Remarkables Ski Area Upgrade and Doolans Expansion - Terrestrial Ecological Impact Assessment

e3 Scientific

NZSki Limited

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Remarkables Ski Area Upgrade and Doolans Expansion
Terrestrial Ecological Impact Assessment

Prepared by e3Scientific Limited for NZSki Limited

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

EXECUTIVE SUMMARY

NZ Ski Limited (NZSki) is seeking consent under the Fast-track Approvals Act 2024 to expand the existing Remarkables Ski Area into the adjacent Doolans Basin. The proposal includes the installation of a new gondola, ski trail, access road and upgrades to existing infrastructure.

The Project is located in the subalpine and alpine environments of the Upper Rastus Burn and Doolans catchments and will require earthworks and associated vegetation and habitat clearance of approximately 15.94 ha.

The Ecological Impact Assessment documents the ecological values of the Project area and characterises the effects on flora, vegetation, invertebrate, lizard and avifaunal values. The investigations undertaken to understand the ecological values were undertaken over two fieldwork campaigns in the summers of 2024/25 and 2025/26. This work has culminated in the preparation of detailed botanical, vegetation and fauna descriptions that have been used to support an assessment of impacts on the ecological values directly and indirectly disturbed by the construction and operation of the proposed ski field. In summary the ecological values within the footprint of the Project area include:

- A total of 12 vegetation communities have been described including three wetland communities.
- A total of 247 indigenous plant species have been recorded in the project area with one species listed as Threatened – Nationally Endangered, 34 species listed as 'At Risk' and a further 38 listed as Regionally At Risk, Data Deficient or Regionally Threatened.
- One or more plant species listed as either Nationally/Regionally At Risk or Threatened are present in all 12 vegetation communities.
- NZ pipit, listed as 'At Risk – Declining' and Eastern falcon, listed as 'Threatened – Nationally Vulnerable' are present within both the Rastus Burn and Doolans catchments.

- The Not Threatened McCanns skink is the only lizard species recorded in the Project Area.
- A diverse invertebrate assemblage of ground dwelling and flying invertebrates has been recorded with a total of 120 distinct taxa from 15 Orders and 64 Families.
- In total, 24 invertebrate species were either unclassified or classified as Data Deficient, At Risk, or Threatened.

All of the vegetation communities contain ecological values that are significant under assessment criteria set out in National, Regional and Territorial Policy documents and District Plans.

Understanding the ecological values of the Project area have been integral in the design of the project with the direct disturbance of wetlands being reduced through design to slightly over 2000 square metres. Detailed engineering consideration has also ensured that direct disturbance is as low as possible.

In addition to characterising ecological values, the impact assessment includes detailed geospatial analysis of the Remarkables Ecological District (ED) in an attempt to understand the areal extent of the vegetation communities across the ED. This work enabled the project to contextualise the extent of the proposed vegetation and habitat loss within the ED. The assessment found that the percentage loss is greatest for high altitude cushionfields (0.94%) with the loss less than 0.3% of the remaining communities.

Ecological effects remain unavoidable in a project such as this where clearance of high and very high value vegetation and habitat is required. A detailed range of measures have been employed and recommended to minimise effects and include:

- Designing of the access road, temporary access tracks to the gondola towers, ski trails and base buildings avoid wetlands as much as possible;
- Ensuring hydrological connection of wetlands is maintained;
- Translocation of At Risk and Threatened plant species;
- Surveys being conducted to identify any nesting bird species within or directly adjacent the disturbance footprint, establishing exclusion zones and translocation measures where required and appropriate.

- Rehabilitation of exposed ground (predominantly access road batter slopes) with vegetation removed from neighbouring areas;
- Implementation of weed monitoring and control measures;
- Implementation of an erosion and sediment control plan.

Notwithstanding the recommendations above, based on the EcIA guidelines Moderate to High residual ecological effects are expected to occur within the ED as a result of the proposed development. The following characterises these ecological effects. The following characterises these ecological effects:

- Direct alteration of 13.46 ha of indigenous vegetation assessed as experiencing a Moderate level of residual effect (all vegetation communities excluding Disturbed vegetation and Snowbank, where no residual effects are expected).
- Fragmentation of indigenous vegetation in the Rastus Burn is assigned a Moderate level of residual effect.
- Fragmentation of indigenous vegetation in the Doolans is assigned a High level of residual effect as the vegetation remains largely intact.
- Sedimentation of wetland communities is assigned a Moderate level of effect even when erosion and sediment controls are implemented.
- A Moderate level of effect on falcon based on a slight change to habitat conditions with respect to a pipit (bird of prey).
- A High level of effect on pipit below 1,700 metres in the Doolans.
- A Moderate to High level of effect of habitat loss on invertebrates.
- Construction noise effects are assigned as Moderate on eastern falcon, NZ pipit and kea and Moderate to High for invertebrates.

Code of Conduct

The author of this report is Liam Salemink-Waldren. I am a Terrestrial Ecologist at e3Scientific Ltd. I have over five years of experience in ecological assessment, monitoring, restoration planning, and conservation management. I hold a Bachelor degree in Environmental Studies from Massey University. I am a full member of Birds New Zealand (Ornithological Society for New Zealand).

The senior review and technical input was undertaken by Glenn Davis. Glenn is the Director and Principal Environmental Scientist of e3Scientific Limited. He has over 25 years' experience in ecological investigations, monitoring, restoration

planning, and environmental management. He holds a BSc in Ecology and MSc in Geography, both from the University of Otago.

The senior review and technical input was also undertaken by Rebecca Teele. She is the Technical Director – Terrestrial Ecology at e3Scientific Ltd. She has over twelve years' experience in ecological assessment, monitoring, restoration planning, and conservation management. She holds a BSc in Ecology with a minor in Statistics, and an MSc with Distinction in Ecology, both from the University of Otago. She is a Certified Environmental Practitioner (CEnvP), a full member of the Environment Institute of Australia and New Zealand, the New Zealand Ecological Society, and Birds New Zealand (Ornithological Society for New Zealand).

We confirm that we have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. This report has been prepared in compliance with that Code, as if it was expert evidence presented in proceedings before the Environment Court. Unless stated otherwise, this report is within our areas of expertise and we have not omitted to consider material facts known to us that might alter or detract from the opinions expressed in this report.

1 Introduction

1.1 Overview

Located approximately 24 km from downtown Queenstown, the Remarkables Ski Area is a popular destination for New Zealanders and international visitors alike. Currently designed to accommodate a maximum of approximately 3,500 skiers per day, demand has regularly exceeded capacity in recent years.

The primary objective of the Remarkables Ski Area Upgrade and Doolans Expansion Project ('the Project') is to provide a world class multi-valley ski area that will attract local and international visitors and cater to both the existing and future visitor demands for ski tourism in the district and region.

To achieve the objective, the Project seeks to upgrade the existing infrastructure within the Remarkables Ski Area and expand the skiable terrain available through an expansion into the adjacent Doolans Basin. The Doolans Basin will be accessed via a newly established gondola and ski trails. At the completion of the Project, the expanded ski field will accommodate up to 6000 skiers per day.

The Project has also been designed to improve the overall resilience of the ski area to the effects of climate change and increasingly variable weather patterns. The Doolans Basin has a heightened ability to retain snow due to its south facing aspect, improving its longer-term resilience to the potential effects of climate change.

NZ Ski Limited (NZSki) is seeking approvals under the Fast-track Approvals Act 2024 to expand the existing Remarkables Ski Area into the adjacent Doolans Basin. The proposal includes the installation of a gondola, ski trail, access road and upgrades of existing infrastructure. The combined area of the direct disturbance associated with terrestrial communities is approximately 15.94 ha.

The area included within the proposed ski field expansion is situated predominantly within the Remarkables Conservation Area. However, activities are also proposed in the Rastus Burn Recreation Area within the existing ski field. The proposed skifield straddles the Queenstown Lakes District and Central Otago District boundaries and is therefore subject to planning provisions within each district.

To facilitate the ski field expansion, earthworks and vegetation clearance will be required to support the installation of ski trails, access roads and the gondola. NZSki commissioned e3Scientific Limited (e3s) to complete studies to characterise the ecological values within the skifield expansion area and undertake an impact assessment of the proposed development activities. e3s has a deep understanding of the ecological values of the Remarkables ski field completing multiple ecological surveys and effects assessments over the last 15 years. The knowledge gained through this work provides a strong foundation for the Ecological Impact Assessment (EcIA).

