Ecological Assessment for Queenstown Trails

Sunshine Bay to Twelve Mile Creek

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Prepared for:
Queenstown Trails

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1 Introduction

Natural Solutions for Nature Ltd (NSN) has been engaged by Queenstown Trails (QT) to prepare an ecological assessment to inform the proposed construction of trails to link Sunshine Bay to the Twelve Mile Recreation Reserve carpark adjacent to Glenorchy Road.

The trail is described in the recently launched Queenstown Trails 10 Year Strategy (2023-2033)[1] as a 5 km dual use 'aspirational' trail that would provide an off-road link between Queenstown and 7 Mile Bike Park, 12 Mile Delta and campground, which link to Moke Lake and Moonlight trails. The trail would link to the broader network as part of the 35km dual use trail between Glenorchy and Queenstown providing a continuation of off-road linkages to communities along the way. This project is being managed in conjunction with the Queenstown – Glenorchy Trails Alliance.

This report will inform a World Trails feasibility study. Queenstown Trails have separated the work covered by this report into two pre-application documents, these have been submitted to the Department of Conservation for consideration as preliminary statements of intent to undertake scoping works and construction of an undulating grade 3 trail.

1.1 Limitations

NSN has provided ecological services in a manner consistent with the level of consideration and expertise exercised by practitioners of ecology and environmental science.

The proposed alignment of the trail had not yet been confirmed with precision at the time of the site visits were undertaken. Access to the site was restricted in places due to the presence of bluffs and very dense vegetation in places.

Noting these restrictions to access, as much of the site as possible was walked, and site values across a corridor of possible access and alignment were recorded and considered. Steep lakeshore areas were viewed by boat. Confidence in the findings of this assessment is high for areas surveyed on foot and moderate (inferred) for areas surveyed by boat and using aerial imagery. A desktop review of relevant scientific and biological literature was undertaken to support the assessment. NSN considers these methods to be sufficient to obtain an understanding of the values likely to be affected by the trail construction, noting the exact footprint of impact has not yet been determined.

No warranty expressed or implied is made for sites not seen and where the alignment of the trail has not been confirmed. Where this assessment has relied on information provided by a third party or publications NSN assumes no responsibility or liability for errors in that data or effects of construction that may arise from reliance on sources external to NSN or that were not available at the time this assessment was prepared.

[1] https://queenstowntrails.org.nz/assets/Uploads/QTT-22795-Strategy-Plan-Document-A4-DIGITAL.pdf

Description of the Activity and Existing Environment

2.1 Location & Land Status

The trails will traverse the reserves and land tenures listed in Table 1 and is within an area of Iwi significance - Wāhi Tūpuna – and is within the foreshore environment of Whakātipu-Wai-Māori; and west of Wilson Bay, the land is encompassed within Punatapu (Bobs Cove and Surrounds). The final alignment will be confirmed by the World Trails feasibility study.

The Reserves affected are administered by the Department of Conservation and Queenstown Lakes District Council.

Land administered by the Department of Conservation ('DOC') along the eastern lake shore of Lake Whakatipu is managed within the Western lakes and Mountains/ Ngā Puna Wai Karikari a Rākaihautū Place ("Place") of the Otago Conservation Management Strategy ("CMS") (2016).[2]

Mountain biking is recognised as a popular activity within this Place with community initiatives resulting the formation of many tracks near Queenstown. The Twelve Mile Delta Recreation Reserve is identified in the CMS as a Gateway destination[3].

Table 1 Land Traversed by the Sunshine Bay to Twelve Mile tracks.

Trail section	Legal Description	Land Status
Recreation Reserve - Sunshine Bay (550 metres southwest of jetty)	Part Res B Sec. 45 – 47 Block I Mid Wakatipu SD	Recreation Reserve. Owned & Administered by QLDC
Road Reserve Sunshine Bay to 7 Mile Carpark	Road Reserve	Administered by QLDC
Sunshine Bay to 7 Mile Carpark	Lot (1 – dwelling present) & 2 DP 573743 Lot 2 DP 27509	Private land – Villa Reef - *potentially affected*
Seven Mile Recreation Reserve - Sunshine Bay to Wilson Bay	Sec. 3 & Pt Sec 2 Blk XIII Sec 41 Blk IV Pt Reserve B Blk I Mid Wakatipu SD	Recreation Reserve. Conservation Area S25 Cons Act; administered as part of the "7 Mile RR" Administered by DOC
Twelve Mile Recreation Reserve - Wilson Bay to Twelve Mile	Part Sec 39 Block IV Mid Wakatipu SD	Recreation Reserve; S17 Reserves Act, 1977 Administered by DOC
Twelve Mile Carpark – Twelve Mile Scenic Reserve	Part Sec. 1 SO 24167	Scenic Reserve/ Conservation Area Administered by DOC

[2] Version incorporating the 2022 partial review.

[3] CMS 2016 incorporating the 2022 partial review; page 58-59

Plate 1: Sunshine Bay Recreation Reserve – 550m west of the boat ramp and jetty; works may be on Road Reserve and/ or the Recreation Reserve – final alignment to be confirmed by QT.
Source: QLDC Spatial Hub – Map Navigator/ Property

Plate 2: Seven Mile Recreation Reserve - Sunshine Bay to Wilson Bay
Source: DOC maps

Plate 3: Twelve Mile Delta Recreation Reserve - Wilson Bay to Twelve Mile
Source: DOC maps

Plate 4: Mt Crichton Scenic Reserve/ Conservation Area - The trail will join into the carpark near a power substation.
Source: DOC maps

2.2 Description of Activity

Non-motorised bike access is provided for in the Twelve Mile, Seven Mile Recreation Reserves and the Mt Crichton Scenic Reserve.[4]

The proposed Sunshine Bay to Twelve Mile Track will traverse the band of broadleaf forest and shrubland between the Glenorchy Road and Lake Whakatipu where the land is generally very steep, bluffy in places but with benches formed by a combination of natural geomorphological processes, and the construction of historical tracks, roads and gold mining.

Where possible the trail alignment will follow the existing system of tracks, old road benches and terraces. The trail will require bridges, culverts and potentially other engineered structures to enable the route to be established below the Glenorchy Road.

The activity description is based on:

- A copy of the pre-application for both trail sections provided to NSN by Queenstown Trails; they are dated September 2021.
- Site visits and discussions with Tom Hey of Elevate Trail Building, a Queenstown based specialist trail building company who has flagged a preliminary route, and Mark Williams (CEO – Queenstown Trails).
- A draft route around the 7 Mile Recreation Reserve mapped by Owen Hale, Department of Conservation (DOC) Heritage and Visitors Ranger, Whakatipu-wai-Māori Office scoped out with QT prior to September 2021. The route was confirmed by Mr Hey in September 2023 after the site visits were undertaken.

[4] Conservation Management Strategy for Otago; Table 2.3 Access to Western Lakes and Mountains/ Nga Puna Wai Karikari a Rākaihautū Place; (page 70, and 73).

Sunshine Bay to 7 Mile Carpark
Trail type: dual use commuting/ recreational
Grade: 3 – Intermediate biking, easy walking track[5]
Length: 3 – 3.5 km
Width: 1.2m

Gradient: 0-8% desired to allow for safe and efficient 2 way and dual use travel. Short sections of 10% up to 20m. Very short sections of max 15% if unavoidable. Always followed up with a reversal to neutralise grade.

Drainage: Minimum 200mm culverts with sumps on entry and exit for silt control. We will match culvert size with that of the road above where catchment is concentrated. Open bowl drains on drier areas. Rock fords where suitable. Frequent grade reversals to avoid erosion and sediment build up.

Construction Method: 1.7t excavator; rock breaking and blasting required; engineering solutions (e.g., 'clip-on/ cantilevered structures) are needed for some bluff sections such as 'Little Thailand', below the Arawata Terrace Track Carpark, and bridges, the largest spanning Five Mile Creek below Bleakley's Bridge which could require a suspension style bridge.

Seven Mile to Wilson Bay
An approximate route between 7 Mile and Wilson Bay was identified a few years ago by Mr Hale Te Papa Atawhai *Department of Conservation* Whakatipu-wai-Māori Office Heritage and Visitor Ranger. Mr Hale was able to map the approximate route based on his recollection of it, this was provided by email dated 22 May 2023. It therefore provides an indicative corridor for the purposes of assessing indicative likely impacts.

The trail will follow an established trail network through the 7 Mile Recreation Reserve before diverting around the foreshore traversing at least two substantial bluff systems before re-joining the 7 Mile Bike Park trail to Wilson Bay.

The proposed route through this section is indicative with QT seeking a grade 3 trail option that will maintain a connection through the Reserve when the conifers there are eventually felled. Refer to **Plate 7.**

Wilson Bay to Twelve Mile/ Mt Crichton Carpark
Trail type: dual use commuting/ recreational
Grade: 3 – Intermediate biking, easy walking track
Length: 1.5 - 2 km
Width: 1.2m

Gradient: 0-8% desired to allow for safe and efficient 2 way and dual use travel. Short sections of 10% up to 20m. Very short sections of max 15% if unavoidable. Always followed up with a reversal to neutralise grade.

Drainage: Minimum 200mm culverts with sumps on entry and exit for silt control. We will match culvert size with that of the road above where catchment is concentrated. Open bowl drains on drier areas. Rock fords where suitable. Frequent grade reversals to avoid erosion and sediment build up.

Construction Method: 1.7t excavator; rock breaking and blasting required; engineering solutions (e.g., 'clip-on/ cantilevered structures) may be needed for some bluff sections. Rock walls may be required to establish separation from the lake and road. Bridges and or large

diameter culverts may be required over the creek draining Lake Dispute while another water course that flows through an established bench and retaining wall structure below the road.

The standard for intermediate grade 3 mountain bike trails is identified by the Department of Conservation, Walking Access *Ara Hikoi Aotearoa*, and the Mountain Safety Council as *"steep slopes and/ or avoidable obstacles possibly on narrow track and/ or with poor traction. There may be exposure at the track's outside edge".* Easy walking track standards are those suitable for people with low to moderate fitness and abilities, they are mostly well formed with some steep, rough or muddy sections. They are clearly sign posted and stream and river crossings are bridged.

Plate 5: The indicative route from Sunshine Bay to 7 Mile Carpark; supplied by Elevate Trail Building, Sep 2023.
Image source: Google Earth and Airbus ©2023.


Plate 6: Indicative location of trail around the 7 Mile, supplied by Elevate Trail Building, Sep 2023.
Image source: Google Earth and Airbus ©2023, Maxar Technologies ©2023

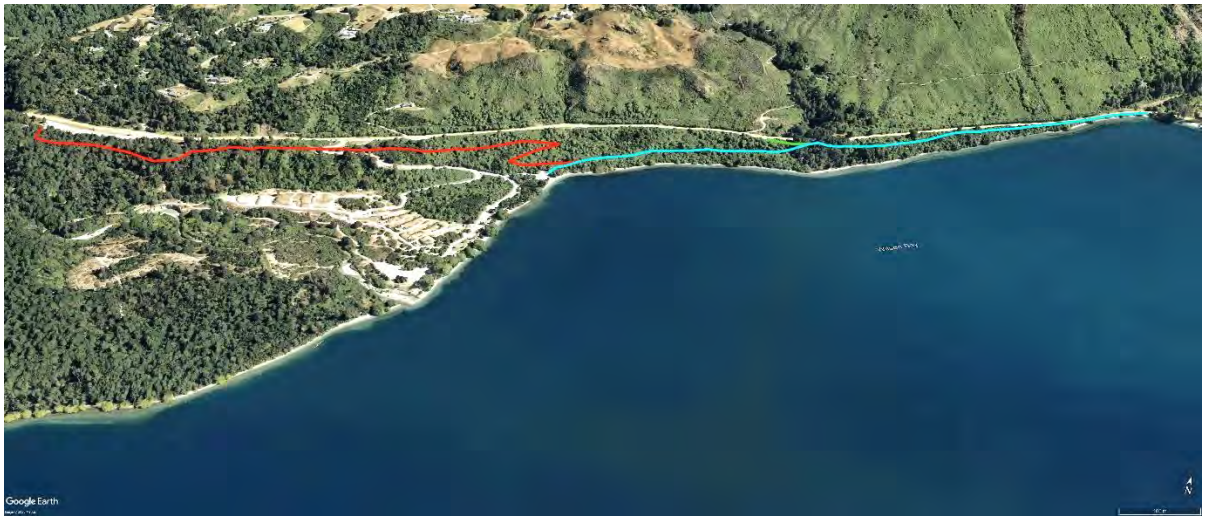

Plate 7: Wilson Bay to Twelve Mile - supplied by Elevate Trail Building, Sep 2023.
Image source: Google Earth and Airbus ©2023.

2.2 Environmental Context

2.2.1 Historical Context

The trail areas are located within the Shotover Ecological District on land classified as Q2.2a and Q2.2b under the Land Environments of New Zealand system (Leathwick, et.al., 2003). More than 30 percent of the vegetation associated with these land environments remains however less than 10 percent is protected.[6]

In the absence of human activity, the potential natural vegetation cover on the foreshore habitats of the area impacted by the proposal is likely to have been dominated by mountain beech with red beech on warmer sites with higher moisture levels on terraces with more organic and higher fertility soils.[7] These communities would have included a diverse range of forest associates. The forests at Bobs Cove and the Mount Crichton Scenic Reserve provide more extensive examples of the communities present in the affected areas.

2.2.2 Physical Environment

Lake Whakatipu is identified as an important geological feature, landform and landscape within the Otago Conservation Management Strategy (CMS); Appendix 9 which also acknowledges the features identified in the QLDC Proposed District Plan. The Sunshine Bay Recreation Reserve is zoned as Nature Conservation within the Proposed District Plan (PDP). The balance of the land affected is zoned Rural under the PDP.

Most of the trail areas is within the Wāhi Tūpuna Statutory Acknowledgement area of Lake Whakatipu (Whakātipu-wai-māori), the portion of the trail west of Wilson Baly is within the Punatapu (Bobs Cove and Surrounds) area historically used by manuwhenua as a nohoaka or staging area while moving through the land; and almost entirely within the Outstanding Natural Landscape (ONL) of the Lake and its margins.

[6] Cieraad E, Walker S, Price R, Barringer J. 2015. An updated assessment of indigenous cover remaining and legal protection in New Zealand's land environments. New Zealand Journal of Ecology 39(2)
[7] Ourenvironment.scinfo.org.nz/maps-and-tool/ NZ Land Atlas – Habitats – vegetation expected in the absence of humans map layer

The District Plan zoning and planning framework is provided for overall context and is not discussed further within the ecological assessment.

Surficial Geology

For the most part, the underlying geology of the lakeshore environment between Sunshine Bay to the Seven Mile Recreation Reserve is Schist formed by metamorphism about 200 million years ago during the Jurassic Period. It is typically comprised of laminated rock with alternating layers of light-coloured (quartz and feldspar-rich) and dark-coloured (mica-rich) schist (Barrel, et.al., 1994).

The Glenorchy-Queenstown Road has been benched across this historical landslide with schist debris and schist derived materials and colluvium deposited along the slope west of the Arawata Track.

The Seven Mile Recreation Reserve contains beach deposits which overlie gently sloping benches cut by wave action when Lake Whakatipu was at higher levels. Linear storm benches are also present near and east of the Seven Mile Creek. Beach deposits range in thickness and are comprised of layered sand, gravel and silty sediments.

The land between Wilsons Bay and the Twelve Mile delta where an unnamed creek flowing through beech forest and a creek draining from Lake Dispute traverses an area of glacial deposits comprised of till and ice-margin sediments. The unnamed creek seeps underground through the gravel substrates emerging below a benched track. Glacial till tends to be unstratified and can be compact gravelly, sandy, silt-clay (basal till deposited at the base of a glacier) or loose clayey and sandy gravel (ablation till, deposited from melting ice). Ice-margin sediments typically form contorted or deformed layers of sandy gravel, sand and silt.

Fan/ deltas are present at the Seven Mile Creek and Twelve Mile Creek, these were formed when Lake Whakatipu was at about 390masl, (80m higher than current level) and are comprised of layered sand, silt and sandy gravel, (Barrel, et.al., 1994).

The mean level of Lake Whakatipu is about 310masl while the Glenorchy-Queenstown Road is about 350masl between Sunshine Bay and the 7 Mile Carpark and about 370 masl at the Mt Crichton Carpark after dropping to just above lake level in Wilson Bay. The height of the trail around the 7 Mile Recreation Reserve is likely to traverse the slope between these elevations at about 330-340 masl, and potentially higher to negotiate the largest bluff system in this section.

Soils

The soils along the lakeshore are Pallic, the order correlating with yellow-grey earths with slaking potential and clay-enriched B horizons (Argillic) soil towards the Sunshine Bay area east of the Arawata Terrace track carpark[8], (Hewitt, 1998), refer to Plate 8. Between the area of the Arawata Track and Seven Mile Creek, soils are Allophanic Brown correlating with yellow-brown earths, and can have horizons that are weak in strength; it is through this area that the landslide noted above has occurred. From the Seven Mile Creek to the Twelve Mile delta, the soils are Firm Brown. These soils have strong moist soil strength in the deeper horizons and are using found on relatively stable sites on flat, rolling or moderately hilly slopes (Hewitt, 1998). Overall, the soils impacted by the work are moderately to well drained, with low to moderate fertility[9].

[8] https://soils-maps.landcareresearch.co.nz/

[9] Maps.orc.govt.nz/OtagoMaps/ - Grow Otago/ Soils/ Upland Soils/ Drainage & Fertility

Plate 8: New Zealand Soil Classification
Source: Soil Portal, Landcare Research Ltd 2009-2018 CC BY-NC-ND 3.0 NZ https://soils-maps.landcareresearch.co.nz/

Climate

The lake foreshore habitats below the Glenorchy-Queenstown Road benefit from the moderating effect of Lake Whakatipu with median annual air temperatures of 10.6 to 11.0°C cooling slightly to 10.1 to 10.5°C along the lowest slope margins above the Road. The median annual number of days with an air temperature greater than 25°C ranges from 17 to about 20 along the lake shore; less than half this number is experienced above about 540masl.[10] The median annual rainfall ranges from 1001 – 1250mm around the Twelve Mile Delta and higher on the slopes above the Queenstown-Glenorchy Road to 901-1000mm on the lower foreshore slopes to the east.[11] Runoff from higher elevations drains through the site to the lake.

The foreshore area impacted by the proposal tends to be moderately sheltered from prevailing north-western winds relative to the open lake and higher elevations but may be exposed to some southern and easterly winds.[12]

3 Methodology

3.1 Desktop Research and Site Visit

Trail sections were visited on 5 days spanning March to May 2023; on 1st March, 22nd April, 23rd April, 28th April, 21st May 2023; refer to Plate 9 for the locations surveyed on these days.

An initial site visit undertaken with an archaeologist from Origin, Tom Hey from Elevate Trail Building and Mark Williams from Queenstown Trails occurred on 1 March 2023, this provided an introduction to the project, the site, the marked route, known obstacles, constraints and construction proposed methods.

During the initial site visit, the need for a herpetological survey was identified for the large tailings area west of the Five Mile Creek. Dr Mandy Tocher (Lizard Expert NZ) was engaged

[10] Maps.orc.govt.nz/OtagoMaps/ - Grow Otago/ - Air Temperature
[11] Maps.orc.govt.nz/OtagoMaps/ - Grow Otago/ - Rainfall/ Annual Rainfall - Median
[12] Maps.orc.govt.nz/OtagoMaps/ - Grow Otago/ - Winds/ Average Annual Wind & Maximum Wind Speed

and undertook a survey of the tailings on 26 and 27 March 2023. The findings of Dr Tocher's survey are provided as Appendix 1 to this report.

Subsequent unaccompanied site visits were undertaken on 22, 23 and 28 of April 2023. A final site visit on 21 May 2023 included the Seven Mile Reserve area and was supported by boat enabling the vegetation communities and bluffs to be viewed from Lake Whakatipu.

Trail sections have been identified based on the applications submitted to the Department of Conservation (DOC) as set out in Section 2.2 above as:

<u>Sunshine Bay to Seven Mile Carpark</u>

- "Little Thailand" to Sunshine Bay
- "Little Thailand" (WP 199 – 201)
- Five Mile to Arawata Track carpark (Waypoint 184 – 188; 191 – 196; 346 – 351; 353 – 361)
- Seven Mile to Five Mile Creek (175 – 183; 337-345)

<u>Seven Mile Creek to Wilsons Bay</u>

- Seven Mile Recreation Reserve (WP 451 - 467; 374 – 381)

<u>Wilsons Bay to Twelve Mile / Mt Crichton carpark</u>

- Twelve Mile boat ramp to Wilsons Bay (WP294 – 303; WP304-333)
- Twelve Mile carpark to Twelve Mile boat ramp - Waypoint (WP) 278 – 293

A map showing the area visited during each site visit is provided in Plate 9 below. Waypoints identifiying values of note within the ranges identified above are indicated on individual maps in Plates 10 to 33A.

