to accommodate the MOP proposals at Milford Sound Piopiotahi Village. Upgrades or replacement would provide for a higher rate and quality of treatment.

5.17.2 Existing Visitor Facilities / Infrastructure

This infrastructure is already present but would be upgraded.

5.17.3 Description of the Existing Ecological Environment

Figure 46. Existing wastewater treatment outfall pipe.

Terrestrial Fauna

As described in Section 5.14, a range of wetland and water birds including waterfowl and **kōau** / shag species (e.g., little black shag, little shag) are likely to use habitats in the area. **Kōau** roost along the edges of a tidal channel opposite existing wastewater infrastructure.

Marine Habitats and Species

The marine habitat which would be affected by the upgrade or replacement of the Wastewater Treatment Plant outfall pipe includes intertidal / shallow subtidal areas along the lower reaches of a tidal channel west of the Wastewater Treatment Plant and along an c. 300 m stretch of coastline in the deeper channel between Deepwater Basin and Milford Sound Piopiotahi.

Along the lower reaches of the tidal channel, the outfall pipe is not visible but there is a marker indicating that it runs along the true left bank of the channel rather than through the middle. The true left bank of the channel has dense saltmarsh vegetation (mostly oioi / jointed rush) which extends all the way down to the edge of the channel (Figure 47). Patches of low-lying saltmarsh vegetation (sea primrose) colonise the seabed along the boundary of the oioi / jointed rush in places (Figure 47).

The lower reaches of the tidal channel are characterised by a cobbly and muddy seabed inhabited by **whetiko** / pulmonate mud snail and with a sparse cover of red, brown and green algae commonly found in brackish environments (e.g., *Cladophora* spp., *Ulva* spp., *Ectocarpus* sp., *Bostrychia* spp.; Figure 47). Polychaete and crab burrows are visible on the surface of the seabed. Given the muddy nature of the substrate, infauna communities are likely to be dominated by common stress-tolerant organisms. Large bivalves (e.g., **tuaki** / **cockle**, **pipi**) are unlikely to be abundant in this kind of substrate and during the site visit bivalve shells were not visible on the surface of the seabed nor immediately below (up to 5 cm beneath the surface of the seabed).

The true right bank of the channel is indigenous forest. While saltmarsh vegetation is concentrated along the true left bank, about halfway through the channel, a large patch of saltmarsh vegetation (mostly oioi / jointed rush) is present on the seabed in proximity of the true right bank.

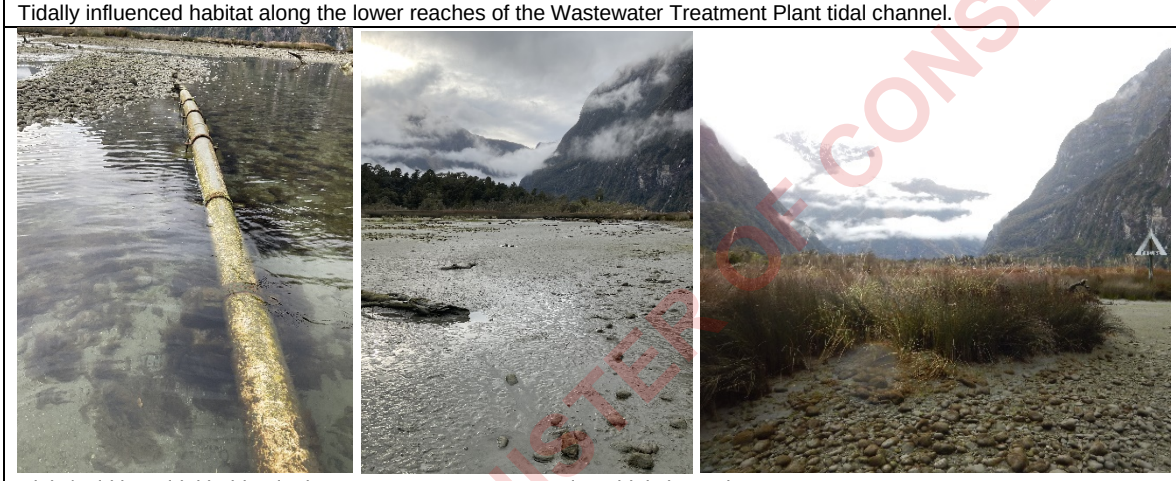
In the mid-upper reaches of the tidal channel, milfoil (a freshwater macrophyte) was present in varying cover (15 to 90%). Īnaka were also observed throughout this channel on our site visit and may use the riparian margin of this intertidal channel as spawning habitat.

Along the channel between Deepwater Basin and Milford Sound Piopiotahi, long stretches of the pipeline are visible as it runs through an area characterised by fine sand and cobbles in the high / mid intertidal zone and by coarse sand in the low intertidal / shallow subtidal zone (Figure 47).

In the high / mid intertidal zone, there is a sparse cover of common red, brown, and green algae typical of brackish environments. Saltmarsh vegetation (oioi / jointed rush) is present at the upper end of the intertidal area. Barnacles (*Austrominius modestus*) and crabs (*Austrohelice crassa*) are present with low abundances in the high / mid intertidal zone.

In the low intertidal / shallow subtidal zone, there is a more widespread cover of common red, brown, and green algae typical of brackish environments (e.g., *Cladophora* spp., *Ulva* spp., *Ectocarpus* sp. and other species of Ectocarpales, *Bostrychia* spp., *Polysiphonia* sp., *Agarophyton chilense*). The algae grow both on the seabed and on the outfall pipe (Figure 47). **Tuaki** / **cockle** are present on the surface of the seabed (Figure 47). This is indicative of infauna communities characterised by the presence of mud-sensitive species. This is consistent with the sandy nature of the seabed in the low intertidal / shallow subtidal zone along the channel between Deepwater Basin and Milford Sound Piopiotahi.

Tidally influenced habitat along the lower reaches of the Wastewater Treatment Plant tidal channel.



High / mid intertidal habitat in the Wastewater Treatment Plant tidal channel.

Low intertidal / shallow subtidal habitat and tuaki / cockle in the Wastewater Treatment Plant tidal channel.

Figure 47. Marine habitat types along the alignment of the outfall pipe.

5.17.4 Preliminary Assessment of Environmental Effects

The potential adverse effects in relation to the Deepwater Basin Node – Wastewater Treatment Plant that need to be considered are listed below:

- The key impacts on marine habitats and species cannot be fully evaluated without further details about the potential upgrade or replacement of the Wastewater Treatment Plant outfall pipe. Based on the habitats and species present along the alignment of the existing outfall pipe, the greatest ecological concern is likely to be associated with effects on saltmarsh vegetation and potential īnaka spawning habitat. We also note that the presence of taonga species (**whetiko** / pulmonate mud snail and **tuaki** / **cockle**) in the area could be affected by upgrades of the Wastewater Treatment Plant outfall pipe.

- General impacts include the potential for reclamation or permanent occupation of the CMA by structures, or erosion and sedimentation issues during construction.
- An additional impact of the proposal relates to the presence of **kōau** / shag roosting and breeding areas in the vicinity of the existing Wastewater Treatment Plant and outfall pipe. Construction works, especially during the **kōau** / shag breeding season, could displace these species and potentially lead to nesting failure.

5.17.5 Recommendations

5.17.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 17. Effects management measures recommended for Deepwater Basin Node: Wastewater Treatment Plant.

Environmental Effect / Impact	**Effects Management Hierarchy Approach**	**Recommendation**
Reclamation or permanent occupation of the CMA (loss of intertidal habitats), damage to intertidal mudflat habitats	Avoid & Minimise	Avoid / minimise effects on saltmarsh vegetation during any replacement of structures, such as the outfall pipe that will require works in saltmarsh habitat. Minor remedial / compensation measures to address the loss of (likely) relatively small areas of currently intact saltmarsh may be required.
Erosion and sedimentation of intertidal habitats, estuarine vegetation clearance, mortality of aquatic fauna	Avoid & Minimise	Minimise excavation of the seabed and carry out any excavation at low tide and/or using a coffer dam, silt curtains or similar sediment control devices to avoid / minimise the transport of sediment outside of the excavation area.
Impacts to breeding **kōau** / shag species	Avoid	Avoid undertaking works during the breeding season for kōau and other water / wetland birds potentially roosting on forest / channel edges. If this is not possible, works should be subject to a survey for nesting indigenous birds and application of appropriate setbacks from nests as necessary.

5.17.5.2 Further Investigations

- None recommended at this time.

5.17.6 Conclusion – Deepwater Basin Node: Wastewater Treatment Plant:

Without further details on the potential upgrade or replacement of the Wastewater Treatment Plant and outfall pipe effects on environmental values cannot be fully determined. However, from the information available, it is expected that adverse ecological effects are likely to be able to be managed to a sufficient level, and the proposal is likely to be feasible from an environmental impact perspective.

5.18 Other MOP Proposals - The Chasm to Cleddau Horse Bridge Walk

5.18.1 Masterplan Concept / Proposal

The proposed Chasm to Cleddau Horse Bridge Walk is not described in the Masterplan, but the Chasm is included in the Masterplan as a Short Stop to be repaired (following damage in the 2020 floods) and upgraded with additional infrastructure. An indicative alignment on the true left of the Waipāteke / Cleddau River, between the Chasm and an existing historic (but derelict) 'Horse Bridge' is available, based on Southern Land Ltd. (2024). It would involve the construction of c.3.2 km of walking trail to 'Walking Track' standard (i.e., 1.0-1.2 m width with well-formed surface; refer to Appendix 5) and will likely require a structure, such as a gantry of c.175 m length, to effect a route around steep bluffs that descend to the river below Sheerdown Peak just upstream of the Horse Bridge. The proposal would also require the replacement of the Horse Bridge.

Figure 48. The Chasm to Cleddau Horse Bridge Walk.

5.18.2 Existing Visitor Facilities / Infrastructure

Other than a carpark and a high-use visitor track at the Chasm (which was damaged in a 2020 flood, with some areas reinstated since that time) and an unmaintained route to the derelict bridge, there are no existing structures in the area.

5.18.3 Description of the Existing Ecological Environment

Figure 49. Cleddau Horse Bridge, looking downstream.

Very little site survey was undertaken in relation to this proposal. Site observations on foot were not within the scope of this assessment, and the information obtained is limited to desktop records supplemented with what could be seen via brief drone flights. Drone flights were limited by poor take-off locations in small forest gaps (severely limiting line of sight operation), and by civil aviation requirements in downstream areas (i.e., a Milford Airport restricted flight area, which extends to the Horse Bridge).

Vegetation

Riparian areas on the true left of the Waipāteke / Cleddau River are cloaked largely in **tawai** / silver beech forest (parasitised by relatively healthy populations of the At Risk – Declining yellow, red, and scarlet mistletoe species) with occasional emergent podocarps (in particular **rimu** and **miro**). Due to the lack of deer browse, the forest has a dense understory that is largely unmodified and intact.

Steeper valley walls have South Island **rātā**, **kāmahi**, and **tawai** / silver beech forest, and gullies and areas disturbed by massive rock and snow avalanches below Sheerdown Peak have seral forest / scrub areas dominated by pioneer species including kōtukutuku / tree fuchsia

as well as **houhi** / mountain ribbonwood, makomako / wineberry, patē, tree tutu, and **koromiko** ('kākāpō gardens;' see Section 5.4.3) that are a highly productive seasonal food source for indigenous forest birds, especially **kākā**, **tūī**, and **korimako**. Similar vegetation as well as fernland, mossfield and herbfield occupies narrow treeslide / avalanche / rockfall paths on steep slopes on the true left upstream of the Horse Bridge; this vegetation appears to be of mixed age and is suggestive of a recurring natural cycle of treeslide (etc.) events followed by regeneration.

Terrestrial Fauna

The area is most notable as a **kōwhiowhio** / blue duck habitat; the Waipāteke / Cleddau River is a northern Fiordland 'security site' for long-term management of the species, and the mid-reaches in the vicinity of the proposal provide ideal habitat. In addition, various Threatened and At-Risk forest bird species are present, including South Island **kākā**, **koekoeā,** northern Fiordland **tokoeka**, and yellow-crowned **kākāriki**, as well as **kea**. Western **weka** and a range of other relatively widespread (i.e., Not Threatened) indigenous forest bird species are also present, including **tītipounamu** / rifleman, **miromiro** / South Island tomtit, pīpipi / brown creeper, **ruru** / morepork, **pīpīwharauroa** / shining cuckoo, **kakaruai** / South Island robin, **tūī**, **korimako** / bellbird and **kererū**.

No information about terrestrial invertebrates or lizard species in the vicinity of the proposal were located. In general, intact forest and seral scrub / forest is likely to support diverse and intact indigenous invertebrate communities.

Freshwater Habitats and Fauna

The Waipāteke / Cleddau River is a 5th order mountain-fed river, which in the proposed walkway envelope has native forest on both banks. Riverbanks were dominated by boulders and the riverbed substrates were dominated by cobbles and boulders with very few, or no fine sediments present.

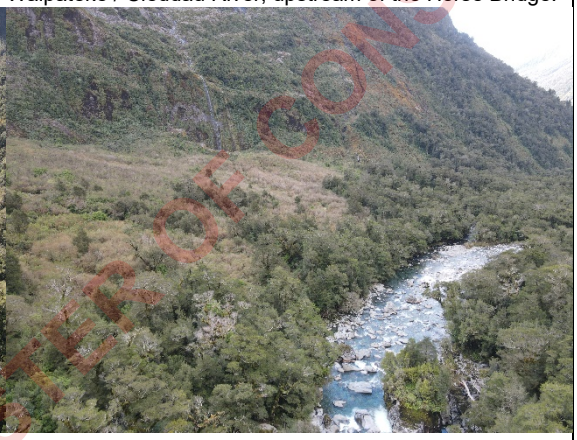
We found no record of macroinvertebrate community measures for Waipāteke / Cleddau River, but it likely provides suitable habitats for sensitive macroinvertebrate taxa which are tolerant of faster flows, such as some species of stoneflies, grazing mayflies, cased caddisflies, and riffle beetles.

We found no records of indigenous fish or fish surveys in Waipāteke / Cleddau River, although it is a known trout fishery. Īnaka were observed at the mouth of Waipāteke / Cleddau River, and additional potential species (based on NZFFD records from Freshwater Basin and the nearby – and somewhat similar – Arthur River) include kanakana / lamprey (Threatened – Nationally Vulnerable), tuna / longfin eel, redfin bully, banded kokopu, and kōaro. However, due to the cascading and flood-prone nature of the river, the fish community in these reaches may be limited to taxa with swimming abilities that allow them to migrate up vertical and turbid sections of river (e.g., kanakana / lamprey, kōaro, and tuna / eels).

Waipāteke / Cleddau River, downstream of the Chasm.

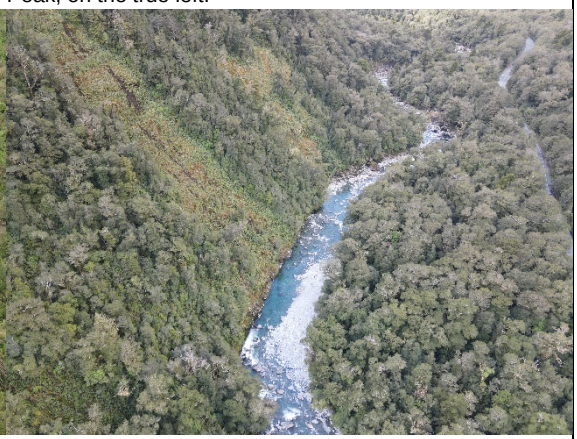
Waipāteke / Cleddau River, upstream of the Horse Bridge.

Waipāteke / Cleddau River, downstream of the Chasm.



Seral fuchsia-dominated forest on slopes below Sheerdown Peak, on the true left.

Seral fuchsia-dominated forest.



Steep slopes descending to the Cleddau on the true left will require a lengthy gantry (or similar) to construct a track.

Figure 50. Additional photos of habitats in the vicinity of the proposed Chasm to Cleddau Horse Bridge Walk.

5.18.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the MOP proposal at The Chasm to Cleddau Horse Bridge Walk option that need to be considered are listed below:

- The key effect of the proposal is that vegetation clearance in forest areas to construct the walking tracks would result in the loss of diverse indigenous understory plant

species, to a potentially significant degree depending on track standard. Because of its dense, low stature growth form at this location, construction of a track in **kōtukutuku**-dominated seral forest is likely to require canopy clearance along the indicative 3.2 km track corridor in places. This would likely result in a degree of habitat fragmentation and edge effects, depending largely on track width and construction methods. Based on a 'Walking Track' standard track, direct and permanent vegetation clearance would be in the vicinity of 0.38 ha, with additional effective clearance due to edge effects and ongoing maintenance of track margins.

- Loss of seral forest habitat and introduction of visitors would reduce the availability of undisturbed feeding habitat for bird species, including seasonal feeding habitat for some species such as **kākā**.
- An additional effect of the proposal is ongoing disturbance to **kōwhiowhio**, in locations where the track is in close proximity to the river and potentially at other locations where the track facilitates access to the river; we note Southern Land Ltd. (2024) refers to access to river pools as a visitor opportunity. However, generally enabling river access at numerous points will displace **kōwhiowhio** from an important area of high-quality habitat.
- An additional effect of the proposal is potential for introduction and / or spread of new freshwater (plant and animal) pests to Waipāteke / Cleddau River, which is currently free of didymo. While this is an existing risk, it would be magnified by increased use and by construction works and potentially increased access to the river by visitors.

5.18.5 Recommendations

5.18.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 18. Effects management measures recommended for Other MOP Proposals – The Chasm to Cleddau Horse Bridge Walk.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Vegetation clearance and disturbance of **kōwhiowhio**	Avoid & Minimise	Minimisation of track length and footprint (width / degree of earthworks) while fully avoiding clearance of canopy trees is the clearest way to minimise effects. Enabling river access leading to kōwhiowhio disturbance should ideally be avoided by generally locating the track at some distance from the river. However, there may be a potential for informal tracks to evolve and in this context, it may be preferable to provide side tracks at a small number (1-2) of locations along the river to satiate visitor interest. These locations should ideally utilise secluded deep pools that provide limited whio feeding habitat rather than bouldery and open riffle / pool sequences of the river (or riffle / rapid sequences) where disturbance of kōwhiowhio feeding is more likely.

Impacts to freshwater habitats	Avoid & Minimise	Construction or upgrades to existing facilities should consider proximity to Waipāteke / Cleddau River. Care should be taken to minimise erosion and direct sediment runoff during construction, and from any increased impervious surfaces and increased visitor traffic (i.e., by allowing a vegetated buffers to remain between hardstand and the adjacent river). Any vegetation clearance within riparian areas should be avoided as much as practicable. Refinement of the construction methodology for the walking track should include input from a specialist freshwater ecologist to determine the appropriate management for any proposed construction activity in, or in close proximity to the rivers or lake (e.g., erosion and sediment controls, avoidance / minimisation of work and machinery in the water).
Loss of / impact to seasonal feeding habitat for bird species including **kākā**	Mitigate	Establish and maintain predator control along the track alignment. In addition, possum control would mitigate loss of fuchsia and other seral forest trees providing seasonal bird feeding opportunities (because possums will also browse these species; see discussion in Section 7.0 regarding landscape-scale predator control.
Introduction of freshwater pests	Avoid / Mitigate	The 'clean, check, dry' practices need to be strictly adhered to when undertaking construction works in and adjacent to waterbodies. The Waipāteke / Cleddau River is thought to currently lack didymo, making this a key concern.

5.18.5.2 Further Investigations

- None recommended at this time.

5.18.6 Conclusion – The Chasm to Cleddau Horse Bridge Walk:

The adverse effects of the proposed Chasm to Cleddau Horse Bridge walking track are limited in physical scale (because of the relatively small footprint of a track) but are magnified by the fact that the proposed area provides intact and important bird habitat. Adverse effects in relation to vegetation clearance and habitat loss should be minimised or otherwise remedied but are likely to be able to be managed to a sufficient level. Considered in isolation, the proposal is considered environmentally feasible. However, compared to many other MOP proposals, it represents a new encroachment into a currently largely unmodified area, and compensatory measures will be required to address impacts from disturbance to fauna.