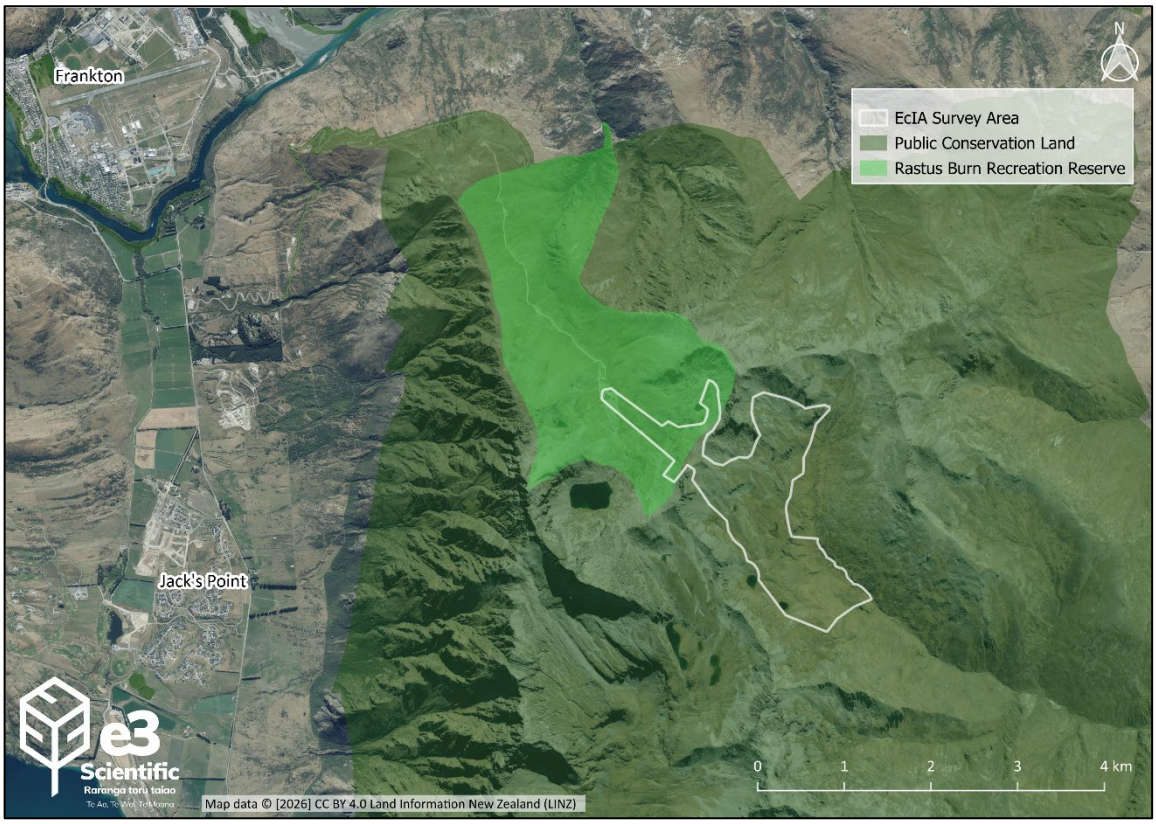

Figure 1: Site Location.

1.2 Project Summary

The Project is located within the Rastus Burn and Doolans Basin, within the wider Remarkables Ranges. The Project broadly falls within three distinct areas:

1. **The existing Remarkables Ski Area and lower Remarkables:** this area includes the existing ski area in the Rastus Burn and the associated Remarkable Ski Area Access Road.

2. **The Doolans Basin Ski Expansion Area:** this area is a new expansion of the existing ski field into the adjacent Doolans Basin.
3. **Lower Car Park Area:** this area includes the existing lower car park adjacent to State Highway 6 and the proposed new areas of car parking located at the foot of the Remarkables, near the Remarkables Ski Area Road access.

For completeness, this assessment only relates to the existing Remarkables Ski Area and the Doolans Basin Ski Area. A separate assessment has been prepared for the Lower Car Park Area.

1.2.1 Existing Remarkables Ski Area Upgrades

The key project works proposed within the existing Remarkables Ski Area are summarised below and include:

- Upgrades to existing infrastructure services and associated structures including upgrades to mains power supply, infield power distribution, water, wastewater, stormwater, communication and snowmaking.
- Expansion of the existing Rastus Burn Base Building and reconfiguration of the arrival surrounds.
- Construction and use of the new Doolans Gondola providing access into the Doolans Basin, including construction of the new Base Station adjacent to the Rastus Burn Base Building and construction of gondola towers, cables and associated infrastructure up to the new Helicopter Ridge Mid station.
- Upgrades to existing and establishment of new access roads and ski trails to provide vehicular access and ski return trails to and from the Doolans Basin.
- Installation of new operational controls to maintain the health and safety of ski field users. Such controls include wayfinding signage, barriers/gates, permanent safety fencing/netting, snow fences, avalanche control, boundary markers.

Refer to the full project description contained in the substantive application for further details and plans relating to the above.

1.2.2 Establishment of the Doolans Basin Ski Expansion Area

The key project works proposed within the Doolans Basin are summarised below and include:

- Establishment and use of the new Doolans Gondola from the Rastus Burn Base Building into the Doolans Basin. The new gondola includes the new Base

Station directly adjacent to the existing Rastus Burn Base Building, the new Helicopter Ridge Mid-station (with a patrol hut), and the new Doolans Return Station directly adjacent (and connected) to the proposed Doolans Cabin Building. It also includes construction of gondola towers, cables and associated infrastructure.

- Establishment and use of a new multi-purpose Doolans Cabin Building, designed to accommodate gondola cabin parking, integrated cabin maintenance, storage, bathroom facilities, café facilities and emergency shelter space.
- Establishment and use of ski trails and access roads between the gondola midstation, the Doolans Cabin Building and associated infrastructure. Where practicable, ski trails and access roads will be co-located to minimise the level of ground disturbance.
- Construction of a learners snowsports area adjacent to the Doolans Cabin Building with a covered passenger conveyor lift, supported by snowmaking infrastructure.
- Establishment of supporting services and facilities in the Doolans Basin, including power, water, wastewater, stormwater, communications and snowmaking facilities.
- Installation of new operational controls to maintain the health and safety of ski field users. Such controls include wayfinding signage, barriers/gates, permanent safety fencing/netting, snow fences, avalanche control, boundary markers.

Refer to the full project description contained in the substantive application for further details and plans relating to the above.

Figure 2: Location of proposed earthworks footprint.

1.3 Scope of the Ecological Report

The ecological assessment is structured as follows:

- Section 2: Sets out the approach to the ecological impact assessment and methods used to characterise the ecological values and impact associated with the proposed skifield expansion.
- Section 3: Provides a review of the environmental context and summarises the existing ecological knowledge based on previous ecological work completed on the Remarkables skifield and in the Doolans catchment.
- Section 4: Details the findings of desktop assessment and field surveys.
- Section 5: Reviews the ecological values with reference to the EIANZ impact assessment guidelines and the ecological significance matters in the QLDC and CODC district plans, the ORC Regional Policy Statement and the National Policy Statement for Indigenous Biodiversity.
- Section 6: Examines the ecological effects of the skifield expansion utilising the methodology set out in the EIANZ impact assessment guidelines.
- Section 7: Sets out a suite of ecological management measures with respect to the mitigation hierarchy and outlines residual effects.
- Section 8: Conclusions and Recommendations.

1.4 Limitations

e3s performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental science profession. No warranties, express or implied, are made. The confidence in the findings is limited by the Scope of Work, and data constraints due to the site visits occurring at one time of year. A full range of biota that are present at this site may not have been seen or recorded; however, desktop research was utilised to aid the assessment.

The results of this assessment are based upon site inspections conducted by e3s personnel, and information provided in scientific literature. All conclusions and recommendations regarding the properties are the professional opinions of e3s personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, e3s assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside e3s, or developments resulting from situations outside the scope of this project.

2 Methodology

The EcIA methodology completed herein follows an industry standard approach and is based on the following work streams:

1. The collation of data from both desktop research and field survey to characterise ecological values.
2. Assignment of the relative importance of ecological values.
3. Impact assessment based on the ecological effects and magnitude of the effect.
4. Review of effects management measures that avoid, mitigate and remediate effects.

We note, the EcIA does not set out offset or compensation measures to address residual effects associated with the ski field expansion. The compensation package is to be informed by ongoing discussions and engagement with the Department of Conservation and mana whenua. This matter is addressed in the Assessment of Environmental Effects prepared by Mitchell Daysh and the associated conditions prepared in association with the approvals sought.

The following section sets out the methods utilised to support the work streams set out above.

2.1 Desktop Review

A review of all existing environmental and ecological information for the Ecological District, the Remarkables skifield and the Doolans catchment was completed. With respect to the environmental context and support a review of ecological values, a range of sources and databases were utilised including:

- Ecological Districts of New Zealand (McEwen, 1987);
- Potential (pre-human) vegetation communities generated by Manaaki Whenua Landcare Research (Landcare Research, 2012);
- Threatened Environment Classification generated by Manaaki Whenua Landcare Research (Landcare Research, 2012);
- New Zealand Department of Conservation Threat Classifications;
- Otago Regional Councils Regional Threat Classifications;

- Botanical information held by the New Zealand Plant Conservation Network (NZPCN, 2026);
- New Zealand Bird Atlas (Cornell Lab of Ornithology, 2025), Herpetofauna database (DOC, Bioweb, 2026) and iNaturalist website (iNaturalist, 2026);
- Walter Peak Conservation Resources Report (DOC, 2015) – largely utilised to provide background information with respect to invertebrates
- Coronet Peak Conservation Resource Report (DOC, 2006) – largely utilised to provide background information with respect to invertebrates.

A significant body of ecological survey and impact assessment work has been undertaken over the last 15 years which has documented ecological values throughout the Rastus Burn Basin. Furthermore, NZSki recognised the need to understand the distribution of ecological values across the ski area and in 2020 and 2021 Neill Simpson from the Conservation Consultancy was engaged to complete ecological assessments of the Rastus Burn and the Upper Doolans areas. These assessments mapped and described the ecological communities within these areas and provided a strong ecological foundation for the impact assessment.

In addition to the reports listed above, botanical lists for the Rastus Burn, Doolans and Wye Creek catchments have been compiled by Neill Simpson over many years of exploration. The botanical lists have formed a very helpful reference database for the survey work.