Plate 9: Location of site visits undertaken 1st March (blue - introduction to project), 22nd April (pink), 23rd April (white), 28th April (orange), 21st May 2023 (green). Image source: Google Earth & Airbus ©2023

Survey waypoints were recorded using a handheld Garmin GPS, vegetation communities and habitats were identified and described, photographs curated and values mapped using MapToaster mapping software and aerial imagery and mapping tools accessed using Google Earth.

Maps and historical descriptions of the lakeshore vegetation between Queenstown and Glenorchy published in Ward and Munro (1989) were also reviewed.

The assessment of the significance of the ecological values identified have relied on the New Zealand Threat Classification System and the published Conservation Status reports:

- Conservation status of New Zealand indigenous vascular plants (de Lange, P.J., et.al., 2017)
- Conservation status of birds in Aotearoa New Zealand (Roberston, H.A., et.al., 2021)
- Conservation status of New Zealand reptiles (Hitchmough, R., et.al., 2021)

The following criteria and classification systems have been used to undertake the assessment of the significance of the ecological values identified:

- The criteria outlined in Chapter 33 (33.2.1.8) of the QLDC Proposed District Plan (decisions version Feb 2022), and the
- The Department of Conservation guidelines for assessing significant ecological values (2016)
- The criteria set out in the National Policy Statement for Indigenous Biodiversity (July, 2023),
- The representativeness of the vegetation, ecosystems and habitats relied on a comparison with the pre-disturbance ecosystems described under the Land Environments of New Zealand (LENZ) classification, Leathwick, (2023).

3.2 Assessment of Ecological Values and Impacts

The likely or potential direct and indirect impacts on the ecological values identified and described have been assessed using the Environment Institute of Australia and New Zealand (EIANZ) Ecological Impact Assessment (EcIA) guidelines (Roper-Lindsay, et.al., 2018).

The impact assessment steps include:

- The assignment of ecological values using a score on a continuum scale from negligible to very high (Table 5 of the EIANZ EcIA guidelines)
- An overall site score ranging from negligible to very high is then determined refereeing to Table 6 of the EIANZ EcIA guidelines, then
- The magnitude and level of the effects will be assessed using the criteria set out in Tables 8 to 11 of the EIANZ EcIA guidelines,
- Consideration of the possible timescale or duration of effects is included in the assessment of the magnitude of overall effects.

The EIANZ EcIA guidelines were used as guidelines within the context of the author's own experience and knowledge.

Waypoint details can be provided as .kml or .gpx files on request.

4 Ecological Values

Significant Geological features, landforms and landscapes

The land affected by the activity does not contain significant geological features or landforms that are specifically recognised in the New Zealand Geo-Preservation Inventory, the District Plan or the Otago Conservation Management Strategy.

However, as discussed in Section 2.2.2 above, there are a series of benches traversing the slope below the Glenorchy Road likely to have been formed by historical road or track construction between Queenstown and Glenorchy. It is also possible that some benches were formed by higher lake levels. The slopes below the present Glenorchy Road also have areas where rock debris from the road construction and associated rock breaking or blasting has been deposited.

4.1 Vegetation

4.1.1 Communities and Habitats

Seven communities (ecosystem units and habitats) have been identified, mapped and described between Sunshine Bay and the Twelve Mile Creek carpark following site visits for this assessment. The ecosystem units and habitats described have adopted the Singers and Rogers (2014) descriptions used in the Otago CMS[13].

The Google Earth mapping tools were used to map the extent of vegetation communities (ecosystem units & habitats). These have been mapped using an altitude filter of height relative to ground (metres) providing an *indication* of the canopy height.

The communities identified and described, in order of largest to smallest area of estimated cover in the corridor between the Glenorchy Road and the lake shore are:

- Broadleaved low forest (c. 24ha)
- Manuka Shrubland /Scrub (c. 6.36ha)
- Mixed mountain-red beech forest (c. 5.84ha)
- Introduced Shrubland (c. 3.47ha)
- Tree tutu/ Vineland/Bracken fernland (c. 3.13ha)
- Bluffs and rock outcrops
- Rātā have been mapped where found within the lakeshore community.

Photographs illustrating the habitat in the corridor of the proposed trail are provided in Appendix 4. Additional photos are available on request.

Broadleaved low forest

This community occupies most of the area impacted by the proposed trail development. There is some variability in both composition and maturity across the area surveyed, but the community was reasonably consistent across the areas mapped as broadleaved low forest. This community most closely approximates the Regenerating Broadleaved species scrub/ forest [VS5] described in Appendix 2 of the Otago CMS table of ecosystem and habitat types within Otago.[14]

[13] Refer to Appendix 2 of the Otago CMS.

[14] Based on Singers, N.J.D and Rogers, G.M. 2014: A classification of New Zealand's terrestrial ecosystems. Science for Conservation 325. Department of Conservation, Wellington 87p.

The forest canopy was less than 10m in height and so "low" is inserted as a qualifying descriptor. This community was mapped at 10m relative ground using the Google Earth altitude filter. Where the canopy is visible on the map, the canopy exceeds 10m relative to ground[15]. The dominant broadleaved tree species frequently exceeded 10cm diameter at breast height (DBH at 1.4m) and the community formed more than 80% canopy cover.

Coriaria arborea (tree tutu), *Carpodetus serratus* (putaputaweta), and *Fuchsia excorticata* (fuchsia), generally dominate the canopy within this community. *Griselinia littoralis* (broadleaf), *Pittosporum tenuifolium* (kohuhu), *Melicytus ramiflorus* (mahoe), and *Myrsine australis* (red matipo), sometimes replace one or more of these species in the canopy. *Coprosma lucida* (shining karamu), *Pseudopanax crassifolius* (lancewood) and *Aristotelia serrata* (wineberry) are also present but usually contribute less than 20% to the canopy although shining karamu is very common throughout. *Cordyline australis* (cabbage trees) are present as isolated trees scattered throughout the lakeshore communities.

A single *Schefflera digitata* (pate) was noted near Waypoint (WP) 302, a species only occasionally seen during the site visits. One *Pseudowintera colorata* (red horopito) was noted near WP340, the only one seen along the foreshore between Sunshine Bay and the Twelve Mile delta. A very mature grove of *Coprosma linariifolia* (150-200mmDBH) was recorded at WP328-329.

Very mature vegetation was noted between waypoints 299 – 301, around 316, and between WP319-329, with diameter at breast height (DBH measured at 1.4m) of trees, some of which are multi-stemmed and exceed 100mm and reaching 300mm +/- in several instances. Large stem diameter (300mm +/-) Fuchsia shares the canopy with very mature mahoe, putaputaweta near WPs 191, 347-349.

The understory in this community can be very open under the densest canopy cover, and very dense where the canopy height is more variable and open (e.g., east of WP349). In areas where conifers have been felled or the canopy is more open seedlings, sometimes at high density were recorded under a parent tree (e.g., broadleaf, red matipo) and saplings of the species identified above are present. Other species frequently recorded in the understory were *Leptecophylla juniperina* (prickly minigimingi), *Corokia cotoneaster* – often etiolated in form due to shading, *Coprosma propinqua* (mingimingi), *Veronica salicifolia* (koromiko), and species also found in the Manuka Shrubland community described below. Fruit (e.g., wineberry) was also dense on the ground in places at the time of the surveys. The community on the steeper slope between WP353 and 360 west of the Arawata Track carpark supported a higher proportion of *Coprosma propinqua, C. lucida, C. linariifolia* and *Corokia cotoneaster*.

As mentioned above, canopy gaps have been created by felled conifers, but they have also developed due to the collapse of Pittosporum which appear to have infested with a borer beetle. NSN has observed complete canopy collapse in *Pittosporum tenuifolium* within about a year of infestation by borer beetles that have become drought stressed. Areas affected by borer are mapped in Plate 33 and 33A.

Lianes *Rubus schmidelioides* and R. *cissimbrioides* (bush lawyer), *Muehlenbeckia australis* (pohuehue), were frequently recorded, while *Parsonsia heterophylla* (native jasmine), *Clematis paniculata* (white clematis) were less frequently observed. Lianes/ Vines form a sub-community, within the broadleaved forest areas where they form extremely dense ground to canopy thickets which together with tall bracken fern (*Pteridium esculentum*) created smothering, impenetrable barriers to the walk-through survey requiring the proposed route to be assessed from above or below. This was particularly noteworthy east of the creek draining Lake Dispute between Wilsons Bay and the Twelve Mile delta boat ramp.

[15] Indicative only

The 'Bracken (*Pteridium* esculentum') fernland [VS10] ecosystem/ habitat type[16] described in Appendix 2 of the Otago CMS as a regenerating ecosystem, has a range of associates that include manuka, tutu, kohuhu and five-finger. This is indicative of the maturing successional processes occurring within the corridor of vegetation below the Glenorchy Road.

Some of the mature lancewood (300mmDBH), kohuhu and fuchsia, putaputaweta (east of the Lake Dispute creek and an un-named creek) between Wilson Bay and the Twelve Mile Delta boat ramp, have trunks with leaning then vertical growth indicative of recovery from a historical landslide. In the area of WP346 to 351, east of Five Mile Creek, a large historical landslide area supports very mature broadleaved forest. At WP348 there is a grove of very mature Fuchsia and very dense *Muehlenbeckia*, a large rata is also present below the proposed track in this area. At WP350 to 351 there is an area of remarkable maturity and diversity, rata is closer to the area proposed track alignment in this area.

Ferns include *Adiantum cunninghamii* (common maidenhair), *Asplenium gracillimum* (hen and chicken), *Cranfillia fluviatilis* (kiwakiwa), *Zealandia pustulata* (hound's tongue), *Polystichum vestitum* (prickly shield fern), *Austroblechnum lanceolatum* (lancefern/ rereti), *Parablechnum minus* (swamp kiokio) and mature bracken fern are found as ground cover, e.g., between WP347-349. Ferns are sometimes present as individual plants, small clusters, and near streams and on historical rock walls and shaded cut banks.

Plate 10: Broadleaf low forest between Sunshine Bay and Five Mile Creek with waypoints of note.

[16] Singers and Rogers (2014)

Plate 11: Broadleaved low forest regenerating with manuka shrubland on the southern slopes where deeper soils are present – Seven Mile Recreation Reserve; no waypoints of note.

Plate 12: Broadleaf low forest – Wilson Bay to Twelve Mile boat ramp; waypoints of note. The creek draining Lake Dispute is near WP299.

Manuka Shrubland /Scrub

Mature and regenerating manuka shrubland occurs in association with *Corokia cotoneaster, prickly mingimingi, Gaultheria antipoda* (bush snowberry)*, Coprosma propinqua, Coprosma lucida* and an occasional *Helichrysum lanceolatum.* Bracken fern contributes patches of dense understory within shrubland/ scrub communities. Plate 13 to 15 show the distribution of this ecosystem unit and habitat. It has been mapped at 5 metres relative to ground providing an indication of the relative height of the maturing community.

Mature and regenerating manuka shrubland dominates the rocky slopes of the Seven Mile Recreation Reserve where pockets of deeper soil are present.

Shrubland/ Scrub is also found near rocky slopes and outcrops, on shallow soils, tailing areas and bluffs and where conifers have been felled opening the canopy. Examples of this community are present near WP457 and around the lakeshore margin of the Seven Mile Recreation Reserve, around the tailings west of Five Mile Creek, and is more prevalent in the Twelve Mile Delta Recreation Reserve. In these areas regenerating broadleaved species are also emerging through the community.

There are pockets where trees and shrubs comprised more than 80% of the canopy and shrubs contribute more to the canopy than trees, these areas are known as scrub but they are patchy within the areas mapped as manuka shrubland/ scrub and sometimes occur within areas mapped as broadleaved low forest (e.g., near WP328 and 329 where *Leptospermum scoparium* (manuka) stems are 100 – 200mm DBH and a grove of very mature *Coprosma linariifolia* were found (150-200mm DBH) as noted above. Scrub areas also support regenerating broadleaved trees such as *Carpodetus serratus, Griselinia littoralis, Myrsine australis, Melicytus ramiflorus,* and *Pittosporum tenuifolium.*

Mature *Sophora* microphylla (kowhai) were recorded at WP347. Lianes (vines), such as bush lawyer and pohuehue also climb through the shrubland and scrub.

Plate 13: Shrubland- Scrub mapped at 5m relative to ground between Sunshine Bay and Five Mile Creek (left arrow) with waypoints of note.

Plate 14: Shrubland/ Scrub mapped at **10m** relative to ground- Seven Mile Recreation Reserve with waypoint of note.

Plate 15: Shrubland-Scrub mapped at 5m relative to ground between Wilson Bay and the Twelve Mile delta with waypoints of note.

Mixed Mountain-Red Beech Forest

Plates 16 to 19 illustrate the distribution of mixed mountain-red beech forest along the foreshore area between Sunshine Bay and the Twelve Mile Creek carpark.

Mountain beech dominate the canopy with several large-stemmed trees (+/- 300 - 450mm DBH) and smaller diameter red beech (120 – 180mm DBH) east of the Twelve Mile Creek/ Mount Crichton carpark, WP 282-284. Eucalypts share the canopy in places with occasionally larger stemmed trees (200-300mm DBH). In places, Eucalypts, regenerating saplings overtop the regenerating beech forest and associated shrubland. Regenerating beech forest retains a mixture of shrubland, and broadleaved species described above.

Near waypoints 318, 324, 325 between Wilsons Bay and Twelve Mile Delta boat ramp are fragments of large diameter (400mm +/- DBH), multi-stemmed mountain and red beech were recorded above and below the proposed trail alignment along with mature, broadleaved beech forest associates. These can and should be avoided by the trail.

Mountain and red beech are also emergent through broadleaved tall forest on a lake bench west of the rock bluffs (WP 466) in the Seven Mile Recreation Reserve with Shrubland associations along the rocky lake margin.

In several areas, beech forest is present on well-formed lake benches; where the canopy within the patch is dense (>80%), the fragment of forest is larger, and the understory is very open, e.g., near WP282 (Twelve Mile carpark), WP330 (Unnamed Creek); refer to Plate 18.

There is a patch of mature red – mountain beech spanning the Five Mile Creek, with red beech dominating the wide natural benched terrace east of the creek (WP186). Beech forest associates in the understory include *Griselinia littoralis, Carpodetus serratus*, cabbage tree*, Myrsine australis* and *Coprosma linariifolia*. Seedlings of *Melicytus ramiflorus* (mahoe) and *Aristotelia serrata* (wineberry) are also present. Mature red beech, cabbage trees and putaputaweta have stem diameters of up to about 400mm DBH. Mature pohuehue/ *Muehlenbeckia australis* reach high into the canopy on thick vines anchored to the forest floor in this area.

Emergent mountain beech trees were also recorded below WP353 and near WP360.

Near WP360 the understory is denser with a mixture of shrubland, broadleaved forest, ferns and lianes. There is some beech canopy failure, and felled conifers have also created openings/ gaps, into which shrubland is regenerating. The land in this area is undulating with terraces or lake benches, some mountain beech in this area have 400mm+/- DBH trunks.

A single totara was found near WP359.

Plate 16: Mixed Mountain-Red Beech Forest mapped at 15m relative to ground between Sunshine Bay and Five Mile Creek (WP186) with waypoints of note.


Plate 17: Mixed Mountain-Red Beech Forest mapped at 15m relative to ground- Seven Mile Recreation Reserve with waypoint of note.

Plate 18: Mixed Mountain-Red Beech Forest mapped at 15m relative to ground between Wilson Bay and the Twelve Mile delta with waypoints of note.

Plate 19: Mixed Mountain-Red Beech Forest mapped at 15m relative to ground at the Twelve Mile delta area with waypoints of note.

Introduced

Introduced, invasive species are most common closest to and along the Glenorchy-Queenstown Road and west of Seven Mile Creek within the Seven Mile Recreation Reserve where conifers (Scots pine, Douglas fir and European larch) have been felled downhill into the rocky bluffs, rock outcrops and across the regenerating shrubland and broadleaf forest. Conifers have also been felled into the lakeshore vegetation between Sunshine Bay and Five Mile Creek and east of the Twelve Mile Track carpark.

There are pockets of gorse, broom, Himalayan honeysuckle, blackberry, crack willows, grey willows, hawthorn and conifers along the route with infestations recorded by waypoints shown on Plates 20 to 22.

Tailing habitats near the Five Mile Creek have introduced broom (*Cytisus scoparius*), at WP344 and WP345. Below the Glenorchy – Queenstown Road and the Arawata Track carpark (WP353) there is an area with invasive *Convolvulus arvensis* (Convolvulus), an organism of interest on the Otago Regional Pest Management Plan (2019), blackberry – also an organism of interest, and conifers.

The proposed track around the Seven Mile Recreation Reserve has been impacted by a mature wilding conifer infestation which has been felled downhill from the margin of the mature forest. Seedlings from the mature forest continue to emerge within the regenerating broadleaved forest and shrubland below. The conifers are likely to be felled and potentially harvested in the future. The track around the Seven Mile Recreation Reserve will maintain a link around this area during any future felling operation; management of hazards to safety notwithstanding.

The lake foreshore between the Twelve Mile Delta boat ramp and Wilsons Bay has invasive weeds along the lake margin with some incursion into the broader band of the broadleaf forest, lianes and bracken communities. These include hawthorn, broom, gorse (WP 294) and crack and grey willows (WP301). Herbaceous weeds such as foxglove are found on the water margin at WP 294. A heavy infestation of the introduced giant aphid population was found on grey willow at WP301.

Closer to Wilson Bay where the sliver of land between the Lake and the Road narrows, there is a higher proportion of hawthorn and crack willow with lupins on the foreshore (WP306, 316, 324).

Between the Twelve Mile campground access road and the Carpark to the west, the proposed track traverses a series of densely vegetated gullies. Closer to the Glenorchy Road, a historical track has been benched, this area is overgrown with broom, buddleia, Himalayan honey suckle, gorse, conifer seedlings, apple trees, grey willow, blackberry and briar. It also supports regenerating indigenous shrubland, broadleaved and beech forest communities WP 285 – 294).

Plate 20: Location of introduced weed infestations between Sunshine Bay and Seven Mile Recreation Reserve.

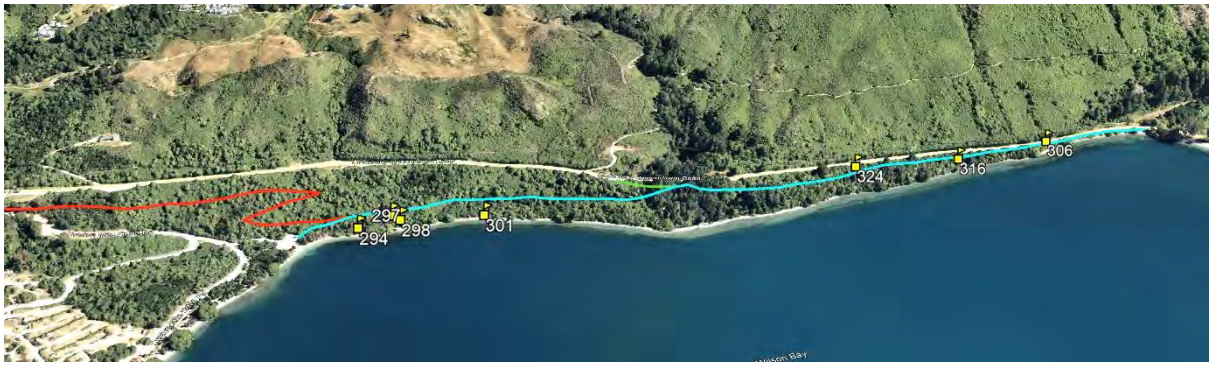

Plate 21: Location of introduced weeds between Wilson Bay and the Twelve Mile delta boat ramp.

Plate 22: Location of introduced weeds Twelve Mile Recreation Reserve

<u>Tree tutu/ Vineland (Lianes)/Bracken fernland</u>

In the narrower bands of vegetation between Wilson Bay and the Twelve Mile Delta boat ramp area (east of waypoint 303 and between waypoints 316 and 318, and near WP 323 – 325), the forest becomes very dense with a tangle of bracken, tree tutu, bush lawyer and pohuehue (*Muehlenbeckia australis)*. In places the growth completely impedes access.

In the area of WP356 below and west of the Arawata Track carpark Muehlenbeckia and bush lawyer are weighing down the canopy of tree tutu, broadleaf and mahoe.

Dense bands of *Muehlenbeckia australis* (pohuehue) may provide habitat for the stick insect *Niveaphasma annulatum.*

Waypoint 347 and WP 349 are in an area with very mature Fuchsia and Broadleaf Forest with a diverse native fern community in the understory and patches of dense tangles *Muehlenbeckia* vines which reach into the canopy.

Areas of particularly dense fern and lianes (vines) are shown on Plates 23 to 25.

Plate 23: Areas of dense bracken fern and tangles of lianes – Muehlenbeckia australis/ bush lawyer between Sunshine Bay and the Five Mile Creek with waypoints for localised examples under the canopy.


Plate 24: An area identified by Elevate Trail Building as very dense; Seven Mile Recreation Reserve.