5.19 Other MOP Proposals – Little Tahiti

5.19.1 Masterplan Concept / Proposal

'Little Tahiti' is the name given to a c.1 ha clearing in a former flood channel of the Waipāteke / Cleddau River. Little Tahiti was not provided as an option for developments within the Masterplan but has since been identified by MOP as a potential location for either a heliport or staff accommodation and was visited during the site visit for this report.

Heliport

Little Tahiti has been suggested as a possible location for the relocation of rotary aircraft (helicopters) from the existing airport. This option was not included in the Masterplan but has since been identified by MOP and assessed during the site visit for this report. The Conservation Impact Analysis report for MOP Stage 2 (Boffa Miskell Ltd, 2021) that accompanied the Masterplan recommended that this site should not be used for this purpose.

Preliminary advice from WSP Consultants to MOP (30 January 2024, provided to Boffa Miskell by Tom Hopkins) is that providing a similar level of service to the existing heliport (i.e., c.10 helicopter parking stands) would require around 2.2 ha of land. In addition, based on the existing cleared area available, the heliport's take off and approach surface would require trimming or clearing an additional area of surrounding forest vegetation.

Staff accommodation

Little Tahiti has also been considered as one of two potential locations for staff accommodation (the first was outlined in the Milford Masterplan and is located within the Piopiotahi Visitors' Hub at Milford Sound Piopiotahi). The proposal may potentially include the construction of staff accommodation (to be determined), a communal outdoor space, and car parking separate, or in addition to, the visitors' accommodation within the Piopiotahi Visitors' Hub.

Figure 51. Little Tahiti.

5.19.2 Existing Visitor Facilities / Infrastructure

The existing clearing in the southeast of Little Tahiti includes a capped former landfill. Other than an unsealed access road and culverted stream crossing, there is no other existing infrastructure at this location. There are presently piles of concrete debris and stockpiled rock armour in the clearing.

As described in E3 Scientific (2022), the clearing was used during the c.1950s-1980s for multiple waste pits of variable depth, containing c.3,000-4,000 m^3 of waste.

It is used for occasional helicopter landings as a load site.

5.19.3 Description of the Existing Ecological Environment

Figure 52. Clearing at Little Tahiti.

Vegetation

The clearing at Little Tahiti is an exotic grass grassland with patchy mikimiki (*Coprosma rugosa* and *C. propinqua* var. *propinqua*) shrubs and pūniu / prickly shield fern. A small number of woody weeds were present at the time of the survey, with blackberry scattered throughout and small numbers of Scotch broom (not otherwise observed in the Cleddau Valley). This vegetation is modified (largely weedy / exotic) and values are low, presumably because it is recent vegetation that occupies the landfill cap (exact landfill boundaries are not known).

At the forested edges of the clearing, and across older stockpiles of rocks, creeping pōhuehue and other indigenous herbs and ferns are present are present. The vegetation surrounding the clearing of Little Tahiti is mature **tawai** / silver beech forest with excellent indigenous values, including numerous indigenous podocarps and a very diverse understory. Marsh wetland habitat (largely a sward of rautahi sedgeland) is present in the vicinity of Tarn Creek.

Terrestrial Fauna

The forest in this area is likely to support northern Fiordland **tokoeka** and South Island **kākā**, and **kea** have been observed in this area. **Kōwhiowhio** / blue duck will be present in the river but would not use the Little Tahiti clearing itself. **Kakaruai** / South Island robin were observed at the site during the site visit. Other species as listed in Section 5.11 are likely also present permanently or seasonally.

Open areas at the Little Tahiti site provide suitable habitat for the Milford boulder butterfly. It is one of only two known locations for the species globally; the other is Deepwater Basin Road (Patrick 2017). This butterfly relies on the creeping pōhuehue growing in the main clearing as a host for their caterpillars. Adult butterflies are also reliant on open, sunny basking areas. It is unclear when Milford boulder butterfly were last recorded at this site, but it does not appear to

have been in at least three years (E3 Scientific, 2022), although survey effort is unknown[47]. E3 Scientific (2022) suggest that the species is still thought to occur at the site. In our experience, terrestrial invertebrate surveys can be extremely fickle (particularly in this case when searching for a species that may be at the point of extinction, and present only in very low numbers). A very precautionary approach is necessary unless further surveys in appropriate conditions (potentially over multiple years) confirm the presence or absence of this species from this site. This assessment assumes Milford boulder butterfly may be present.

No other records of indigenous terrestrial invertebrates or lizards are known.

Freshwater Habitats and Fauna

Access to the Little Tahiti area crosses 'Tarn Creek' (unmapped and unnamed on Topo50 maps), a tributary of Waipāteke / Cleddau River. It is surrounded by indigenous forest, which provides the relatively narrow channel (c.5.5 m) with very high shading (>90%). Where there is a culvert crossing that breaks this forested margin, the vegetation becomes dominated by exotic grass for c.15 m. Notably, the crossing was a multi-barrel culvert structure where two and possibly all three of the barrels did not provide for fish passage, as they were perched at the downstream end and / or did not provide sufficient flow depths.

The banks of Tarn Creek were stable vegetated earth, cobbles, and boulders; in-stream substrates were dominated by cobbles with very little to no fine sediments. E3 Scientific (2022) note that surface waters in this creek exceed default guideline values for copper due to migration of contaminants from buried waste. Some sensitive macroinvertebrate taxa (e.g., caddisflies, mayflies, and stoneflies that feed on algae or leaf litter) may be present due to the good in-stream and riparian habitat quality, however, the community is likely to be degraded by the exceedance of copper in surface waters.

There were no records in the NZFFD of fish or fish surveys in this waterway, but taxa present in the wider catchment (e.g., īnaka, kōaro) likely utilise this habitat. No fish were observed in this waterway during a site visit, but unidentified galaxiids were observed in an adjacent small pond and likely also use Tarn Creek.

Additional information regarding the freshwater habitats in the Waipāteke / Cleddau River adjacent to Little Tahiti is provided in Section 5.18.3 above, and in Section 5.20.3 below.

Overall

The most important feature of Little Tahiti is that it is one of two known locations globally for Milford boulder butterfly, which is reliant on creeping pōhuehue in open areas and on forest edges. Otherwise, whilst the Little Tahiti clearing itself is a modified former landfill with little vegetation value, it is surrounded by very high value intact **tawai** / silver beech forest habitat.

[47] As noted in Section 4.11, it appears to have last been definitively observed at Milford Sound Piopiotahi Village in 2010.

Creeping pōhuehue at Little Tahiti provides habitat for Milford boulder butterfly, although this species has not been observed for at least several years.

Little Tahiti, former landfill area.

Little Tahiti, former landfill area.

Tall intact forest on the access track to Little Tahiti.

The multi-barrel culvert crossing at Tarn Creek, Little Tahiti. Fish passage is partly impeded through the left barrel, but the middle and right barrel act as a full barrier to fish.

An isolated pond, where galaxiids were noted, next to the waterway at Little Tahiti.

Figure 53. Additional Little Tahiti photos.

5.19.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the MOP proposals at Little Tahiti that need to be considered are listed below:

- A key potential impact of any development at Little Tahiti (whether rotary services or staff accommodation, etc.) is loss of, or impact to, Milford boulder butterfly. This could arise via:

- Vegetation clearance and direct removal of creeping pōhuehue, resulting in the loss of the only host plant for the caterpillar life stage;
- Indirect loss of creeping pōhuehue and / or sunny basking areas for adult Milford boulder butterfly due to shading e.g., from buildings[48];
- Dust from earthworks, and
- Conceivably, and whilst this potential effect is unknown and probably undetectable, helicopter operation could injure / kill adult Milford boulder butterfly (due to downdrafts etc.), especially if helicopters are taking off / landing on a regular basis throughout the cleared area that provides habitat.

Because Milford boulder butterfly is classified as Threatened – Nationally Critical and Little Tahiti is one of only two known sites for the species, essentially any adverse effect to the population at this site represents a significant adverse effect to an irreplaceable and vulnerable ecological value.

- A key potential impact if the heliport option is pursued is vegetation clearance. Based on a c.1 ha existing cleared area, at least 1.2 ha (to achieve a c.2.2 ha heliport) of surrounding **tawai** / silver beech forest would need to be cleared. This amount does not include any further clearance required in the approach and take-off surface. Vegetation clearance in this area would result in the loss of intact, mature, and diverse indigenous forest habitat of importance for Threatened and At Risk fauna species such as **tokoeka**. Further indirect habitat loss is likely due to edge effects beyond the cleared area. The scale of vegetation clearance required for the heliport proposal represents a significant adverse effect.
- A key potential impact if the staff accommodation option is pursued is vegetation clearance. Dependent on scale, clearance of very high value forest habitat to expand the existing clearing would represent up to a significant adverse effect, for the reasons given above. Any forest or tree clearance risks mortality or injury of protected and Threatened indigenous bird species (e.g., **tokoeka**) and these impacts would need to be carefully avoided.
- An additional potential impact regardless of the option pursued is disturbance to fauna from increased human activity, and potentially substantially increased noise from helicopter operations. The likely outcome is displacement of sensitive species from the area (permanently or during e.g., heliport operation).
- An additional effect of the proposed development of the site is the potential for increased flashiness (immediate conveyance of water runoff) from roofs of the proposed accommodation facilities, and any sealed surfaces including new access roads. This may increase conveyance of stormwater contaminants associated with vehicles into Tarn Creek and the Cleddau River during rainfall.
- Release or mobilisation of contaminants from works affecting buried landfill waste may lead to a range of adverse ecological effects, but this is a matter that requires input from ecotoxicology / groundwater specialists and is not within the expertise of ecologists to assess alone.

The potential positive effects of the MOP proposals at Little Tahiti are:

[48] Whilst creeping pōhuehue is occasionally found within forests, it is generally a species of open sunny areas.

- Works within the existing cleared area to remove landfill waste are a positive opportunity to avert potential future impacts (e.g., flooding that exposes waste and leads to release of contaminants and litter) but should be carefully staged as required to ensure continuous presence of areas of creeping pōhuehue, as well as dust management across the site.

5.19.5 Recommendations

5.19.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 19. Effects management measures recommended for Other MOP Proposals – Little Tahiti.

Environmental Effect / Impact	Effects Management Hierarchy Approach	Recommendation
Impacts to Milford boulder butterfly	Avoid	Effects management is dependent on the nature of works proposed, and whether or not Milford boulder butterfly are found to be present (see Section 5.19.5.2 below). In general, if Milford boulder butterfly are present: - Opportunities to enhance habitat, boost the species' population, and undertake translocations etc. (as appropriate) should be pursued, to safeguard the long-term survival of the species. - Rotary services are likely inappropriate if Milford boulder butterfly are present. Occasional / sporadic existing helicopter landings are less likely to be of concern. - Construction of buildings that results in shading to creeping pōhuehue and sunny basking areas with rocks should be avoided. In general, if further detailed investigation confidently determines that Milford boulder butterfly are absent (and potentially locally / globally extinct): - Vegetation clearance, construction etc. within the existing cleared area is unlikely to be of ecological concern.
Vegetation clearance in lowland forest and important forest bird (e.g., northern Fiordland **tokoeka)** habitat	Avoid	Clearance of forest should be avoided. Practically, this means that Little Tahiti is not an appropriate location for rotary services at the scale of what currently is provided at the existing aerodrome.
Enhancement opportunity:	n/a (Habitat Enhancement)	Works within the existing cleared area to remove landfill waste are a positive opportunity to avert potential future impacts (e.g., flooding exposing waste). Whilst this work may already be underway (E3 Scientific, 2022), it should be

Remediate existing habitat / avert future damage		considered as an integral and upfront step as part of any development at this node.
Weed establishment and spread	Mitigate	Following any earthworks exposing bare land, follow-up woody weed control is required. Existing blackberry and Scotch broom are likely to spread from seeds or fragments.

5.19.5.2 Further Investigations

- Undertake investigations to confidently determine the presence or absence of Milford boulder butterfly. The timing, methods, and frequency of surveys should be developed (and the surveys undertaken) by a suitably qualified entomologist with expertise in Lepidoptera (moths and butterflies).
- If Milford boulder butterfly is present, project shaping input and impact management measures (e.g., avoiding specific areas, translocation, habitat enhancement etc.) will be required in relation to any development at Little Tahiti. These measures should be developed / supervised by the entomologist. A decision to proceed with the proposal in a way that risks impacts to Milford boulder butterfly is likely to be unacceptable on ecological grounds, due to the irreplaceability and vulnerability of this species.

5.19.6 Conclusion – Little Tahiti

- Whilst Little Tahiti is a cleared former landfill, it is nevertheless one of only two known sites globally that is known to have recently supported the Threatened – Nationally Critical Milford boulder butterfly. Further, it is surrounded by intact primary **tawai** / beech forest of very high value. Milford boulder butterfly has not been detected at the site in recent years, but if found to be present (via further comprehensive survey) built developments (especially rotary services) are unlikely to be ecologically acceptable.
- However, removal of the existing landfill waste is a potential positive effect of the proposal that could be carefully undertaken with minimal impacts to Milford boulder butterfly; this would also provide opportunities for habitat enhancement.
- Regardless of the presence of Milford boulder butterfly, the direct vegetation clearance required for the heliport represents a significant adverse effect.

Whether the proposal is environmentally feasible is largely dependent on the status of Milford boulder butterfly and the exact nature of what is proposed for the site.

However, regardless of the status of Milford boulder butterfly, due to the substantial degree of forest clearance that would be required, Little Tahiti is not an appropriate or technically feasible location for the relocation of the existing aerodrome's passenger rotary services, from an environmental impact perspective.

5.20 Other MOP Proposals - Tūtoko Bridge to Milford Sound Lodge Walkway

5.20.1 Masterplan Concept / Proposal

The proposed Tūtoko Bridge to Milford Sound Lodge Walkway is not described in the Masterplan but was referred to in an infrastructure assessment report prepared as part of MOP Stage 2 (Stantec NZ Ltd, 2021). The following assessment is based on an indicative alignment (on the true right of the Waipāteke / Cleddau River), extending from Milford Sound Piopiotahi / Milford Sound Lodge to the start of the Tūtoko Valley Track and historic Tūtoko Bridge, involving up to 2.3 km of 'Walking Track' standard track.

Figure 54. Tūtoko Bridge to Milford Sound Lodge Walkway.

5.20.2 Existing Visitor Facilities / Infrastructure

There is a small pull-over at the Tūtoko Bridge where the Tūtoko Valley track leaves the road. Nearer Milford Sound Piopiotahi Village there is an extensive footprint with buildings and developed impervious or gravelled surfaces around the Milford Sound Lodge, which receives high numbers of visitors. The walkway largely follows an existing marked (but otherwise generally unformed) predator trapping line.

5.20.3 Description of the Existing Ecological Environment

Figure 55. Barren Peak and the Waipāteke / Cleddau River between Milford Sound Piopiotahi (out of sight at left) and Tūtoko River (at right). Milford Sound Lodge visible at lower centre.

No ecological site survey occurred in relation to this proposal, other than surveys at Little Tahiti, and brief observations of freshwater habitats at the Tūtoko and Waipāteke / Cleddau Rivers.

Vegetation

The vegetation along the proposed walkway is primarily mature **tawai** / beech forest with intact indigenous values including numerous large podocarps. There are some areas with lower stature shrubland and wetlands, particularly where the track would pass through old river channels. Most vegetation within this area is relatively unmodified, except where it is subject to edge effects from proximity to SH94. The indigenous sedge *Carex subviridis* has been observed nearby and may be present within the envelope of the proposal. While classified as Not Threatened nationally, this is the only known location for this species in Fiordland, and represents a southern / western limit for the species (Wildland Consultants Ltd, 2009).

Terrestrial Fauna

Numerous forest bird species are present, as listed in Section 5.19, including **tokoeka**.

The proposed track would pass through an area (Little Tahiti, see Section 5.19) that provides suitable habitat for the Milford boulder butterfly. The other site for this species is Deepwater Basin Road (at the western end of the proposed track; Patrick, 2017), meaning that the proposed track includes both known locations for the species, and may include other possible habitats for / populations of the species.

No other records of indigenous terrestrial fauna (invertebrates or lizards) are known.

Freshwater Habitats and Fauna

Within the proposed walkway envelope, the Tūtoko and Waipāteke / Cleddau Rivers are bordered by indigenous forest. In-stream substrates are dominated by gravels and cobbles, with very little to no cover of fine sediment. The true right bank of the Waipāteke / Cleddau River at the Milford Sound Lodge is stabilised with rock rip-rap.

The lower sections of the proposed walkway cross and run adjacent to two smaller waterways, a side braid of the Waipāteke / Cleddau River, and 'Tarn Creek,' a tributary of Waipāteke / Cleddau River. The riparian margins of these smaller waterways are indigenous forest, and the in-stream substrates were dominated by cobbles with very little to no fine sediments. Flow habitats are heterogenous, ranging from riffle to pools, with sections of undercut banks and overhanging boulders. These habitat types likely provide important refugia habitat from the larger rivers (Tūtoko or Waipāteke / Cleddau Rivers), especially when the system is in flood.

We found no record of macroinvertebrate community measures for these waterways, but they likely provide suitable habitats for sensitive macroinvertebrate taxa, such as mayflies, stoneflies, and caddisflies. We found no records of fish, or fish surveys, but īnaka (whitebait) were observed at the mouth of the Waipāteke / Cleddau River, and NZFFD records from an adjacent waterway show kanakana / lamprey, tuna / longfin eel, and kōaro. These taxa may be present in waterways traversed by the proposed walking track.

Overall

The most important feature of the track area is that it is traverses both of the two only known locations for Milford boulder butterfly, which is reliant on creeping pōhuehue in open areas and on forest edges. The site also includes tributary waterways with fringing wetland habitat, and very high value intact **tawai** / silver beech forest habitat.

Tūtoko River at the suspension bridge, looking upstream.

Waipāteke / Cleddau River at the Milford Sound Lodge, looking upstream.

Waipāteke / Cleddau River near Milford Sound Lodge.

SH94 near Milford Sound Lodge.

Figure 56. Additional Tūtoko Bridge to Milford Sound Lodge Walkway photos.

5.20.4 Preliminary Assessment of Environmental Effects

The potential adverse effects of the Masterplan concepts at the Tūtoko Bridge to Milford Sound Lodge Walkway option that need to be considered are listed below:

- The key potential impact of the proposal is loss of, or impact to, Milford boulder butterfly.
- In addition, vegetation clearance for track construction within forest areas would include the loss of diverse lowland sub-canopy shrubs and forest floor species across an already narrow corridor of lowland forest already squeezed between steep slopes, SH94, and the river. Based on a 'Walking Track' standard track, direct and permanent vegetation clearance would be in the vicinity of 0.26 ha, with additional effective clearance due to edge effects and ongoing maintenance of track margins. At this track standard, it should be possible to avoid loss of canopy trees.
- An additional potential effect of the proposed walking track is increased runoff of fine sediment into waterways. Tracks should be constructed set back from waterway margins.

5.20.5 Recommendations

5.20.5.1 Effects Management

The following measures are recommended to manage the environmental effects identified above.

Table 20. Effects management measures recommended for Other MOP Proposals – Tūtoko Bridge to Milford Sound Lodge Walkway.

Environmental Effect / Impact	**Effects Management Hierarchy Approach**	**Recommendation**
Impacts to Milford boulder butterfly	Avoid	Effects management is dependent on whether or not Milford boulder butterfly are found to be present (see Section 5.19.5.1-5.19.5.2 above). In short, the proposal must avoid adverse effects to this species, and should seek opportunities to enhance its habitat.
Vegetation clearance in lowland forest and important forest bird (e.g., northern Fiordland **tokoeka)** habitat	Avoid & Minimise	Minimisation of track length and footprint (width / degree of earthworks) while fully avoiding clearance of canopy trees is the clearest way to minimise effects. Mortality of protected and Threatened indigenous bird species (e.g., northern Fiordland **tokoeka**) would need to be carefully avoided, with earthworks and clearance of logs (etc.) from the proposed track being the main sources of mortality risk.
Impacts to freshwater habitat	Avoid & Minimise	Construction or upgrades to existing facilities should consider proximity to Waipāteke / Cleddau River. Care should be taken to minimise erosion and direct sediment runoff during construction, and from any increased impervious surfaces and increased visitor traffic (i.e., by allowing a vegetated buffers to remain between

		hardstand and the adjacent river). Any vegetation clearance within riparian areas should be avoided as much as practicable. Refinement of the construction methodology for the walking track should include input from a specialist freshwater ecologist to determine the appropriate management for any proposed construction activity in, or in close proximity to the rivers or lake (e.g., erosion and sediment controls, avoidance / minimisation of work and machinery in the water).
Introduction of freshwater pests	Avoid / Mitigate	The 'clean, check, dry' practices need to be strictly adhered to when undertaking construction works in and adjacent to waterbodies. The Waipāteke / Cleddau River currently lacks didymo, making this a key concern.