2.2 Geospatial Analysis

Geographic Information Systems (GIS) were used to perform terrain analysis within the study area and the wider landscape. Ecological mapping was undertaken using data from previous projects and knowledge of the area with the aim of estimating areas of the various vegetation communities that may be disturbed as a result of the project. The terrain analysis was used to identify subsets of each vegetation community, allowing variability to be assessed across factors including aspect, heat and evapotranspiration, slope, and elevation.

2.2.1 Aspect, Elevation, and Slope Analysis

Aspect, elevation, and slope was analysed across both the Upper Doolans and Rastus Burn Catchment utilising 8m and 1m digital elevation model (DEM)

datasets. Figure 3 and Figure 4 present the variability in aspect, elevation and slope across the study area. This information was utilised to account for these three parameters driving biodiversity variability and therefore utilised in the development of the vegetation survey plan.

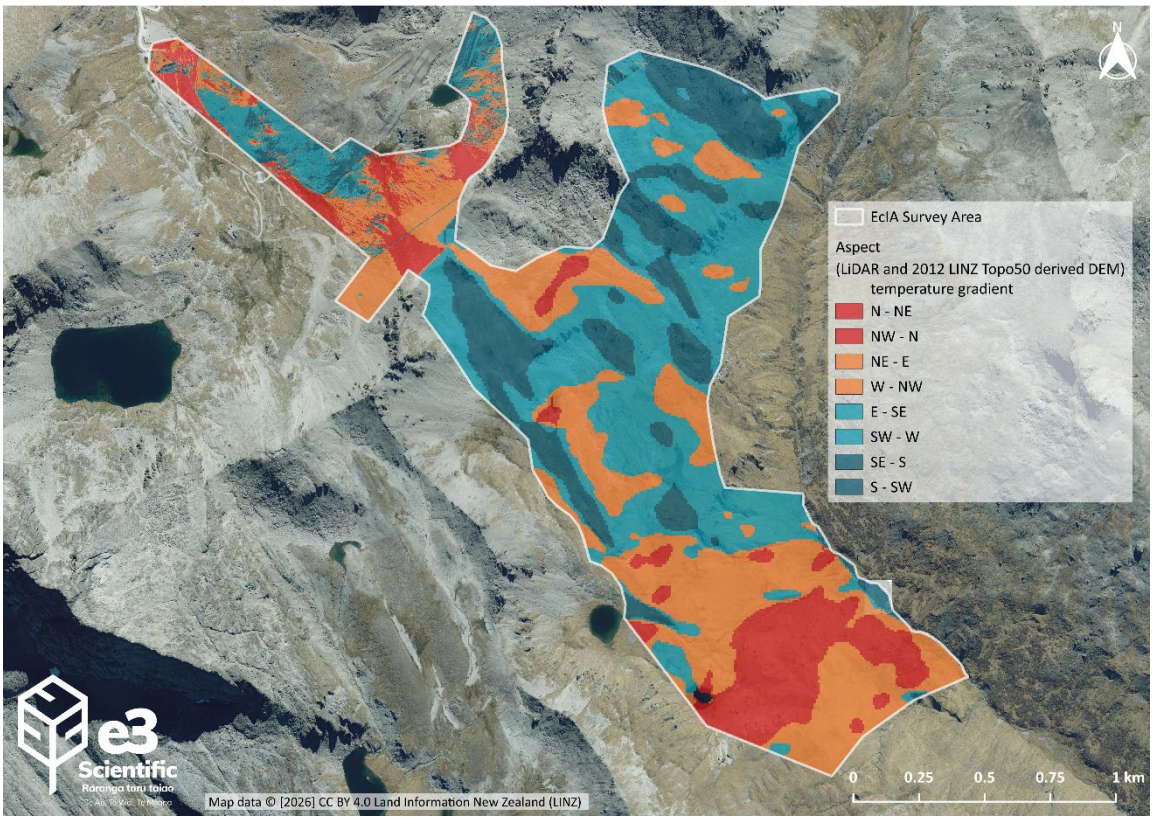

Figure 3: Aspect and elevation analysis.

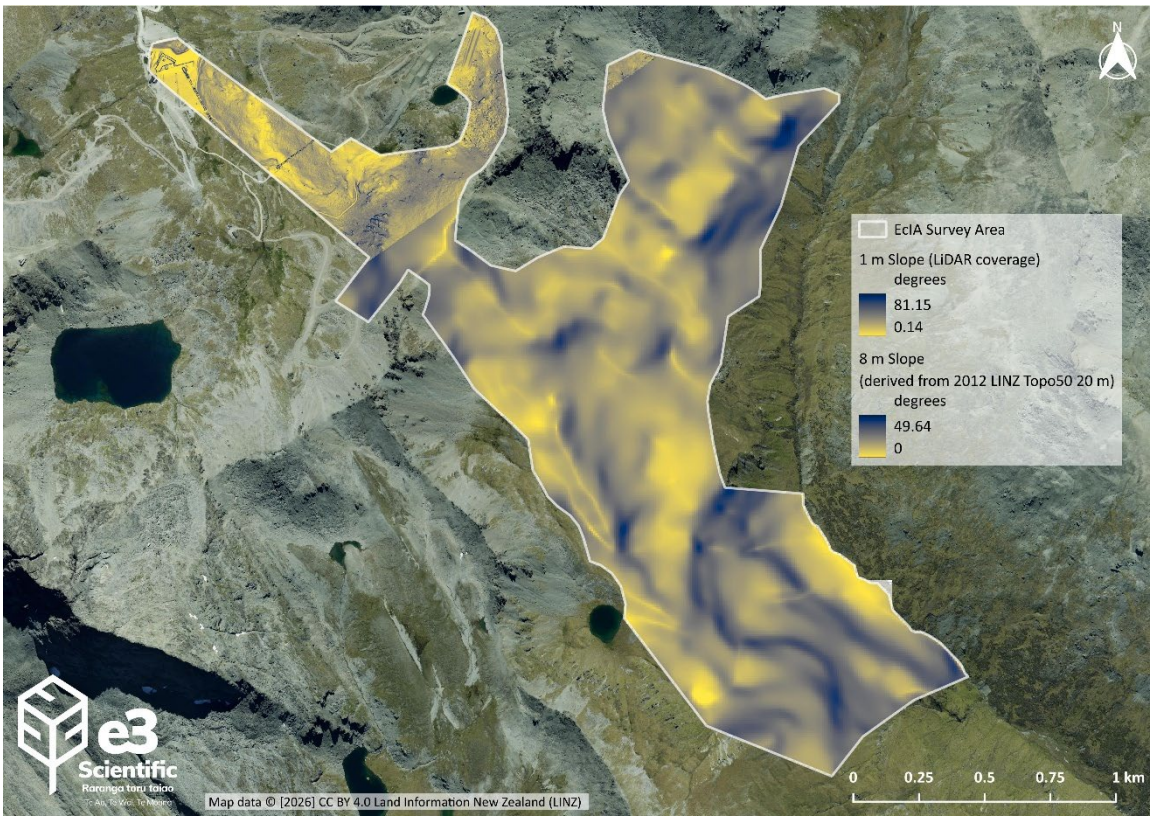

Figure 4: Slope analysis.

2.2.2 Flow Accumulation Analysis

To support wetland mapping across the study area, hydrological analysis was undertaken to model likely flow paths and water accumulation. Both a 1m and 8m Digital Elevation Model (DEM) and a flow accumulation model was run to provide an indication of potential wetland areas (see Figure 5 and Figure 6). For use of the 1m DEM it was coarsened to obtain a 3x3m cell which is more suitable for observing landscape and broad hydrological patterns. The model assumes uniform precipitation across all DEM cells (3x3m or 8x8m) and consistent surface infiltration. e3s notes that the model does not provide a wetness index, instead, dark areas indicate higher potential for water accumulation. These outputs highlight areas that are more likely to contain wetlands or waterbodies but do not confirm their presence.

Although patterns of flow accumulation can be observed in Figure 5 and Figure 6; detailed desktop analysis has been used at a high resolution that is not well represented in the figures and does not accurately reflect outcomes of the analysis undertaken. This work was used to inform wetland delineation site selection and ground truthing, aiding in the survey work detailed in Sections 2.3.2 and 4.1.

Figure 5: Hydrological analysis based upon available 1m DEM[i].