Plate 25: Areas of dense bracken fern and tangles of lianes – Muehlenbeckia australis/ bush lawyer between Wilson Bay and the Twelve Mile Creek carpark with waypoints for localised examples under the canopy.

Bluffs and rock outcrops

The existing Glenorchy Road has been blasted through the bluff systems and rock debris from this is still present in places below the Glenorchy Road.

Shrubland and grasses are present on the rock outcrops, and bluff habitats including browntop, *Coprosma propinqua, Corokia cotoneaster* and prickly mingimingi with short tussock grasses e.g., *Poa colensoi*.

A large rock tailing area is present on the western side of Five Mile Creek, near the rocky gorge and bluffs below (WP181-183). This area was identified as potential lizard habitat during the initial site visit. A herpetologist was engaged, and their report is attached as Appendix 1.

The popular rock jumping location known as "Little Thailand" is identified by WP199, refer to Plate 26 below. This is noted as a place of interest rather than as a site of particular ecological value.

The bluffs were not inspected closely enough to rule out the presence of the Nationally critical *Lepidium sisymbrioides* (Kawerau cress). Bluffs should be checked prior to rock breaking blasting or earthworks and a plan for the management of impacts developed if necessary. Areas identified by Elevate Trail Building as requiring blasting or rock breaking have been identified in Plate 40 below.

Plate 26: Rock bluffs and outcrops between Sunshine Bay and west of the Arawata Track carpark; the popular rock jumping location known as "Little Thailand" is identified by WP199.

Plate 27: Rock bluffs and outcrops in Seven Mile Recreation Reserve; bluffs identified by Elevate Trail Building may require some blasting or rock breaking to establish a trail.

Southern rātā

Southern rātā, a Threatened - Nationally vulnerable species, is scattered along the lake margin between the Five Mile Creek to “Little Thailand” (WP199) and Sunshine Bay well below the proposed track alignment north of WP 364, above the bluff and large boulders with mountain beech near WP 366. However, in the area between WP 357-359, the proposed track alignment passes very close to some large Rātā. On the Seven Mile Recreation Reserve Rātā is found on the lake shore margin between WP 376 and 377. Refer to Plates 28 and 29 below identify where Rātā is present in relation to the bluffs and rock outcrops. It is possible that not all Rātā have been mapped due to the inaccessibility of the land and the likely separation between the proposed trail and the Rātā did not necessitate the production of this level of detail.

Plate 28: Rātā distribution (red) between Sunshine Bay and the Five Mile Creek mapped in relation to the rock outcrops and bluffs (grey).

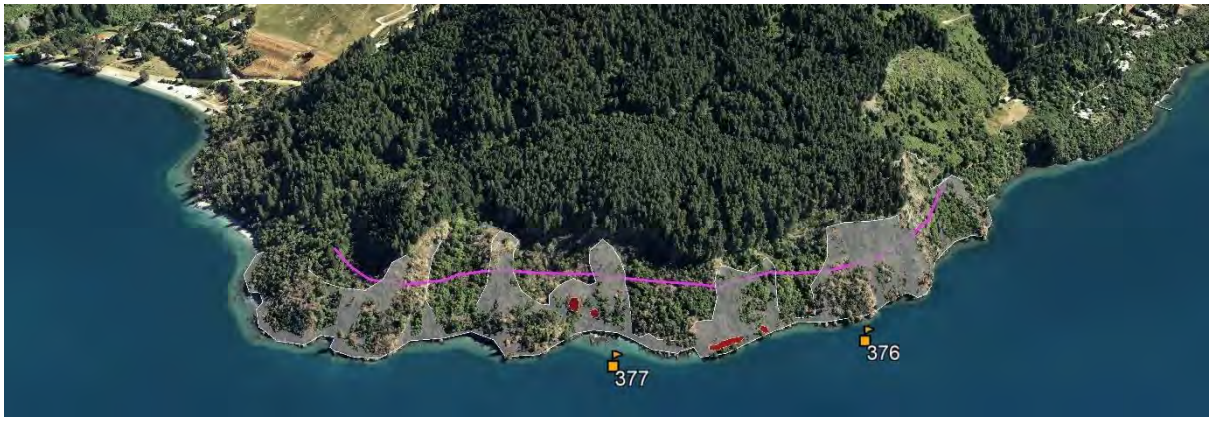

Plate 29: Rātā distribution (red) in the Seven Mile Recreation Reserve, mapped in relation to the rock outcrops and bluffs (grey). Waypoints are those recorded while surveying from the boat.

4.2 Freshwater

Elevate Trail Building has identified sites where they consider culverts, and small stream crossings may be required, these are shown in Plate 31.

NSN has additionally identified the location of the Creeks draining from Lake Dispute, the land west of Wilson Bay and some ephemeral drainages elsewhere. In areas where historical landslips have been identified - refer WP 300 area in Plate 30 below and WP346 to 351 in Plate 10 above - damp ground, surface or subsurface water may be intercepted with the formation of the benched track through these areas.

A search of freshwater fish records in the NIWA Freshwater Fish Database resulted in the identification of four records of freshwater fish (kōaro and brown trout) between One Mile

and Twelve Mile Creeks, refer Plate 32. Survey sites were restricted to the larger flow creeks of the One Mile, Five Mile above the Glenorchy Road, and a site in the lower reach of the Twelve Mile, and another upstream of the Glenorchy Road in that catchment. These larger creeks were found to have kōaro (*Galaxias brevipinnis*), a species known to climb over rocks and wet surfaces to migrate upstream for spawning. This species inhabits fast flowing creeks with cobble or course gravel substrates in forest, shrubland and or tussock vegetated catchments.

Brown trout (*Salmo trutta*) were only recorded in the lower reach of the Twelve Mile Creek below the gorge, on the Delta (site 3; Plate 32).

The presence of native vegetation, exotic woodland and forests, farmland and the relatively undeveloped condition of the larger and smaller sub-catchments creates the expectation that a healthy invertebrate fauna will be present in the creeks, streams and within the catchments. No specific assessment of instream or terrestrial invertebrates was undertaken during the site visits.

Other than the major creeks where Galaxiids have been found, it is likely that kōaro are also likely to be present in the creek draining from Lake Dispute but are unlikely to be in the unnamed Creek to the east as it seeps underground emerging below an old road bench and rock wall below the proposed trail alignment (refer Photo 16 and 17 in Appendix 4). The land between the Glenorchy Road and lake is very steep in the areas where Elevate Trail Building have identified creeks and streams (Plate 31), culverts under the Glenorchy Road may in some instances form barriers to any upstream movement. It is in my opinion highly unlikely that indigenous freshwater fish are present within very steep, ephemeral, intermittently flowing drainages.

However, a freshwater ecologist or hydrologist may be required to inspect the proposed stream crossings once the construction requirements are defined to ensure no barriers to upstream movement of kōaro and no upstream access to brown trout are created by the development of the Trail.

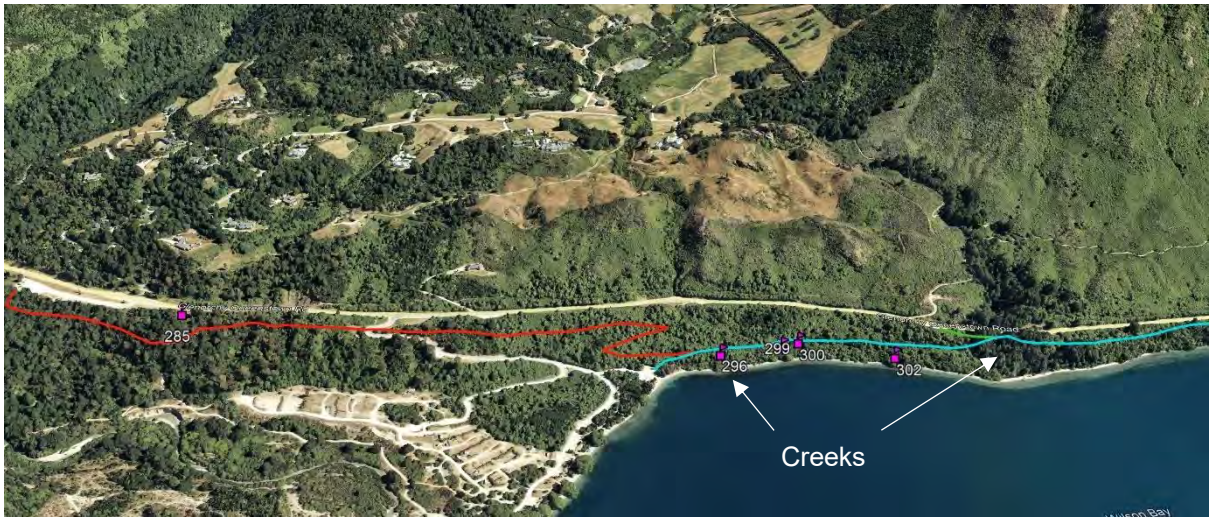

Plate 30: Creek draining Lake Dispute (WP 296) across the proposed track and location of dry gullies (east of 285) and damp ground through historical landslip (WP299 – 300); an ephemeral drainage with a gravel spill (WP302) and an unnamed Creek with beech forest that seeps into the ground, emerging below the proposed trail – refer to Photo 16 in Appendix 4.

Plate 31: Creeks identified by Elevate Trail Building intercepted by the proposed tracks; NSN ephemeral drainages/ dry gullies; WP 342, 201.

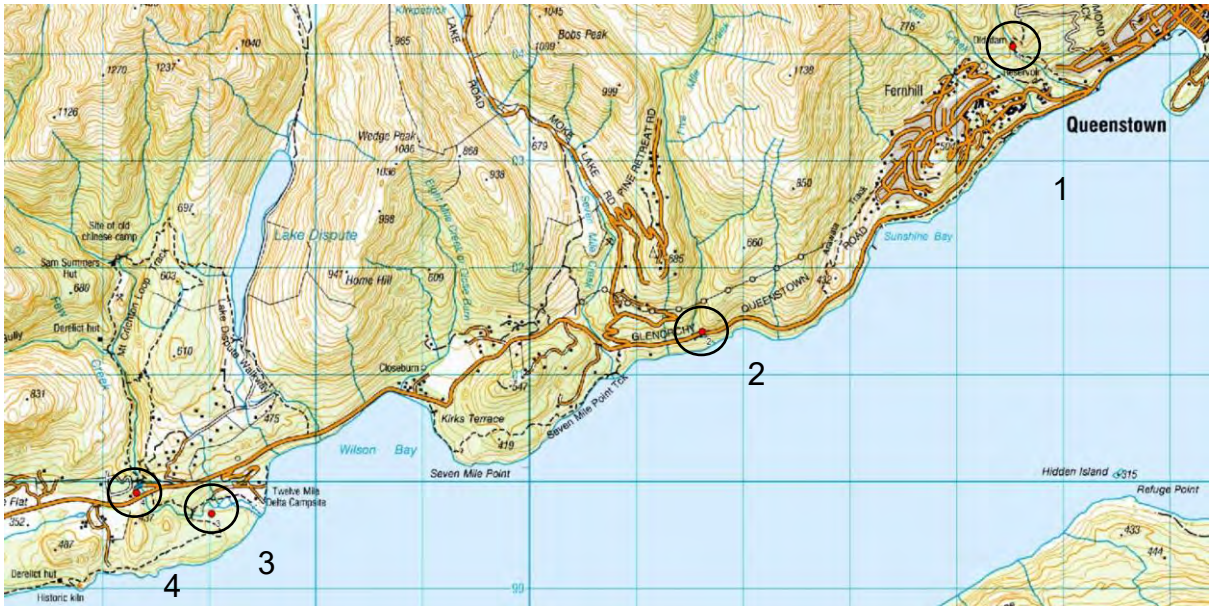

Plate 32: NIWA Freshwater Fish Database freshwater fish records. All recorded kōaro, site 3 also recorded brown trout.

4.3 Fauna

4.3.1 Avifauna

A list of the indigenous avifauna found within the proposed trail corridor is provided in Appendix 2. Eleven indigenous species commonly associated with the habitat of the area were found to be present or likely to be present within the affected area. Three are Threatened: Nationally vulnerable, the New Zealand (eastern) falcon and the long-tailed cuckoo, a seasonal migrant which lays eggs in the nests of brown creeper and kaka, a species which is occasionally recorded in the Whakatipu Basin/ Sunshine Bay area. Species recorded during the surveys included tui, bellbird, silvereye, tomtit, grey warbler, fantails, as well as introduced species blackbird, dunnock, and European starling. Species found on the lake that will be unaffected by the trail development are mallard, Australasian crested grebe, and New Zealand scaup.

The broader list of species likely to be present in the area is included in Appendix 2 list; these are is informed by personal experience and knowledge and the checklists reported in the eBird New Zealand Bird Atlas database for the 10-kilometre grid square surrounding the

affected area[17]. Failure to detect species listed in Appendix 2 during the site visits should not be considered as confirmation of their absence from the site.

4.3.2 Lizards

Dr Tocher of Lizard Expert NZ undertook a survey of two areas of gold tailings. The survey was undertaken on March 26th and 27th 2023. One was very small, and found to have unsuitable habitat, no lizards were present. The largest (c. 1850m^2) area surveyed was located between Sunshine Bay and the Seven Mile. Dr Tocher found the site to have a mix of rock sizes, "perfect for both skinks and geckos". The rock habitat was unshaded, covered in sun-loving lichens, and was found to be about 1m deep and layered providing multiple retreat opportunities for lizards. The nocturnal south-western large gecko (*Woodworthia* "south-western large") was found at the larger area of rock tailings. The diurnal McCann's skink (*Oligosoma maccanni)* was also present in relatively lower numbers compared to the gecko population. Both species were found where the rock habitat was best, and neither were found where rocks were shaded at the edge of the tailings area. It is possible that a second *Woodworthia* species could be present, however Dr Tocher considered this to be unlikely. Although the exotic grass at the edge of the larger tailings habitat appeared to have potential for the southern grass skink (*Oligosoma* aff. *polychroma* clade 5), no evidence of it was found.

Dr Tocher's full report is provided as Appendix 1 at the back of this report. Further assessment has not been made by NSN.

4.3.3 Invertebrates

A specific assessment of indigenous invertebrates has not been undertaken, however, as part of this assessment, the following observations and notes were made. Invertebrates have not been assessed beyond the provision of these observations and will not be discussed further in this report.

A search of the Otago Regional Council Otago Ecosystems and Habitat Mapping layers for Terrestrial Habitat reveal the potential presence of the large cryptic geometrid looper moth *Gingidiobora subobscurata*, which is an At-Risk: declining (taxonomically unresolved) specialist feeder on the large cliff-face herb *Gingidia montana* which has a population at Bobs Cove.

Pittosporum tenuifolium appear to have been infested by borer beetles in several locations between Sunshine Bay and the Twelve Mile Delta. Infestations can be more severe if plants are stressed. Over the past three years, New Zealand has experienced La Nina conditions and in the Lakes District, this has resulted in some very dry conditions. Once infested, NSN has observed that *Pittosporum* can succumb and or suffer extensive dieback or death over the course of about 1 to 2 years. Collapse of the tree may follow, or the tree may regenerate from buds lower on the trunk (personal observation). Plates 33 and 33A illustrate the distribution of *Pittosporum* struck by the borer beetles and Beech trees where canopy failure resulting from unknown causes have been recorded. This distribution is indicative only and reflects incidental records noted during the site visits rather than a survey for *Pittosporum* borer strike.

An infestation of *Tuberolachnus salignus* (Giant willow aphid) an introduced species that was first detected in New Zealand in 2013 and has since become widespread, was found on grey willow at WP301 (Plate 21) along the lake shore between Wilson Bay and the Twelve Mile Delta. Giant willow aphids have a range of adverse impacts on willows, honey production and bee hive health, honeydew production, sooty mould development, contamination of wool affected by heavy sap and are wasp attractants[18].

[17] https://ebird.org/atlasnz/effortmap
[18] https://www.giantwillowaphid.co.nz/?a=48183 Scion Research; Plant & Food Research

Manuka throughout the surveyed area was also observed to be affected by sooty mould, this is the result of an infestation by sap sucking scale insects. They excrete sap sugars as fine droplets known as honeydew when feeding. Sap lodging on stems and foliage supports the growth of soot fungus which blackens the infested plants. The sooty cover can be a few millimetres thick and can blight other plants growing under or near the infested plants. Plant stress is believed to result from sap loss rather than the reduction in photosynthesis caused by the sooty coating[19].

There are native scale insects which also produce honeydew with the consequent growth of soot fungus, usually *Capnodium elegans.* Recent research into the "companion biota" of *Leptospermum scoparium* has revealed that the introduced Australian (eriococcid) scale insect species *Acanthococcus leptospermi* is the more prevalent species infesting manuka. They are not known to kill manuka but may diminish it.[20]

Niveaphasma annulatum a stick insect species (not threatened) found in the South Island with reports from the Whakatipu area is a large herbivorous species associated with manuka, southern rata, *Muehlenbeckia* and *Coriaria* (tutu) *species.* The species has been found feeding on manuka and the small, ground creeping liane *Muehlenbeckia axillaris* and larger more scrambling *M. complexa* several times. It has been found on but not feeding on *Coriaria angustissima* and *C. plumosa* and southern rata several times[21]. The abundance and density of tutu and *Muehlenbeckia australis* in the vegetation below the Glenorchy road along with the presence of southern rata warrants consideration that the species may be also present. It is not threatened.

Plate 33: Location of borer infestations (red) in *Pittosporum tenuifolium* and canopy dieback in beech trees (white) between Sunshine Bay and Seven Mile Recreation Reserve.

[19] https://www.nzffa.org.nz/farm-forestry-model/the-essentials/forest-health-pests-and-diseases/Pests/Manuka-blight/manuka-blight-eriococcus-orariensis/; article compiled 1977.
[20] Bohórquez Rodríguez de Medina, J. (2018)

Plate 33A: Location of borer infestations (red) in *Pittosporum tenuifolium* and canopy dieback in beech trees (white) between Wilson Bay and Twelve Mile Creek carpark.

4.4 Summary of Ecological Values

Ward and Munro (1989) mapped and described the vegetation along the foreshore of Lake Whakatipu from Queenstown to the Buckler Burn, Glenorchy. They identified five broad communities between Sunshine Bay and the Twelve Mile Creek: broadleaved low forest, manuka scrub and shrubland associations, bracken fernland and shrubland associations, red beech forest and "gum"/ *Eucalyptus* Forest. The bracken fernland and shrubland associations were further divided into "bracken – broadleaved shrubs shrubland" and "bracken – tutu fernland – scrub".

The communities identified and described by NSN in this assessment indicate continuing successional progress within the lakeshore vegetation over the past three decades.

The existing vegetation communities described by this assessment are mature, diverse, and support an expected diversity of avifauna commonly found within comparable habitats in the surrounding area including the extensive network of local Reserves. Pockets of very mature vegetation suggest the habitats are very old and serve as refugia from the influences of fire and historical clearance. The presence of nocturnal south-western large gecko (*Woodworthia* "south-western large") and diurnal McCann's skink (*Oligosoma maccanni)* in large areas of rock tailings also suggest that the vegetation and habitats below the Glenorchy Road have acted as refugia for these populations. This finding elevates the value of the historical tailings, other rock habitats providing suitable habitat described in Dr Tocher's report (Appendix 1), and mature areas of indigenous vegetation as diverse refugia and repositories of genetic stock from historical communities previously more widespread.

5 Ecological Significance and Value

5.1 Assessment of Ecological Value

As described in Section 3.1 above, the assessment of the significance of the ecological values identified have relied on the New Zealand Threat Classification System and the published Conservation Status reports for indigenous vascular plants, birds and reptiles.

I note the activity may be at least partially exempt from the RMA processes, however, I have assessed the significance of the values identified using the criteria set out in Policy 33.2.1.8 of the PDP and the criteria within the National Policy Statement on Indigenous Biodiversity (NPS-IB) (July 2023) for completeness. The criteria in Policy 33.2.1.8 and the NPS-IB are

consistent with the criteria described within the DOC Science for Conservation Publication 327: *Department of Conservation guidelines for assessing significant ecological values* prepared by Davis, M., Head, N.J., Myers, S.C. and Moore, S.H. (2016) which is slightly broader in its criteria. All are consistent with the criteria set out in Roper-Lindsay et.al., (2018) EIANZ EcIA Guidelines referenced in Section 3.1.

The foreshore Recreation Reserves of Sunshine Bay, Seven Mile and Twelve Mile Delta are not listed in the PDP Schedule of Significant Natural Areas (Chapter 33.9). However, the criteria set out in Policy 33.2.1.8 of the PDP and the National Policy Statement for Indigenous Biodiversity (July 2023), were applied as a test to determine whether the vegetation present meets the criteria and should therefore be considered as a SNA under Policy 33.2.1.1. of the PDP.