5.20.5.2 Further Investigations

- See Section 5.19.5.2. Investigations for Milford boulder butterfly in relation to this proposal should consider all open habitats along the proposed track.

5.20.6 Conclusion – Tūtoko Bridge to Milford Sound Lodge Walkway

- The adverse effects of the proposed Tūtoko Bridge to Milford Sound Lodge Walkway walking track are limited in physical scale (because of the relatively small footprint of a track) but are magnified by the fact that the proposed area includes the only known global habitat for Milford boulder butterfly. Adverse effects to Milford boulder butterfly must be avoided.
- Adverse effects in relation to general vegetation clearance and habitat loss should be minimised or otherwise remedied, but overall, are considered manageable.

The proposal is considered environmentally feasible.

5.21 Summary of Assessments

The following Masterplan concepts / MOP proposals are considered to be technically feasible from an environmental impact perspective, with any impact management requirements likely to be generally straightforward to implement and sufficient to manage adverse effects:

- Node 1: Te Rua-o-Te-Moko Fiordland National Park Gateway;
- Node 4: Overnight Walk – Countess Range;
- Node 5: Key Summit to Cascade Creek (and Key Summit to Divide alternative)
- Node 7: Cleddau Cirque
- Piopiotahi Visitors Hub – Various Proposals (i.e., those listed in Section 5.11);
- Piopiotahi Visitors Hub – Barren Peak Spur Walk;
- Piopiotahi Visitors Hub – Hine-te-awa Bowen Falls Experience ('Lower Pontoon Walkway');
- Piopiotahi Visitors Hub – Hine-te-awa Bowen Falls Experience ('Lower Viewpoint').
- Cleddau Delta Node – Cleddau Bush Tracks
- Deepwater Basin Node: Recreational Boat Ramp and Trailer Parking
- Cleddau Delta Node – Dedicated Sea Kayak Area;
- Deepwater Basin Node – Wastewater Treatment Plant; and
- Other MOP Proposals – Tūtoko Bridge to Milford Sound Lodge Walkway.

The following Masterplan concepts / MOP proposals are considered to be technically feasible from an environmental impact perspective but require some or all of the following: further information; carefully locating the proposal to avoid / minimise effects (noting that this may be inherently difficult in the context of the specific activity); implementation of complex and / or costly impact management measures; and proceeding with some aspects of the activity but not others:

- Node 2: Eglinton Reveal;
- Node 3: Te Huakaue Knobs Flat including Kiosk Creek and Walks;
- Node 3: Walking / Cycling Trail – Te Anau Downs to Cascade Creek ('SH94 alternative' option); and
- Node 4: Ō-Tāpara / Cascade Creek;
- Node 5: Whakatipu Trails Head;
- Node 6: Gertrude Valley;
- Other MOP Proposals – The Chasm to Cleddau Horse Bridge Walk; and
- Other MOP Proposals – Little Tahiti (staff accommodation option).

Four Masterplan concepts / MOP proposals are considered likely to result in significant adverse ecological effects that are unlikely to be able to be managed to an appropriate level. There is limited ability to avoid, minimise or remedy their likely adverse effects. If pursued, complex and / or substantial ecological offset or compensation measures would be necessary, noting that it is

generally considered inappropriate to offset / compensate significant adverse effects to irreplaceable and vulnerable biodiversity features. On this basis, the following Masterplan concepts / MOP proposals are **not** considered to be technically feasible, from an environmental impact perspective:

- Node 3: Walking / Cycling Trail – Te Anau Downs to Cascade Creek ('proposed trail');
- Node 3: Walking / Cycling Trail – Te Anau Downs to Cascade Creek ('Divide extension'); and
- Piopiotahi Visitors Hub – Hine-te-awa Bowen Falls Experience ('Top Links').
- Other MOP Proposals – Little Tahiti (heliport option).

6.0 Ngā Tūtohunga / General Effects and Recommendations

The following adverse environmental impacts are relevant to essentially all MOP concepts / proposals assessed in Section 5.0. Whilst in general these are specified where they are of greatest concern, they are listed again below, with a brief explanation.

- Vegetation clearance and edge effects:
  - Edge effects are inherent to all track construction and habitat clearance, driving change in vegetation composition and structure alongside the physical footprint of the area of habitat clearance. This can include changes driven by regular clearance / cutting of seedlings, ferns, etc. on track edges, and the proliferation of exotic weedy species (e.g., foxglove, wall lettuce) and species with seeds spread by walkers (e.g., bastard grass / sedge species).
  - In keeping with the very high habitat values in a National Park / World Heritage Area context, minimise track and trail footprints wherever possible. In addition, apply measures such as:
    - Where tracks need to be formed, use small machinery such as a narrow tracked <1 tonne digger rather than larger machinery. This may add time and cost, but will reduce impacts and make it easier to avoid localised ecological features including large trees or rotting logs).
    - Where tracks need to be formed, end-haul stripped material within the final track footprint, rather than side casting. This may add time and cost but will reduce impacts. Where side casting is used, ensure that duff / leaf litter (e.g., site-won material from the track footprint) is spread over the final track edge rather than leaving side-cast subsoil or rocks. Hand-place any blast rock.
  - For all tracks and trails, during detailed design (prior to the resource consenting / approval stage), it is recommended that a walkover of the proposed track alignment is undertaken by suitably experienced botanist / ecologist in order to provide input into any necessary changes required to avoid small / localised higher value ecological features. In forest habitat, similar input from a bat expert is required to avoid known or potential roost trees.
- Weed introduction / spread:
  - In general, woody weed issues are effectively absent from almost all of the Masterplan concept and Masterplan locations, except in areas at Milford Sound Piopiotahi Village and extensive areas of Russell lupin near the Upokororo / Eglinton River. However, there are substantial, and complex weed infestations in the Te Anau Downs area, and in scrub on the true right of the lower Upokororo / Eglinton River (below the gorge) that pose a key risk to important habitats in Fiordland National Park.
  - Earthworks in general have the potential to introduce or spread weeds, where machinery (etc.) is not cleaned before transport between weed infested and weed free sites.

- Following earthworks and vegetation clearance, especially at Milford Sound Piopiotahi Village or in the vicinity of the National Park boundary (where weeds are relatively more abundant), follow up weed surveillance / control will be required, for example on a 6-monthly basis for 2-3 years post-construction.

- Fauna disturbance:
  - As described in various places in Section 5.0, disturbance of fauna (especially birds) by human activities (even apparently benign activities such as walking and cycling) can cause effective habitat loss / displacement, because many bird species and other fauna perceive humans as predators.
  - In general, bird species are most sensitive to these impacts during the breeding season, but responses vary at a species level and depend on prior habituation. Estuarine / water or wetland bird species are most sensitive, particularly shy, cryptic bird species such as koitareke / marsh crake, pūweto / spotless crake, and matuku hūrepo / Australasian bittern.
  - This means that construction of new tracks and introduction of humans to currently undisturbed or infrequently disturbed areas, especially estuarine, wetland, and lake habitats is of potential concern in terms of effective habitat loss / displacement.
- Sedimentation and erosion:
  - In general, earthworks and vegetation clearance can generate sedimentation and erosion, and can introduce or mobilise contaminants. Whilst natural flooding can also cause these issues (especially in the Fiordland context), the difference is that erosion and sediment runoff from construction often happens outside high river flow events meaning that fine silts (etc.) settle more easily and can cause adverse impacts to aquatic fauna.
  - Methods and implementation of erosion and sediment control (ESC) measures for construction of Masterplan concepts should be overseen by a suitably qualified expert.
  - Appropriate implementation of ESC measures is necessary to give effect to the policies and objectives for freshwater in the Te Tangi a Tauira Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan (Appendix 3), as well as various legislative and policy requirements.
- Mortality of terrestrial fauna (bats / lizards / nesting birds):
  - Earthworks and vegetation clearance (especially removal of trees) can lead to direct mortality and injury of fauna. Whilst this is of year-round concern (especially for pekapeka / bats), it is especially important during the bird breeding season (when eggs and chicks are present) and in winter (when lizards and bats are sedentary).
  - Clearance of rank grassland and shrubland can lead to mortality of lizards, even in vegetation types where exotic grass species are dominant.
  - All / most species of concern (in terms of likelihood of impact) are Threatened and At Risk species that are absolutely protected under the Wildlife Act 1953. For some of these species, injury or mortality of individuals may have species population-level effects.

- In this context, project shaping input from appropriately qualified specialist ecologists / pre-construction surveys / construction management and salvage is likely to be required in relation to any:
    - Proposed earthworks or vegetation clearance in rank grasslands, shrublands, bluffs, or boulderfields;
    - Works in bird breeding habitat during the bird breeding season (approximately 1 September – 28/29 February); and
    - Large canopy tree clearance[49]. However, we strongly recommend that all large canopy tree clearance is avoided or minimised as far as practicable via upfront design measures.

- Outdoor lighting:
    - Outdoor lighting can cause a range of adverse effects to bird, bat, fish, and invertebrate (terrestrial and freshwater) species, including mortality and loss of habitat.
    - The default position should be to avoid outdoor lighting altogether, unless it is considered absolutely essential. This also has the helpful benefit of saving upfront and ongoing costs.
    - Where it is considered absolutely essential to provide outdoor lighting (e.g., because of health and safety risks), input from lighting specialists should be sought, with the goal of installing lighting to the bare minimum, of low wattage, operated via motion sensor (not always-on), and using warm-spectrum, hooded, and downward-pointing lights designed and installed specifically to minimise spill.
- Fish passage:
    - In-stream structures (e.g., bridges, weirs) can prevent or delay fish movement through alterations to the natural steam bed and/or hydrology of the waterway. Culverts are preferably avoided in waterways providing fish habitat. River / waterway crossings should be designed to avoid or minimise in-stream disturbance and piling and allow for fish passage i.e., by using a single-span bridge design or locating bridge piles outside of the wetted channel footprint. This approach is also preferred from a resilience point of view.
- Waterway setbacks:
    - Carparks and hard surfaces are recommended to be setback at least 25 m from all watercourses, for the provision of long-term benefits to aquatic and terrestrial biota.
    - Stormwater management devices should be included as part of the final designs of buildings and other hardstand.
- **Kea** / visitor interactions:
    - Adverse **kea** / visitor interactions (Weston et al., 2023) occur already, especially along SH94 from Monkey Creek to the Chasm. By providing new visitor facilities at Node 6 (Gertrude Valley) and Node 7 (Cleddau Cirque), the

[49] DOC and the Milford Road Alliance already have established 'bat controls' in relation to large tree clearance. These are implemented throughout the SH94 area including the Waipāteke / Cleddau Valley where pekapeka / bats are not currently known to be present.

Masterplan proposals are likely to exacerbate these existing issues. On the other hand, implementation of the Masterplan also provides an opportunity to manage the Piopiotahi / Milford Sound visitor experience and visitor facilities in a way that takes **kea** into account, upfront.

- We note that **kea** feeding (etc.) by visitors is first and foremost a human behaviour issue. In this context, we support a suggestion from DOC technical experts that MOP provides an opportunity to resource and apply **kea** advocacy work. This includes the 'Kea Advocacy Toolbox' (under development by DOC in conjunction with Kea Conservation Trust and the Zoo and Aquarium Association), and also the 'Rautaki Whakaora Kea 2024-2034' (Kea Recovery Strategy) being released in draft later in 2024 (Kerry Weston, *pers. comm*. 2024). The findings from related social science research currently underway (being led by DOC) may also inform this work.
- To mitigate adverse effects of the MOP concepts / proposals on kea, MOP should establish a mechanism to provide ongoing financial resource (e.g., from the proposed visitor levy) for **kea** advocacy work. The Milford Road corridor is an obvious and visible location for such work to occur.

- Other:
  - Once a track is constructed, visitor safety imperatives drive management changes that further affect biodiversity outcomes.
    - This includes track / hut setback measures during aerial 1080 bait operations and / or deployment of staff resources to remove baits from tracks. This adds complexity and cost to 1080 operations and likely somewhat reduces their effectiveness (because tracks or buffer zone areas are effectively not treated).
    - Standing dead wood (dead spars / overhanging branches) are typically removed from near tracks and other structures to prevent windthrow causing damage or visitor injury. Standing dead wood provides important feeding opportunities for species such as **kākā**, and roosting habitat for bird and pekapeka / bat species. Cumulatively, removal of standing dead wood along many kilometres of walking tracks and road edges is an impact that is not insignificant.
  - For all buildings and visitor stopping areas (except for the Knobs Flat and Milford Sound Piopiotahi Village areas where existing wastewater treatment infrastructure is present), use vault toilets (or similar). This approach avoids the need to clear habitat to construct soakage areas and reduces risks of nutrient runoff / pollution near sensitive and generally pristine freshwater habitats.

7.0 Ngā Hua o te Aromatawai / Cumulative Effects

Taken as a whole, the combined effect of all Masterplan concepts / MOP proposals will result in a substantially higher level of direct habitat loss and indirect habitat modification due to human / visitor impacts compared to existing levels. Based on a high-level estimate, the combined proposals would lead to around 20 ha of direct loss of habitat, with substantially more impacted by edge effects and habitat fragmentation. In the context of Te Rua-o-Te-Moko Fiordland National Park which has very high ecological values, and because existing activities (highway maintenance, tourist developments, etc.) have already caused historic and ongoing adverse ecological effects, cumulative impacts from the Masterplan concepts / MOP proposals are a significant adverse ecological effect. Ongoing pest and predator impacts, whilst the subject of ongoing management, add to the picture.

At a high level, cumulative effects include impacts to habitat type, extent, and quality, with implications for species population sizes and long-term ecosystem viability. Broad-scale counter-measures in terms of pest / predator control, weed control, and species management / research are necessary and already under resourced relative to what is already needed, without accounting for new impacts arising from the Masterplan / MOP.

With the potential for cumulative effects firmly in mind, the Conservation Impact Analysis for MOP Stage 2 (Boffa Miskell, 2021) made key recommendations to:

- Consolidate infrastructure within existing modified / built areas;
- Consolidate visitor activities at a small number of locations rather than dispersing visitor impacts;
- Ensure any visitor facilities, including infrastructure, are sensitively located, and are designed, constructed and / or operated in a way that is sympathetic to the natural environment.

Whilst the Masterplan concepts and MOP proposals largely accord with these principles, there are notable exceptions (e.g., the ‘Top Links’ and the Te Anau Downs to Cascade Creek cycleway ‘proposed trail’). Further, at a smaller scale, the Masterplan and additional MOP proposals include a number of new activities (especially walking tracks) in new locations. In another instance, at Node 7, the proposal utilises an already cleared area but proposes structures that cannot fit fully within it. Whilst this report identifies that many of these proposals would lead to relatively minimal direct impacts when considered individually, and recommends measures to avoid and minimise effects, there will not be ‘no impact’ especially if all proposed tracks (etc.) are built. Walking tracks and other apparently small-scale habitat loss nevertheless means narrow corridors of vegetation clearance, edge effects, habitat loss and fragmentation, and fauna disturbance and effective habitat loss. An approach that puts habitat protection upfront is preferred; this entails tailoring the visitor infrastructure to the space available rather than the other way around.

On this basis, the overall Masterplan / MOP must be implemented in tandem with a suitable range of projects / measures intended specifically to account for accrued minor losses, achieving an overall net gain (improvement) for habitats. As was suggested in the Conservation Impact Analysis for MOP Stage 2 (Boffa Miskell, 2021), the single most pressing opportunity for net gains is landscape-scale control of introduced mammalian predators. This is recommended as a priority for additional investment, as an integral component of the Masterplan. The

advantages of funding effective landscape-scale control of introduced mammalian predators in the area include:

- The technology to control most introduced mammalian predators at a landscape scale is already available and limited only by funding.
- The approach aligns with Predator Free 2050 (PF2050) as well as other initiatives being considered in this area. However, a far greater emphasis on controlling feral cats is required.
- It would replace the need for numerous, small scale, less effective, and often sporadic predator control programmes currently being undertaken. This statement is not a criticism of existing control works (and the almost $10 M invested in the past decade); rather it is a reality that predator control is often implemented as a response measure (e.g., in response to predator pulses resulting from mast years) rather than with an ambitious, proactive, and ongoing 'predator free' (or similar) goal.
- Removal of introduced mammalian predators would allow for the recovery of populations of indigenous fauna currently being impacted by introduced mammalian predators.
- It would allow for the re-introduction of indigenous fauna that previously occurred in the area. This would have several benefits including increasing the natural range and populations sizes of the re-introduced species, supporting existing conservation objectives, and returning the ecological functions these species once played to the area (e.g., seed dispersal / pollination etc).
- Re-introduction of indigenous fauna would improve the visitor experience and provide an exciting opportunity to make these species visible to visitors in their natural (historical) habitat and provide an example of what New Zealand would have been like before humans.

Other large-scale opportunities to achieve environmental benefits and compensate for the accrued impacts of MOP proposals include the following measures:

- Exploring whether there are opportunities to purchase and add large lowland wetland areas, **mānuka** scrub, and remnant / regenerating **tawai** / beech forest areas in the vicinity of the Upokororo / Eglinton River that are currently in private ownership. Whether this option is available is unknown, but it would have the benefit of being a one-off measure that would provide greater statutory protection for some of the larger and most valuable wetlands in the region. However, this option is likely only worthwhile if implemented in tandem with weed control and other restoration effort; there is less merit in simply adding land to the conservation estate without sufficient budget to protect and enhance its values.
- Weed control, targeting Russell lupin in the upper Eglinton (above the gorge) and large scotch broom infestations in indigenous scrub below the gorge (especially on the true right). Whilst the environmental benefits of controlling Russell lupin in active riverbed areas are likely more marginal (due to the substantial costs required, likely over decades) sustained control on floodplains and terraces / grasslands is an urgent and necessary step to protect grassland habitats from further degradation.
- Pig control, and ongoing surveillance. Observations during site visits for the preparation of this report suggest that pigs pose a serious threat to indigenous habitats in the Eglinton both above and below the gorge (especially on the true right), and we are unaware that any management is currently occurring.

- In addition to greatly expanded landscape-scale pest control (as discussed above), a specific objective could involve an ambitious predator-free 'mainland island' project. This would most logically mean the Cleddau catchment and / or Arthur catchment and / or Sinbad Gully, to take advantage of geographic barriers to pest movement. The Eglinton is broadly a more fertile and productive habitat (especially for pekapeka / bats and tree-cavity nesting birds) but is not as well protected by its topography; in other words, it would likely be a more beneficial but much more difficult undertaking. Considering existing PF2050 goals, for any 'mainland island' project to additionally compensate for MOP proposals it would need to exceed PF2050 efforts and include control of mice, all mustelid species, cats, and all browsing ungulates (if present). As with landscape-scale pest control generally, and as discussed above, this approach creates obvious opportunities such as fauna re-introductions.
- Substantial upfront investment in threatened species conservation biology and novel predator control techniques that can be implemented at scale, to increase the efficiency and effectiveness of future biodiversity management efforts.

The above list is not exhaustive, and nor would any single action be sufficient. To address the adverse effects of the MOP proposals, it is considered likely that a combination of the measures above will be required, as well as stakeholder support and significant (multi-million dollars per annum) ongoing financial commitment most likely leveraging visitor revenue and requiring a substantial increase in baseline management effort and staffing. Indeed, with sufficient resource, biodiversity gains compared to the existing situation are realistically possible, and this should be the goal.

However, the permanent effects of the MOP proposals require permanent solutions. A possible scenario is that the proposals proceed, and there is a well-resourced initial response, but budgets or enthusiasm wane years down the line as leadership and societal priorities change. In this scenario, any reduction in effort or cessation of predator / biodiversity management will erode the benefits of the initial response and leave the environment permanently worse off. Increased development will also form a new baseline upon which future development can be justified, enabling further change and environmental modification. Even now, following over a century of tourism, the environments in the SH94 corridor have been modified, with little ability to remember nor measure the previous ecological states that were more intact and that carried a higher proportion of natural values. In the context of further developments via MOP, priority must therefore be placed on upfront actions with built-in and lasting benefit.