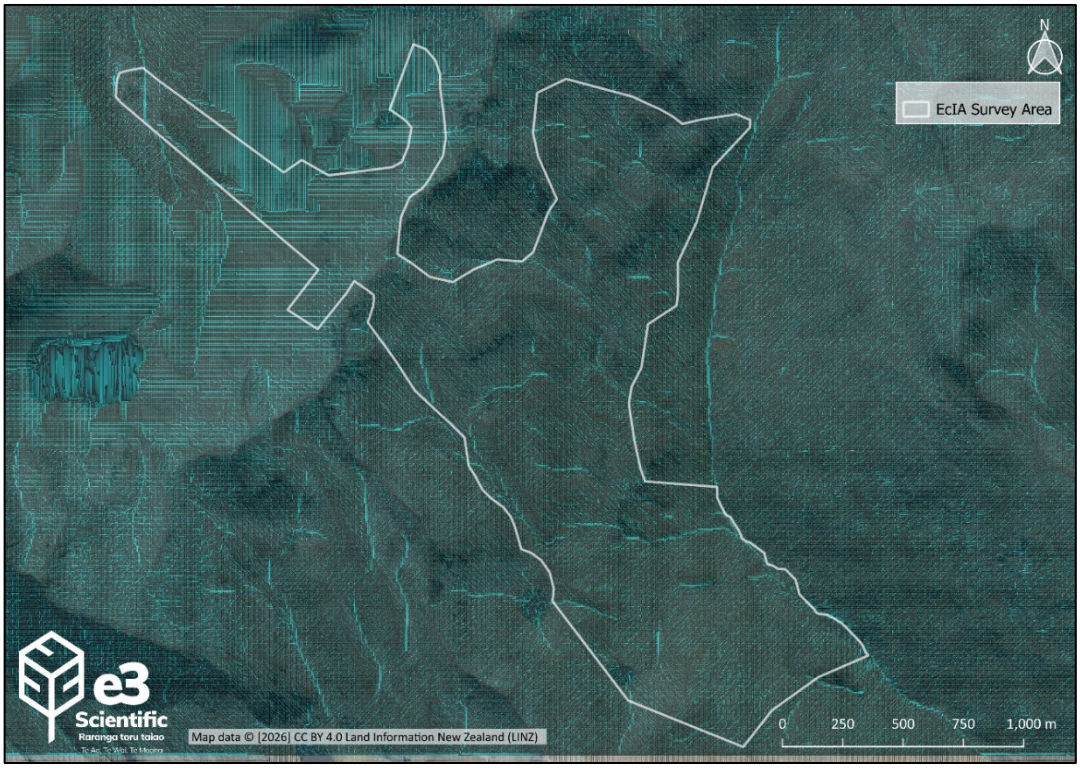

Figure 6: Hydrological analysis based upon available 8m DEM.

[i] Areas of raster cell (flow) accumulation based upon the DEM slope are depicted as intensified colour profiles in Figure 5 and Figure 6 above, representing likely topography driven flow paths.

2.2.3 Estimating the Extent of Ecological Communities Across the Ecological District

To gain an understanding of the magnitude of effect of the ski field expansion, e3s used GIS analysis to understand the extent of ecological communities in the sub alpine and alpine zones in the Remarkables Ecological District (containing the Remarkables Range and Tapuae-o-Uenuku/Hector Mountains). The GIS analysis involved employing a Random Forest (RF) classification mapping methodology to map all vegetation above 1100m elevation (38,343 ha).

The elevational cutoff of 1100m asl was used within the Ecological District as this represents the natural height at which comparable vegetation communities are present within the wider ED. Analysis showed that the natural tree line fluctuates from approximately 900 to 1200 m asl with greater heights being rarer in occurrence. As such, adopting the height of 1100 m asl provides an accurate yet conservative assessment (ensuring the impacts are not understated) of the areal extent of vegetation communities present in the Ecological District.

Fieldwork data that identified and delineated vegetation types within the project area was used as training data for the RF model. There were 12 vegetation types identified and used for the RF model. Additionally, two freshwater ecosystems (tarns and waterways) were identified and mapped in order to provide reference data so that they would not be incorrectly characterised into one of the vegetation classes. This said, waterways could not be accurately differentiated from all wetland types within the RF analysis. As such, totals have been calculated to ascertain how much of the projected vegetation cover is contained within the larger RF class. As the waterways are fundamentally a freshwater ecosystem and do not support terrestrial species the effects of the area loss have not been considered within this assessment. Not all vegetation types were equal in area size; to counter this a balanced RF model was used to make all classes equal within the model. If left unbalanced the model skews results with the higher areas of vegetation taking over smaller area vegetation masses. The vegetation and freshwater ecosystem types and total area of the training data is shown in Table 1.

Table 1: Training data from Remarkables vegetation survey used for RF model and how each type was categorised using Singers and Rogers classification.

Vegetation type	Singers & Rogers Classification	Area (ha)
Snow tussock grassland	AL1	396.94
North facing tussock grassland	AL1	170.19
Dracophyllum scrub	VS7	18.51
Cushionfield	AH2	152.65
High alpine cushionfield	AH2	11.8
Cushion bog	WL9	8.09
Riparian wetland	WL9	5.79
Seepage	W17	88.68
Waterways	Not classified	7.81
Tarn	Not classified	5.13
Rockfield	AH2.2	335.76
Rocky outcrops	AH2	56.96
Snowbank	AH2	0.21
Disturbed	Not classified	54.59

The training data was vectorised and aligned with the Otago 0.3 m Rural Aerial Photos (2017-2019) from Toitū Te Whenua (LINZ) to generate class labels. Aerial imagery from 2025 is available but does not cover the complete Area of Interest (AOI). The extent of the labelled training dataset is shown in Figure 7.

Figure 7: Training data extent for environmental classification of Ecological District above 1100 m asl.

The imagery's RGB bands were reshaped into feature vectors, and only pixels within training polygons were used to fit a balanced RF model. The model was then applied to the imagery in a tiled workflow to avoid memory issues, producing two outputs: a classified raster representing the most likely vegetation class for each pixel, and a confidence raster indicating the model's certainty in its predictions. The confidence raster does not represent a statistical measure of mapping accuracy, but rather the level of agreement among the decision trees within the RF model for each classification. Higher confidence values reflect stronger consensus among trees, while lower values indicate greater uncertainty or ambiguity between classes.

The classified RF model output was visually assessed for real-world accuracy. Some classes were misidentified by the model and were manually corrected to the appropriate class. The model produced edge effects along the eastern and southern boundaries of the 1100m extent. These artifacts are attributable to: (1) the chunked sampling methodology used to manage memory constraints during training, and (2) spatially clustered training data concentrated in the northwestern portion of the analysis extent, which limited the model's ability to learn spectral signatures for minority classes across the full study area. Model accuracy could be improved by distributing training polygons more evenly across the entire analysis extent, increasing the size and number of training samples for underrepresented classes, and incorporating additional predictor variables such as slope and aspect derived from a digital elevation model.

The classified raster was assigned the Singers & Rogers classification. Raster cells were used to calculate the total coverage for each unit, which is provided in Table 2 and mapped in Figure 8.

Table 2: Total area of vegetation communities (Singers and Rogers, 2014) above 1100 metres within the Remarkables Ecological District.

Singers & Rogers Classification	Vegetation Type	Area (ha)
AL1 - Narrow-leaved and slim snow tussock grassland	Snow tussock grassland	10082.58
VS7 – *Dracophyllum rosmarinifolium* scrub	Scrub	3769.22
AH2 - *Dracophyllum muscoides* cushionfield	Cushionfield	3102.55
AH2 - Rockfield (denoted as AH2.2 in Figure 8)	Rockfield	11133.57
WL9/WL17 – Cushionfield/*Schoenus pauciflorus* sedgeland	Wetland	6885.62
Unclassified	Disturbed vegetation	2639.86
Unclassified	Tarn	1115.57

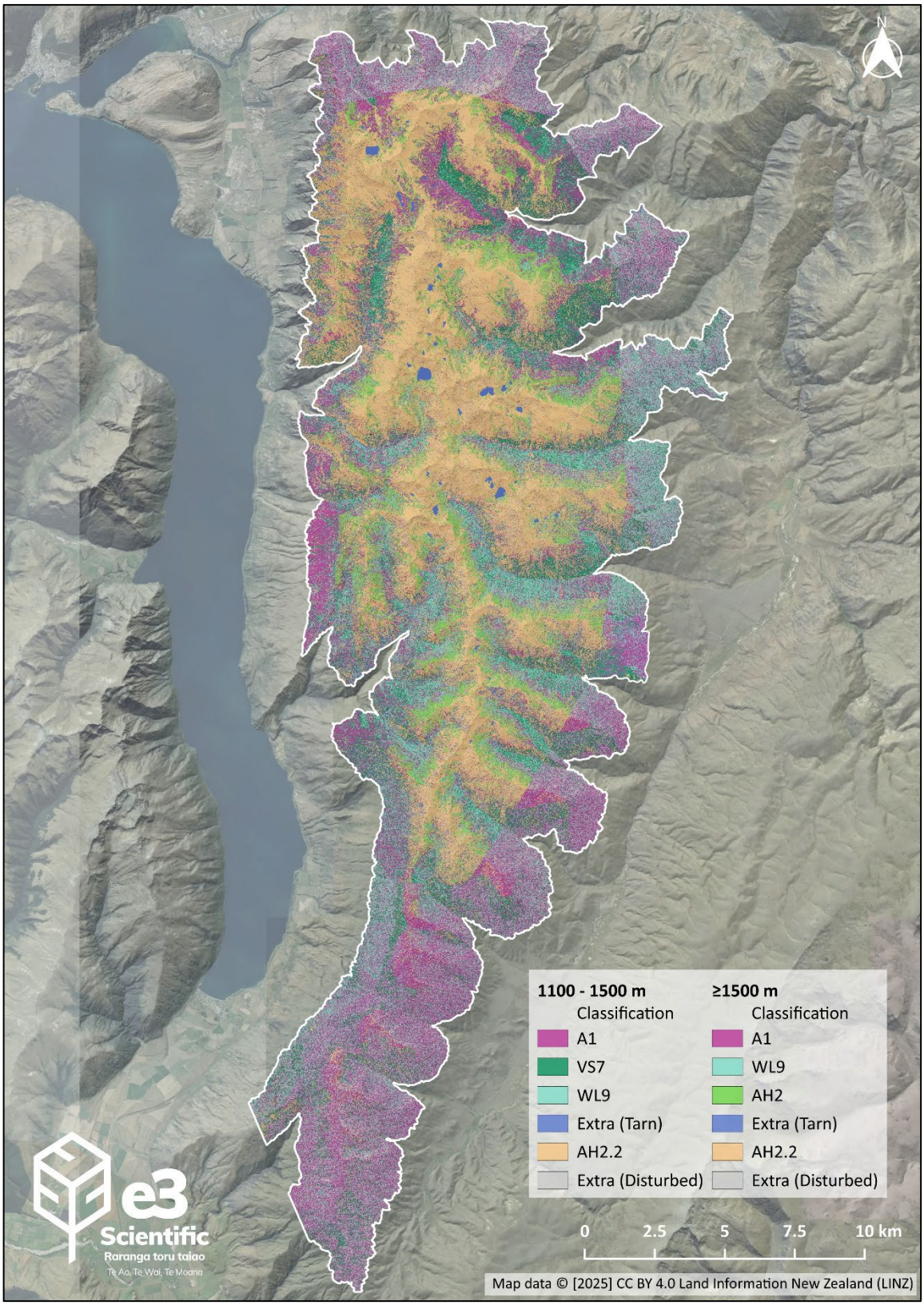

Figure 8: Environmental classification for Ecological District above 1100 m asl.