The representativeness of the vegetation, ecosystems and habitats relied on a comparison with the pre-disturbance ecosystems described under the Land Environments of New Zealand (LENZ) classification, Leathwick, (2023), Appendix 2 of the Otago CMS which lists ecosystem and habitat types within Otago,[22] and examples of the range of vegetation remaining in the Shotover Ecological District and surrounding Lakes Ecological Region and lakeshore habitats that are known by the author.

The scoring criteria described in Tables 4 to 6 of Roper-Lindsay et.al., (2018) were considered when assessing the relative value of the ecosystems present but the author also defers to their experience and local knowledge in assessing the ecological value. A copy of Tables 4 to 6 (Roper-Lindsay, 2018) are provided in Appendix 3 to this Report.

An ecological value and significance score is provided for each of the three Trail segments: Sunshine Bay to Seven Mile, Seven Mile Recreation Reserve and the Twelve Mile Recreation Reserve between Wilson Bay and the Twelve Mile Delta Recreation Reserve. The latter was divided into two sections for the purpose of the assessment of values which varied considerably across this section of trail. However, the section of trail between Wilson Bay and the Twelve Mile Delta carpark was recombined for the purpose of determining impacts.

Further Notes - Ecological Values

Appendix 4 of the Otago CMS lists Priority Ecosystem Units on PCL in Otago, these have been identified though the natural heritage prioritisation processes.

None of the priority ecosystem types identified within the Western lakes and Mountains/ Ngā Puna Wai Karikari a Rākaihautū Place are present within the Reserves affected by the proposal.

Appendix 7 of the Otago CMS lists ferns (Various species), kowhai and tui as Nationally iconic species; the trail would offer an opportunity to see these “quintessentially kiwi” species.

Assessment of Ecological Significance

Tables 2 to 6 below provides a summary of the ecological values identified within the corridor of land affected by the three proposed Trails and their ecological significance.

[22] Based on Singers, N.J.D and Rogers, G.M. 2014: A classification of New Zealand’s terrestrial ecosystems. Science for Conservation 325. Department of Conservation, Wellington 87p.

Table 2 Sunshine Bay to Seven Mile Creek – Assessment of Ecological Significance of Vegetation and Habitats

Assessment of the Vegetation and Habitats using the Ecological Criteria of the QLDC PDP, DOC Guidelines, and NPS-IB and the scoring system of the EIANZ

Significance Criteria	Assessment Description	Council PDP Criteria	DOC Guidelines	NPS-IB App, 1 SNA Criteria	EIANZ Score
Representativeness	The vegetation is representative of communities, ecosystem types and habitats of the Shotover Ecological District and Q2.2 LENZ Land Environment classifications. The vegetation communities naturally associated with the Q2.2a LENZ units remain in more than 30% of the Land Environment, but less than 10% is represented in the network of protected land. Although the ecosystems associated with this LENZ is well protected locally and contiguously with the foreshore vegetation communities in places. Mature and regenerating broadleaved low forest (Plate 10), manuka shrubland /scrub (Plate 13) fragments of mixed red and mountain beech forest (Plate 16), mature tutu/ vineland (lianes) and bracken fernland (Plate 23) with vegetation ranges from very mature, more than 70 years old – refer to Plates 34 and 37, to open areas with seedling regeneration and infestations of woody weeds. The regenerating communities contain a natural and diverse composition and structure, and a range of fauna characteristic of the habitats within the Shotover Ecological District and typically associated with the vegetation communities and diversity present and formerly more widespread on lakeshore of Lake Whakatipu within the Lakes Ecological Region. The presence of Southern rātā in the foreshore communities of this area is of particular significance and will be addressed further below. The areas of mature and regenerating vegetation are fragments that have persisted on the steep ground below the Glenorchy Road following clearance and/ or fires following the early settlement and development of the Ecological District, and the establishment of Glenorchy Road.	Yes	Yes	Yes	Very High

	Geckos and skinks found within the historical tailing sites suggest this human created habitat has, in combination with the foreshore and bluffy habitat, provided refuge from historical fires. In some areas along the Glenorchy Road, the vegetation contains a higher proportion of invasive species, these are localised areas of low to moderate value but they also support regenerating natives.				
Rarity & Distinctiveness	The expansive areas of mature Broadleaved low forest (Plate 10), and tree tutu/ vineland and bracken fernland (Plate 23) and pockets of Southern rātā (Plate 28) are particularly noteworthy in the corridor of lakeshore vegetation between the Glenorchy Road and Lake Whakatipu. The following At-risk: declining (high value) species were recorded within or in the near vicinity of the proposed and indicative track alignment: • *Leptospermum scoparium* – Manuka has been classified as At-Risk with the qualifiers of Data Poor and with designated status due to the potential and unknown impacts of myrtle rust on the Myrtaceae family. *Leptospermum* was not named as one of the more susceptible species of the Myrtaceae genera to myrtle rust but was elevated to the status of At-Risk as a precautionary measure.[23] The closest reported myrtle rust infestation is Timaru with South Island infestations arising from infected North Island/ Nelson sourced nursery stock[24]. Manuka is a common component of shrublands within the Shotover Ecological District and Lakes Ecological Region. • *Woodworthia* "south-western large" Lizards are scarce along the shores of Lake Whakatipu this population is therefore locally important.	Yes	Yes	Yes	High to Very High

[23] de Lange, et.al., (2018): page 7.
[24] https://inaturalist.nz/observations?place_id=6803&subview=map&taxon_id=549208 accessed 14/11/2023

	• The presence of McCanns skink *Oligosoma maccanni* was also considered noteworthy as it is more commonly associated with grassland habitats but was found at the margins of rocky tailings and open shrublands. The following Threatened: Nationally Vulnerable (very high value) species are likely to be present or the site is within the home range of the species or species host (*): • *Metrosideros umbellata* – Southern rātā The threat status of this species has been elevated by the risk posed by myrtle rust; it is less common in the North Island and vulnerable to possum browse in some areas. Southern rātā are present on the foreshore of Lake Whakatipu as only a few scattered populations, including the trees in this area, (Plate 28). There is one area of rātā that is very close to the proposed trail (WP357 – 359); this will need to be avoided. • *Falco novaeseelandiae* – eastern falcon Falcon are reasonably well distributed within the suitable habitat of the Lakes Ecological Region, including the north-eastern mountains adjacent to Lake Whakatipu. The author considers it highly likely that the proposed trails will be within the territory of at least one or two pairs. • *Eudynamys taitensis* – long tailed cuckoo (*) Long tailed cuckoo are a highly mobile, seasonal migrants; they lay eggs in the nests of brown creeper; the only one of three host species is found in the vicinity of the activity. Brown creeper are present within the lakeshore habitats, therefore Long-tailed cuckoo may also be seasonally present. The latter two species are listed as specified highly mobile fauna (NPS-IB; Appendix 2). South Island Kaka (Threatened: Nationally Vulnerable) may be present as dispersing individuals but are not resident within the Shotover Ecological District. A Kaka has recently been reported in the Sunshine Bay area with frequent sightings reported in Spring 2023 (eBird, 2021;				

	accessed 14/11/2023); although this species is capable of making long distance flights to foraging habitat, it is not unreasonable to consider that this bird may have made its way along the lakeshore corridor to Sunshine Bay. They are attracted to flowering rātā (summer) but these are unlikely to sustain them. Kaka have been found dead in the Whakatipu Basin with autopsies indicating malnutrition (pers. comm. R Teele, DOC, 2023). No species found within the site are present at their distributional limit with the exception of kaka. No species are endemic to Otago or are of restricted occurrence or present due to unique environmental factors with the exception of Southern rātā which are locally restricted to the rocky foreshore of Lake Whakatipu.				
Diversity & Pattern	The mature and in some places, very mature broadleaved forest and regenerating mixed red and mountain beech forest, manuka shrubland /scrub, mature tutu/lianes and pockets of Southern rātā along the lakeshore form the lower elevation communities and habitats that have been disturbed and fragmented by fire, clearance and in places residential development. Bluff and rocky habitat communities are also interspersed along the foreshore corridor providing additional diversity in the number of habitats present. These have not been surveyed in this assessment due to uncertainty of the line and health and safety constraints. The vegetation below the Glenorchy Road reflects the geology, presence of historic landslides, rock outcrops, debris, bluffs and small creeks and shaded, dry gullies draining across the Glenorchy Road from the slopes above. Appendix 2 provides a full list of the species recorded during the site visits. In the area between Sunshine Bay and the Seven Mile Recreation Reserve **49** species were recorded. **37 plant** (28), **moss** (1), and **fern** (6), species recorded were **indigenous,** comprising **76% of the** species recorded. These communities provide habitat for of the indigenous fauna within the lakeshore environment of Lake Whakatipu.	Yes	Yes	Yes	High to Very High

	The proximity to the lake is environmentally moderating, this may have contributed to the retention of pockets of very mature examples of the communities listed, particularly between the Five Mile Creek and the Arawata Track Carpark. In several areas, there are specimens with very large diameter at breast height measurements and growth forms that indicate they have survived and continued to grow following localised landslips. Mature tree tutu and lianes that reach into, and over mature canopies form dense thickets in places potentially providing habitat for stick insect as well as bird fauna (and possums). In some areas, the vegetation contains a higher proportion of invasive species, these areas are of low to moderate value as they also support regenerating natives that may in time shade the invasive species out. Human created habitats including the tailings and rock wall environments are inhabited by lizards and ferns.				
Ecological Context	The lakeshore communities provide and maintain an important corridor connecting the larger, natural areas, and remaining indigenous habitats e.g., those extending along much of the foreshore of the northeastern portion of Lake Whakatipu, the Five Mile Creek catchment and band of lakeshore vegetation extending towards the One Mile Creek catchment closer to Queenstown. In some places they form the lakeshore component of altitudinal sequences e.g., in the Five Mile and Twelve Mile/ Mt Crichton areas. The diverse band of indigenous communities below the Glenorchy Road is wide enough to be self-sustaining with natural functions of regeneration from pockets of very mature vegetation in evidence. Isolated few or single plants and seedlings from species known within the Bobs Cove Recreation Reserve (e.g., mountain totara (Podocarpus *laetus),* red horopito (*Pseudowintera colorata),* NZ iris *(Libertia ixioides)* suggest either these species have persisted or are evidence of natural dispersal and confirmation that the habitat is used by birds moving within the foreshore habitat corridor.	Yes	Yes	Yes	High to Very High

	The vegetation communities therefore provide an important genetic foundation upon which the process of natural regeneration relies; they provide a range of habitats that help link the natural areas of the Whakatipu Basin foreshore corridor with higher altitude ecosystems.				
Naturalness	Naturalness is variable across the site with historical disturbance and rock debris from the construction of Glenorchy Road, historical tracks, mining tailings and the infestations of conifers, clearance of those conifers and the invasion of weeds along the margins of the lake and Glenorchy Road. The land also supports areas of very intact, mature vegetation, mature regeneration and recent regeneration of indigenous communities within areas where canopies have failed, or conifers have been felled.	na	Yes	na	Moderate to Very High
OVERALL	Very High except where invasive weeds are dominant with Low to Moderate Value. The presence of Southern rātā in the foreshore communities of this area along with the discovery of geckos, skinks and very mature forest and tree tutu, is of particular significance. Confirmation of the absence of threatened or at-risk herbaceous bluff species and further lizard surveys may be required along the proposed alignment through this area.				Very High

Plate 34: All Vegetation Communities and Habitat Types – Sunshine Bay to Seven Mile Recreation Reserve; Broadleaved low forest (green), Manuka Shrubland /Scrub (tan), Mixed mountain-red beech forest (purple), Introduced Shrubland (pink), Tree tutu/ Vineland(lianes)/Bracken fernland (blue), Bluffs and rock outcrops (grey) and Rātā (red). Refer to Plates showing individual communities for improved definition.

Plate35: All Vegetation Communities and Habitat Types – Seven Mile Recreation Reserve; Broadleaved Low Forest (green), Manuka Shrubland /Scrub (tan), Mixed mountain-red beech forest (purple), Introduced Shrubland (pink), Tree tutu/ Vineland(lianes)/Bracken fernland (blue), Bluffs and rock outcrops (grey) and Rātā (red). Refer to Plates showing individual communities for improved definition. Shrubland and rocky outcrop communities have some overlap.

Plate 36: All Vegetation Communities and Habitat Types – Wilson Bay to Twelve Mile Delta Recreation Reserve; Broadleaved low forest (green), Manuka Shrubland /Scrub (tan), Mixed mountain-red beech forest (purple), Introduced Shrubland (pink), Tree tutu/ Vineland(lianes)/Bracken fernland (blue), Bluffs and rock outcrops (grey) and Rātā (red). Refer to Plates showing individual communities for improved definition.

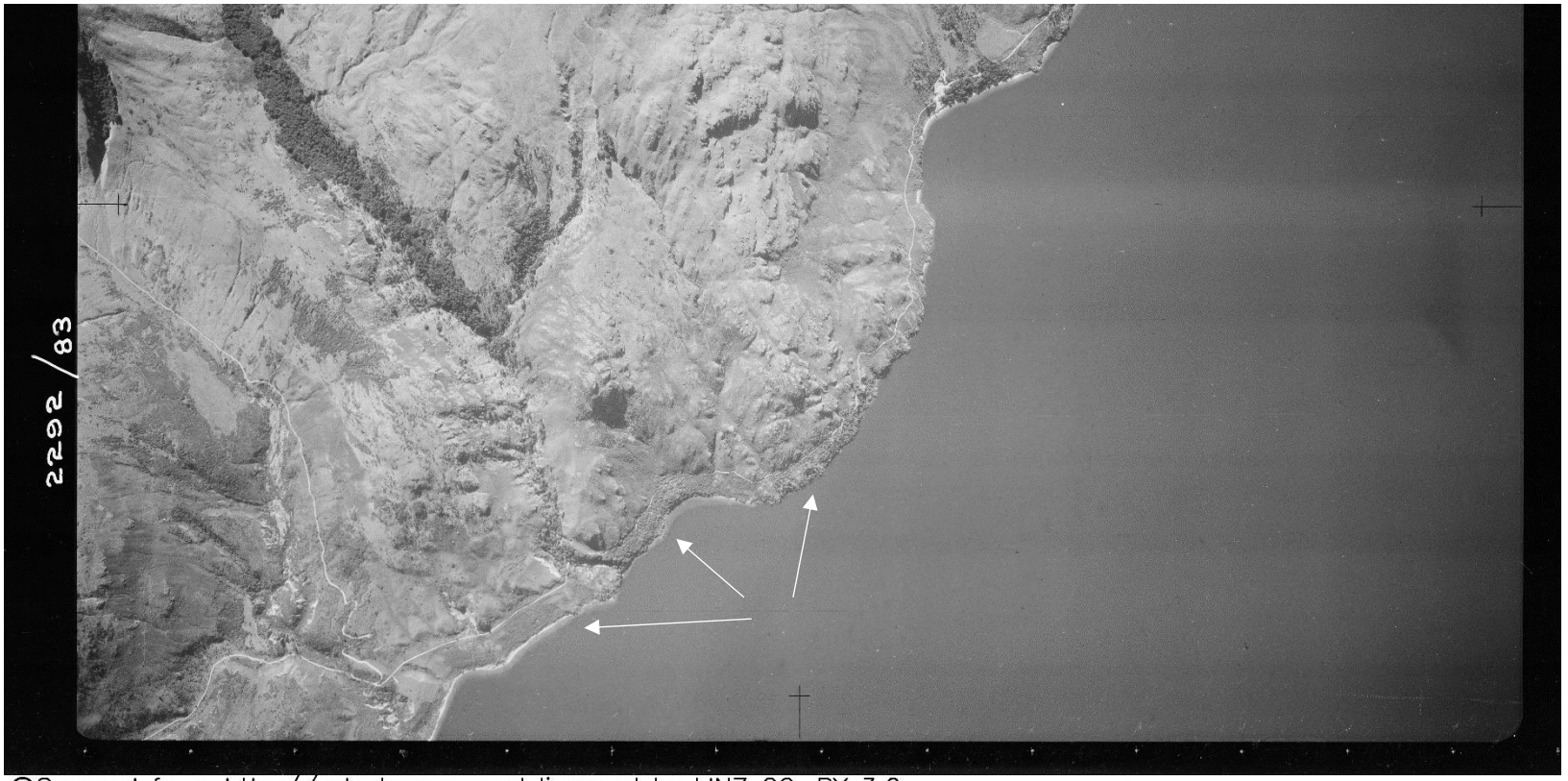

Plate 37: Photograph dated 31/3/1954 showing mature regenerating vegetation east and west of the Five Mile Creek Survey Number SN842, Run Number 2292; Photo Number 83

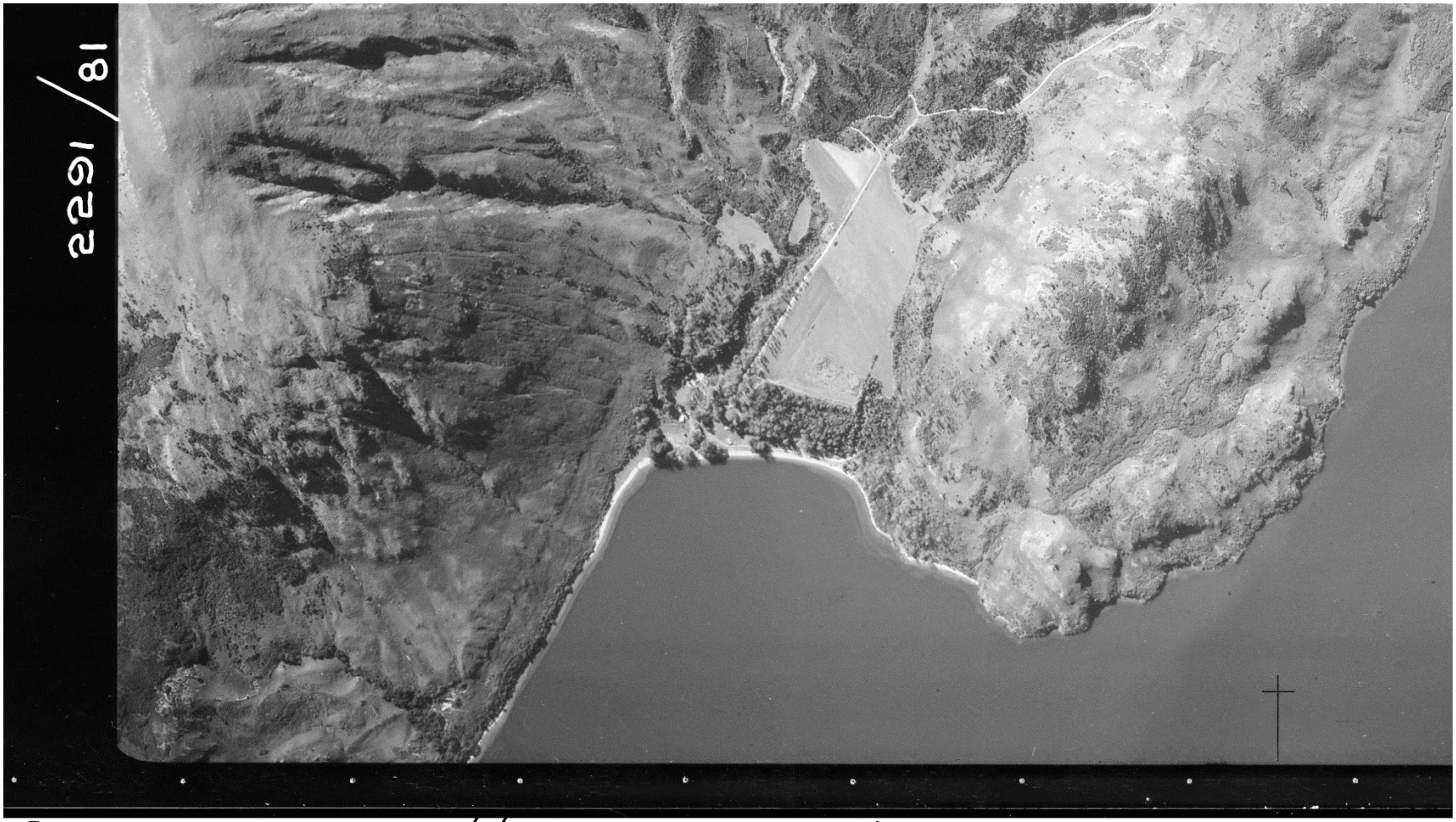

Plate 38: Seven Mile Recreation Reserve; Photograph dated 31/3/1954; Survey Number SN842; Run Number 2291; Photo Number 81. The more mature communities mapped in Plate 35 can be seen in the aerial photograph with the ledge like form across the peninsula legible and potentially offering a route north of the southernmost rock outcrop.