Ongoing biodiversity management in the SH94 corridor must be seen as the essential 'quid pro quo' of the MOP proposals and the Piopiotahi / Milford tourism industry in general. This will require robust solutions 'locked-in' by multiple layers of security, including via legislation and policy instruments, including the Fiordland National Park Management Plan, by visitor / concessionaire levies, and by the involvement and empowerment of stakeholders including mana whenua, the Te Anau community, and DOC's biodiversity and science advisors.

8.0 Te Whakamutunga / Summary and Conclusions

As part of Stage 3, Phase 1 of the Milford Opportunities Project, this report has identified the ecological values associated with the locations of proposed new visitor developments and infrastructure in the Milford Sound Piopiotahi / SH94 corridor (Te Rua-O-Te-Moko / Fiordland National Park). These developments have been proposed as Masterplan concepts following 'Stage Two' of MOP, or otherwise proposed by the MOP team during Stage 3.

The Milford Sound Piopiotahi and SH94 corridor is well known to contain an exceptionally important range of indigenous ecosystems that are intact ki uta ki tai (from mountain to sea), and the Eglinton has long been a focal point for mainland conservation efforts in New Zealand. The SH94 corridor is overall one of the most ecologically important areas on the mainland and a stronghold for numerous taonga species, including key populations of Threatened and At Risk tipu / plant, manu / bird, mokomoko / lizard, te aitinga pekepeke / invertebrate and pekapeka / bat species. Many of these species are generally dependent on active predator and pest control efforts, and many are sensitive to further habitat loss or unmanaged visitor impacts.

This report concludes that most Masterplan concepts are technically feasible from an environmental impact perspective, but four concepts or proposals are **not** likely to be technically feasible (i.e., they are likely to result in significant adverse environmental effects that are unlikely to be able to be managed to an appropriate level). Further to the individual assessments of each of the concepts as a standalone, this report also discusses the cumulative impacts of the combined MOP proposals.

It is noteworthy that this report focuses almost solely on adverse environmental effects and impacts, finding that very few proposals would include any positive outcomes for any aspect of indigenous biodiversity that are built-in. Because of the general lack of any biodiversity benefits, further refinement and implementation of the Masterplan will require substantial effort to devise appropriate compensatory mechanisms, such as increased efforts in predator and pest control, species management, and research. Leveraging the proposed visitor access fee is a clear opportunity to resource these efforts.

Because of potentially piecemeal implementation of the numerous Masterplan concepts, the key risk is that accumulated individual effects gradually compound but are never appropriately addressed together and in full. Considering that the purpose of the Masterplan is to encourage visitor use and enjoyment of the Milford Sound Piopiotahi area, greater emphasis on conservation and protection measures is required to ensure that this important corner of Te Rua-O-Te-Moko / Fiordland National Park remains as it was, forever.

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Appendix 1: Glossary of Fauna Species

The following table (Table 1 below) provides a glossary of terrestrial and freshwater fauna species mentioned in this report and additional species known to be present (whether permanently / seasonally), and their likelihood of presence within broad areas of the SH94 corridor where MOP concepts / proposals may be constructed. It does not record presence in the situation where a species may be present e.g., in remote parts of the catchment areas but where it is not present (or likely to be present) in the general vicinity of the SH94 corridor and the MOP concepts / proposals.

Interpretation:

- Area: Lower / Upper Eglinton means the Upokororo / Eglinton River above and below the gorge respectively; Upper Hollyford means the Whakatipu-ka-tuku / Hollyford River above Divide Creek; and Cleddau means Waipāteke / Cleddau River.
- Likelihood colours:
    - Dark green = very likely / known presence.
    - Light green = likely presence.
    - Grey / green = possible presence.
    - Red = unlikely presence / known absence.
    - Yellow = unknown / not able to predict with confidence (e.g., areas / species unlikely to have been specifically surveyed, or habitat suitability uncertain).
- **Bolded** species are listed taonga species in the Ngai Tahu Claims Settlement Act 1998.

Note:

This table has been prepared with references to species databases such as eBird, the NZ Freshwater Fish Database, and DOC internal GIS records, where possible. Some records may be many years old, and in many cases there are incomplete records and limited survey effort. The table has therefore been completed / supplemented based on the expert opinion of the authors.

The table should therefore be considered high-level and indicative only; some inaccuracies or omissions are inevitable.

Table 1. Terrestrial and freshwater fauna species mentioned in this report (and other species known to be present), and their likelihood of occurrence within areas of the SH94 corridor.

Fauna Type	Te Reo Name	English Name	Scientific Name	Threat Status	Area / Likelihood of Occurrence			
					Lower Eglinton	Upper Eglinton	Upper Hollyford	Cleddau
Bat	Pekapeka	Long-Tailed Bat	*Chalinolobus tuberculatus*	Threatened - Nationally Critical				
	Pekapeka	Southern Lesser Short-Tailed Bat	*Mystacina tuberculata tuberculata*	Threatened - Nationally Increasing				
Bird	**Kāhu**	Australasian Harrier	*Circus approximans*	Not Threatened				
	Kākā	South Island Kākā	*Nestor meridionalis meridionalis*	Threatened - Nationally Vulnerable				
	Kākāriki	Yellow-Crowned Parakeet	*Cyanoramphus auriceps*	At Risk - Declining				
	Kakaruai	South Island Robin	*Petroica australis australis*	At Risk - Declining				
	Kārearea	Southern Falcon	*Falco novaeseelandiae* "southern"	Threatened - Nationally Endangered				
	Karoro	Southern Black-Backed Gull	*Larus dominicanus*	Not Threatened				
	Kea	Kea	*Nestor notabilis*	Threatened - Nationally Endangered				
	Kererū	Kererū	*Hemiphaga novaeseelandiae*	Not Threatened				
	Kōau / Kāruhiruhi	Pied Shag	*Phalacrocorax varius varius*	At Risk - Recovering				
	Kōau / Kawau Tuī	Little Black Shag	*Phalacrocorax sulcirostris*	At Risk - Naturally Uncommon				
	Kōau / Kawaupaka	Little Shag	*Microcarbo melanoleucos brevirostris*	At Risk – Relict				
	Kōau / Māpunga	Black Shag	*Phalacrocorax carbo novaehollandiae*	At Risk – Relict				
	Koekoeā	Long-Tailed Cuckoo	*Eudynamys taitensis*	Threatened - Nationally Vulnerable				
	Korimako	Bellbird	*Anthornis melanura melanura*	Not Threatened				
	Kōtare	New Zealand Kingfisher	*Todiramphus sanctus vagans*	Not Threatened				
	Kotoreke	Marsh Crake	*Zapornia pusilla affinis*	At Risk - Declining				
	Kōwhiowhio / Whio	Blue Duck	*Hymenolaimus malacorhynchos*	Threatened - Nationally Vulnerable				
	Kuruwhengi	Australasian Shoveler	*Spatula rhynchotis*	Not Threatened				
	Mātā / Mātātā	South Island Fernbird	*Poodytes punctatus punctatus*	At Risk - Declining				
	Matuku Moana	White-Faced Heron	*Egretta novaehollandiae novaehollandiae*	Not Threatened				
	Matuku-Hūrepo	Australasian Bittern	*Botaurus poiciloptilus*	Threatened - Nationally Critical				
	Miromiro	South Island Tomtit	*Petroica macrocephala macrocephala*	Not Threatened				
	Mohua	Mohua	*Mohoua ochrocephala*	At Risk - Declining				

	Pāpango	New Zealand Scaup	*Aythya novaeseelandiae*	Not Threatened
	Pārera	Grey Duck	*Anas superciliosa*	Threatened - Nationally Vulnerable
	Pāteke	Brown Teal	*Anas chlorotis*	Threatened - Nationally Increasing
	Pīhoihoi	New Zealand Pipit	*Anthus novaeseelandiae novaeseelandiae*	At Risk - Declining
	Pīpipi	Brown Creeper	*Mohoua novaeseelandiae*	Not Threatened
	Pīpīwharauroa	Shining Cuckoo	*Chrysococcyx lucidus lucidus*	Not Threatened
	Pīwakawaka	South Island Fantail	*Rhipidura fuliginosa fuliginosa*	Not Threatened
	Pīwauwau	Southern Rock Wren	*Xenicus gilviventris rineyi*	Threatened - Nationally Endangered
	Poaka	Pied Stilt	*Himantopus himantopus leucocephalus*	Not Threatened
	Pūkeko	Pukeko	*Porphyrio melanotus melanotus*	Not Threatened
	Pūweto	Spotless Crake	*Zapornia tabuensis tabuensis*	At Risk - Declining
	Riroriro	Grey Warbler	*Gerygone igata*	Not Threatened
	Ruru Koukou / Ruru	Morepork	*Ninox novaeseelandiae novaeseelandiae*	Not Threatened
	Tarapirohe	Black-Fronted Tern	*Chlidonias albostriatus*	Threatened - Nationally Endangered
	Tarāpuka	Black-Billed Gull	*Chroicocephalus bulleri*	At Risk - Declining
	Tarāpunga	Red-Billed Gull	*Chroicocephalus novaehollandiae scopulinus*	At Risk - Declining
	Tauhou	Silvereye	*Zosterops lateralis lateralis*	Not Threatened
	Tawaki	Fiordland Crested Penguin	*Eudyptes pachyrhynchus*	At Risk - Declining
	Tētē / Tētē-Moroiti	Grey Teal	*Anas gracilis*	Not Threatened
	Tītitipounamu	South Island Rifleman	*Acanthisitta chloris chloris*	Not Threatened
	Tokoeka	Northern Fiordland Tokoeka	*Apteryx australis* "northern Fiordland"	Threatened - Nationally Vulnerable
	Tūī	Tūī	*Prosthemadera novaeseelandiae novaeseelandiae*	Not Threatened
	Warou	Welcome Swallow	*Hirundo neoxena neoxena*	Not Threatened
	Weka	Western Weka	*Gallirallus australis australis*	Not Threatened
Fish		Southern Flathead Galaxias (Southland-Otago)	Galaxias "southern"	Threatened - Nationally Vulnerable
		Gollum Galaxias	*Galaxias gollumoides*	Threatened - Nationally Vulnerable
		Common Bully	*Gobiomorphus cotidianus*	Not Threatened
		Redfin Bully	*Gobiomorphus huttoni*	Not Threatened

	Īnanga	Īnanga	*Galaxias maculatus*	At Risk - Declining
	Kōaro	Kōaro	*Galaxias brevipinnis*	At Risk - Declining
	Kōkopu	Banded Kōkopu	*Galaxias fasciatus*	Not Threatened
	Kanakana	Lamprey	*Geotria australis*	Threatened - Nationally Vulnerable
	Tuna	Longfin Eel	*Anguilla dieffenbachii*	At Risk - Declining
Lizard		Cascade Gecko	*Mokopirirakau* "Cascades"	At Risk - Declining
		Takitimu Gecko	*Mokopirirakau cryptozoicus*	Threatened - Nationally Vulnerable
		Jewelled Gecko	*Naultinus gemmeus*	At Risk - Declining
		Southern Grass Skink	*Oligosoma* aff. *polychroma* Clade 5	At Risk - Declining
		Awakopaka Skink	*Oligosoma awakopaka*	Threatened - Nationally Critical
		Cryptic Skink	*Oligosoma inconspicuum*	At Risk - Declining
		Barrier Skink	*Oligosoma judgei*	Threatened - Nationally Endangered
		Eyres Skink	*Oligosoma repens*	At Risk - Declining
		South-Western Large Gecko	*Woodworthia* "south-western"	At Risk - Declining
		Short-toed Gecko	*Woodworthia* "southern mini"	At Risk - Declining

Appendix 2: River Habitat Assessment Sheet

River Habitat Assessment (RHA) Field Recording Sheet

Habitat parameter	Condition category										SCORE
1. Deposited sediment	*The percentage of the stream bed covered by fine sediment.*										
	0	*5*	*10*	*15*	*20*	*30*	*40*	*50*	*60*	*≥ 75*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
2. Invertebrate habitat diversity	*The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.*										
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
3. Invertebrate habitat abundance	*The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.*										
	95	*75*	*70*	*60*	*50*	*40*	*30*	*25*	*15*	*5*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
4. Fish cover diversity	*The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.*										
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
5. Fish cover abundance	*The percentage of fish cover available.*										
	95	*75*	*60*	*50*	*40*	*30*	*20*	*10*	*5*	*0*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
6. Hydraulic heterogeneity	*The number of of hydraulic components such as pool, riffle, fast run, slow run, rapid, cascade/waterfall, turbulance, backwater. Presence of deep pools score higher.*										
	≥ 5	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
7. Bank erosion	*The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.*										
Left bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
Right bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
8. Bank vegetation	*The maturity, diversity and naturalness of bank vegetation.*										
Left bank AND Right bank	*Mature native trees with diverse and intact understorey*		*Regenerating native or flaxes/sedges/tussock > dense exotic*			*Mature shrubs, sparse tree cover > young exotic, long grass*			*Heavily grazed or mown grass > bare/impervious ground.*		
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
9. Riparian width	*The width (m) of the riparian buffer constrained by vegetation, fence or other structure(s).*										
Left bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	*0*	
Right bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	*0*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
10. Riparian shade	*The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).*										
	≥ 90	*80*	*70*	*60*	*50*	*40*	*25*	*15*	*10*	*≤ 5*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
TOTAL	(Sum of parameters 1-10)										

Appendix 3: Relevant Iwi Management Plan Policies

The following sections and policies of *Te Tangi a Tauira Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan* (IMP) are reproduced below.

Section 3.3 Te Atawhenua Fiordland

3.3.4 Piopiotahi – Milford Sound

Piopiotahi is an area of immense cultural importance to Ngāi Tahu. It is also one of the icon tourist destinations of New Zealand.

The popularity of Piopiotahi as a tourist destination creates challenges such as overcrowding, congestion, and issues related to the provision of infrastructure and services.

Ngāi Tahu ki Murihiku believe that, without careful planning and management, Piopiotahi may face a scenario of "push and shove, with everyone trying to get the last dollar out the place". Unless creative approaches are implemented, the area, and the cultural values associated with it, will become degraded.

A significant management issue for the Piopiotahi area is whether, as visitor numbers increase, alternative options should be provided for visitors to Fiordland National Park, or whether visitor use should remain concentrated at existing sites where infrastructure already exists.

The position of Ngāi Tahu ki Murihiku is that places like Piopiotahi can cope with increased visitor numbers and infrastructure, if activities and visitors are managed in a coordinated, sustainable way and infrastructure is carefully planned.

2. Avoid compromising the cultural, historic, and natural values of Piopiotahi as a result of inappropriate land use, subdivision and development.

3. Carefully monitor the nature and number of concession applications for commercial recreation and tourism operations in the Piopiotahi area, to ensure that human activities are not compromising the natural character, beauty or ecology of the region.

4. Ensure that Ngāi Tahu ki Murihiku is proactively involved with the management and future development of Piopiotahi (e.g. future transport options).

5. Encourage appropriate business growth and development that enhances the natural and cultural values of Piopiotahi.

6. Advocate for existing infrastructure to be improved to the highest possible standards, and for the utilisation of new technologies that can enable new growth and development while minimising adverse effects.

7. Advocate for a coordinated, sustainable approach to the provision and management of utilities and services in Piopiotahi.

8. Require that activities related to roading, bridges, sewage facilities, buildings and other infrastructure avoid discharges of contaminants to the waters of the Sounds. Bunding, riparian areas and other measures must be used to mitigate any adverse effects associated with discharge (e.g. run off of stormwater).

10. Ensure, and advocate for, the integrated management of the land, sea and air within the Piopiotahi environment.

Section 3.3.5 Fiordland Future Development

Fiordland is largely an undeveloped area, which has National Park Status under the Conservation Act 1997 and the National Parks Act 1996. However, there are numerous unresolved planning and management issues with respect to future growth development in Fiordland, both industrial (e.g. hydropower) and tourism and infrastructure related. Such activities, if not managed appropriately, have the potential to adversely affect the relationship of Ngāi Tahu ki Murihiku and their culture and traditions with their ancestral lands, water, sites, wāhi tapu and other taonga.

Generally, Ngāi Tahu ki Murihiku believe that there is room for more growth in Fiordland, if a long-term, co-ordinated approach is taken to better manage visitor growth, tourism, resource use and development and infrastructure.

1. The relationship of manawhenua with their ancestral lands, water, sites wāhi tapu and other taonga of Fiordland must be recognised and provided for in all decisions relating to development.

3. Ensure that the natural character of the Fiordland environment is protected for future generations. The effects of visitors and other tourism development on the environment must be managed in a way that ensures that the values of Fiordland are not compromised.

4. Advocate for keeping future development in areas that are presently modified and that already have infrastructure in place. The preference of Ngāi Tahu ki Murihiku is to leave undeveloped or minimally developed areas of Fiordland in as natural state as possible.

6. Planning for future development must recognise and provide for cumulative effects on the land, water, biodiversity, and cultural landscape of Fiordland.

Section 3.3.6 Visitor Management

Tourists often come to Fiordland to experience a pristine natural environment. Yet increasing numbers of tourists have the potential to adversely affect the natural environment, and the ability of visitors to enjoy that environment.

A significant issue for Ngāi Tahu ki Murihiku is increasing numbers of visitors, and the growth and development of visitor services in Fiordland. Such activities, if not managed appropriately, have the potential to compromise the very values that make Fiordland attractive to visitors, developers, and residents alike. As such, Ngāi Tahu ki Murihiku look for balance between maintaining Fiordland as a beautiful place to visit and protecting the natural environment and cultural heritage.

1. Advocate for the concentration of the majority of visitor activities in areas that are presently modified and that already have infrastructure in place. The preference of Ngāi Tahu ki Murihiku is to leave undeveloped, or minimally developed areas of Fiordland, in as natural state as possible.

3. Require that the cultural and natural values of Fiordland are not compromised for recreation or tourism opportunities.

6. Any interpretation and information relating to Ngāi Tahu ki Murihiku history, values, traditions, or beliefs associated with areas of significance to Ngāi Tahu ki Murihiku is best prepared and delivered by Ngāi Tahu ki Murihiku. When concessionaires seek to use cultural history (e.g., pūrākau) in their operations, it is recommended that a kaitiaki Rūnanga representative is employed as part of the concession activity to provide and interpret such information.

7. Encourage respect for Ngāi Tahu's association with culturally significant mountains, including those recognised as Tōpuni, through working with the Department of Conservation to develop educational material to be made available to mountain climbers, the public, concessionaires and users of the area (e.g., encouraging users to remove rubbish and waste).

Section 3.3.8 National Park Policy and Planning

The Department of Conservation recognises Ngāi Tahu as the iwi with manawhenua over the Fiordland National Park area, and thus pursues an objective of partnership between the Department and Ngāi Tahu ki Murihiku.

1. Tangata whenua, as kaitiaki of their cultural heritage, should play a key role in the identification, protection, and management of their cultural and historic heritage within National Parks.

2. The Department of Conservation must ensure access to all areas of the Fiordland National Park to enable Ngāi Tahu to exercise their role as kaitiaki.

3. Protect existing customary use rights from erosion by government policy.

Section 3.3.9 Cultural Interpretation

1. Interpretation and information relating to Ngāi Tahu ki Murihiku history, values, traditions, or beliefs (including place names) is not to be provided to any clients as part of any commercial guiding, filming or interpretation activity unless the interpretation and information is agreed to by the appropriate kaitiaki rūnanga as being appropriate and accurate.

2. Any interpretation and information relating to Ngāi Tahu ki Murihiku ancestors, ancestral places, history, values, traditions, or beliefs associated to Ngāi Tahu ki Murihiku is best prepared and delivered by Ngāi Tahu ki Murihiku. When concessionaires seek to use cultural history (e.g., pūrākau) in their operations, it is recommended that a kaitiaki Rūnanga representative is employed as part of the concession activity to provide and/or interpret such information.

3. In some cases, Ngāi Tahu ki Murihiku may request that concessions applicants prepare an interpretation panel, in consultation with Ngāi Tahu ki Murihiku, explaining Māori history and cultural associations with the area.