2.3 Vegetation Field Surveys

The following sections set out the methods utilised for the field survey of floristics, vegetation, avifauna and invertebrates.

2.3.1 Vegetation Survey

A total of one-hundred and five 2 x 2 metre vegetation quadrats were surveyed across all described vegetation communities within the study area between 30 January to 7 February 2025 and 20 January to 12 February 2026. The work took a total of 10 field days. Within each quadrat, all plant species present in and around the plot were recorded. Species present within the quadrat were assigned an abundance value based on their relative cover, using a method designed to be easily replicable by different personnel. Abundance categories are as follows[ii]:

1) Less than 1 % total cover;
2) 2-5 % total cover;
3) 6-25 % total cover;
4) 26-50 % total cover;
5) 51-75 % total cover; and
6) Greater than 75% total cover.

Each species within the quadrats as well as any additional species located outside the quadrat but within an approximate radius of 10 m were recorded with their relative abundance noted as either locally common or locally scarce with respect to each quadrat. A species was considered locally common if five or more plants were observed during an approximate five-minute search around the plot. Species observed four or fewer times were considered locally scarce. Recording species outside the quadrat assisted in confirming whether the quadrat was representative of the wider vegetation community and in describing the full species assemblage within each community.

[ii] Scores total cover takes into account occurrence in different strata. Therefore, the total vegetative cover can sum to greater than 100% total cover.

Figure 9: Location of vegetation quadrats.

Rare plant assessments were also conducted along all walked routes between the 30 January to 31 March, 2025 and 13 January to 12 February, 2026 for At Risk or Threatened plant species (de Lange, et al., 2024). The routes covered a distance of greater than 380 kilometres within and adjacent the boundaries of the study area (see Figure 12). This allowed small or isolated populations to be recorded, providing greater context to the distribution of nationally rare species within habitat comparable to the study area.

2.3.2 Wetland Assessment

Assessment of the presence of inland natural wetlands (as defined under the NPS-FM (Ministry for the Environment, 2020) was undertaken following the methods outlined in MfE's Wetland Delineation Protocols (2022). Two methods of determining wetland presence/absence were utilised and are described below. Each utilised the New Zealand wetland plant indicator status ratings 2021 (Clarkson, Fitzgerald , Champion, Forester , & Rance , 2021), and the Munsell Soil Color Charts (Munsell Color, 2010).

Rapid vegetation tests

Rapid vegetation tests were undertaken in sites of conclusively wetland vegetation (sites containing all OBL[iii], and FACW[iv] dominant species). Where this occurs, more detailed vegetation, soils and hydrological analysis are not required. Notwithstanding this point, to provide additional confidence in the rapid vegetation assessment, brief descriptions of the soil and hydrological characteristics were recorded at many of the sites. In total, 45 rapid vegetation tests were completed with 10 of the sites also being the location of the vegetation survey analysis described in Section 2.3.1.

Vegetation Quadrat Analysis

Where sites displayed upland characteristics or where the vegetation composition was less conclusive (areas with one or more dominant species being classified as FAC, FACU, UPL, or are not classified with an indicator status), rapid vegetation tests are not appropriate. In these locations the New Zealand Wetland Delineation Data Forms were completed utilising the respective vegetation, soils

[iii] Obligate species. Almost always is a hydrophyte, rarely in uplands (estimated probability >99% occurrence in wetlands).

[iv] Facultative Wetland species. Usually is a hydrophyte but occasionally found in uplands (estimated probability 67–99% occurrence in wetlands).

and hydrology tools, categorising each location as either wetland or upland utilising the Wetland Delineation Protocols Assessment Metrics (see Figure 10). As the vegetation observed at each strata was all located within the herb strata a 2 x 2 m vegetation quadrat was completed as per the Assessment Protocols (Ministry for the Environment, 2022). In total, 44 vegetation quadrats were undertaken, with the following information collected at each site:

- Total vegetation cover of each species within the quadrat area (where overlap of different vegetation heights occurred this sometimes resulted in a percentage cover of greater than 100%);
- Determination of a pass/failure of the dominance test and prevalence index for each site's vegetation;
- Observation of hydrological indicators (including but not limited to, the water table height, reduced iron, geomorphic position, surface cracking, water marks and oxidation along rootlets);
- Observation of hydric soil indicators (including but not limited to, the Munsell soils colour profile, soil consistency, soil drainage, colour mottling, and parent material).

The characteristics identified in each of the assessment criteria enabled e3s to assess the status of each location as either wetland or upland.

Quadrats were completed in various vegetation types with replicates completed across various aspects, elevation and slope to account for biological variability driven by physiognomic attributes. It is noted that where highly comparable areas (displaying similar soil, hydrological and vegetative characteristics) were located in close proximity to assessment sites, additional assessments were not completed. The location of the vegetation survey quadrats are shown in Figure 11.

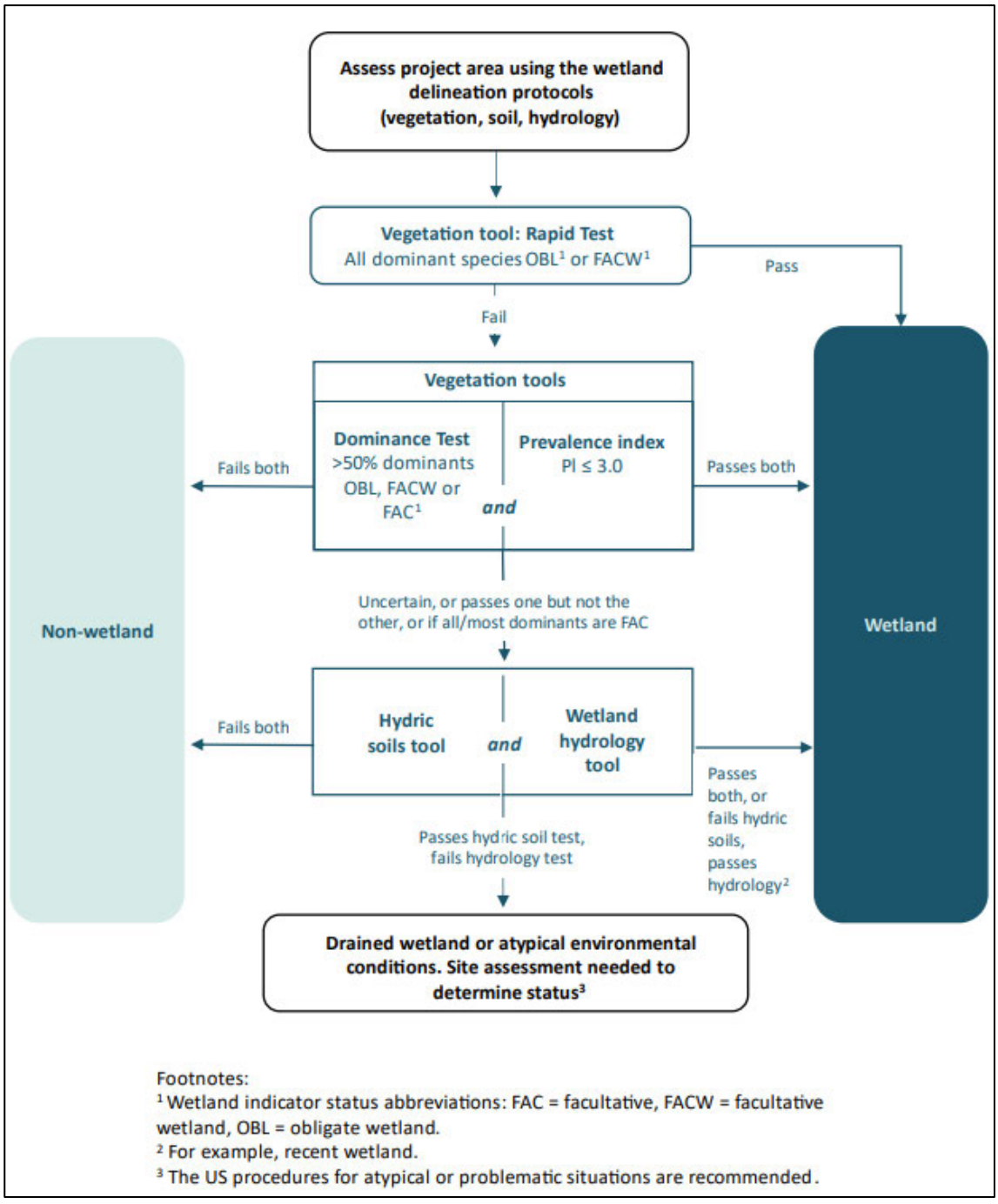

Figure 10: Wetland Delineation Protocols Assessment Metrics (Ministry for the Environment, 2022.).