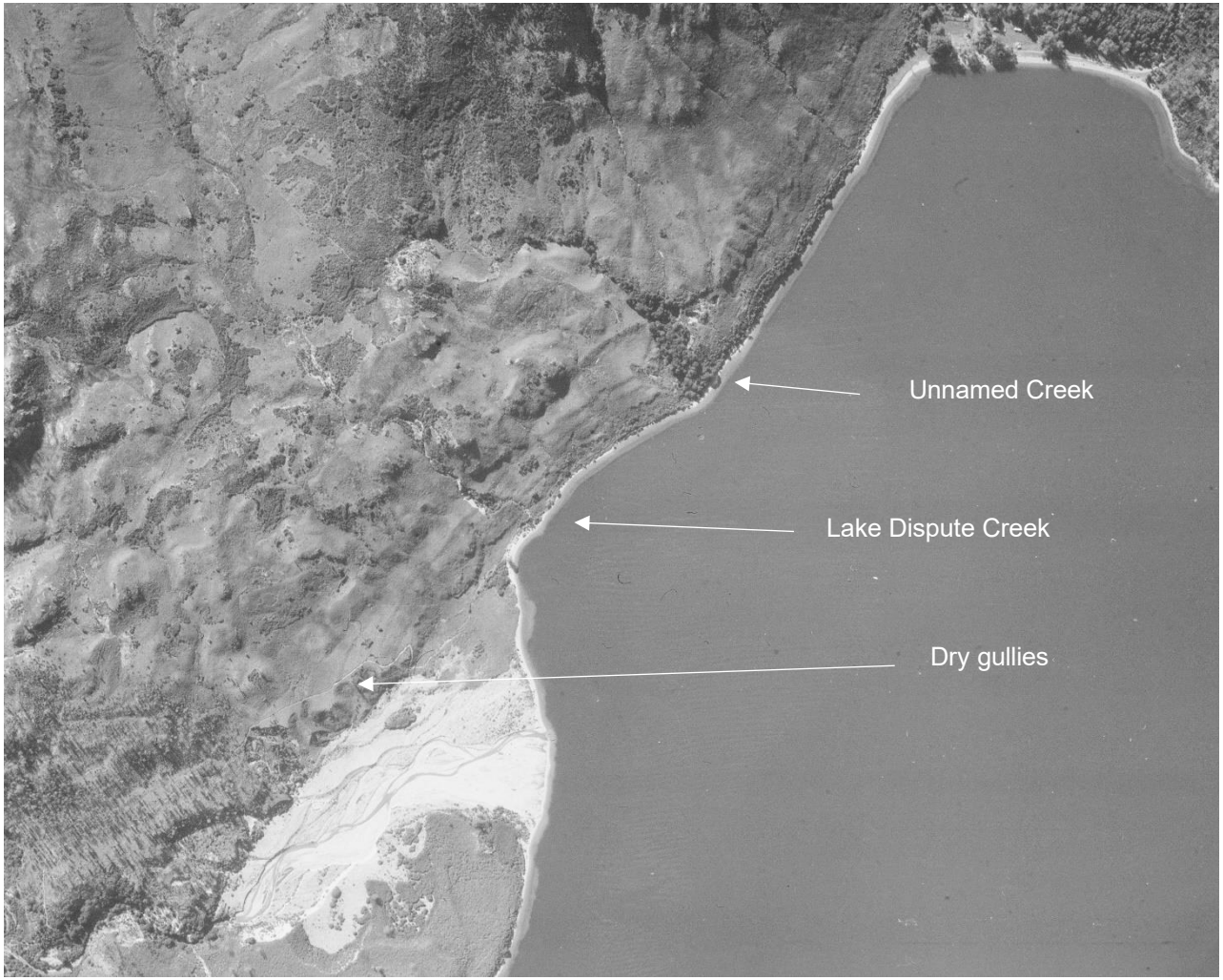

Plate 39: Mature beech forest and regenerating broadleaved forest, lianes and bracken vegetation along the foreshore between Wilson Bay and the Twelve Mile Delta. The Glenorchy Road is a track tracing its way through the mature lakeshore vegetation north of the Unnamed Creek which drains to ground emerging below the benched track and rock wall.

Survey Number: SN842
Run Number: 2290
Photo Number: 83
Photo Taken: 31/3/1954

Source: http://retrolens.nz and licensed by LINZ CC-BY 3.0

Table 3 Seven Mile Recreation Reserve – Assessment of Ecological Significance of Vegetation and Habitats

Assessment of the Vegetation and Habitats using the Ecological Criteria of the QLDC PDP, DOC Guidelines, and NPS-IB and the scoring system of the EIANZ

Significance Criteria	Assessment Description	Council PDP Criteria	DOC Guidelines	NPS-IB App, 1 SNA Criteria	EIANZ Score
Representativeness	The vegetation communities naturally associated with the Q2.2a LENZ units remain in more than 30% of the Land Environment, in this area but less than 10% is protected.[25] The vegetation in this area is a representative of the range of communities, ecosystem types and habitats of the Shotover Ecological District and LENZ Land Environment classification. However, the vegetation closest to the proposed alignment of the trail is degraded by conifer infestations and the felling of Douglas fir forest across the slope below. The vegetation across the upper slope south of the mature wilding conifer stand also contains a higher proportion of invasive species, and while indigenous species are present and regenerating, the vegetation has a lower level of naturalness. A large area containing a variety of invasive weeds is present in the eastern area of the proposed trail, the representative values are lowest in areas with the highest density of weeds and low to moderate in the areas affected by felled conifers where indigenous species are regenerating well. Mature and regenerating broadleaf forest (Plate 11), manuka shrubland /scrub (Plate 14), fragments of mixed red and mountain beech forest on the western lower terrace (Plate 17), are present between the bluff and rocky habitats (Plate 27); all vegetation communities are actively regenerating. Bluff and rocky outcrop communities were not inspected closely and may support threatened or at-risk herbaceous bluff species.	Yes	Yes	Yes	Low (areas of highest weed burden) to High (areas of more intact indigenous communities closer to the Lake)

[25] Walker, et.al. 2015; Landcare Research TEC2012 2002 LENZ Lookup Table, last updated 26/3/2015.

	The pockets of more mature broadleaved forest and beech forest were present more than 70 years ago; refer to Plates 35 and 38 above.				
Rarity & Distinctiveness	The vegetation communities naturally associated with the Q2.2a LENZ units remain in more than 30% of the Land Environment, but less than 10% is represented in the network of protected land. Although the ecosystems associated with this LENZ is well protected locally. Portions of this area are infested with invasive, introduced weeds. The following At-risk: declining (high value) species were recorded within or in the near vicinity of the proposed and indicative track alignment: • *Leptospermum scoparium* – Manuka has been classified as At-Risk with the qualifiers of Data Poor and with designated status due to the potential and unknown impacts of myrtle rust on the Myrtaceae family. Leptospermum was not named as one of the more susceptible species of the Myrtaceae genera to myrtle rust but was elevated to the status of At-Risk as a precautionary measure.[26] Manuka is a common component of shrublands within the Shotover Ecological District and Lakes Ecological Region and forms a component of the shrubland across the southern slopes of the Seven Mile Recreation Reserve. The following Threatened: Nationally Vulnerable (very high value) species are likely to be present or the site is within the home range of the species or species host (*): • *Metrosideros umbellata* – Southern rātā (Plate 29) The threat status of this species has been elevated by the risk posed by myrtle rust; it is less common in the North Island and	Yes	Yes	Yes	Moderate to Very High

[26] de Lange, et.al., (2018): page 7.

	vulnerable to possum browse in some areas. The rātā are well removed from the proposed alignment in this area but are present on the foreshore margin of Lake Whakatipu as only a few scattered populations, including the trees in this area. • *Falco novaeseelandiae* – eastern falcon Falcon are reasonably well distributed within the suitable habitat of the Lakes Ecological Region, including the north-eastern mountains adjacent to Lake Whakatipu. The site is likely to be within the range of at least one pair. • *Eudynamys taitensis* – long tailed cuckoo (*) Long tailed cuckoo are a highly mobile, seasonal migrants; they lay eggs in the nests of brown creeper – The only one of three host species is found in the vicinity of the activity. Brown creeper are present within the lakeshore habitats, therefore Long-tailed cuckoo may be seasonally present. The latter two species are listed as specified highly mobile fauna (NPS-IB; Appendix 2). South Island Kaka (Threatened: Nationally Vulnerable) may be present as dispersing individuals but not known to breed within the Shotover Ecological District. The vegetation present is unlikely to be of sufficient quality to attract or retain them. No species found within the site are present at their distributional limit with the exception of kaka. No species are endemic to Otago or are of restricted occurrence or present due to unique environmental factors with the exception of Southern rātā which are locally restricted to the rocky foreshore of Lake Whakatipu.				
Diversity & Pattern	Bluff and rocky habitat communities are interspersed with regenerating broadleaved low forest, manuka shrubland /scrub on the southern slopes and the gullies draining them. A patch of mixed red and mountain beech forest is present on a terrace in the western portion of the proposed alignment while Southern	Yes	Yes	Yes	Low (where affected by introduced weeds and wilding conifers) to

	rātā is found clinging to rocks on the lakeshore well removed from the proposed alignment. **29** species have been recorded in the areas that were accessed during the site visit. **23** were indigenous equating to **79%** of those recorded. The Seven Mile Recreation Reserve has been disturbed by historical clearance, fire and the infestation and maturation of a wilding Douglas fir forest. The most mature areas of indigenous vegetation were present more than **70 years** ago, refer to Plates 11, 14, 17, 27, 29 and 35 and 38. The diversity of the bluff and rocky outcrop habitats has not yet been fully investigated but the juxtaposition of the bluffs, rock outcrops to the broadleaved low forest, Southern rātā and shrubland communities makes this area diverse in habitat. Species present in this area include Kowhai and *Corokia cotoneaster*. A further lizard survey may be required to confirm the alignment of the trail through this area.				High (where indigenous communities are more intact and diverse)
Ecological Context	The very steep, bluffy terrain and rock outcrops of the portion of the Seven Mile Recreation Reserve fringing the lake is more intact with areas degraded by the mature Douglas fir forest and other weed infestations present at the upper slope margin of the wilding conifers and the western and eastern margin of the proposed trail around this area. The areas of best regeneration are found deeper within the steep gullies of the southern slopes and lakeshore fringes. The sheltered, rocky lakeshore habitat has supported vegetation that provides a seed source for regeneration at the site and beyond; the steepness of the site has provided refugia for some species, potentially including lizards. The lakeshore habitat provides a corridor of habitats linking with other refugia along the lakeshore environment and has sustained	Yes	Yes	Yes	Moderate to Very High Low where degraded by wilding Douglas fir.

	pockets of mature vegetation from which regeneration has spread; these include areas of Southern rātā.				
Naturalness	Refer to notes above regarding the level of disturbance and areas of invasive weeds.	na	Yes	na	Low next to the wilding Douglas fir to Very High on Lake margin
OVERALL	The level of disturbance, and presence of invasive weeds moderates the values of this area in the vicinity of the proposed trail. Lower on the slope and along the Lake margins, the values are very high; areas of broadleaved forest and mixed beech forest also have been assessed as having high values. The presence of Southern rātā in the foreshore communities of this area is of particular significance and so where rātā are present, the Very High values are confined to those specimens. Confirmation of the absence of bluff species and lizards may be required along the proposed alignment through this area; the overall value of high is therefore retained as a conservative measure.				Low to **High**; Very High where rātā are present.

Table 4 Wilson Bay to Twelve Mile Delta Recreation Reserve Boat Ramp – Assessment of Ecological Significance of Vegetation and Habitats

Assessment of the Vegetation and Habitats using the Ecological Criteria of the QLDC PDP, DOC Guidelines, and NPS-IB and the scoring system of the EIANZ

Significance Criteria	Assessment Description	Council PDP Criteria	DOC Guidelines	NPS-IB App, 1 SNA Criteria	EIANZ Score
Representativeness	The vegetation is representative of the range of communities, ecosystem types and habitats of the Shotover Ecological District and Q2.2 LENZ Land Environment classifications. Mature and regenerating broadleaved low forest, fragments of mixed red and mountain beech forest, mature tutu/ vineland (lianes) and bracken fernland with manuka shrubland /scrub vegetation ranges including patches of very mature Fuchsia, tree tutu, and *Coprosma linariifolia* more than 70 years old in the narrow band of vegetation remaining between the Glenorchy Road and the Lake– refer to Plates 36 and 39. The regenerating communities are diverse in composition and structure and support a range of fauna characteristic of the	Yes	Yes	Yes	Low (narrowest and weed infested areas) to Very High (mature vegetation)

	habitats within the Shotover Ecological District and typically associated with the vegetation communities and diversity present and formerly more widespread lakeshore habitats of Lake Whakatipu within the Lakes Ecological Region.				
Rarity & Distinctiveness	The vegetation communities naturally associated with the Q2.2a LENZ units remain in more than 30% of the Land Environment, but less than 10% is represented in the network of protected land. Although the ecosystems associated with this LENZ is well protected locally. The narrow corridor of mature Broadleaved low forest, mixed beech forest and tree tutu/ vineland and bracken fernland have persisted and continued to regenerate for more than 70 years (Plate 39). The following At-risk: declining (high value) species were recorded within or in the near vicinity of the proposed and indicative track alignment: • *Leptospermum scoparium* – Manuka has been classified as At-Risk with the qualifiers of Data Poor and with designated status due to the potential and unknown impacts of myrtle rust on the Myrtaceae family. *Leptospermum* was not named as one of the more susceptible species of the Myrtaceae genera to myrtle rust but was elevated to the status of At-Risk as a precautionary measure.[27] Manuka is a common component of shrublands within the Shotover Ecological District and Lakes Ecological Region. See notes in Table 6 re myrtle rust. The following Threatened: Nationally Vulnerable (very high value) species are likely to be present or the site is within the home range of the species or species host (*): • *Falco novaeseelandiae* – eastern falcon	Yes	Yes	Yes	Low (adjacent to the Glenorchy Road west of the Campground access road) to Very High elsewhere

[27] de Lange, et.al., (2018): page 7.

	Falcon are reasonably well distributed within the suitable habitat of the Lakes Ecological Region, including the north-eastern mountains adjacent to Lake Whakatipu. The site is likely to be within the home range of at least one pair. • *Eudynamys taitensis* – long tailed cuckoo (*) Long tailed cuckoo are a highly mobile, seasonal migrant; they lay eggs in the nests of brown creeper – The only one of three host species is found in the vicinity of the activity with populations confirmed in the beech forest and shrubland to the north near Lake Dispute. Brown creepers are also present within the lakeshore habitats, therefore Long-tailed cuckoo may be seasonally present. They have also been recorded in the Twelve Mile catchment (eBird, 2021; accessed 14/11/2023). The latter two species are listed as specified highly mobile fauna (NPS-IB; Appendix 2).				
Diversity & Pattern	The mature and in some places, very mature broadleaved – Fuchsia - forest and regenerating mixed red and mountain beech forest, manuka shrubland /scrub, very mature tutu/lianes and bracken fern along the lakeshore form the lower elevation communities and habitats that have elsewhere been disturbed and fragmented by fire, clearance and in places residential development. The vegetation below the Glenorchy Road responds to the geology, presence of historic landslips, alluvial deposits, and creeks draining across the Glenorchy Road from the slopes above. The broadleaved low forest, regenerating beech forest, mature tutu and lianes; and regenerating shrublands are diverse with the highest diversity of the three trail segments found in this area - **52** species were recorded in the very narrow strip between Wilson Bay and the Twelve Mile Delta boat ramp; including **42 indigenous** plant (28), moss (at least 1), fern (9) and fungi (at least 1) species. Moss, lichen and fungi were under-reported by	Yes	Yes	Yes	High to Very High

	this survey. The highest diversity in this area was northeast of the un-named creek, Plate 39 in a narrow band of vegetation. The communities present provide habitat for indigenous fauna within the lakeshore environment of Lake Whakatipu. The proximity to the lake is environmentally moderating, this may have contributed to the retention of pockets of very mature examples of the communities listed. In several areas, there are specimens with very large diameter at breast height measurements and growth forms that indicate they have survived and continued to grow following localised landslips. Mature tree tutu and lianes that reach into, and over mature canopies forming dense thickets in places may provide habitat for stick insect as well as birds and possums. In some areas, the vegetation contains a higher proportion of invasive species, these areas are of low to moderate value, but they also support regenerating natives.				
Ecological Context	The lakeshore communities provide and maintain an important corridor connecting the larger, natural areas, and remaining indigenous habitats e.g., those extending along much of the foreshore of the northeastern portion of Lake Whakatipu, and within the Twelve Mile Creek catchments, including significant natural areas (42A, 43A) northwest and west of the proposed activity. The vegetation therefore contributes to the altitudinal sequences of the surrounding area, although slightly disjunct. The diverse band of indigenous communities below the Glenorchy Road is wide enough to be self-sustaining with natural functions of regeneration from pockets of very mature vegetation in evidence. Isolated few or single plants or seedlings from species known within the Bobs Cove Recreation Reserve (e.g., native jasmine, and pate (*Schefflera digitata*), suggest either the species have persisted or are evidence of natural dispersal and confirmation	Yes	Yes	Yes	High to Very High

	that the habitat is used by birds moving within the foreshore habitat. The vegetation communities therefore provide important genetic values from which restoration efforts can draw, and habitats that help link the fragmented natural areas of the Whakatipu Basin.				
Naturalness	Naturalness is variable across the narrow band of vegetation with historical disturbance resulting from the construction of Glenorchy Road, historical tracks, and the invasion of weeds along the margins of the lake and Glenorchy Road.	na	Yes	na	Low to Very High
OVERALL	Except where invasive weeds are dominant, this very narrow band of mature indigenous forest has persisted and been regenerating for more than 70 years with the highest diversity present northeast of the Unnamed Creek; refer to Plate 39.				High to Very High

Table 5 Twelve Mile Delta Recreation Reserve Boat Ramp to Carpark – Assessment of Ecological Significance of Vegetation and Habitats

Assessment of the Vegetation and Habitats using the Ecological Criteria of the QLDC PDP, DOC Guidelines, and NPS-IB and the scoring system of the EIANZ

Significance Criteria	Assessment Description	Council PDP Criteria	DOC Guidelines	NPS-IB App, 1 SNA Criteria	EIANZ Score
Representativeness	The vegetation is representative of the range of communities, ecosystem types and habitats of the Shotover Ecological District and the Q2.2 LENZ units. Mature and regenerating broadleaved low forest contributes only a very minor portion of habitat in this area. It is dominated by mountain beech dominated forest in the west which includes specimens of very mature Mountain beech and shares the canopy with mature Eucalypts in places; a large portion of introduced shrubland along a historical terrace/ track adjacent to Glenorchy Road; manuka shrubland /scrub vegetation in the eastern portion above the Delta access track. Some of the mature vegetation is more than 70 years old – refer to Plates 36 and 39.	Yes	Yes	Yes	Low to High

	The indigenous communities are reasonably diverse in composition and structure. They support a range of fauna characteristic of the habitats within the Q2.2 LENZ units and the Shotover Ecological District and typically associated with the vegetation communities and diversity present, and formerly more widespread within the lakeshore habitats of Lake Whakatipu within the Lakes Ecological Region. The mountain beech and Eucalypts are present above a series of dry gullies closer to the Twelve Mile Creek carpark.				
Rarity & Distinctiveness	The vegetation communities naturally associated with the Q2.2a LENZ units remain in more than 30% of the Land Environment, but less than 10% is represented in the network of protected land. Although the ecosystems associated with this LENZ is well protected locally and more broadly within the Twelve Mile Delta Recreation Reserve that the trail skirts into. The following At-risk: declining (high value) species were recorded within or in the near vicinity of the proposed and indicative track alignment: • *Leptospermum scoparium* – Manuka has been classified as At-Risk with the qualifiers of Data Poor and with designated status due to the potential and unknown impacts of myrtle rust on the Myrtaceae family. *Leptospermum* was not named as one of the more susceptible species of the Myrtaceae genera to myrtle rust but was elevated to the status of At-Risk as a precautionary measure.[28] Manuka is a common component of shrublands within the Shotover Ecological District and Lakes Ecological Region and the lakeshore communities. See notes re myrtle rust in Table 6.	Yes	Yes	Yes	Low to Moderate (closer to the Glenorchy Road west of the Campground access road) to High where mature beech trees remain and are co-dominant in places with Eucalyptus

[28] de Lange, et.al., (2018): page 7.