Section 3.3.10 General Water Policy

The essence of Fiordland is water. Traditionally the waters of Fiordland provided a means of transport, supported mahinga kai, was used for recreation purposes and maintained populations that centred themselves along major waterways. Today, the pristine waters of the region are an example of what we can strive for in other areas of Murihiku.

1. Require that freshwater management in Fiordland reflects the principles of ki uta ki tai, and thus the flow of water from source to sea, including the relationship between rivers, lakes, wetlands, waipuna and the coastal Fiords.

2. Ensure that development and tourism in Fiordland does not compromise the pristine state of Fiordland waters.

4. Use the waters of Fiordland as a baseline for water quality standards in other areas of Murihiku.

5. Manage our freshwater resources wisely, mō tātou, ā, mō ngā uri ā muri ake nei, for all of us and the generations that follow.

Section 3.3.12 Ngā Roto Waimāori – Lakes

The tradition of Ngā Puna Wai Karikari o Rakaihautu tells how the principal lakes of Fiordland, including Moturau (or Motu-ua Lake Manapōuri), Hauroko and Te Ana-Au (Lake Te Anau) were dug by the rangatira Rakaihautu on his inland journey south with his famous ko.

Moturau, Hauroko, and Te Ana-au lakes are the deepest lakes in New Zealand. Moturau, Hauroko, and Te Ana-au are Statutory Acknowledgement sites under the NTCSA 1998 (Schedules 45, 29, and 58), providing for the special association of Ngāi Tahu with the lakes.

The names of these lakes record Ngāi Tahu history and describe the cultural, historical and physical landscapes associated with them. It was the ancestor Tamatea Ure Pokaiwhenua Pokaimoana that named the Moturau, possibly a woman's name but more likely to relate to the many islands found in the lake. The name Hauroko is strongly associated with urupā in the immediate vicinity, including one on an island in the lake, known today as Mary (Mere) Island. Te Ana-au fi gures in Ngāi Tahu history as one of the last places where Ngāi Tahu and Ngāti Mamoe came into conflict after the

peace established between Rakiihia and Te Hautapunui o Tū. It was also an important mahinga kai in the interior of Fiordland.

3. Maintain and protect the cultural, spiritual, historic and traditional association of Ngāi Tahu ki Murihiku with ngā roto waimāori in Fiordland.

4. All Ngāi Tahu Whānui, current and future generations, must have the ability to access, use and protect ngā roto waimāori, and the history and traditions that are part of such landscapes.

5. Protect, and where needed enhance, the mauri or life supporting capacity of ngā roto waimāori.

6. Avoid the use of ngā roto waimāori as a receiving environment for the discharge of contaminants (e.g. industrial, residential, recreational or agricultural sources).

Section 3.3.14 Customary Use

Customary use is the on-going access to, and sustainable use of, mahinga kai resources. Following European settlement, there was an enormous loss of mahinga kai resources, and hence a great loss of customary use by tangata whenua. This loss was due to a number of reasons, including the physical destruction of habitats (e.g. clearance of forest and drainage of wetlands), the subsequent decline in species that relied on that habitat, and the introduction of foreign animals, birds, fish and plants had a devastating effect on many native species. The loss was particularly dramatic with regards to native birds.

In an attempt to address the dramatic decline in species, the Government began to impose controls and restrictions over hunting certain species. As early as 1922, harvesting of kererū was outlawed. In 1953 the Wildlife Act was passed, providing absolute protection to most native bird species. The introduction of conservation legislation in the years that followed (e.g. Conservation Act 1987, the National Parks Act 1980, Marine Mammals Protection Act 1978, and the Reserves Act 1977) focused on managing for preservation purposes, and thus gave little recognition to customary use rights.

Fiordland is one of the largest areas of forest remaining in Te Waipounamu, and is thus an extremely important region for species of cultural importance. Ngāi Tahu ki Murihiku is greatly concerned over the loss of our indigenous birds, plants and fish, and is opposed to uncontrolled, unauthorised harvesting or illegal poaching of indigenous species. At the same time, customary use rights, as guaranteed by the Treaty of Waitangi, must be recognised and provided for.

For Ngāi Tahu ki Murihiku, customary use is consistent with conservation of species. The concept of kaitiakitanga is an integral component of resource use.

Customary use comes with management responsibilities to care and protect natural resources, which in effect translates into carefully regulated access and sustainable use of those species that are able to sustain a take (now or in the future). Customary use is not limited to non-commercial. Ngāi Tahu ki Murihiku believe that the sustainable use of native flora and fauna, in and out of the conservation estate, can be the basis of future economic, social, and tribal development.

1. All Ngāi Tahu Whānui, current and future generations, must have the ability to access, use and protect mahinga kai resources, and the history and traditions that are part of customary use of such resources, as guaranteed by the Treaty of Waitangi.

2. Protect existing customary use rights from erosion by government policy.

3. The cultural, spiritual, historic and traditional association of Ngāi Tahu ki Murihiku with taonga species must be recognised and provided for within all management and/ or recovery plans associated with those species. This includes taonga species as per the Ngāi Tahu Claims Settlement Act, and all other species considered taonga by Ngāi Tahu ki Murihiku.

4. Encourage effective working relationships with the Department of Conservation with regards to customary use of native plants, birds, marine mammals, and other traditional materials on conservation lands.

5. Encourage communication between the Department of Conservation and Ngāi Tahu ki Murihiku, with regards to specific areas on conservation land where specific traditional resources may be found and sustainably harvested.

6. Use the kaitiaki rōpū forum to facilitate access to specific cultural and customary resources (e.g. trees, bone and feathers) held by the Department of Conservation.

7. Work towards the restoration of key mahinga kai areas and species, and the tikanga associated with managing those places and species.

8. Make full use of the knowledge of tangata whenua with regards to native birds, plants and other traditional materials, and its value in understanding how to protect and enhance biodiversity.

9. Promote joint management and co-management of key mahinga kai places and species on conservation land.

10. Encourage collaborative research and monitoring projects between tangata whenua and scientists that address customary use issues using both Mātauranga Māori, or traditional knowledge, and mainstream science.

11. Promote a good working relationship with the Fish and Game Council with regards to customary use and access to game birds (native and non-native) for cultural use.

Section 3.3.16 Native Forest Ecosystems

About two-thirds of Fiordland is forested. Tangata whenua consider the forests of Fiordland as the lungs of the land; the filtration system. The forests are natural capital, providing invaluable ecosystem services for the land, water, air, biodiversity and humans.

1. Ngāi Tahu ki Murihiku consider the forests of Fiordland as taonga to be protected and therefore enhanced for future generations.

2. Promote the management of whole ecosystems and landscapes, in addition to single species.

3. Encourage the protection and appropriate valuation of native forest ecosystems as natural capital: the water, soil and biodiversity, and the essential ecosystem services they provide.

4. Promote the integration of biodiversity management across land ownership land use boundaries. 5. Take responsibility for the impacts of human activities on native forest ecosystems.

6. Ensure efforts are directed at identifying solutions for biodiversity decline, not just the problems.

7. Make full use of the knowledge of tangata whenua with regards to indigenous biodiversity, and the value of such knowledge in understanding how to protect and enhance biodiversity.

8. Ensure that the customary rights of tangata whenua to access and use the resources of native forest ecosystems are recognised and provided for.

10. That, where possible, the owners of indigenous forests will be encouraged to enter into protective heritage covenants.

11. Support and promote efforts to control and manage pests (animal and noxious pest plants) in native forest ecosystems.

Section 3.3.18 Species Recovery

Species recovery focuses on enhancing the recovery of threatened native plant and animal species in coastal, land and freshwater ecosystems. This is achieved through such initiatives as habitat enhancement, breeding programmes, species transfer and predator control.

For Ngāi Tahu ki Murihiku, species recovery is about restoring populations of native species that can be sustained in natural habitats. It is also about restoring populations to a level where customary use is an achievable goal.

1. The cultural, spiritual, historic and traditional association of Ngāi Tahu ki Murihiku with native species must be recognised and provided for in all management associated with those species.

2. Ensure that taonga species provisions of the Ngāi Tahu Claims Settlement Act 1998 are given effect to within Fiordland National Park boundaries, including taonga species management, recovery plans, and species transfers onto/from the area.

3. Work proactively and effectively with the Department of Conservation, through kaitiaki rōpū, to “restore the dawn chorus” through effective species recovery and habitat enhancement programs for our native bird species.

4. Consider the potential effects (positive and adverse) on native birds when assessing any resource consent or concession application in Fiordland.

5. Avoid compromising the habitat, diversity and abundance of native bird species at risk as a result of inappropriate land use, development or subdivision.

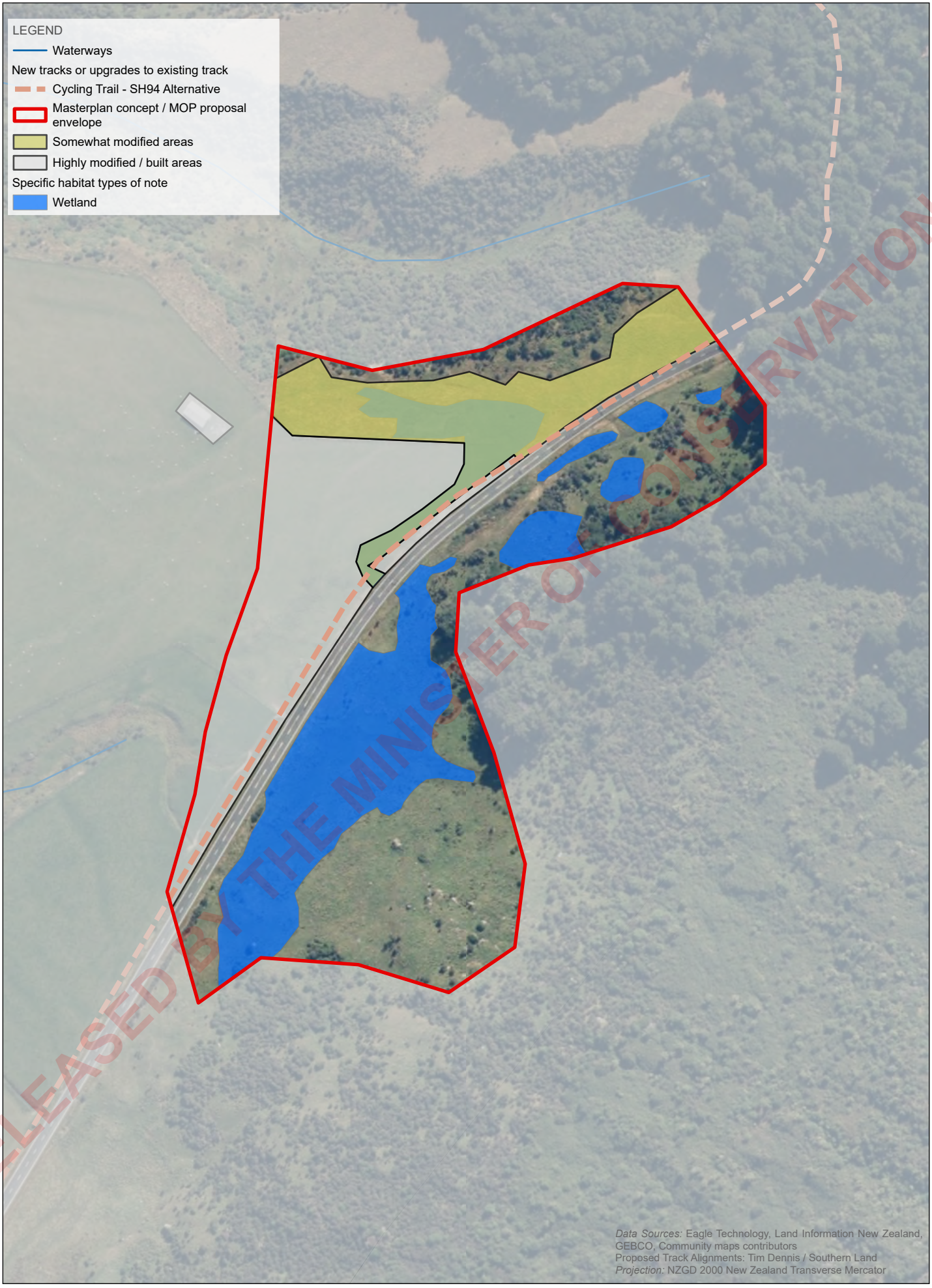
6. Support and encourage scientific research that assists in the conservation and recovery of native birds, particularly those that are at risk.

7. Encourage researchers to consult with and involve local tangata whenua experts as part of any research on culturally important native bird species.

8. Encourage the use of Mātauranga Māori in scientific research and monitoring surveys for species recovery.

9. Protect and enhance the eel population and/or habitat within Fiordland National Park, while recognising the customary use rights of Ngāi Tahu.

Appendix 4: Maps



Boffa Miskell

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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

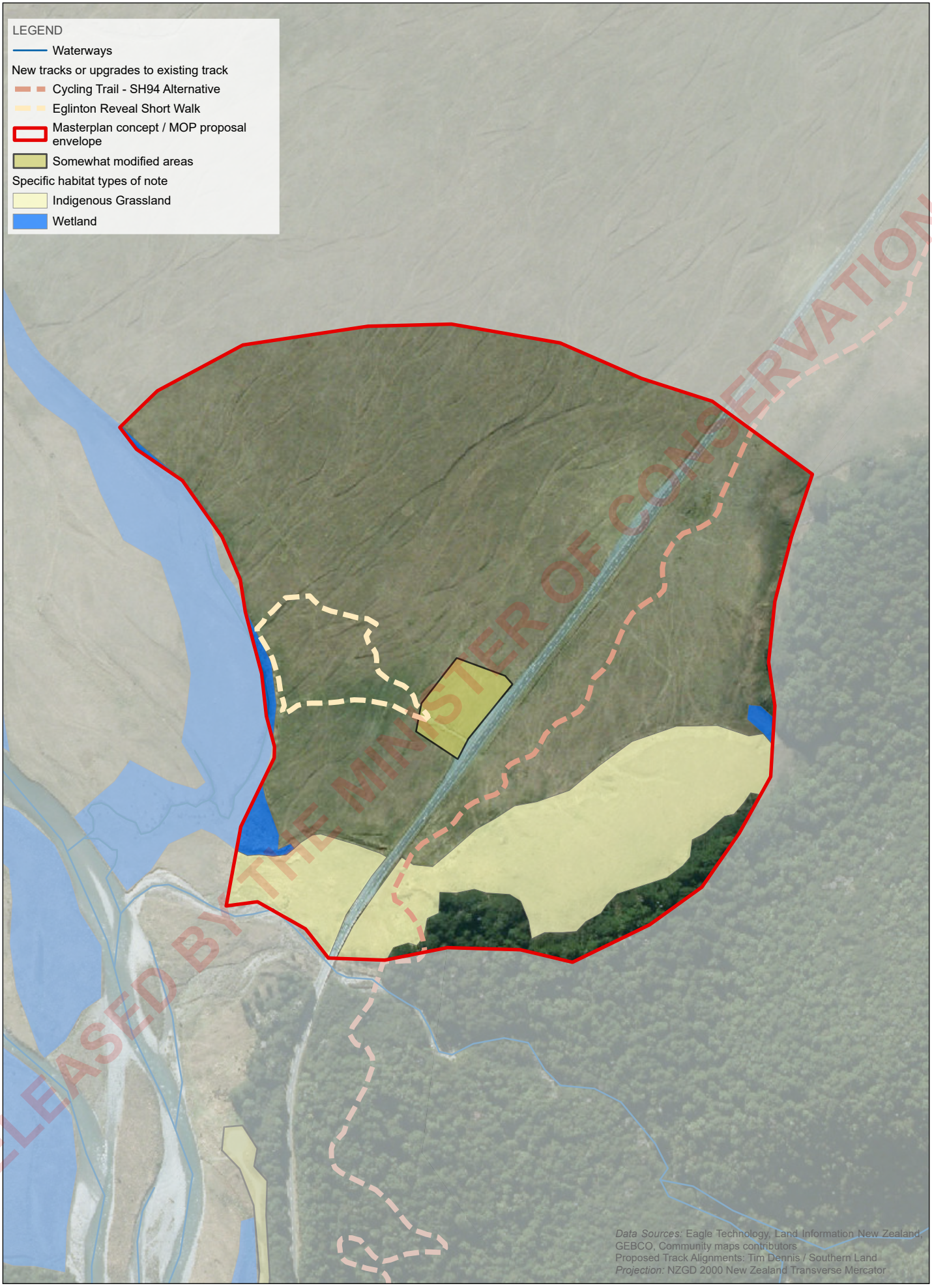
Node 1: Te Rua-o-Te-Moko Fiordland National Park Gateway

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A1



Boffa Miskell

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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

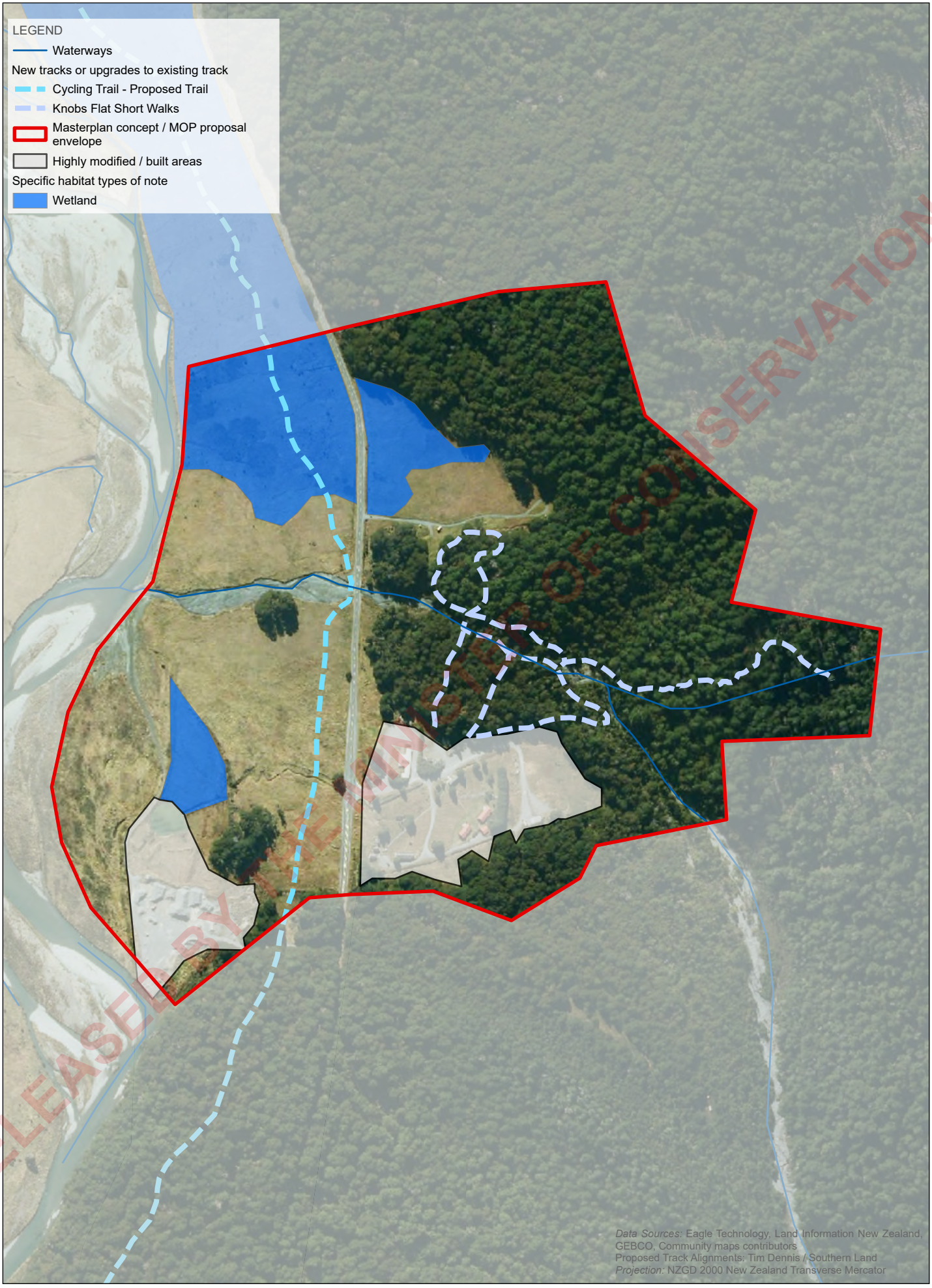
Node 2: Eglinton Reveal

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A2



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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