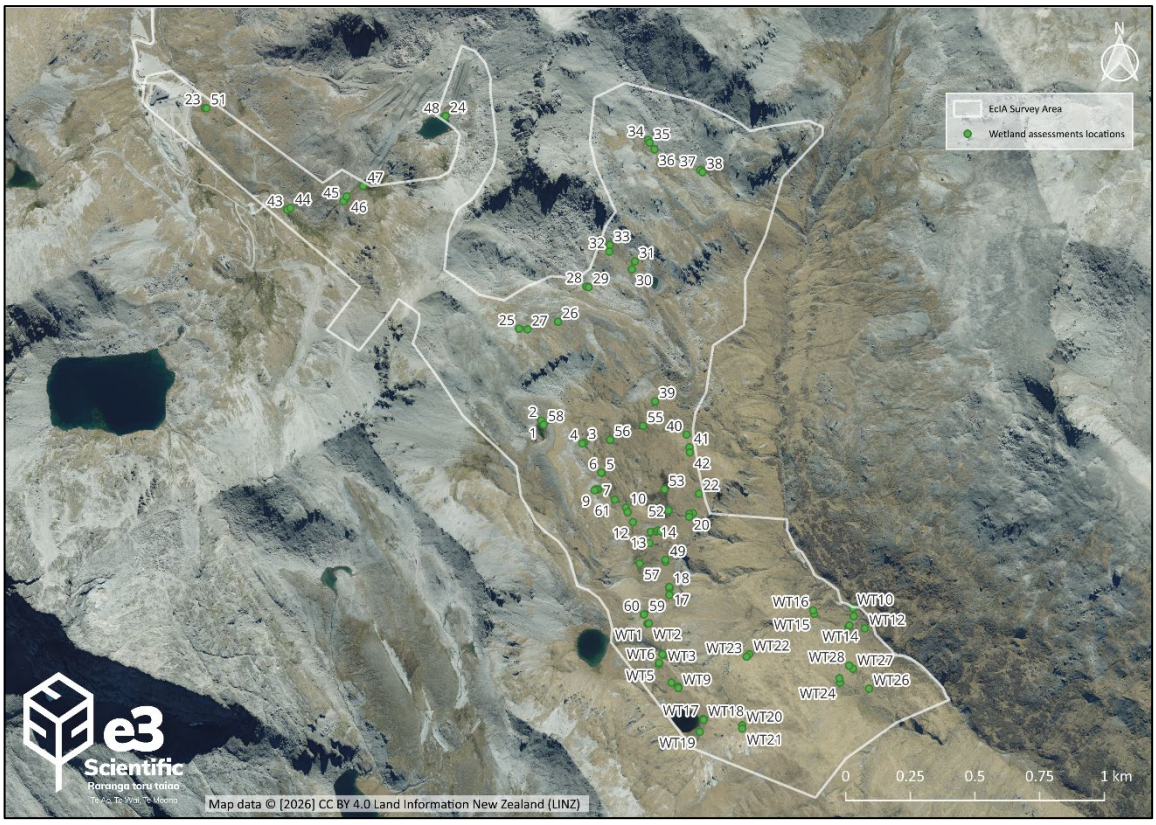

Figure 11: Wetland assessment locations.

Determination of wetland boundaries

Quadrat/rapid test assessments were often undertaken along transects and in close proximity to one another to delineate the boundaries between wetland and upland sites. Following the characterisation of wetland and upland sites, mapping of the wetland boundaries was undertaken. This was achieved through walking the boundary of complex wetland areas with a handheld GPS, use of GIS analysis and mapping physical attributes observed in both historic and recent aerial imagery.

Limitations

The New Zealand wetland plant indicator status ratings 2021 (Clarkson *et al.*, 2021) has assessed the more well known wetland species within the alpine environment, however a large number of species that occur within drier (upland sites) have not yet been classified and as such cannot be used to assess the vegetation against the dominance test and prevalence index without getting bias from the other species. Therefore, where species within a specific area did not meet the requirements for applying the rapid vegetation tool, e3s undertook a more detailed assessment of the hydrology and hydric soils criteria.

In the case of *Chionochloa macra* (which is highly comparable to *Chionochloa rigida* and occupies similar ecological conditions), its high abundance throughout the study area led e3s to provisionally assign a wetland rating of Facultative Upland (FACU) to support delineation.

2.4 Fauna Surveys

2.4.1 Herpetofauna Survey

The GIS-based terrain analysis enabled systematic stratification of 66 Gee's minnow trap locations across all vegetation communities, altitude bands, and aspects likely to support lizard populations. Across the 2024/25 and 2025/26 lizard active seasons, a total of 5,470 trap-days were completed. Manual habitat searching was also undertaken. The survey of lizards and the associated Assessment and Lizard Management Plan (LMP) is detailed within a separate report (e3Scientific, 2026e). Refer to the LMP for further detail.

2.4.2 Avifauna Survey

Avifauna surveys were completed between the 30 January and 31 March 2025 and 13 January to 12 February 2026. Monitoring included designated 5-Minute Bird Counts (5mbcs), dawn and dusk surveys, and general observations during all field work.

The 5mbc were completed at all vegetation quadrats (observing all adjacent areas) on the 30th, 31st (January 2025), 3rd, 4th, 5th, 7th (February 2025), 20th, 30th (January 2026), 9th and 12th (February 2026) during fine weather conditions. During each 5mbc, the following was recorded:

- Bird species;
- The number of individuals seen and heard;
- Any behavioural observations (foraging, breeding plumage, age/sex (if possible)); and
- Time spent in different habitat types.

In total, 105 locations were surveyed accounting for approximately 540 observation minutes. All 5mbc surveys occurred between the hours 08:00 and 18:00. The weather conditions during the 5mbcs were fine, with warm temperatures (10-20 °C), clear skies to scattered cloud coverage, and light winds

(less than 10 km/h) with moderate wind gusts (10-30 km). All surveys were completed by suitably qualified and experienced personnel, with extensive experience in these habitat types, skilled in identifying indigenous and exotic avifauna species by sight (aided by binoculars) and sound.

In addition to the 5mbcs, avifauna species encountered while travelling between quadrats and during other fieldwork were recorded. See Figure 12 for all areas tracked within the study area boundaries. For each observation, the location was marked with a GPS waypoint, along with the species, number of individuals and any behavioural observations, consistent with the 5mbc recording methods. This ensured any species not detected during 5mbcs were still documented, providing a more comprehensive understanding of the avifauna species present across the study area.

Furthermore, one hour dawn and dusk surveys (30 minutes before and after sunrise/sunset) were completed from 25 – 27 February 2025, 19-20 January 2026, and 29 January to 1 of February 2026 from central observation points (see Figure 13). This was to observe any crepuscular activity of avifauna species (such as kea (*Nestor notabilis*)) that can be more active during this period.

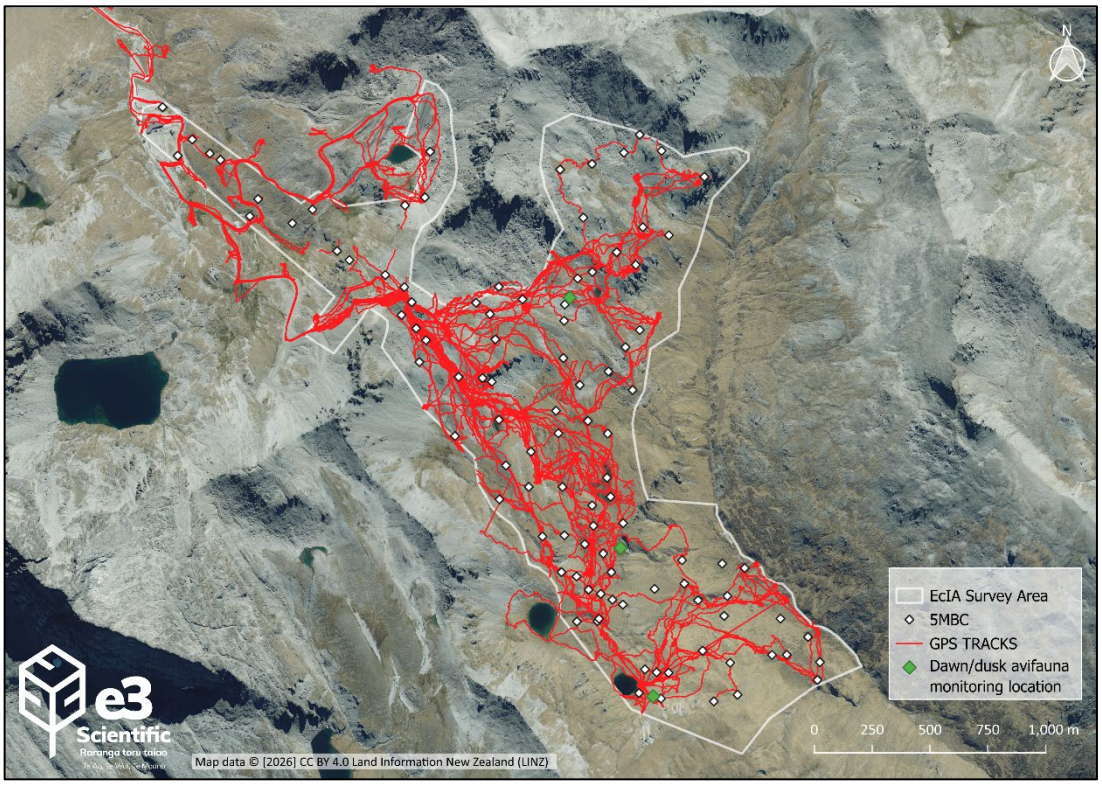

Figure 12: Avifauna assessment locations and all GPS tracks.