	The following Threatened: Nationally Vulnerable (very high value) species are likely to be present or the site is within the home range of the species or species host (*): • *Falco novaeseelandiae* – eastern falcon Falcon are reasonably well distributed within the suitable habitat of the Lakes Ecological Region, including the north-eastern mountains adjacent to Lake Whakatipu. The site is likely to be within the home range of at least one pair. • *Eudynamys taitensis* – long tailed cuckoo (*) Long tailed cuckoo are a highly mobile, seasonal migrant; they lay eggs in the nests of brown creeper – The only one of three host species is found in the vicinity of the activity with populations of Brown Creeper confirmed in the beech forest and shrubland to the north and within the affected lakeshore habitat. Therefore, Long-tailed cuckoo may be seasonally present. They have also been recorded in the Twelve Mile and Lake Dispute catchments (eBird, 2021; accessed 14/11/2023). The latter two species are listed as specified highly mobile fauna (NPS-IB; Appendix 2).				
Diversity & Pattern	The mature regenerating mountain beech dominated forest, and manuka shrubland /scrub, have persisted through land clearance, mining, fire and the establishment of the Glenorchy Road. The vegetation below the Glenorchy Road responds to the geology, alluvial deposits, creeks and shaded, dry gullies draining across the Glenorchy Road from the slopes above that have potentially been shaped by historical mining/ sluicing. The regenerating beech forest, and regenerating manuka shrublands west of the boat ramp are reasonably diverse with **35** species recorded including **25** indigenous plant, moss, and fern species (**71%**). These communities provide habitat for indigenous	Yes	Yes	Yes	Low (weed infested areas) to High (mature beech forest and manuka shrubland areas)

	fauna which forage through the area and into the surrounding habitat of the contiguous Reserves. A flattened area between the Glenorchy Road and the steeper escarpment contains a higher proportion of invasive species, these areas are of low to moderate value, (where they also support regenerating natives).				
Ecological Context	The land between the Twelve Mile Delta boat ramp and the Carpark to the west are part of Twelve Mile Creek catchment and is located within habitat contiguous with the significant natural areas (42A Mt Crichton Scenic Reserve to the north, and 43A – Bobs Cove Recreation Reserve to the west) northwest of the proposed activity and the Twelve Mile Delta Recreation Reserve. Much of the proposed trail alignment traverses communities that are historically disturbed with a large component of introduced, invasive weeds.	Yes	Yes	Yes	Moderate
Naturalness	Naturalness is variable across the site with historical disturbance resulting from the construction of Glenorchy Road, historical tracks, mining tailings and the infestations of conifers, clearance of those conifers and the invasion of weeds along the margins of the Glenorchy Road.	na	Yes	na	Low to Moderate
OVERALL	Invasive weeds are dominant through a substantial portion of this area; however, mountain beech dominated forest dominates the western portion of this trail section. Eucalyptus and Eucalypt seedlings are co-dominant in places in the western area.				Moderate

5.2 Summary of Significance and Values

The overall assessment of significance for the three trail sections assessed in Tables 2 to 5 are summarised in Table 6 below.

Specific summary comments on the ecological values are provided below.

Vegetation

The increase in broadleaved low forest, manuka shrubland/ scrub, the persistence of mature tutu and the decrease in bracken fern cover compared to the mapped habitats of Ward and Munro, 1989 illustrate the continuing process of regeneration which has, along with the discovery of south-western large gecko (*Woodworthia* "south-western large") and diurnal McCann's skink (*Oligosoma maccanni)*, increased the value of this habitat.

There are portions of the corridor between the Glenorchy Road and Lake Whakatipu that have been degraded by infestations of invasive weeds and the control of wilding conifers. In these areas, the ecological values are lower.

However, natural regeneration is present where conifers have been felled, and where canopy dieback of beech forest and Pittosporum stands has occurred.

The presence of Southern rātā along the lake margin and within mid-slope communities east of the Five Mile Creek elevates the value of those communities as this species is present as only very scattered populations around the shore of Lake Whakatipu and where present, they are vulnerable to damage by possum browse and potentially myrtle rust.

There are patches of broadleaved low forest between Sunshine Bay and the Seven Mile, and between Wilson Bay and the Twelve Mile Delta boat ramp which support very mature vegetation including very large-stemmed Fuchsia, broadleaf, beech trees, tree tutu and putaputaweta, and *Coprosma linariifolia* that are more than 70 years old.

Avifauna

The indigenous and introduced birds commonly associated with the habitats present were recorded during the site visit. There is potential for NZ falcon – eastern; and long-tailed cuckoos to be present from time to time or on a seasonal basis within the habitat. Based on my own observations in the area, the lakeshore habitat is likely to be within the known range of at least one to two falcon pairs. From time-to-time Kaka are recorded to forage in the Sunshine Bay area, including the Spring of 2023 (eBird, 2021; accessed 14/11/2023). While kaka are known to make long-distance flights to foraging areas, they are not known to breed in the area between Bobs Cove and Queenstown. The habitat along the lake foreshore is considered to be an important element of the foraging habitat that may support dispersing kaka, even if the viability of populations dispersing to this area is limited by the absence of very large tracts of beech and podocarp forest. This vegetation is not likely to sustain any dispersing birds. Kaka in the Whakatipu Basin have been found to have succumbed to malnutrition (pers. comm. R Teele, DOC).

Lizard Fauna

Lizard Expert NZ herpetologist Dr Mandy Tocher undertook a survey of an area of tailings identified as having potential to support geckos or skinks. As noted above, the survey confirmed south-western large gecko (*Woodworthia* "south-western large") and diurnal McCann's skink (*Oligosoma maccanni)*, geckos and skinks the tailings west of the Five Mile

Creek and a report detailing the survey and recommendations is provided as Appendix 1 to this report.

Freshwater Fish

Koaro *Galaxias brevipinnis,* an At-Risk: declining endemic freshwater fish has been found in the larger creeks above the Glenorchy Road. Their habitat preference is for fast flowing, streams with cobble or coarse gravel beds. The steep, bluffy terrain between the lake and the Glenorchy Road combined with the low and sometimes intermittent flows may render the small streams within the affected areas unsuitable as habitat. However, the creek draining Lake Dispute between Wilson Bay and the Twelve Mile Delta may support kōaro, this would require a survey by a freshwater ecologist to confirm.

Table 6 Summary of Ecological Significance and Values

Significance Criteria	**Sunshine Bay to Seven Mile**	**Seven Mile**	**Wilson Bay to Twelve Mile Delta**	**Twelve Mile Delta to Carpark**
Representativeness	Very High	Low to High	Low to Very High	Low to High
Rarity & Distinctiveness	High to Very High	Moderate to Very High	Low to Very High	Low to High
Diversity & Pattern	High to Very High	Low to High	High to Very High	Low to High
Ecological Context	High to Very High	Low to Very High	High to Very High	Moderate
Naturalness	Moderate to Very High	Low to Very High	Low to Very High	Low to Moderate
Overall	Very High	Low to Very High	High to Very High	Moderate

6 Ecological Impact Assessment

The nature, magnitude and level of actual or potential effects, both adverse and positive, associated with trail construction have been identified and described using the guidance of the criteria described in Tables 8 to 11 of the EIANZ EcIA Guidelines Roper-Lindsay (2018).

The effects of trail construction are direct, indirect and cumulative and will occur during preparatory work for construction (e.g., vegetation clearance, blasting), construction (earthworks, bridge and structure construction, culverts and installation of drainage), and then following the establishment of the trails as a result of use and maintenance (drainage, weed infestations, root damage, access for weed and predator control and enhancement planting if appropriate or required).

The following Table sets out the actual and potential effects and their recommended management; a residual Impact Assessment is then determined.

No opinion or assessment is offered with respect to landscape impacts of trail development as this fall outside my area of expertise.

Table 7 Ecological Impact Assessment – Sunshine Bay to Seven Mile Recreation Reserve

Effects	Probability of Occurrence	Level of Effects	Management Measures	Magnitude of Effect After Management
Preparatory Works Vegetation Clearance/ Pruning from the footprint of tracks and structures (viewing platforms, steps/ stairs, boardwalks, bridges, handrails, safety fences, stiles and signage etc.) required to establish the structure or track and from the full width of the track corridor (where present) and discretionary removal of any vegetation beyond the footprint of the track that is considered hazardous or that may adversely impact upon the track components such as batter slopes, drainage or track surface materials. This includes localised pruning and removal along a narrow pathway under the canopy of the vegetation, affecting the canopy in a small number of sites.				
Vegetation Clearance for track and structures	High, required to form track and install structures	**Low to Moderate** effects with localised **High** magnitude effects on areas of High Ecological Values Overall, the works will be temporary – short term (up to 5 years) to potentially medium term (5 to 15 years). More long term impacts are possible if permanent benching is required on bluff habitats if the Threatened: Nationally critical *Lepidium sisymbrioides* (Kawerau cress) and the Not	Avoid disturbance to Southern rata and very mature stands of broadleaved low forest and beech trees. Avoid clearance of indigenous vegetation where possible, if clearance can't be avoided, remove introduced vegetation in preference to indigenous; if required prune indigenous vegetation, or remove branches in preference to removal. If removal of indigenous vegetation is required for safe and practical formation and use of the track; remove vegetation and retain debris on site adjacent to track where doing so will not unduly degrade or smother the existing vegetation or create a fire hazard. Localised mulching of debris may be required if unaffected vegetation would otherwise be	This impact is consistent with the Otago CMS anticipated impacts associated with new track construction.[29] **Low to Moderate Effects if Recommendation Implemented.** The works could have more than minor and potentially significant adverse effects that will be difficult to mitigate if clearance and or rock breaking/ blasting and construction removes areas of Southern rata or vegetation canopy in mature Beech Forest and Broadleaved low forest or Threatened:

[29] Otago CMS 2016 incorporating the 2022 partial review; Appendix 1.

		threatened host for large cliff-face herb *Gingidia montana* which hosts the specialist feeder; the large, At-Risk: declining (but taxonomically unresolved), cryptic geometrid looper moth *Gingidiobora subobscurata* are found to be present.	smothered and damaged or the naturalness of the community would be unduly degraded. Area of canopy clearance is likely to be variable and can be offset by the removal of invasive weeds enabling natural regeneration to continue under conditions of reduced or no competition. Survey to determine whether at-risk or threatened herbaceous bluff species are present in areas to be blasted or broken; develop a plan to avoid or reduce impacts on bluff species where/ if required. Avoid track development over Southern rata and mature trees, and their root systems/ damage to root systems where possible.	Nationally critical *Lepidium sisymbrioides* (Kawerau cress)
Effects	**Probability of Occurrence**	**Level of Effects**	**Management Measures**	**Magnitude of Effect After Management**

Rock blasting/ breaking & Rock Wall Construction may be required to establish a benched track through areas that traverse very steep, rock outcrops and bluffs; these areas have been identified (Plate 40) between Sunshine Bay and the Five Mile Creek, including the popular rock jumping area known as “Little Thailand”. This may result in canopy openings, exposure of rock and creation of rock debris at or below excavation sites breaking or burying vegetation downslope of work and physical alteration of the habitats and vegetation communities on bluffs or rocky outcrop habitats.

Bluffs and Rocky Outcrops - Rock blasting/ breaking and Rock wall construction - structure placement on rock habitats including preparatory works and installation of structures. At least 280m of blasting/ rock	High, required to form benched track and / or install structures across very steep rock outcrops/ bluffs	Low to High ecological effect in areas of Moderate to Very High ecological Value: **Low to Very High Effects.** Effects may be visible in the medium to long-term depending on the extent and location of works.	Avoid opening the canopy of mature vegetation wherever possible. Rock breaking and blasting should occur under the canopy of mature vegetation such that the canopy remains unchanged and root structures are not damaged causing dieback over time. Very High (more than minor and potentially significant adverse effects that will be difficult to mitigate) should be avoided by ensuing rock breaking/ blasting and benching results in no	**Low to Moderate Effects if Recommendation Implemented.** **Minor/ potentially more than minor/ significant if *Lepidium sisymbrioides* (Kawerau cress) are found and would be lost as a result of the work.**

breaking and/ rock wall work identified (Table 7)		***This assessment does not include consideration of the effects on the landscape.***	more than the small scale and localised loss of vegetation canopy cover or the loss of bluff/ rock outcrop vegetation noted above. Limited exposure of new rock habitats and the transplant of any bluff obligate species into comparable habitat to avoid or reduce losses if applicable. Vegetation down slope is not broken or buried by excavation or rock debris. Rocks may be used to form small stream crossings, to armour stream crossing areas or assist with retention of cut or fill batters by rock walls. Transplant ferns, ground cover associated with rocky habitats and seedlings into reshaped batters, rock walls or retention areas or comparable habitats.	
Habitat Disturbance – lizards Including for Construction – preparatory works and installation of bridges and structures Lizard habitat disturbance including any work that results in the movement (even hand movement) or removal of unshaded, lichen covered rocks	High – a bridge over the Five Mile Creek will be required.	**Low to Moderate Effects.** Disturbance will be associated with the construction phase. There may be a minor shift away from the existing baseline conditions but the underlying character, composition and attributes of the lizard habitat can be retained and protected if not enhanced by weed and predator control and the use of rock to recreate or create new habitat.	Avoid areas of lizard habitat. If this is not possible, obtain a Wildlife Permit to disturb habitat and adhere to the prescriptions of a Lizard Management Plan to be prepared once the final alignment of the track and magnitude of effects is confirmed. Work in lizard habitat will be supervised by a herpetologist or suitably qualified and instructed ecologist under the supervision of a herpetologist and lizards moved out of harm's way – or managed according to the prescriptions of a Lizard Management Plan. Rocks may be stockpiled to create new lizard habitat in sunny, open areas.	**Low – Moderate temporary** – short term (months); **Less than minor/ Minor and potentially positive**

in the tailings habitat, and potentially other sites which may prove suitable following further surveys.		Magnitude of effects will require confirmation of a herpetologist.		

Effects	Probability of Occurrence	Level of Effects	Management Measures	Magnitude of Effect After Management

Trail Construction, Use and Maintenance

Construction of tracks and structures may require excavation to establish piles and footings, cut to fill excavation, cut to waste excavation and levelling using hand tools, motorised equipment and machinery. Batter slope excavation may reach a maximum height of 1.5 metres, slope excavation exceeding this may require Resource Consent.

This may result in soil disturbance, including disturbance of the duff layer and subsoil. Localised compaction and fill deposition may occur.
Aggregate surfacing including placement and compaction of local materials from the track may be required. Use of local material such as rock debris from the establishment of Glenorchy Road may be necessary for obtaining fill/ surfacing materials. Ground works or in-ground timber steps including formation and levelling, drainage and timber construction may be required in places.

Construction of drainage and redirection of surface water from the structure, structure footings, and track surface to existing natural contours using various means such as culvert pipes, drainage sumps, cut-outs and cross boards may be required. This may result in surface water runoff including minor, localised modification of existing natural watercourses.

Earthworks, including for preparatory works, Construction, installation of structures and ongoing use and maintenance	High – earthworks will be required to form the track and prepare for structures.	Low to Very High Effects. Overall, the works will be temporary – short term (up to 5 years) to potentially medium term (5 to 15 years) Where the trail can follow existing benches with little need for clearance effects will be **Low.**	Earthworks are minimised and confined to the footprint of the track and provide for appropriate drainage from the track surface. Existing benches and tracks are used wherever possible. A Sediment and Erosion Management Plan is prepared and ensures the track construction does not create or exacerbate erosion as a result of excavation and formation of the track or discharge of water from the track surface.	**Low effects if Recommendation Management Measures Implemented** **Minor/ less than minor**

		Where benching and clearing that impacts on vegetation such that canopy gaps are created or dieback of mature vegetation occurs, or Southern rata are impacted, effects will be **High to Very High.**	Appropriate sediment barriers will be established and maintained during and following construction until such time as the risk of sedimentation associated with track construction and use is no longer present.	
Freshwater	Negligible – very slight chance of changing the baseline condition of drainages, streams or creeks	**Low to Very Low.** It is unlikely that kōaro will be present in any of the streams affected by this work; however, a survey should be undertaken by a freshwater ecologist to confirm this in areas with a fast flow over cobble / coarse gravel.	A hydrologist confirms that the trail formation will ensure the hydraulic function of any streams (permanent or ephemeral) are maintained and the natural patterns of drainage are maintained. Ensure that no barriers to freshwater fish (kōaro) are created by the establishment of the track and the hydraulic character of the stream is not altered. Confirm the absence of kōaro in the work zone of the creek draining Lake Dispute, west of Wilson Bay.	**Low/ Less than minor**
Increased opportunity for invasive weeds to establish	Low – there is a chance that disturbance to the site could result in localised spread of weeds, but the establishment of access could also result in improved weed control and a broad range of weeds is already present along the Glenorchy Road.	**Low to Very Low**	Remove invasive weeds from the track margins and vicinity of the track (5 m buffer either side where safe to do so; and towards the Glenorchy Road where access below the track is not possible.	**Low/ Less than minor; Positive Effect**
Increased opportunity for predators	Moderate	**Moderate** – risk of increased predator activity.	Establish a predator control network and support the servicing of traps along the track.	**Low/ Less than minor; Positive effect**

(mustelids, rats, possums) to move through or invade the habitat below the Glenorchy Road		Balanced by opportunity for predator control		

Table 8 Ecological Impact Assessment – Seven Mile Recreation Reserve

Effects	Probability of Occurrence	Level of Effects	Management Measures	Magnitude of Effect After Management
Preparatory Works				
Vegetation Clearance/ Pruning from the footprint of tracks and structures (viewing platforms, steps/ stairs, boardwalks, bridges, handrails, safety fences, stiles and signage etc.) required to establish the structure or track and from the full width of the track corridor (where present) and discretionary removal of any vegetation beyond the footprint of the track that is considered hazardous or that may adversely impact upon the track components such as batter slopes, drainage or track surface materials. This includes localised pruning and removal along a narrow pathway under the canopy of the vegetation, affecting the canopy in a small number of sites.				
Vegetation Clearance for track and structures	High, required to form track and install structures	**Low to Very High Effects** The works will have **Low** level effects if trails are constructed through highly disturbed areas with a high proportion of introduced weeds. The works could have more than minor and potentially significant adverse effects that will be difficult to mitigate if rock breaking/ blasting and construction interferes with Southern rata trees or where bluff obligate species are found in the affected areas. Overall, the works will be temporary – short term (up to 5 years) to potentially medium term (5 to 15	Avoid track development over Southern rata and mature trees, and their root systems/ damage to root systems where possible. Avoid clearance of indigenous vegetation where possible, if clearance can't be avoided, remove introduced vegetation in preference to indigenous; prune indigenous vegetation, or remove branches in preference to removal. If removal of indigenous vegetation is required for safe and practical formation and use of the track; remove vegetation and retain debris on site adjacent to track where doing so will not unduly degrade or smother the existing vegetation or create a fire hazard. Localised mulching of debris may be required if unaffected vegetation would otherwise be smothered and damaged or the naturalness of the community would be unduly degraded. Avoid disturbance to/ opening the canopy.	This impact is consistent with the Otago CMS anticipated impacts associated with new track construction.[30] **Low to Moderate / Minor / Less than Minor Effects if Recommendation Implemented** Minor/ Less than minor adverse effects may be discernible and may result in localised noticeable effects but will not cause any significant adverse effects if recommendations can be adhered to.

[30] Otago CMS 2016 incorporating the 2022 partial review; Appendix 1.

		years) or long term (15-25yrs) for bluff sites.	Area of canopy clearance is likely to be variable and can be offset by the removal of invasive weeds enabling natural regeneration to continue under conditions of reduced or no competition. Survey to determine whether at-risk or threatened herbaceous bluff species are present in areas to be blasted; develop a plan to avoid or reduce impacts on bluff species where required.	

Rock blasting/ breaking & Rock Wall Construction may be required to establish a benched track through areas that traverse very steep terrain, rock outcrops and bluffs; these areas have been identified. Most of the route identified through the Seven Mile Recreation Reserve is through areas disturbed by wilding conifers and their subsequent and recent control (felling). Track formation using blasting or rock breaking methods to form a bench may expose more rock and create rock debris at or below excavation sites; breaking or burying vegetation downslope of work and physically alter habitats and vegetation communities on bluffs or rocky outcrops.

Effects	**Probability of Occurrence**	**Level of Effects**	**Management Measures**	**Magnitude of Effect After Management**
Bluffs and Rocky Outcrops - Rock blasting/ breaking and Rock wall construction - structure placement on rock habitats including preparatory works and installation of structures.	High, required to form benched track and / or install structures across very steep rock outcrops/ bluffs	**Low to High** ecological effect in areas of Moderate to High ecological Value: **Low to Very High Effects.** Effects may be visible in the medium to long-term depending on the extent and location of works.	New areas of exposed rock habitat may be created. Rocks may be stockpiled to create new lizard habitat in sunny, open areas. Effect will be low where rock breaking will occur under the canopy of mature vegetation in such as way that the canopy remains unchanged and root structures are not damaged causing dieback over time; OR, where the site is highly disturbed by Douglas fir infestations. Limited exposure of new rock habitats and transplant of any bluff obligate species into comparable habitat to avoid or reduce losses if applicable. Vegetation down slope is not broken or buried by excavation.	**Low to Moderate Effects if Recommendation Implemented:** Effects are expected to be less than minor or minor with the effects of benching discernible but will not cause significant adverse ecological effects.