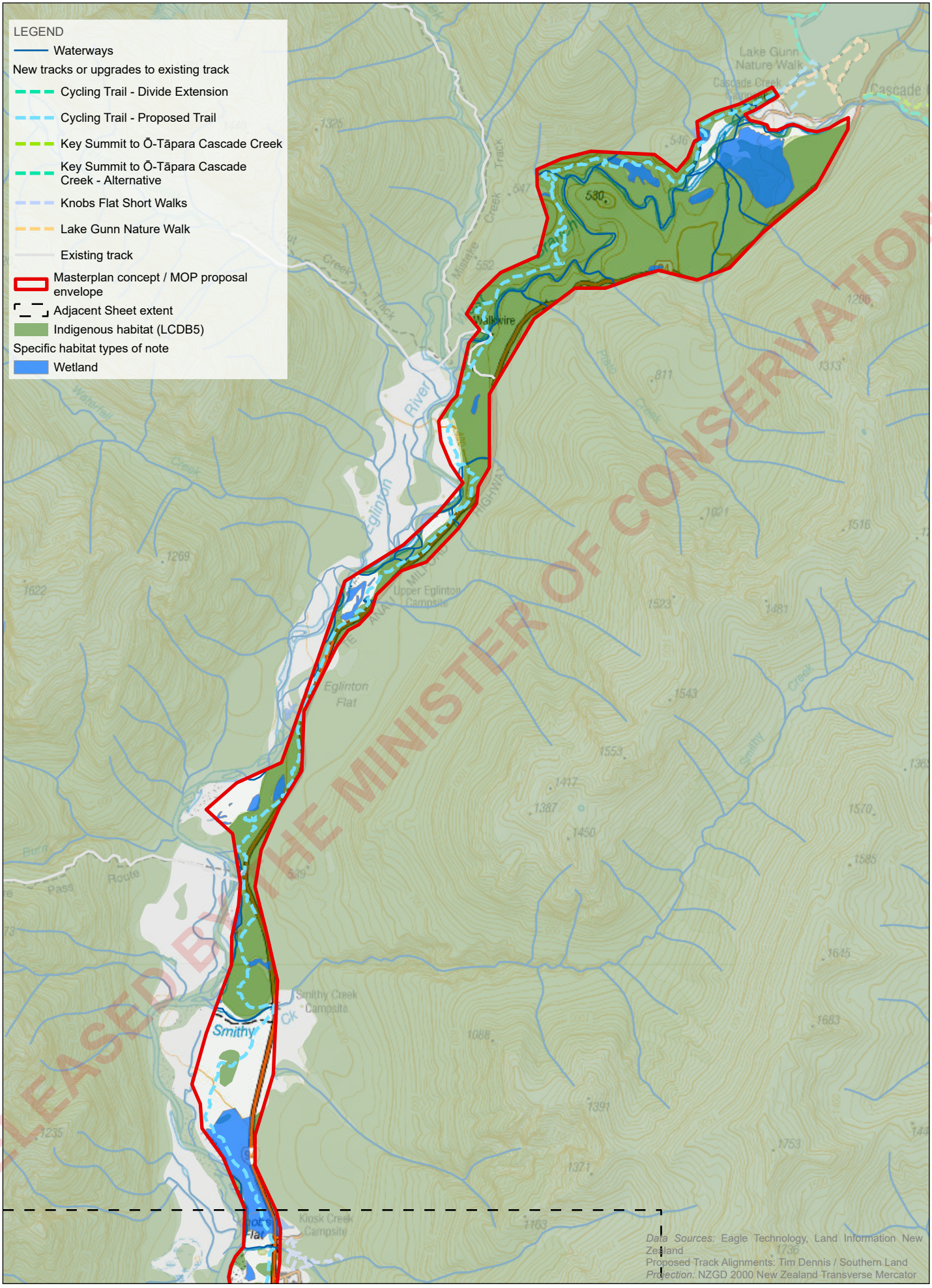
Node 3: Te Huakaue / Knobs Flat incl. Kiosk Creek and Walks

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A3



Boffa Miskell

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1:40,000 @ A4

MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

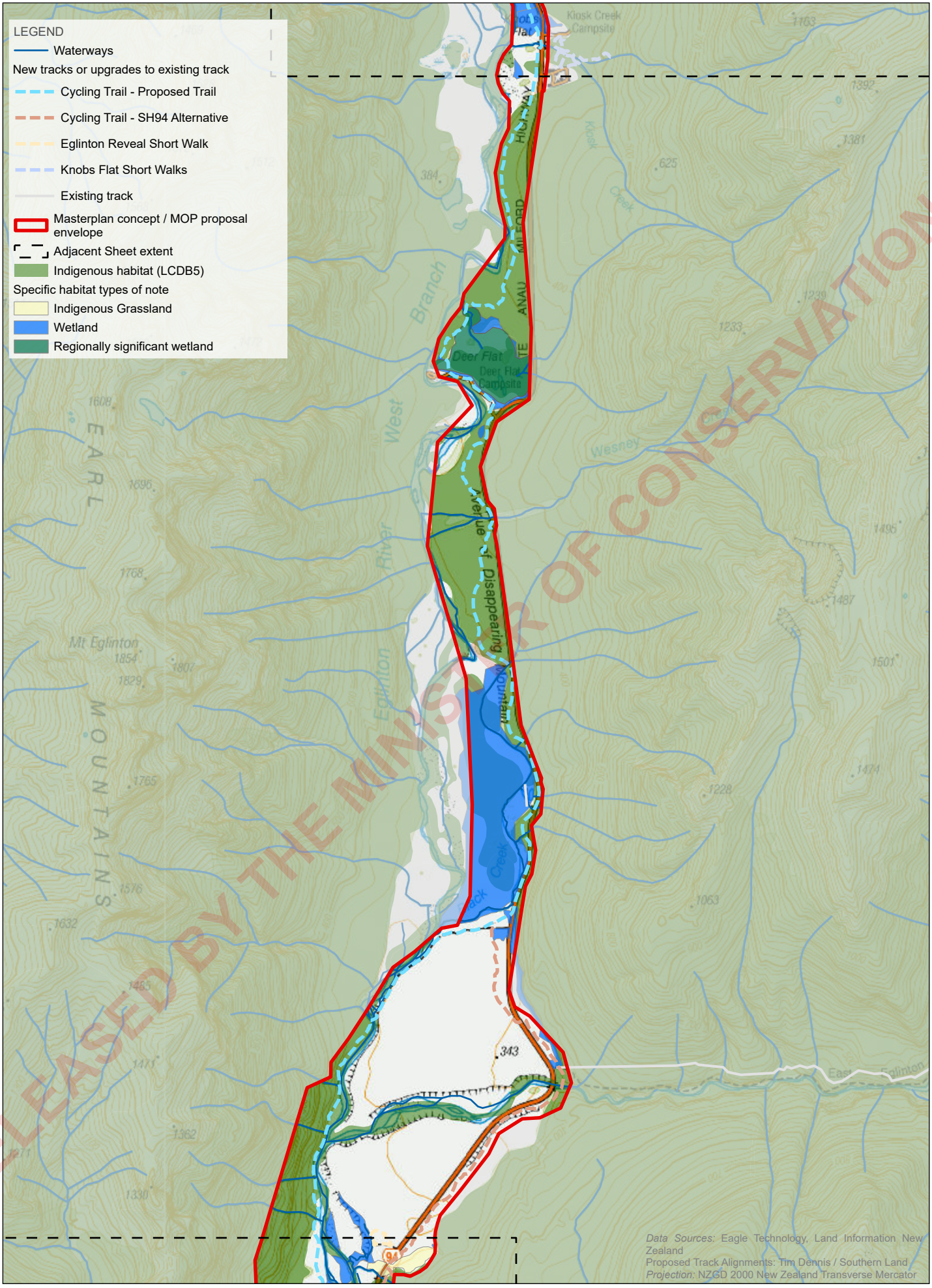
Node 3: Walking / Cycling Trail

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A4.1



Boffa Miskell

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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

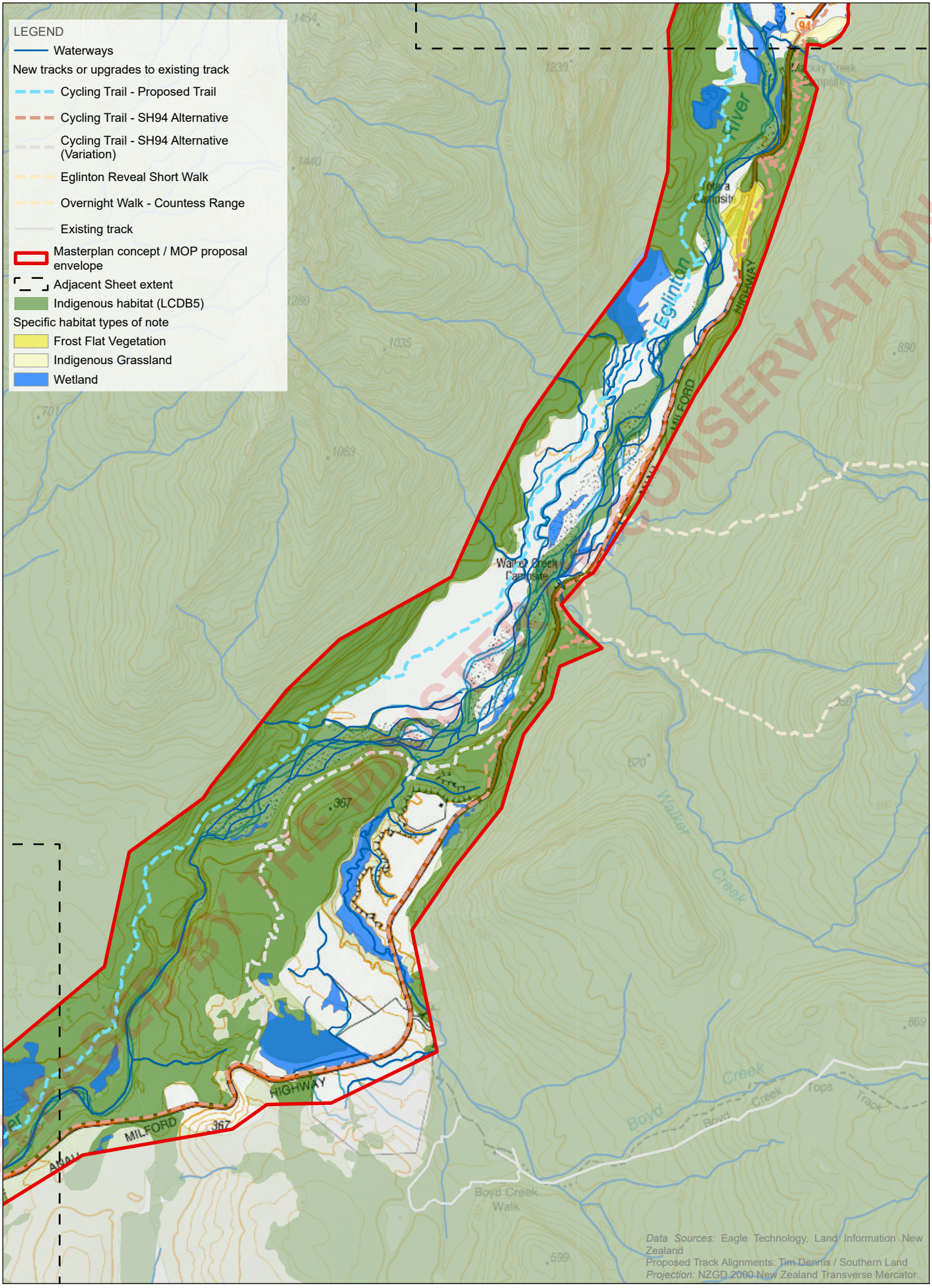
Node 3: Walking / Cycling Trail

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A4.2



Boffa Miskell

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0 1 km

1:40,000 @ A4

MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

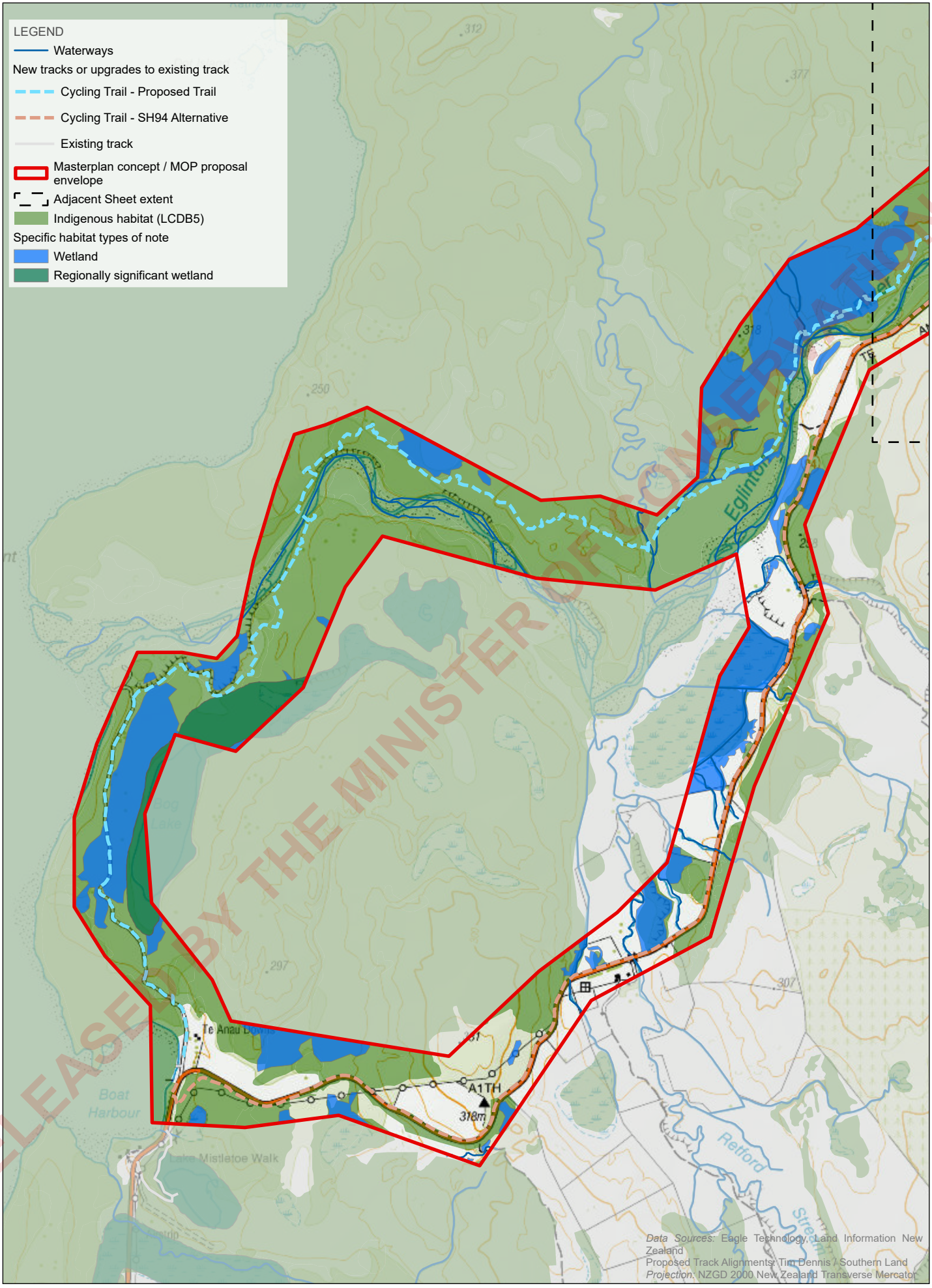
Node 3: Walking / Cycling Trail

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A4.3



Boffa Miskell

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0 1 km

1:40,000 @ A4

MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

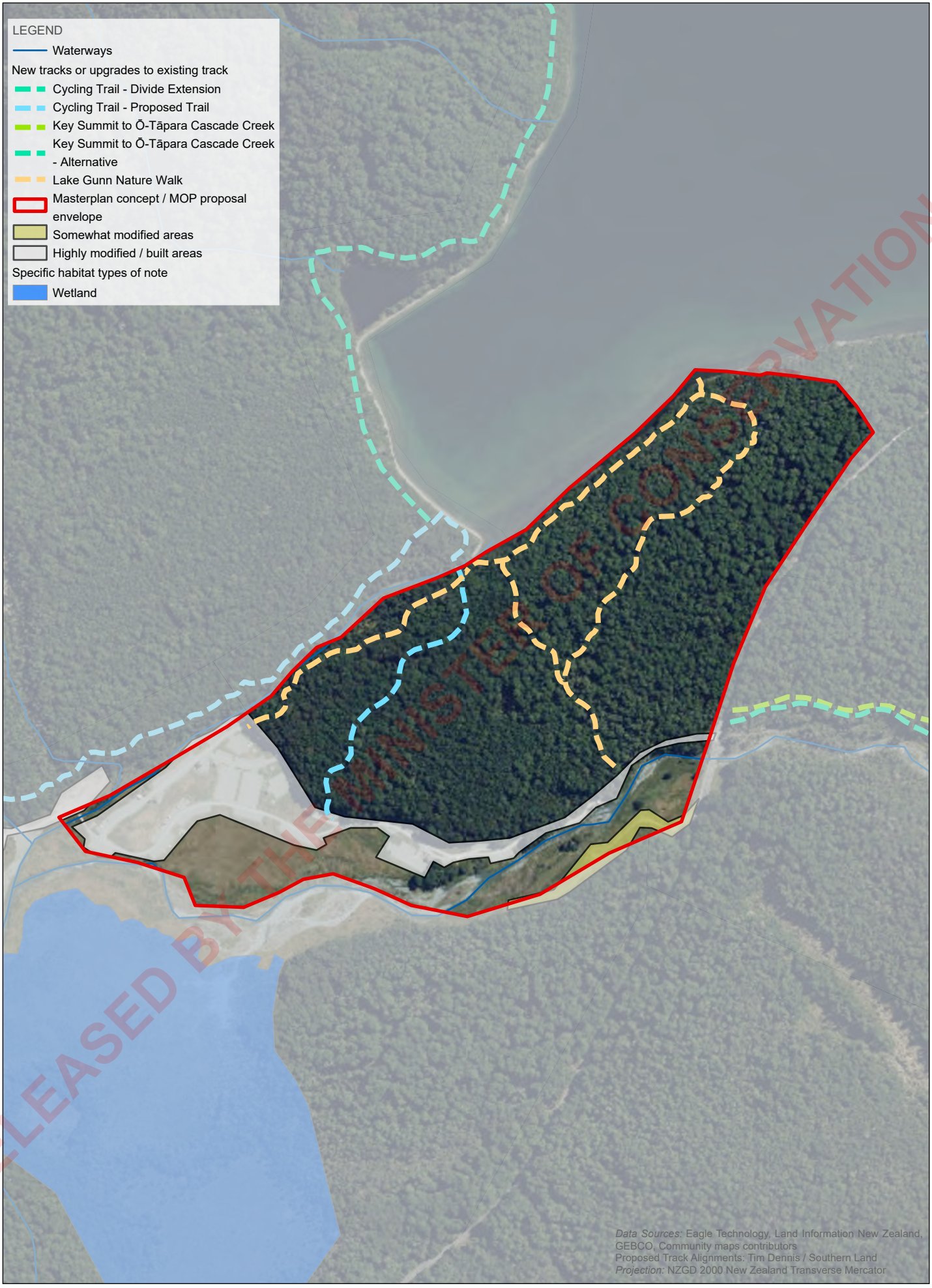
Node 3: Walking / Cycling Trail

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A4.4



Boffa Miskell

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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