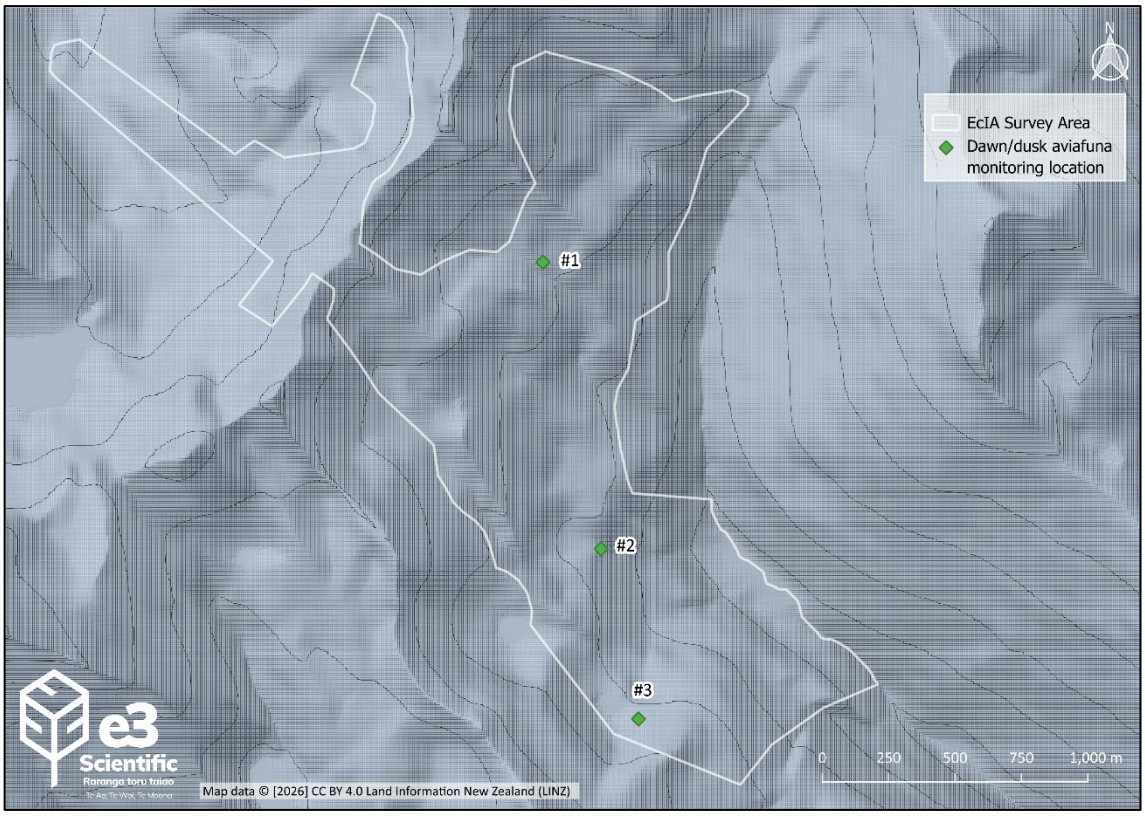

Figure 13: Observation viewpoints.

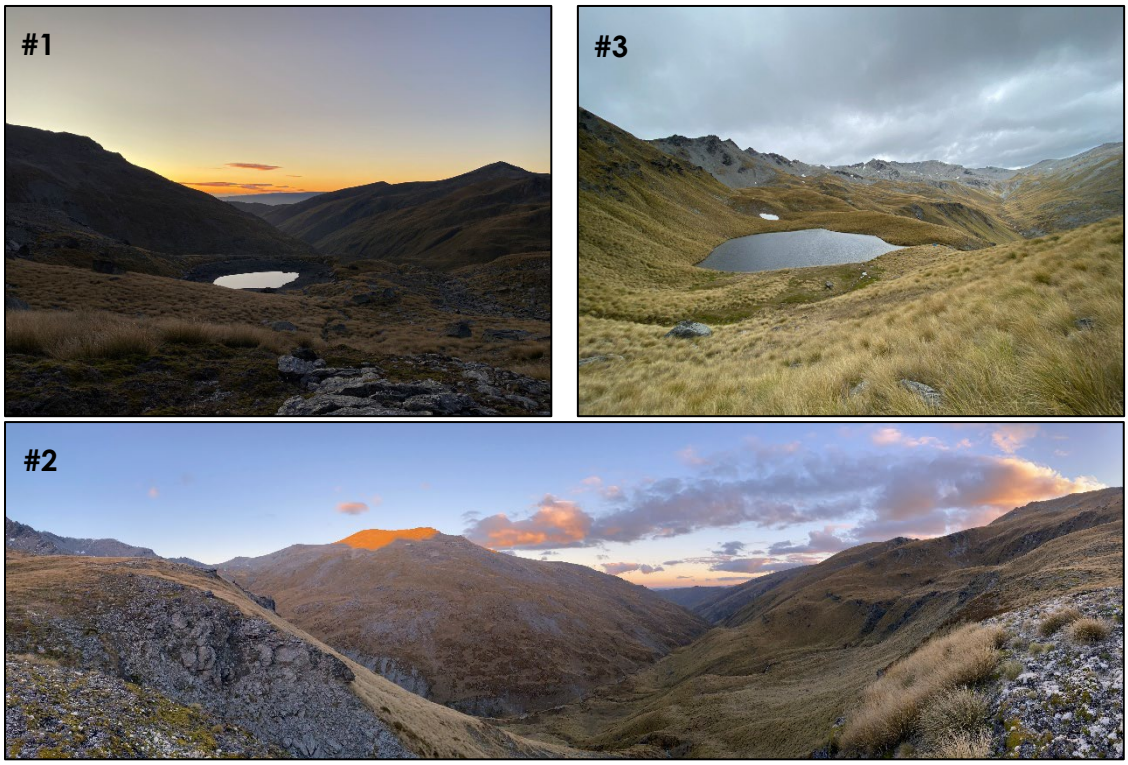

Figure 14: Photographs taken from each respective viewpoint.

It is noted that various exotic passerine and galliform (land fowl) species were observed across the survey locations. This included, Eurasian skylark (*Alauda*

arvensis), chukar (*Alectoris chukar*), common redpoll (*Acanthis flammea*), and yellow hammer (*Emberiza citrinella*). These species may contribute to the ecological value of a community as a food source for predatory birds. Notwithstanding this point, they have not been included elsewhere within the assessment of ecological values.

2.4.3 Invertebrate Survey

Invertebrate sampling was undertaken using three sampling techniques: pitfall trapping, manual sampling, and light trapping. All specimens were collected and identified by Entomologists (including Leptidoptera, Arachnida, and Coleoptera specialists) at Lincoln University.

Pitfall trapping

A sampling plan was designed and implemented to survey all major vegetation communities, across a range of altitudes and aspects. Although some species are host specific (which were targeted in manual collection), other terrestrial invertebrates are predominantly generalists and pitfall locations were selected that were representative of the wider vegetation communities (rather than targeting microsites which were unlikely to provide a representative collection of samples within each vegetation type). A total of 140 pitfall traps were deployed over two field seasons. One hundred traps (25 in the Rastus Burn and 75 in the Doolans) were deployed from the 26 February to the 10th of March 2025, across 20 sampling sites, each containing five pitfall traps. A further 40 traps were deployed within the Doolans between 1300-1500 m from the 19 January to the 1 of February 2026.

Each pitfall trap was dug into the ground so that the pottle lip was flush with the surface of the adjacent ground. Each pitfall trap was then filled with a solution of sodium benzoate ($C_7H_5NaO_2$; to prevent decomposition), fitted with a shelter and a lizard ladder to ensure lizards were not inadvertently harmed. Year 1 (2025) traps were left out for 12 days (11 nights). During this time period, the weather was warm with day temperatures between 13-21 ^{0}C and cooler nighttime temperatures between 1-10 ^{0}C. Wind ranged from light to approximately 40 km/h. One day of rainfall was recorded on the 3rd of February with 3.5 mm of precipitation recorded. The day before traps were deployed, 12 mm of rain was recorded.

Year 2 (2026) traps were left out for 14 days (13 nights). During this period, the weather was warm with day temperatures between 10-18 ^{0}C and cooler

nighttime temperatures between 2-6 ^{0}C. Wind ranged from light to approximately 60 km/h. Four days of rainfall occurred between the 21-24 January with approximately 45 mm of precipitation recorded.