			Very High (more than minor and potentially significant) adverse effects that will be difficult to mitigate if rock breaking/ blasting and benching results in the localised loss of vegetation canopy cover or the loss of bluff/ rock outcrop vegetation.	
Effects	**Probability of Occurrence**	**Level of Effects**	**Management Measures**	**Magnitude of Effect After Management**
Habitat Disturbance – lizards Lizard habitat disturbance including any work that results in the movement (even hand movement) or removal of unshaded, lichen covered rocks in the tailings habitat, and potentially other sites which may prove suitable following further surveys.	Moderate The initial report prepared by Dr Tocher identified several sites of potential lizard habitat - by open, sunny, rocky habitat in addition to the location where presence of geckos and skinks were confirmed.	**Low to Moderate Effects.** Disturbance will be associated with the construction phase; to be confirmed by a herpetologist	Avoid areas of lizard habitat and undertake a lizard survey to confirm where these areas may be. If it is not possible to avoid lizard habitat, obtain a Wildlife Permit to disturb habitat and adhere to the prescriptions of a Lizard Management Plan to be prepared once the final alignment of the track and magnitude of effects is confirmed. Work in lizard habitat will be supervised by a herpetologist or suitably qualified and instructed ecologist under the supervision of a herpetologist and lizards moved out of harm's way – or managed according to the prescriptions of a Lizard Management Plan.	**Low – temporary** – short term (months); Minor/ less than Minor; potentially positive There may be a minor shift away from the existing baseline conditions, but the underlying character, composition and attributes of the lizard habitat can be retained and protected if not enhanced by weed and predator control and the recreation or creation of new habitat using rock excavated to establish benched tracks.

Trail Construction, Use and Maintenance

Construction of tracks and structures may require excavation to establish piles and footings, cut to fill excavation, cut to waste excavation and levelling using hand tools, motorised equipment and machinery. Batter slope excavation may reach a maximum height of 1.5 metres, slope excavation exceeding this may require Resource Consent.

This may result in soil disturbance, including disturbance of the duff layer and subsoil. Localised compaction and fill deposition may occur.
Aggregate surfacing including placement and compaction of local materials from the track may be required. Ground works of in-ground timber steps including formation and levelling, drainage and timber construction may be required in places.

Construction of drainage and redirection of surface water from the structure, structure footings, and track surface to existing natural contours using various means such as culvert pipes, drainage sumps, cut-outs and cross boards may be required. This may result in surface water runoff including minor, localised modification of existing natural watercourses.

Earthworks for construction, ongoing use and maintenance	High – earthworks will be required to form the track and prepare for structures.	**Low to Very High** Effects. Overall, the works will be temporary – short term (up to 5 years) to potentially medium term (5 to 15 years)	Minimise and confine the footprint of the track and provide for appropriate drainage from the track surface. Prepare a Sediment and Erosion Management Plan to ensure the track construction does not create or exacerbate erosion as a result of excavation to establish the track or discharge of water from the track surface. Appropriate sediment barriers will be established and maintained during and following construction until such time as the risk of sedimentation associated with track construction is no longer present. Where the trail can follow existing benches with little need for clearance or highly degraded and weed infested areas, effects will be **Low.** Where benching and clearing that impacts on vegetation such that canopy gaps are created or dieback of mature vegetation occurs, effects will be **High.** Avoid damage to roots and vegetation that creates canopy gaps and removes mature vegetation or leads to dieback following construction.	**Low to Moderate Effects if Recommendation Management Measures Implemented** Minor/ Less than minor
Effects	**Probability of Occurrence**	**Level of Effects**	**Management Measures**	**Magnitude of Effect After Management**
Freshwater	Negligible – very slight chance of changing the baseline condition of drainages, streams or creeks	**Low to Very Low.**	It is unlikely that kōaro will be present in any of the ephemeral streams affected by this work in this area. A survey should be undertaken by a freshwater ecologist to confirm this if fast flowing streams with cobble / coarse gravel substrates are found to be present in the affected area.	**Low/ Less than minor**

			Ensure that no barriers to freshwater fish (kōaro) are created by the establishment of the track and the hydraulic character of the stream is not altered.	
Increased opportunity for invasive weeds to establish	Low – there is a chance that disturbance to the site could result in localised spread of weeds but the establishment of access could also result in improved weed control. A broad range of weeds is already present in the affected area.	**Low to Very Low**	Remove invasive weeds from the track margins and vicinity of the track (5 m buffer either side where safe to do so, this effort should extend to a width of at least 10 metres uphill where access below the track is not safely possible.	**Low/ Less than minor/ potentially positive**
Increased opportunity for predators (mustelids, rats, possums) to move through or invade the habitat below the Glenorchy Road	Moderate	**Moderate** – risk of increased predator activity. Balanced by opportunity for predator control	Establish a predator control network and support the servicing of traps along the track.	**Low/ Less than minor/ potentially positive**

Table 9 Ecological Impact Assessment – Wilson Bay to Twelve Mile Delta Recreation Reserve/ Mt Crichton Scenic Reserve Carpark

Effects	Probability of Occurrence	Level of Effects	Management Measures	Magnitude of Effect After Management
Preparatory Works Vegetation Clearance/ Pruning from the footprint of tracks and structures (viewing platforms, steps/ stairs, boardwalks, bridges, handrails, safety fences, stiles and signage etc.) required to establish the structure or track and from the full width of the track corridor (where present) and discretionary removal of any vegetation beyond the footprint of the track that is considered hazardous or that may adversely impact upon the track components such as batter slopes, drainage or track surface materials. This includes localised pruning and removal along a narrow pathway under the canopy of the vegetation, affecting the canopy in a small number of sites.				
Vegetation Clearance for track and structures	High, required to form track and install structures	**Low to Moderate** effects with localised **High** magnitude effects on areas of High Ecological Values Overall, the works will be temporary – short term (up to 5 years) to potentially medium term (5 to 15 years). .	Avoid disturbance to very mature stands of broadleaved low forest and beech trees and their root systems where possible. Avoid clearance of indigenous vegetation where possible, if clearance can't be avoided, remove introduced vegetation in preference to indigenous; if required prune indigenous vegetation, or remove branches in preference to removal. If removal of indigenous vegetation is required for safe and practical formation and use of the track; remove vegetation and retain debris on site adjacent to track where doing so will not unduly degrade or smother the existing vegetation or create a fire hazard. Localised mulching of debris may be required if unaffected vegetation would otherwise be smothered and damaged or	This impact is consistent with the Otago CMS anticipated impacts associated with new track construction.[31] **Low to Moderate Effects if Recommendation Implemented.** The works could have more than minor and potentially significant adverse effects that will be difficult to mitigate if clearance and or rock breaking/ blasting and construction removes significant areas of mature Beech Forest and Broadleaved low forest.

[31] Otago CMS 2016 incorporating the 2022 partial review; Appendix 1.

			the naturalness of the community would be unduly degraded. Area of canopy clearance is likely to be variable and can be offset by the removal of invasive weeds enabling natural regeneration to continue under conditions of reduced or no competition.	

Effects	Probability of Occurrence	Level of Effects	Management Measures	Magnitude of Effect After Management

Trail Construction, Use and Maintenance

Construction of tracks and structures may require excavation to establish piles and footings, cut to fill excavation, cut to waste excavation and levelling using hand tools, motorised equipment and machinery. Batter slope excavation may reach a maximum height of 1.5 metres, slope excavation exceeding this may require Resource Consent.

This may result in soil disturbance, including disturbance of the duff layer and subsoil. Localised compaction and fill deposition may occur.
Aggregate surfacing including placement and compaction of local materials from the track may be required. Use of local material such as rock debris from the establishment of Glenorchy Road may be necessary for obtaining fill/ surfacing materials. Ground works of in-ground timber steps including formation and levelling, drainage and timber construction may be required in places.

Construction of drainage and redirection of surface water from the structure, structure footings, and track surface to existing natural contours using various means such as culvert pipes, drainage sumps, cut-outs and cross boards may be required. This may result in surface water runoff including minor, localised modification of existing natural watercourses.

Earthworks, including for preparatory works, Construction, installation of structures and ongoing use and maintenance	High – earthworks will be required to form the track and prepare for structures.	Low to Very High Effects. Overall, the works will be temporary – short term (up to 5 years) to potentially medium term (5 to 15 years) Where the trail can follow existing benches with little need for clearance effects will be **Low.**	Earthworks are minimised and confined to the footprint of the track and provide for appropriate drainage from the track surface. Existing benches and tracks are used wherever possible. A Sediment and Erosion Management Plan is prepared and ensures the track construction does not create or exacerbate erosion as a result of	**Low – Moderate effects if Recommendation Management Measures Implemented** Minor Adverse effects may be discernible or noticeable but will not cause any significant adverse effects if the recommendations can be adhered to.

		Where benching and clearing that impacts on vegetation such that canopy gaps are created or dieback of mature vegetation occurs, or Southern rata are impacted, effects will be **High to Very High.**	excavation to establish the track or discharge of water from the track surface. Appropriate sediment barriers will be established and maintained during and following construction until such time as the risk of sedimentation associated with track construction and use is no longer present.	Potentially significant in areas of mature forest if recommended management measures can not be implemented
Freshwater	Negligible – very slight chance of changing the baseline condition of drainages, streams or creeks	**Low to Very Low.** Kōaro may be present in the two creeks affected by this work; however, a survey should be undertaken by a freshwater ecologist to confirm this where areas with a fast-flowing water over cobble / coarse gravel are found to be present.	A hydrologist confirms that the trail formation will ensure the hydraulic function of any streams (permanent or ephemeral) are maintained and the natural patterns of drainage are maintained. Ensure that no barriers to freshwater fish (kōaro) are created by the establishment of the track and the hydraulic character of the stream is not altered.	**Low/ Less than minor**
Increased opportunity for invasive weeds to establish	Low – there is a chance that disturbance to the site could result in localised spread of weeds, but the establishment of access could also result in improved weed control and a broad range of weeds is already present along the Glenorchy Road.	**Low to Very Low**	Remove invasive weeds from the track margins and vicinity of the track (5 m buffer either side where safe to do so; and towards the Glenorchy Road where access below the track is not possible.	**Low/ Less than minor/ potentially positive**
Increased opportunity for predators (mustelids, rats,	Low – the site is easily accessible by the full range of predators	**Low** – risk of increased predator activity.	Establish a predator control network and support the servicing of traps along the track.	**Low/ Less than minor/ potentially positive**

possums) to move through or invade the habitat below the Glenorchy Road	known to the area regardless of whether trail development occurs.	Balanced by opportunity for predator control		

Plate 40: Areas identified by Elevate Trail Building as requiring rock breaking/ blasting to install the trail between Sunshine Bay and Five Mile Creek. Refer Table 7 for the estimated dimensions of each rock breaking/ blasting site. A total length of at least 280m of rock breaking/ blasting identified; a 280m line shown to indicate length. The popular rock jumping site known as “Little Thailand” is near WP17

Table 7: Schedule of rock breaking/ blasting sites provided by Elevate Trail Building between Sunshine Bay and Five Mile Creek

Blast Site	Length of Track and Work required	Values identified nearby
1	15m - Breaking rock	
2	15m – Blast and rock wall	
3	30m – break/ blast	
4	10m – break and rock wall	Rata nearby
5	40m – break/ blast	Rata nearby; mature Fuchsia and broadleaved forest
6	15m – blast/ break and rock walls to make line work	Rata nearby(?)
7	10m – bridge/ blast/ rock wall	Rata below and west
8	30m – blast and rock walls	
9	Low line: “lots of blasting”, High line: easier but “pinchy”	
10	10m - Break/ blast or extend clip on	
11	10m – under big bluff, break/ blast	
12	15m – break/ blast boulders	
13	15m – bluff needs blast and barrier	
14	20m – blast/ structure to fill bluff gap	
15	10m – break around bluff	
16	10m – blast and rock wall	
17	10m - blasting	Rata below (?)
17A	Two lines marked, low line better but needs structure and blasting; upper line still tough and goes too high	Rata below (?)
18	10m – blast and rock wall	
19	5m – blast and rock wall	
Total	**At least 280m rock breaking/ blasting length**	

For health and safety reasons, the site visits did not include areas that were very steep between the area of Little Thailand (Site 17) and Sunshine Bay (19).

6.1 Summary of Ecological Effects

If the recommendations included in Tables 7 to 9 can be implemented to the highest level practicable, the impacts associated with the development of the three trails can, in the opinion of the author, be managed to the following levels.

Table 10 Summary of Ecological Effect Following Implementation of Impact Management Measures

Level of Impact	Sunshine Bay to Seven Mile	Seven Mile	Wilson Bay to Twelve Mile Delta Carpark
Vegetation Clearance	Low-Moderate; potentially significant	Low-Moderate; minor/ less than minor	Low-Moderate; potentially significant
Bluff and Rocky Outcrop Disturbance	Low-Moderate; minor/ potentially more than minor; potentially significant	Low-Moderate; minor/ less than minor	na
Lizard Habitat	Low-Moderate; Minor, temporary; potentially positive	Low; less than minor; potentially positive	na
Earthworks	Low/ minor/ less than minor	Low-Moderate; minor/ less than minor	Low-Moderate; Minor; potentially significant
Freshwater	Low/ less than minor	Low; less than minor	Low; less than minor
Invasive Weeds	Low; less than minor; potentially positive	Low; less than minor; potentially positive	Low; less than minor; potentially positive
Predator Management	Low; less than minor; potentially positive	Low; less than minor; potentially positive	Low; less than minor; potentially positive

8 Recommended Management Measures

The achievement of the level of effects assessed above relies on the implementation of the impact management measures set out in Tables 7 to 9 above. These included:

1. Avoid disturbance to very mature stands of broadleaved low forest and beech trees and their root systems where possible. In particular, damage to the roots and very mature stands of Fuchsia, Coprosma linariifolia, Carpodetus serratus, beech trees, broadleaf, tree tutu and in places mature lianes should be avoided.

2. In general track construction should try to avoid clearance of indigenous vegetation where possible, if clearance can't be avoided, remove introduced vegetation in preference to indigenous; if required prune indigenous vegetation, or remove branches in preference to removal.

3. If removal of indigenous vegetation is required for safe and practical formation and use of the track; remove vegetation and retain debris on site adjacent to track where doing so will not unduly degrade or smother the existing vegetation or create a fire hazard.

4. A suitably qualified and experienced ecologist may be engaged to inspect the trail construction in stages working ahead of the operation as it progresses and to identify site specific solutions to avoid or reduce disturbance to vegetation and habitats.

5. Localised mulching of debris may be required if unaffected vegetation would otherwise be smothered and damaged or the naturalness of the community would be unduly degraded.

6. The area of canopy clearance is likely to be variable and can be offset by the removal of invasive weeds enabling natural regeneration to continue under conditions of reduced or no competition.

7. There is an extensive network of historical benches and terraces, and these should be used where practically feasible to do so. In many of these areas, the understory is open under dense canopies, and it appears as though a trail could be constructed without breaking the canopy or creating visible damage beyond the track itself.

8. Bluffs should be checked for the Threatened: Nationally critical *Lepidium sisymbrioides* (Kawerau cress) and the Not threatened host for large cliff-face herb *Gingidia montana* which hosts the specialist feeder; the large, At-Risk: declining (but taxonomically unresolved), cryptic geometrid looper moth *Gingidiobora subobscurata*, prior to blasting or rock breaking and a plan for the management of impacts developed if necessary.

9. It is recommended that a Sediment and Erosion Management Plan is prepared and ensures the track construction does not create or exacerbate erosion as a result of excavation to establish the track or discharge of water from the track surface.

10. Appropriate sediment barriers should be established and maintained during and following construction until such time as the risk of sedimentation associated with track construction and use is no longer present.

11. There are few streams that are likely to support kōaro, those considered most likely are found between Wilson Bay and the Twelve Mile boat ramp. Ensure that no barriers to freshwater fish (kōaro) are created by the establishment of the track and the hydraulic character of the stream is not altered.

12. It is recommended that a hydrologist confirms that the trail formation will ensure the hydraulic function of any streams (permanent or ephemeral) are maintained and the natural patterns of drainage are maintained.

13. The nocturnal south-western large gecko (*Woodworthia* “south-western large”) was found at large area of rock tailings along with the diurnal McCann’s skink (*Oligosoma maccanni).* The recommendations of Dr Tocher L(izard Expert NZ) are supported. It would be beneficial to engage a herpetologist to undertake a rapid lizard habitat assessment and if track construction must intersect a habitat deemed likely to support lizards, then a herpetologist should be engaged to survey the habitat and prepare a Lizard Management Plan, if required; a link for the Plan template is provided in the References below.

14. There is a chance that disturbance to the site could result in localised spread of weeds, but the establishment of access could also result in improved weed control and a broad range of weeds is already present along the Glenorchy Road. Invasive weeds should be removed from the track margins and vicinity of the track (5 m buffer either side where safe to do so; and towards the Glenorchy Road where access below the track is not safely possible. This would provide a beneficial effect.

15. The site is easily accessible by the full range of predators known to the area regardless of whether trail development occurs. However, the development of a track will enable the establishment of a predator control network and their servicing better protecting the rata and continuing process of natural regeneration. The trail between Sunshine Bay and the Seven Mile Recreation Reserve may improve the

access of predators, therefore the unmanaged level of impact was assessed as moderate.

8.1 Constraints

The alignment of the proposed trail network was further refined after the site visits to assess ecological values were undertaken. It is possible that there are values and potential impacts that have not been assessed where the route changed or where access over very steep sites was required and could not be safely achieved for these surveys. This is particularly so for the Seven Mile Recreation Reserve area and the bluffs and rock outcrops in the eastern portion of the trail between the Arawata Track carpark and Sunshine Bay.

It is therefore recommended that prior to any earthworks, or the clearance of mature trees in the areas identified within this report, the trail is assessed by a suitably qualified botanist or ecologist and herpetologist to confirm that no significant values will be disturbed such that the values would be lost. This could be undertaken in stages.

This may involve a botanical survey of the bluff habitats with the support of suitably qualified, harnessed safety support prior to any rock breaking/ blasting.

The recommendations made in this report should be reconfirmed or refined as necessary following any further surveys and assessments where the requirement for this has been indicated.

8.2 Monitoring

Monitoring to assess damage to root structures that result in dieback following construction may be required. This could be established using photo points, drone surveys and/ or walk through surveys on the trail following construction in areas where disturbance likely to result in damage has occurred (if applicable). As noted within the report, there are existing areas of canopy failure and dieback as a result of natural causes. The impacts of trail construction would need to be distinguished from those.

Monitoring of the trail construction should also include outcomes for any plants transplanted, the effectiveness of sediment control measures, trail stability and the retention of fish passage for kōaro where applicable.

8.3 Response of Elevate Trail Building to this Assessment and Recommendations

The following response to the Recommendations for Effects Management were forwarded by Queenstown Trails CEO Mark Williams on behalf of Elevate Trail Building (email; dated 14/11/2023).

1. We will be able to stay in the shaded bush away from the lizard habitat. Save for an approximately 20m section from the bridge to bush which could be boardwalked as an extension of the bridge.

2. I don't think any mature canopy will be broken. As the trail is desired to be an mountain bike style clearance and construction will be to a minimum to get a 1.7 excavator through.

3. The line stays away from any Rata except one that I'm happy for Dawn to observe or significant beech and shouldn't need to disturb any significant root systems.

4. The trail avoids most open areas of bluffs shown on Dawns maps and stays above most bluffs where possible ib the spill from the road construction.

5. Many areas marked for blasting may be done with a rock breaker rather than blasting. Not sure if this makes a difference but could be worded as general rock breaking rather than all blasting.

6. Existing tracks can be used where possible as approved by heritage.

7. Suggest sediment control is just where running water is present (rather than the whole track)

8. The line round the 7 Mile Peninsula looks high. Not sure if this is my line or Owen Hale's (DOC; Ranger Heritage and Visitors). There are 3 main bluffs on this section. Only 1 is major but Owen knows the way through (as do I). I'll attach my latest gps file for this line. Hoping to use the Doc approval for this as I found a few of their flags where I walked. **[NSN Response: updated route received 14/11/2023 inserted into Plates; assessment of adjusted trail alignment has not changed the outcomes of this assessment].**

9. Happy with all the management suggestions

9 References

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Acknowledgements

Aerial photographs have been sourced from Google Earth Pro and the suppliers of the Open-Source imagery can components of that platform including Data SIO, NOAA, US Navy, NGA, GEBCO.

Historical Photographs have been sourced from retrolens.nz and licensed by LINZ CC-BY 3.0.

Appendix 1 Lizard Expert NZ – Herpetological Report

Appendix 2 Species recorded within the proposed trail corridor.