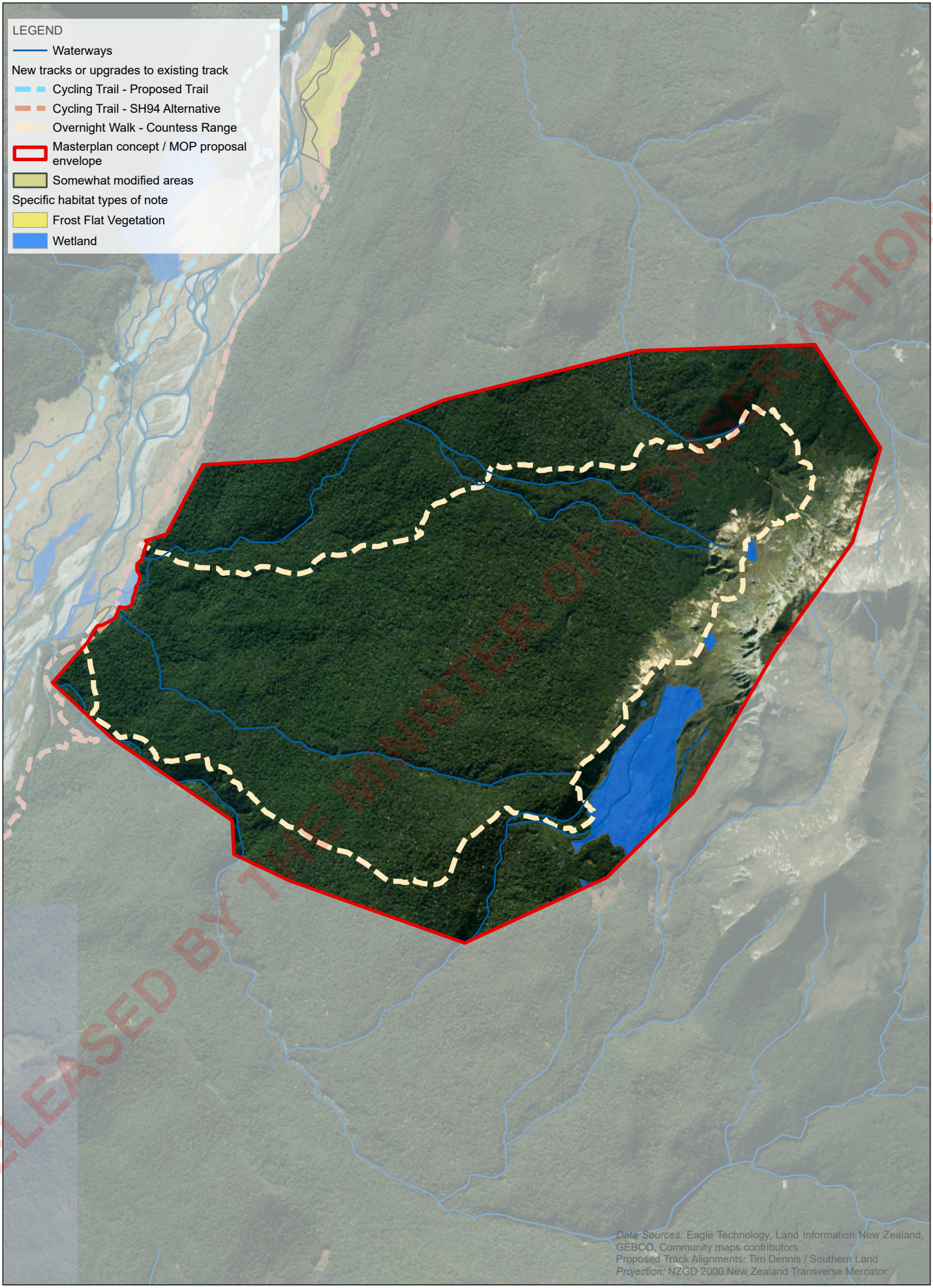
Node 4: Ō-Tāpara Cascade Creek

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A5



Boffa Miskell

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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

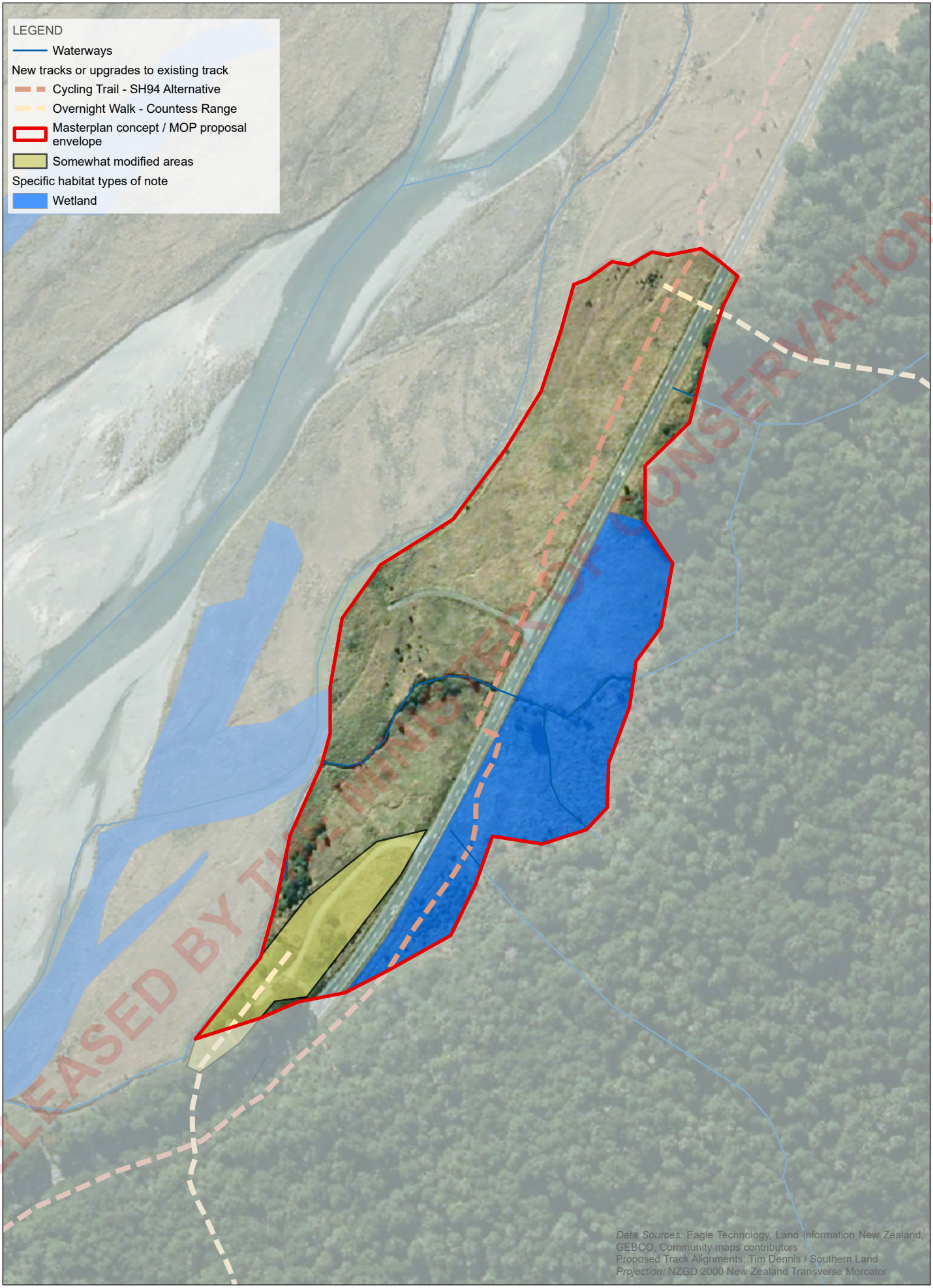
Node 4: Overnight Walk – Countess Range

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A6



Boffa Miskell

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0 40 m

1:3,000 @ A4

MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

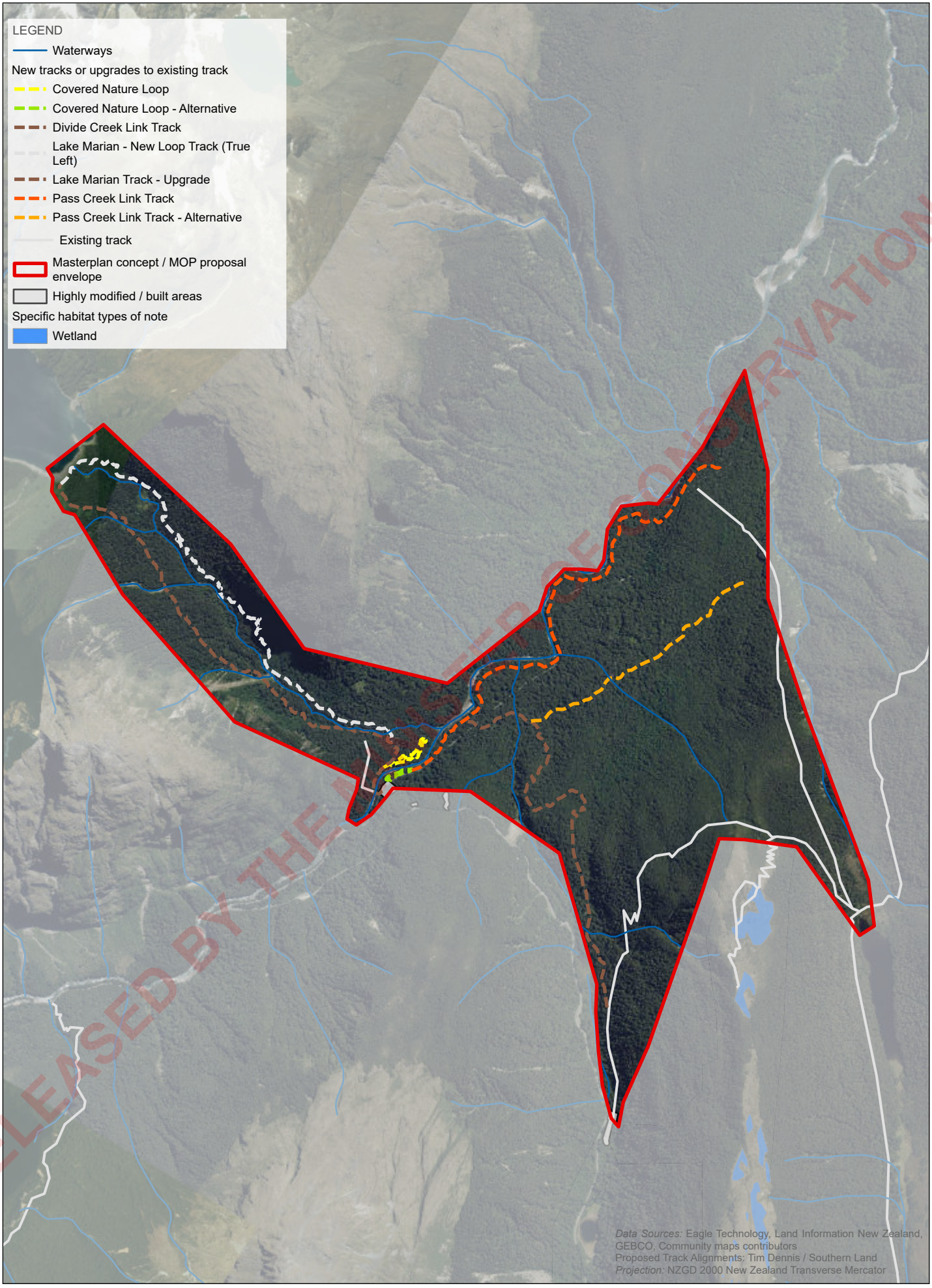
Node 4: Countess Range – Walker Creek

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A7



Boffa Miskell

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0 680 m

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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

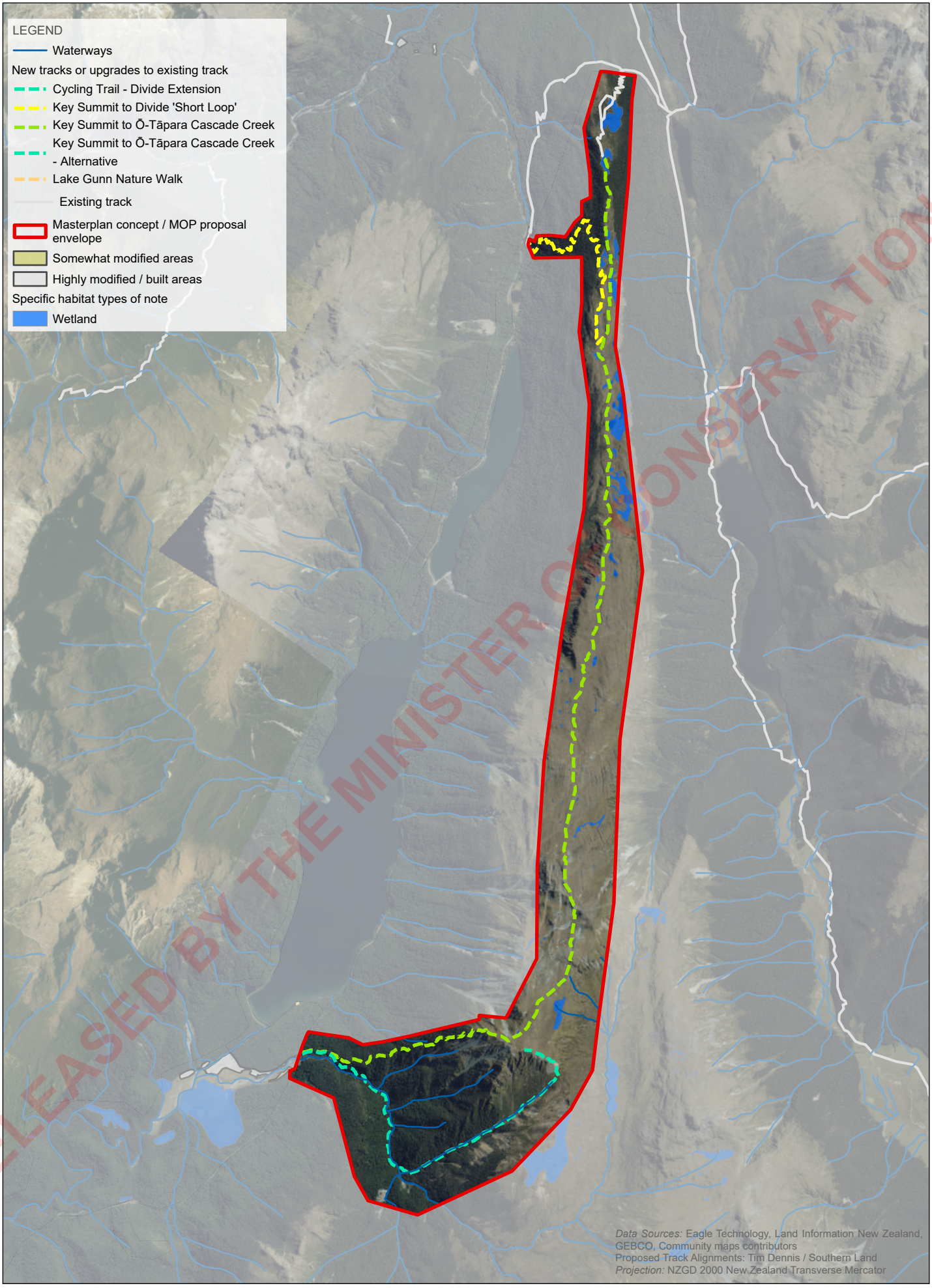
Node 5: Whakatipu Trails Head

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A8



Boffa Miskell

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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

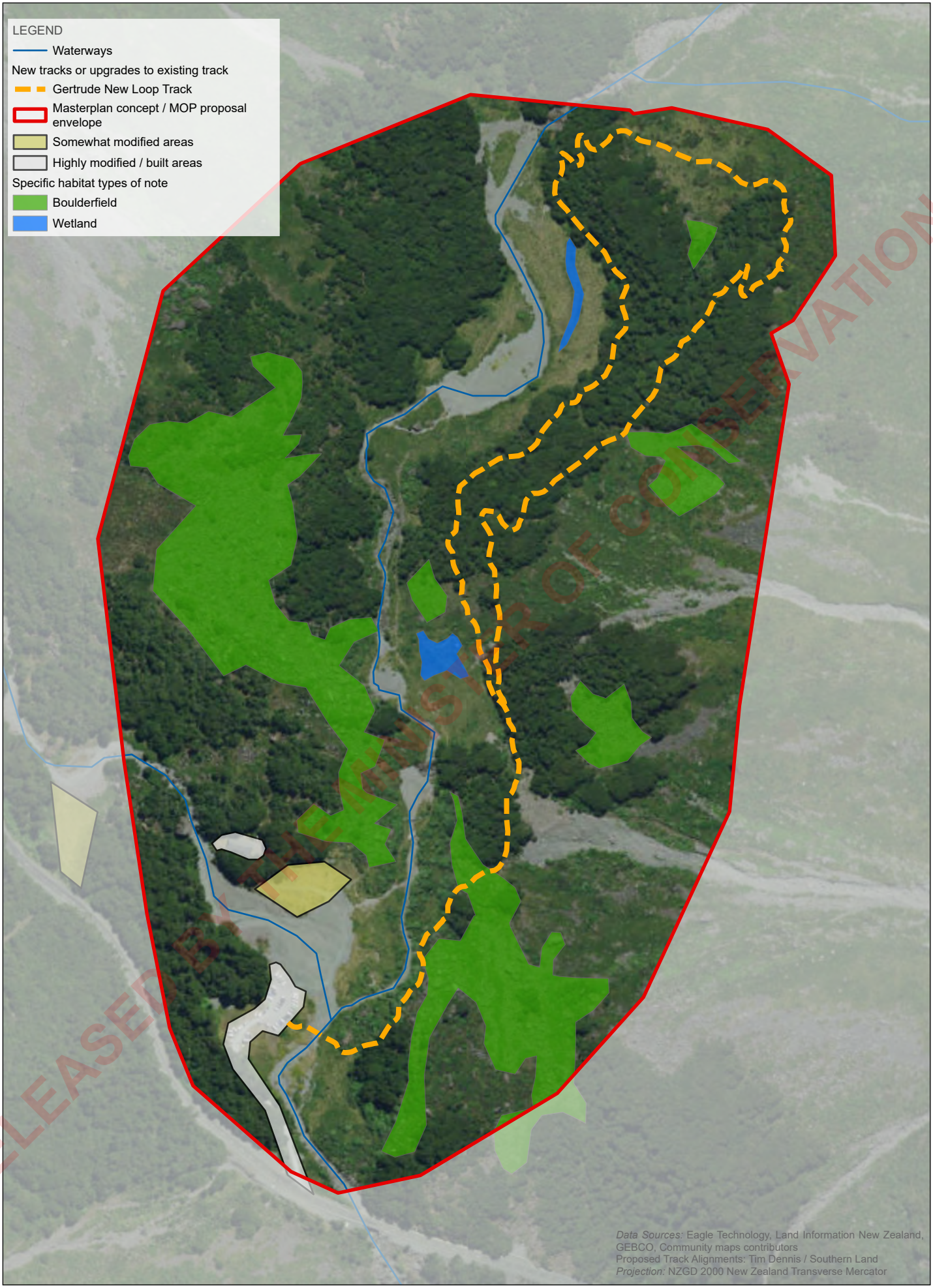
Node 5: Key Summit to Ō-Tāpara Cascade Creek

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A9



Boffa Miskell

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0 100 m

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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