Species recorded within the proposed trail corridor

Conservation Status per de Lange et al. (2018)
Trail Section 1 = Sunshine Bay to Seven Mile Creek; 2 = Seven Mile Recreation Reserve; 3 = Wilson Bay to Twelve Mile Delta Recreation Reserve; west – west of the Twelve Mile boat ramp; east – east of the Twelve Mile boat ramp

Species	Common name	Conservation Status	Location			
			Trail Section			
Trees & Shrubs			1	2	3W	3E
Aristotelia serrata	Wineberry	Not threatened	■		■	■
Carpodetus serratus	Putaputaweta	Not threatened	■	■	■	■
Coprosma ciliata		Not threatened			■	
Coprosma dumosa		Not threatened				■
Coprosma linariifolia		Not threatened	■	■		■
Coprosma lucida	shining karamu	Not threatened	■	■	■	■
Coprosma propinqua	Mingimingi	Not threatened	■	■	■	■
Cordyline australis	Cabbage tree	Not threatened	■	■	■	■
Coriaria arborea	tree tutu	Not threatened	■	■	■	■
Coriaria sarmentosa	tutu	Not threatened	■			
Corokia cotoneaster	Korokio	Not threatened	■	■	■	■
Dracophyllum longifolium	inaka	Not threatened				■
Fuchsia excorticata	kotukutuku, tree Fuchsia	Not threatened	■		■	■
Fuscospora cliffortioides	mountain beech	Not threatened	■	■	■	■
Fuscospora fusca	Red beech	Not threatened	■		■	■
Gaultheria antipoda	bush snow berry, fool's beech	Not threatened	■		■	■
Griselinia littoralis	broadleaf, kapuka, papauma	Not threatened	■	■	■	■
Helichrysum lanceolatum		Not threatened		■		■
Ileostylus micranthus	Green mistletoe, pirita	Not threatened	■			■
Leptecophylla juniperina subsp. juniperina	Prickly mingimingi	Not threatened	■	■	■	■
Leptospermum scoparium	manuka	At-Risk: declining	■	■	■	■
Melicytus ramiflorus	Mahoe	Not threatened	■	■		■
Metrosideros umbellata	Southern rātā	Threatened: Nationally vulnerable	■	■		
Myrsine australis	red matipo	Not threatened	■	■		■
Olearia avicenniifolia	Mountain akeake	Not threatened		■		■
Pittosporum tenuifolium	kohuhu / black matipo	Not threatened	■	■	■	■
Podocarpus laetus	mountain tōtara	Not threatened	■			
Pseudopanax colensoi var ternatus	Three-finger	Not threatened			■	■
Pseudopanax crassifolius	Lancewood	Not threatened	■	■		■
Pseudowintera colorata	red horopito	Not threatened	■			
Schefflera digitata	Pate, seven finger	Not threatened			■	■
Sophora microphylla	kowhai	Not threatened	■	■		■

Veronica salicifolia	koromiko	Not threatened				
Herbaceous - monocots						
Astelia fragrans	Bush Lily/ kakaha	Not threatened				
Libertia ixioides	mikoikoi, NZ Iris	Not threatened				
Phormium tenax	swamp flax	Not threatened				
Grass - Native						
Poa colensoi	blue tussock	Not threatened				
Climbers						
Clematis paniculata	white clematis	Not threatened				
Muehlenbeckia australis	pohuehue	Not threatened				
Parsonsia heterophylla	New Zealand jasmine	Not threatened				
Rubus cissimbrioides	bush lawyer	Not threatened				
Rubus schmidelioides	Tataramoa, bush lawyer	Not threatened				
Ferns *(CMS – Appendix 7 – Nationally iconic species)*						
Adiantum cunninghamii	Common maidenhair fern	Not threatened				
Asplenium flabellifolium	butterfly fern	Not threatened				
Asplenium gracillimum	hen and chicken fern	Not threatened				
Austroblechnum lanceolatum	Lance fern/ nini	Not threatened				
Cranfillia fluviatilis	Creek fern, kiwakiwa	Not threatened				
Parablechnum minus	swamp kiokio	Not threatened				
Polystichum richardii	prickly shield fern	Not threatened				
Polystichum vestitum	punui, prickly shield fern	Not threatened				
Pteridium esculentum	bracken, rarauhe	Not threatened				
Zealandia pustulata	hound's tongue, kowaowao,	Not threatened				
Moss						
Austrolycopodium fastigiatum		Not threatened				
Fungi						
Corpinellus sp.	common gilled mushrooms					
Introduced species						
*Agrostis capillaris	browntop					
**Anthoxanthum odoratum*	Sweet vernal					
**Buddleja davidii*	buddleia	Otago RPMP – OOI CMS Table A6.2 pest				
**Circium sp.*	thistle					
**Convolvulus arvensis*	Convolvulus	Otago RPMP – OOI				
**Cotoneaster coriaceus*	late cotoneaster					
**Crataegus monogyna*	hawthorn	Otago RPMP – OOI CMS Table A6.2 pest				

**Cytisus scoparius*	wild broom	Otago RPMP 2019 CMS Table A6.2 pest				
**Digitalis purpurea*	foxglove					
**Hedera sp.*	Ivy					
**Larix decidua*	larch	CMS Table A6.2 pest				
**Lupinus polyphyllus*	Wild Russell lupin	Otago RPMP 2019				
**Eucalyptus*	Gum tree					
**Leycesteria formosa*	Himalayan honeysuckle	CMS Table A6.2 pest				
**Malus sp.*	apple					
**Pinus sp.*	conifer					
**Pinus sylvestris*	Scots pine	CMS Table A6.2 pest				
**Populnea alba*	White poplar					
**Rosa rubiginosa*	briar	Otago RPMP - OOI				
**Rubus fruticosus agg.*	blackberry	CMS Table A6.2 pest				
**Salix cinerea*	grey willow	Otago RPMP - OOI CMS Table A6.2 pest				
**Salix fragilis*	crack willow	Otago RPMP – OOI CMS Table A6.2 pest				
**Ulex europaeus*	gorse	Otago RPMP 2019				

"RPMP – OOI" – Otago Regional Pest Management Plan (2019) Organism of Interest (Appendix 1)
Otago RPMP -
CMS Table A6.2 – Pest Plants

Avifauna

Species recorded and or likely to be present, including migratory species. Introduced species are indicated with an asterix (*)
Conservation status per Robertson et. al., (2021)

Species	Common name	Conservation Status
*Acanthis cabaret**	Lesser redpoll	
Anthornis melanura	Bellbird | Korimako	Not threatened
*Carduelis carduelis**	European goldfinch	
Circus approximans	Australasian harrier	Not threatened
*Chloris chloris**	European greenfinch	
Chrysococcyx lucidus	Shining cuckoo | Pīpīwharauroa	Not threatened
Gerygone igata	Grey warbler | Riroriro	Not threatened
Eudynamys taitensis	Long-tailed cuckoo | Koekoeā	Threatened: Nationally vulnerable
Falco novaeseelandiae	New Zealand falcon | Kārearea	Threatened: Nationally vulnerable
*Fringilla coelebs**	Common chaffinch	
Hemiphaga novaeseelandiae	Kereru | New Zealand pigeon	Not threatened
*Hirundo neoxena**	Welcome swallow	
Microcarbo melanoleucos	Little pied shag	At-Risk: Relict
Mohoua novaeseelandiae	Brown creeper | Pīpipi	Not threatened
Nestor meridionalis	New Zealand kaka	At-Risk: Recovering
Ninox novaeseelandiae	Ruru | Morepork	Not threatened
*Passer domesticus**	House sparrow	
Petroica macrocephala	Tomtit | Miromiro	Not threatened
Phalacrocorax carbo	Black shag	At-Risk: Relict
Prosthemadera novaeseelandiae	Tūī | Tui	Not threatened
*Prunella modularis**	Dunnock	
Rhipidura f. fuliginosa	NZ fantail | Pīwakawaka	Not threatened
*Turdus merula**	Eurasian blackbird	
*Turdus philomelos**	Song Thrush	

Zosterops lateralis	Silvereye | Tauhou	Not threatened

Herpetofauna

Species recorded and or potentially present (+)

Oligosoma mccanni	McCann's skink	
Oligosoma chionochloescens n. sp. (+)	Tussock skink	New species split from *O.* aff *polychroma*
Woodworthia "south-western large"	south-western large gecko	At-risk: declining
Woodworthia "Cromwell" (+ but unlikely)	Kawarau gecko	At-risk: declining

Invertebrate fauna

Species recorded and or potentially present (+)
Conservation Status – stick insect - per Buckley et al. 2016; https://nztcs.org.nz/nztcs-species/33943

Tuberolachnus salignus	Giant willow aphid	Introduced
Niveaphasma annulatum (+)	Stick insects	Not threatened

Appendix 3: Assessment Criteria Tables – EIANZ Guidelines

Source: Roper-Lindsay et.al., (2018) Ecological Impact Assessment (EcIA) EIANZ Guidelines for use in New Zealand: terrestrial and freshwater ecosystems; 2nd Edition May 2018;

Table 4 Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/habitat/community.

Matters	Attributes to be considered
Representativeness	Criteria for representative vegetation and aquatic habitats: • Typical structure and composition • Indigenous species dominate • Expected species and tiers are present • Thresholds may need to be lowered where all examples of a type are strongly modified Criteria for representative species and species assemblages: • Species assemblages that are typical of the habitat • Indigenous species that occur in most of the guilds expected for the habitat type
Rarity/distinctiveness	Criteria for rare/distinctive vegetation and habitats: • Naturally uncommon, or induced scarcity • Amount of habitat or vegetation remaining • Distinctive ecological features • National priority for protection Criteria for rare/distinctive species or species assemblages: • Habitat supporting nationally Threatened or At Risk species, or locally[19] uncommon species • Regional or national distribution limits of species or communities • Unusual species or assemblages • Endemism
Diversity and Pattern	• Level of natural diversity, abundance and distribution • Biodiversity reflecting underlying diversity • Biogeographical considerations – pattern, complexity • Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation
Ecological context	• Site history, and local environmental conditions which have influenced the development of habitats and communities • The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (from "intrinsic value" as defined in RMA) • Size, shape and buffering • Condition and sensitivity to change • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material • Species role in ecosystem functioning – high level, key species identification, habitat as proxy

Table 5 Factors to consider in assigning value to terrestrial species for EcIA

Determining factors	
Nationally Threatened species, found in the ZOI either permanently or seasonally	Very High
Species listed as At Risk – Declining, found in the ZOI, either permanently or seasonally	High
Species listed as any other category of At Risk, found in the ZOI either permanently or seasonally	Moderate
Locally (ED) uncommon or distinctive species	Moderate
Nationally and locally common indigenous species	Low
Exotic species, including pests, species having recreational value	Negligible

Table 6. Scoring for sites or areas combining values for four matters in Table 4.

Value	Description
Very High	Area rates High for 3 or all of the four assessment matters listed in **Table 4**. Likely to be nationally important and recognised as such.
High	Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or Area rates High for 1 of the assessment maters, Moderate for the remainder. Likely to be regionally important and recognised as such.
Moderate	Area rates High for one matter, Moderate and Low for the remainder, or Area rates Moderate for 2 or more assessment matters Low or Very Low for the remainder Likely to be important at the level of the Ecological District.
Low	Area rates Low or Very Low for majority of assessment matters and Moderate for one. Limited ecological value other than as local habitat for tolerant native species.
Negligible	Area rates Very Low for 3 matters and Moderate, Low or Very Low for remainder

Table 8. Criteria for describing magnitude of effect (Adapted from Regini (2000) and Boffa Miskell (2011))

Magnitude	Description
Very high	Total loss of, or very major alteration to, key elements/features/ of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature

Table 9. Possible timescales for duration of effects [27]

Permanent	• Effects continuing for an undefined time beyond the span of one human generation (taken as approximately 25 years)
Long term	• Where there is likely to be substantial improvement after a 25 year period (e.g. the replacement of mature trees by young trees that need > 25 years to reach maturity, or restoration of ground after removal of a development) the effect can be termed 'long term'
Temporary	• Long term (15-25 years or longer – see above) • Medium term (5-15 years) • Short term (up to 5 years) • Construction phase (days or months)

Table 10. **Criteria for describing level of effects** (Adapted from Regini (2000) and Boffa Miskell (2011))

Ecological Value ▸ Magnitude ▾	Very high	High	Moderate	Low	Negligible
Very high	Very high	Very high	High	Moderate	Low
High	Very high	Very high	Moderate	Low	Very low
Moderate	High	High	Moderate	Low	Very low
Low	Moderate	Low	Low	Very low	Very low
Negligible	Low	Very Low	Very low	Very low	Very low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

Table 11. **Extent of adverse effects of a proposal** (from QP website, Feb 2014)

Nil Effects	No effects at all
Less than Minor Adverse Effects	Adverse effects that are discernible day-to-day effects, but too small to adversely affect other persons
Minor Adverse Effects	Adverse effects that are noticeable but that will not cause any significant adverse impacts
More than Minor Adverse Effects	Adverse effects that are noticeable that may cause an adverse impact but could be potentially mitigated or remedied
Significant Adverse Effects that could be remedied or mitigated	An effect that is noticeable and will have a serious adverse impact on the environment but could potentially be mitigated or remedied
Unacceptable Adverse Effects	Extensive adverse effects that cannot be avoided, remedied or mitigated

Appendix 4 Photographs - Habitats Traversed by Proposed Trail

Photo 1: Very steep terrain view above WP367 – 368 view of slope west of the Arawata Track carpark on Glenorchy Road.

Photo 2: Steep terrain with Southern rata present on the mid-slope near the trail alignment, WP358. West of the Arawata Track carpark on Glenorchy Road.

Photo 3: Variable vegetation cover, very dense to open conditions within the Broadleaved low forest. WP 350

Photo 4: Mature Fuchsia excorticata (c.400mm DBH) between Arawata Track and the Five Mile Creek (WP 348)

Photo 5: Beech Forest on flat bench east of Five Mile Creek (WP186)

Photo 6: Five Mile Creek Gorge where bridge required. Red beech – Mountain beech either side.

Photo 7: Broom and felled conifers west of the tailings habitat; west of Five Mile Creek. The proposed trail alignment flagging is visible. An opportunity to enhance the habitat is obvious at this site. Mapped as Shrubland/ Rocky habitat.

Photo 8: Tailings east of Seven Mile Creek surrounded by broom and rocky shrubland

Photo 9: Mature Fuchsia excorticata with a reasonable route through them. WP341 west of Five Mile Creek.

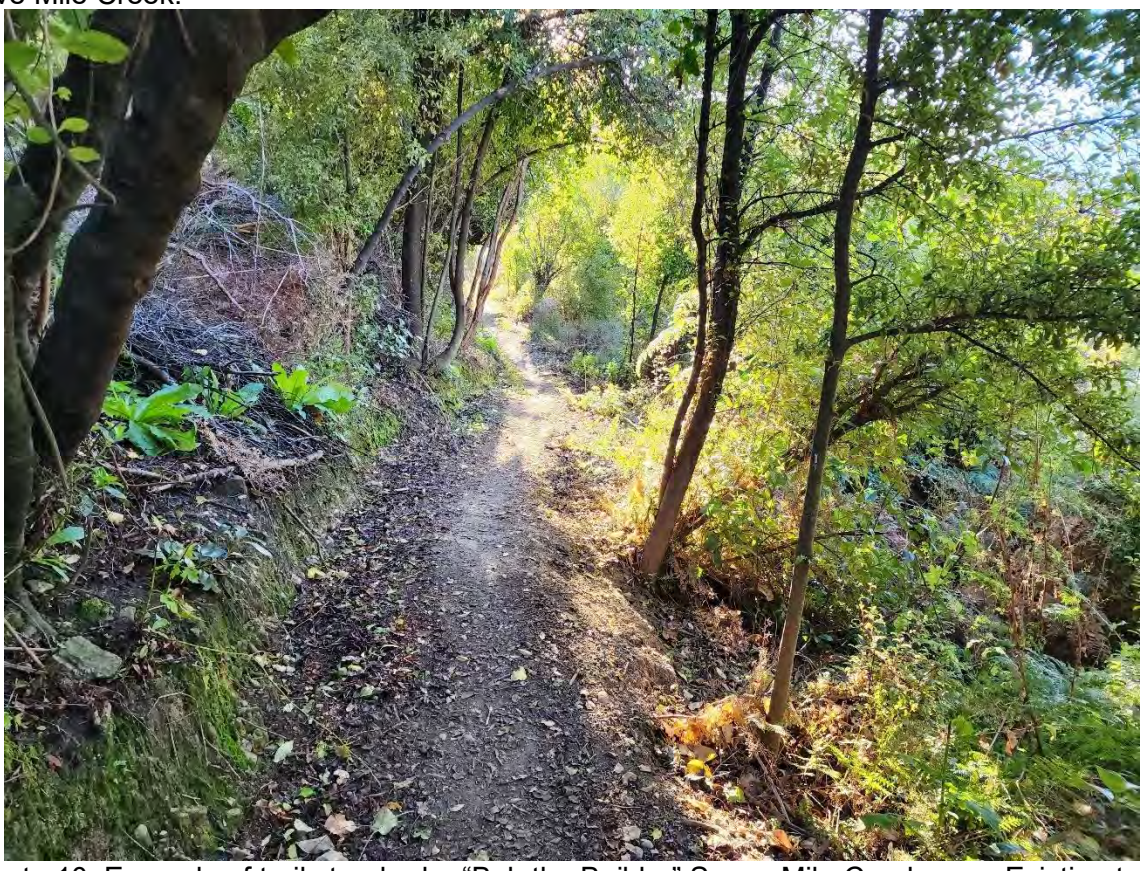

Photo 10: Example of trail standard – “Bob the Builder” Seven Mile Creek area. Existing trail.

Photo 11: View of Seven Mile Peninsula between WP374 – 375 towards WP 456 higher on slope where trail traverses; area degraded by conifer felling.

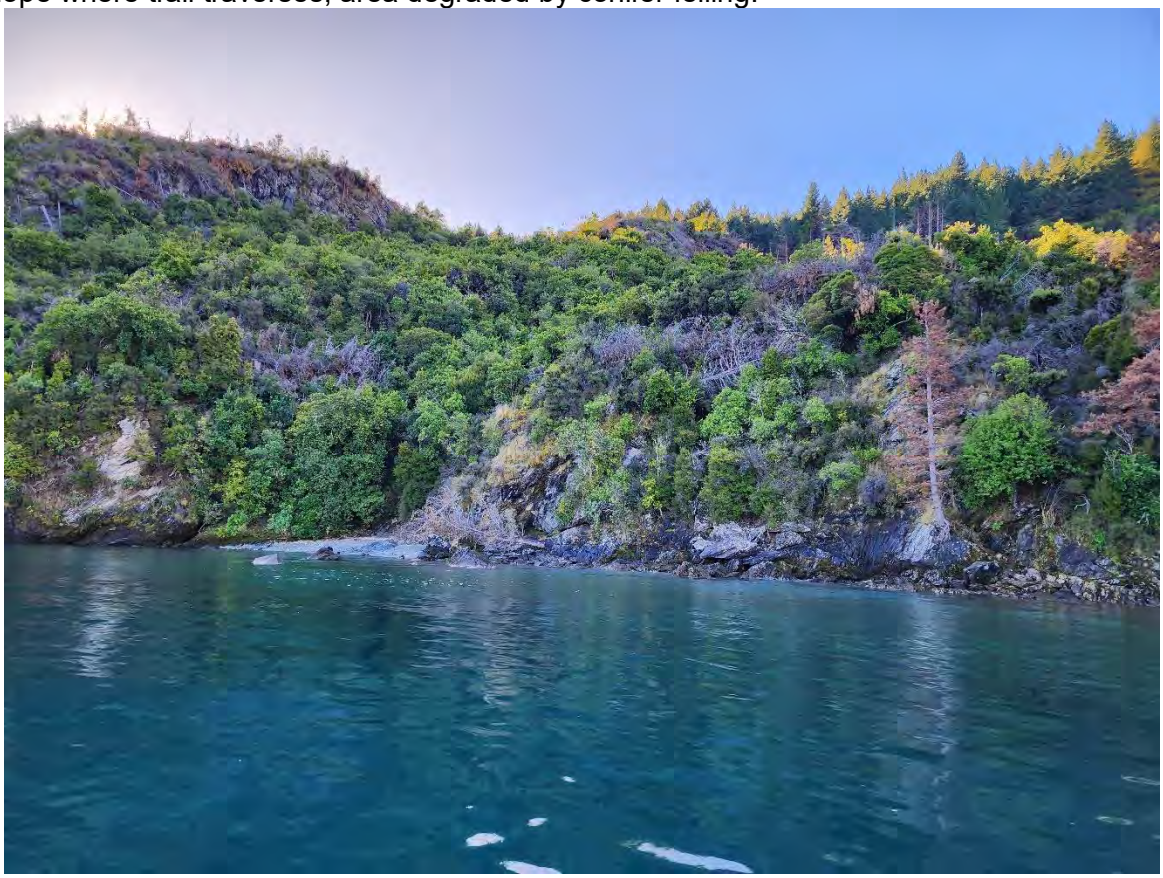

Photo 12: View of Seven Mile Recreation Reserve/ Peninsula at WP378; the proposed trail traverses the slope along the boundary between the broadleaved forest and the felled conifers on the left of this view.

Photo 13: Dense lianes (vines) between Wilson Bay and Un-named Creek - WP309

Photo 14: Dense lianes (vines) between Wilson Bay and Un-named Creek – WP310

Photo 15: Red beech – Mountain beech canopy dieback at Un-named Creek between Wilson Bay and Twelve Mile Delta (WP321)

Photo 16: Benched rock wall track (WP333) west of the un-named creek which drains into the ground emerging below the benched track and rock retaining.

Photo 17: view west from WP333 west of Un-named creek/ ephemeral gully between Wilson Bay and Twelve Mile Delta.

Photo 18: Eucalyptus on bench at western end of trail near Twelve Mile Carpark (WP281)