Node 6: Gertrude Valley

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A10

Boffa Miskell

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0 24 m

1:1,000 @ A4

MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

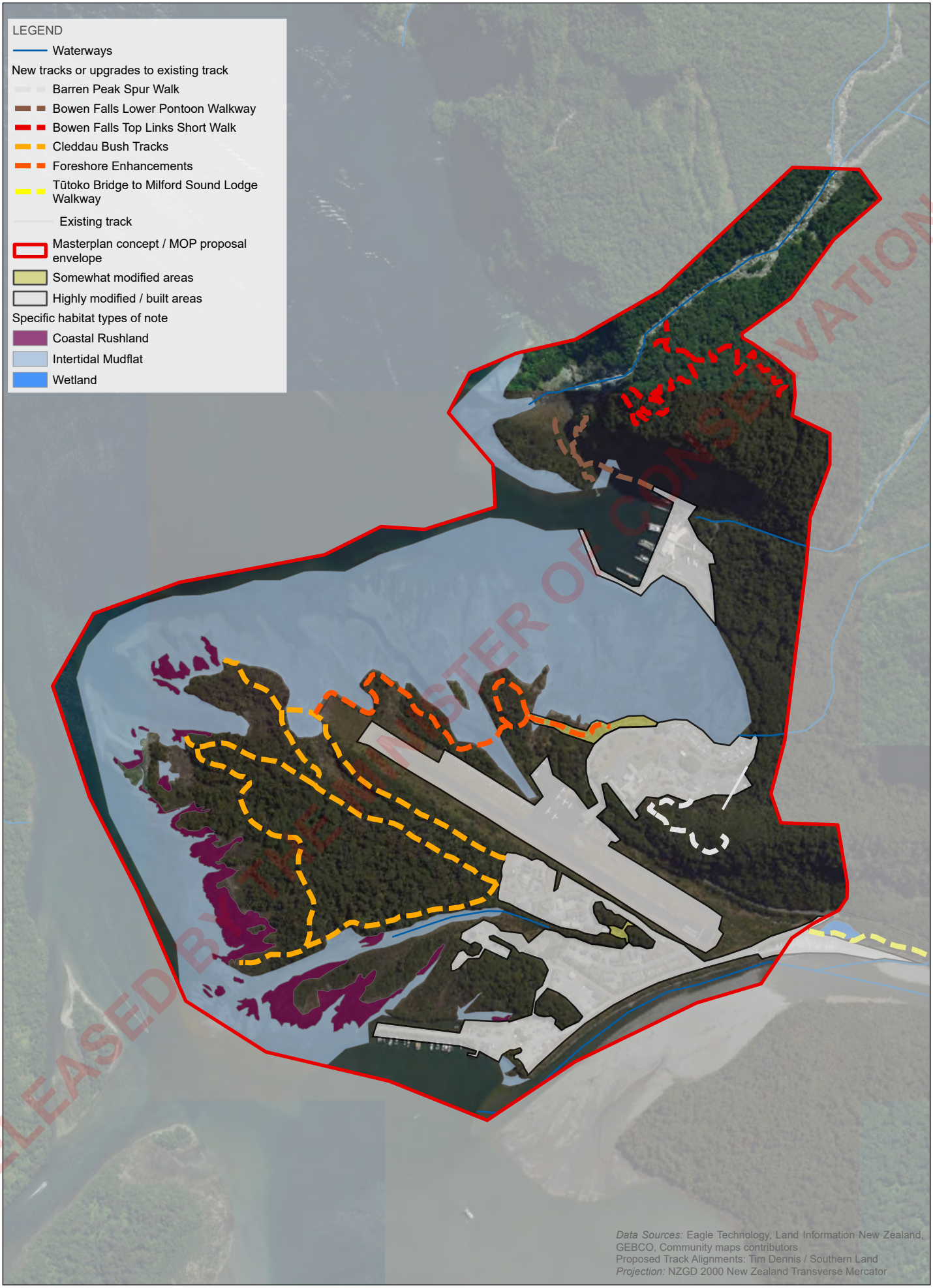
Node 7: Cleddau Cirque

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A11



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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

Piopiotahi Milford Sound Village

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A12

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0 40 m

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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

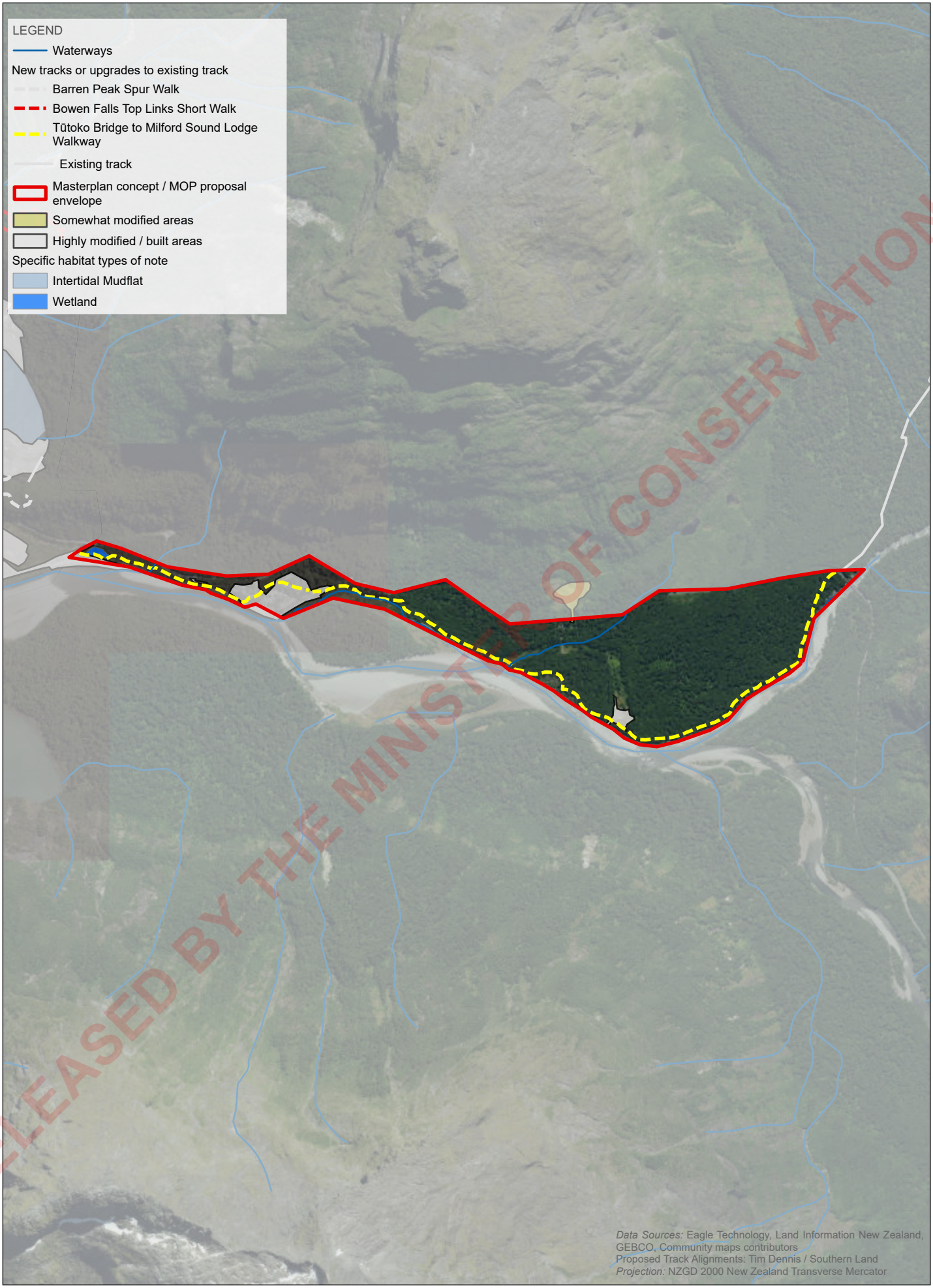
Little Tahiti

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A14



Boffa Miskell

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0 400 m

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MOP: ASSESSMENT OF ENVIRONMENTAL VALUES

Tūtoko Bridge to Milford Sound Lodge Walkway

Date: 02 May 2024 | Revision: 0

Plan prepared for Milford Opportunities Project by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Map A15

Appendix 5: Walking Track and Cycling Trail Standards

The walking track and cycling trail standards are reproduced below based on the final Walking & Cycling Experiences Feasibility Report (Southern Land Ltd, 2024) for MOP Stage 3, Phase 1.

Track, Trail Standards

Assumptions in this report regarding the likely ecological impacts of proposed walking tracks and cycling trails are generally based on Southern Land (2024), which itself is based on the following standards:

- DOC Cycle Track Service Standards 2020
- DOC Track Construction & Maintenance Guidelines July 2008
- DOC Hut Service Standards
- NZ Cycle Trail Design Guide 5th Ed. 2019
- SNZ HB 8630:2004 Track & Outdoor Visitor Structures Handbook

Note however that an assumption of a minimum track width of 1.0 m for all formed tracks has been applied, based on feedback provided on a '90% Draft' version of this report (Tom Hopkins *pers. comm.* 2024). This varies from the published standards above as well as Table 7 in Southern Land (2024).

Visitor Groups

For the purposes of designing backcountry tracks and structures, users are defined in broad groups. SNZ HB8630 and DOC standards are summarised as follows:

Table 21. Visitor groups.

Visitor Group (used by DOC)	DOC TLA	MOP Visitor Groups 2020
Short Stop Travelers	SST	Short Stop Attraction Visitors
Day Visitors	DV	Day Experience Visitors
Backcountry Comfort Seekers	BCC	Front Country Overnight Visitors
Backcountry Adventurers	BCA	Enabled Backcountry Visitors
Remoteness Seekers	RS	Wilderness Remote Experience Visitors

Track / Trail Specifications

Table 22: Walking track specifications.

Cat.	Type	Max grade	Steps	Track width*	Formation	Structures	Bridges	Accessible	Footwear
SST	Short Walk	1:5.7, 10°	Yes, 1:1.5, 190 mm riser, 2.5 m between landings	1.0-2 m	Well formed & mud free, max 10% mud <50 mm deep	1.2 m min width	All major & minor bridged	Yes, max 5°, no steps, 1.2 m wide, compacted firm surface	Shoes
DV	Walking Track	1:3.7, 15°	Yes, 1:1.2, 4 m between landings	1.0-1.2 m	Well formed, max 20% mud <100 mm deep	0.75 m min width	All major & >1 m wide	Not stated	Light hiking boots
BCC	Easy Tramping Track	No max	Yes, as per Walking Track	1.0-1.2 m	Wet areas <50% total length, markers or poled if not formed	0.6 m min width	All major, minor refer SNZ HB 8630: Section 2.6.3.3	No	Light hiking or Tramping boots
BCA	Tramping Track	No max	Not typically used	No minimum	Markers or poled, natural surface	0.6 m min width	All major if not easily crossed in normal flow	No	Tramping boots

*Note that the track widths in Table 22 above vary from published SNZ HB8630 and DOC service standards, as well as Table 7 in the final Walking & Cycling Experiences Feasibility Report (Southern Land Ltd, 2024). This is based on advice (Tom Hopkins *pers. comm.* 2024) that 'Short Walk,' 'Walking Track' and 'Easy Tramping Track' tracks proposed to be built as part of MOP are likely to be machine built, and are therefore unlikely to be able to practically achieve track widths less than c.1.0-1.2 m.

Table 23: NZCT Trail specifications (only Grades 1 and 2 are shown, as this is the target grade for the proposed cycle trail).

Grade	**1 - Easiest**	**2 - Easy**
Width (m)	1.5 m min. (one way), 2.5 m dual	1.2 m min. (one way), 2.2 m dual
Grade Max °	4	6
Grade up °	2	3.5
Grade Down °	3.5	5
Built Features	Roll all, no step	Roll all, step max 200mm
Turn Diameter (m)	12	8
Turn Camber °	10	20
Structures (m)	1.5 (min 1.2)	1.2 min
Surface Conditions	Compacted, firm, uniform, well drained, cambered	

Table 24: Relationship of NZCT off-road grades to HB8360 track classes and visitor groups.

NZCT Grade	Equivalent HB 8630 User Group and Track Classification	HB 8630 Visitor Group	Reasoning / comments
1. 	2. Short walk	SST	Easiest non-urban category in HB 8630. All watercourses bridged. NZCT route distances will be longer than those suggested in HB 8630.
2. 	3. Walking track	DV	Similar experience level. Similar steps between adjacent categories.
3. 	4. Great walk/ easy tramping track	BCC	Similar experience level. Moderate exertion levels Similar steps between adjacent categories.

Track / Trail Levels of Service for MOP Proposals

Table 25. Track / trail levels of service for MOP proposals (reproduced without modification from Southern Land 2024).

Description	Length (m)	Type/Grade*	Brief Description	Experience Description
Eglinton River Track	500	Easy cycle trail or Short Walk	Easy walking track towards Eglinton River to connect with the cycle trail	Easy short walk with views up & down valley, overlook of small horseshoe wetland
Knobs Flat short walks	1,300	Short Walk	Short walks in and around Knobs Flat accommodation including to waterfall & across Kiosk Creek	Easy short walks in open mossy beech forest with harder track (Easy Tramping Track) to stunning waterfall
Countess Range Track & Hut (option 2)	12,000	Easy Tramping Track & 40 Bed Hut	Easy tramping track & Serviced 40 bed hut	Significant climb through beech forest to gentle open tops with stunning 250° views & hut, loop to create whole journey and add interesting & varied tops travel
Countess Range Track & Hut (option 1)	11,000	Advanced Tramping Track & 20 Bed Hut	Advanced Tramping track & Standard 20 bed hut	Significant climb through beech forest to gentle open tops with stunning 250° views & hut, loop to create whole journey and add interesting & varied tops travel
Option 1: True right of Eglinton River ...				
Te Anau Downs to Black Creek cycle trail - True right of Eglinton River	37,000	Easy cycle trail	Cycle trail on True Right of Eglinton River to Black Creek	Easy riding through a combination of red beech forest, regenerating forest and open grasslands. Two large bridges required. Views over the lower Eglinton River
Black Creek to Smithy Creek cycle trail	11,100	Easy cycle trail	Cycle trail from Smithy Creek to Black Creek	Trail takes riders past Mirror Lakes & Deer Flat plus interesting landform on plain at Knobs Flat

Smithy creek to Mistake Creek cycle trail	8,200	Easy cycle trail	Cycle trail from Mistake Creek to Smithy Creek	Trail mostly in red beech forest between road and river. Very short sections next to the road to avoid erosion or swampy grasslands
Mistake Creek to Ōtāpara Cascade Creek cycle trail	6,000	Easy cycle trail	Cycle trail from Ōtāpara Cascade Creek to Mistake Creek	Trail on the true right of the Eglinton River to Lake Gunn south shore & Ōtāpara Cascade Creek node
Ōtāpara Cascade Creek to Lake Gunn (northern end)	5,000	Easy cycle trail	Cycle trail along western side of Ōtāpara Lake Gunn	Trail on the western shore including link to Melita Falls (previously tracked in 1970's), stunning lake and mountain views, exciting riding across cliff faces
Ōtāpara Lake Gunn to Lake Fergus and to The Divide	3,830	Easy cycle trail	Cycle trail along western side of Lake Fergus to Divide Car park/node	Connection to The Divide node, changing beech forest, lake views, completing the journey to/from The Divide
Option 2: True left of Eglinton River along SH94 from Te Anau Downs to Blacks Creek				
Te Anau Downs to Black Creek cycle trail following SH94	29,700	Easy cycle trail	Cycle trail following margins of SH94 to Blacks Creek then join Option 1 alignment	Trail along the road margins, potential to leave road 2km west of Boyd Creek and include lovely beech forest riding with views to the Eglinton River. Some nice beech forest sections between Totara Flat and Eglinton Reveal. Bridge over East Eglinton River required
HINEPIPIWAI LAKE MARIAN & WHAKATIPU NODE				
Lake Marian Falls Track	750	Short Walk	Upgrade of existing track to waterfalls to short walk or walking track standard	Minor upgrades to track surface & structure widths to cater for increasing number of visitors to improve flow and reduce congestion to this outstanding short walk to the loud crashing waterfalls in the boulder strewn Marian Creek.

Lake Marian Track - Upgrade	2,370	Easy Tramping Track	Upgrade of existing Lake Marian Track to either easy tramping track or walking track standard.	Upgrades to improve accessibility and reduce congestion on this popular day walk to Hinepipiwai Lake Marian which gives views up valley to hanging snow fields, rock faces and alpine scenery
Lake Marian Loop - True left	3,200	Easy Tramping Track	New track on the true left of Marian Creek to create loop with existing Lake Marian Track	New track to reduce congestion by creating a loop track which is favoured over 'there and back' type tracks. The bush on the true left offers similar experiences to the true right existing track
Covered Nature Trail (accessible)	500	Short Walk	New accessible and fully covered track accessed from Whakatipu node. Options include both sides of Hollyford River and lower sections of Marian Creek, Longitudinal Gradient max 5° as per HB8630.	Aiming for lovely mossy beech forest, views over the Hollyford River at designated viewpoints. Covered from weather and accessible.
Pass Creek Link	3,000	Easy Tramping Track	New track connecting Whakatipu Node to Pass Creek Track, Lake Howden, Key Summit & Divide (Divide to Howden currently Great Walk/Easy Tramping Track). Test whole loop at Easy Tramping Track standard for consistency	Creation of a day walking loop taking in Key Summit. Aimed at more active visitors wishing to have a relatively easy day walk
Key Summit to Ōtāpara Cascade Creek Track – Option 1	18,970	Easy Tramping Track	New tramping track from Key Summit along ridge to Ōtāpara Cascade Creek node.	Day walking track on the open and stunning Key Summit Ridge culminating in a descent down Cascade Creek to the Ōtāpara Cascade Creek node.

Key Summit To Ōtāpara Cascade Creek Track – Option 2	17,320	Advanced Tramping Track	New tramping track from Key Summit along ridge to Ōtāpara Cascade Creek node.	Day walking track on the open and stunning Key Summit Ridge culminating in a descent down Cascade Creek to the Ōtāpara Cascade Creek node.
Key Summit Ridge Loop - Alternative	8,500	Easy Tramping Track	New easy tramping track to Key Summit Ridge, Ōtāpara Lake Gunn viewpoint and return on new track to The Divide	Alternative option to full ridge providing a shorter day walk more achievable by more people but still capturing the outstanding ridge travel which is the feature of this opportunity
Divide Creek link to Marian Car Park	2,690	Easy Tramping track	New easy tramping track from the Divide to Hinepipiwai Lake Marian car park	This connects with the Pass Creek link forming a full day walking loop.

CLEDDAU VALLEY & MILFORD SOUND/PIOPIOTAHI

Gertrude Valley Loop Track	1,840	Short Walk	New 1,800m high quality short walk. Consider opportunities for getting a viewpoint (possibly true left of Gertrude Creek) as part of walk	Aim is to provide an easy alpine walk with views to the head of the valley & surrounds

The Chasm to Cleddau Horse Bridge	3,240	Day Walk	New day walk connecting these existing sites on the true left of the Cleddau River	Aiming for a short walk in the Cleddau Valley with views across the Cleddau River taking in the Chasm and Horse Bridge will provide a link at each end which are points of interest in their own right.
Milford Sound Lodge to Tutoko River Bridge Track	2,330	Day Walk	New day walk connecting Milford Sound Lodge to the historic Tutoko Bridge	Aiming for an easy forest walk for visitors wanting to explore the lower valley as part of their stay in Milford Sound Piopiotahi
Barren Peak Spur walk & Viewing Deck	470	Short Walk	Upgrade of the existing Barren Peak Spur walk, consider if loop option possible to reduce congestion, steps & platforms included	Aiming to provide a better viewing spot which cuts out the building in the foreground and only adds a few minutes to the experience for a significantly better viewpoint
Hine-te- awa Bowen Falls – Upper Walks	990	Short Walk & Easy Tramping Track	New short walk from top of cable car or similar, along ridge to view the top of falls from viewing platform + steps to manage grades, and new easy tramping track to the Bowen River	Aiming to capture the power and excitement of the upper falls as the water drops off the cliff face 250m above the fiord. Easy tramping track to connect with upper river valley

Hine-te-awa Bowen Falls – Lower Walks	450	Short Walk	Reinstate walk to lower falls viewing area - short walk	The lower falls route has been highly successful in the past and reinstatement will achieve this outcome again. There is an option of a lower falls viewing platform which could provide comparable views to the upper falls
Cleddau Delta Walks (accessible)	2,100	Short Walk	New short walk(s) within the mature forest of the delta. Test as accessible option. Length up to 3.5km considered	Aiming to create an easy walk(s) which could be added to a day in Milford Sound Piopiotahi. The Delta offers mature lowland forest and has numerous viewpoints across the fiord

Together. Shaping Better Places.

Boffa Miskell is a leading New Zealand environmental consultancy with nine offices throughout Aotearoa. We work with a wide range of local, international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, Te Hīhiri (cultural advisory), engagement, transport advisory, climate change, graphics, and mapping. Over the past five decades we have built a reputation for creativity, professionalism, innovation, and excellence by understanding each project's interconnections with the wider environmental, social, cultural, and economic context.

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