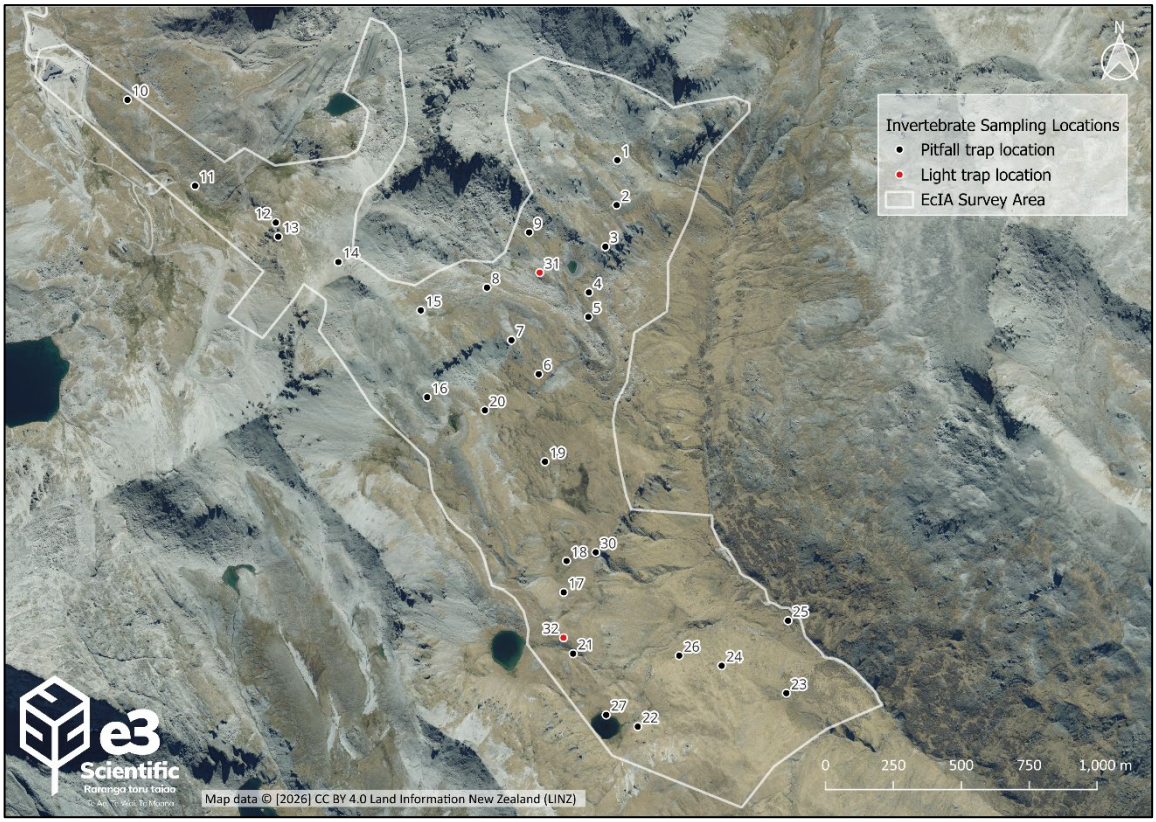

Figure 15: Location of invertebrate traps.

Manual collection

Manual invertebrate collection was undertaken over a period of five days between the hours of 07:00 and 21:30 (25-27th February 2025 and 19-20 January 2026, totalling upward of 50 hours) by an Entomologist. Day conditions were generally favourable with clear skies or scattered cloud, light winds and warm peak temperatures. Collection focused on rare species with particular consideration given to host specific species, day flying moths, and species unlikely to be caught using the pitfall or light trapping methods. In addition, any invertebrates caught during any of the other ecological work completed by e3s ecologists were collected and identified.

Light Trapping

Light trapping was undertaken across three nights on the 25th and 26th of February 2025 and the 19th January 2026, with warm day time temperatures and cooler nighttime temperatures, typical for the alpine environment. The night of the 25th

had less favourable weather conditions (a light breeze), therefore light trapping was only undertaken for one hour between 21:00 and 22:00. The night of the 26th February 2025 and 19th January 2026 both had more favourable weather conditions (no wind) and three and four hours respectively of light trapping was completed between 21:30 and 02:00 until no new species were observed or expected to be drawn in by the light. Moon conditions on both nights were good, with the moon waning at 12 and 6 % illumination on the 25th and 26th of February 2025 respectively and waxing at approximately 1% illumination on the 19th January 2026.

The light trap consisted of a generator powered 200-watt mercury vapour lamp, capable of emitting light up to 12 km in favourable conditions. The light trap was set up at a height approximately one metre above the ground, on a large white sheet. On both occasions, the light trap was located on a prominent ridge visible across large areas of the main Doolans Basin and Doolans Creek Right Branch, and was observable across the full range of terrestrial habitats within the Doolans Basin. The location is shown in Figure 15.

Identification

Prioritisation of the identification of collected invertebrate specimens was undertaken to identify taxa based upon ecological importance within the context of the proposed project. Species level taxonomic identification was completed for potentially rare specimens (Data Deficient, At Risk, Threatened or currently Unclassified) or ecological indicator species. All samples suspected of being one of these species was identified to provide geographic and ecological context to species within the project footprint. Family or Genus level taxonomic identification was completed within groups known to not contain any nationally rare species and where Not Threatened specimens had already been identified to the species level. Additionally, some invertebrates collected were not identified where they were common and Not Threatened species (based on an understanding of their higher taxonomic classification).

Limitations

There were limitations with the invertebrate survey, including weather conditions, time of year, and duration of sampling. Weather conditions, particularly temperature, but also precipitation, humidity, wind and solar radiation, strongly affect invertebrate activity and behaviour, and therefore their likelihood of being observed. The invertebrate surveys were undertaken during the Summer of 2025

and 2026 in weather conditions that were generally calm with mild temperatures. The singular time of year when sampling was undertaken influences the results, as many invertebrates display seasonal patterns and short lifecycles and/or a short active phase. Finally, the duration of sampling limited the chances of recording more uncommon species. To account for these limitations, a review of available literature was undertaken (see Section 2.1) to inform species assemblages for each vegetation community, providing a likelihood of occurrence for species not collected via sampling, based upon available scientific knowledge.

2.5 Ecological Impact Assessment

The assessment of ecological effects for the study area has been completed using the Environment Institute of Australia and New Zealand Ecological Impact Assessment guidelines ((Roper-Lindsay *et al*., 2018), hereafter "EIANZ guidelines"). The impact assessment follows the steps outlined below:

- The ecological values for the study area have been described. These are detailed in Section 4 of this report.
- Ecological values are assigned a score on a continuum scale of Negligible to Very High. These scores are based on an assessment against criteria which are set out in the EIANZ guidelines. The ecological value scores and the rationale are described in Table 9 of this report.
- Determination of the magnitude of the effect that the activity has on the ecological values. The scale of the magnitude also ranges from Negligible to Very High. The magnitude of effect scores are detailed in Section 6 of this report.
- The overall level of effect is then determined by a combination of ecological value and the magnitude of the effect. Level of effect categories include Net Gain, Very Low, Low, Moderate, High and Very High. The level of effect scores are detailed in Sections 6 of this report.
- Where the ecological impacts result in a level of effect greater than low (residual effect) additional mitigation has been provided in Section 7.

3 Existing Environment

3.1 Environmental Context

The majority of the proposed development is located within the Doolans Basin, situated to the south-east of the current ski area. The remaining area of proposed development is located within the Rastus Burn Basin (current ski area).

The subject areas are located within the Remarkables Conservation Area (Doolans Basin) and the Rastus Burn Recreation Reserve within the Remarkables Ecological District of the Lakes Ecological Region (McEwen, 1987). Under the Central Otago District Plan the area is Rural Resource Area. Under the Queenstown Lakes District Plan the existing ski area is zoned Remarkables Ski Area Sub-Zone.

3.1.1 Climate

The Remarkables lies between the wet mountains of the main divide and the very dry climate of Central Otago. The closest rainfall station to the site is at Queenstown Airport which has an average annual rainfall of 757 mm (Macara, 2015). Due to no weather station at the Remarkables, climate data has been sourced from Queenstown Airport Data, NIWA Virtual Climate Station Network (VCN) data and Mt Larkins records. The VCN data was found to be unrealistically similar to Queenstown Airport given the expected effect of elevation on rainfall totals. From this desktop analysis, annual rainfall estimates ranged from 754mm to 1634mm. Annual median rainfalls are mapped on the Grow Otago website as ranging from 1000-1250 mm in the valley and up to 1500 mm on the ridge.

Mean monthly temperature in Queenstown for January is 15.9ºC and for July 3.8º C and at 1500 m on the Remarkables would be about 10ºC to 12ºC lower (Meurk, 1982).

3.1.2 Geology

GNS Science's QMAP compiles regional geological maps at a scale of 1:250,000 (GNS, 2026). The map units for the Remarkables are predominantly the basement schist described as "Well foliated psammitic and pelitic schist with incipient segregation; minor greenschist and metachert; quartz veins common; TZIII (Caples Terrane).". In the Doolans the schist is described as "Interlayered

psammitic and pelitic greyschist; minor greenschist; TZIV (Rakaia Terrane)." There are smaller deposits of glacial till, and alluvial/colluvial material typically in the bottom of gullies or downslope of large scarps described as "Undifferentiated till consisting of variably weathered, generally bouldery angular gravel with minor sand in cirque moraines" and "Loose, commonly angular, boulders, gravel, sand, and silt forming alluvial fans; grades into scree (upslope) and valley alluvium."

The study area has a number of notable geological features resulting from glaciation and erosional processes including rock tors, scree slopes, boulder fields and exposed ridges with gentler slopes and subsequently complex hydrological patterns interlinking the terrain.

3.1.3 Soils

The soils reflect the underlying rock, climate and plant cover. Dunstan steepland orthic brown soils cover 45% of New Zealand and are the dominant soil of the uplands and high country. The soils occur where rainfall is in the region of 600 mm to 1500 mm and ranges from 350 m to 1600 m in altitude (Hewitt, 1993). At higher altitudes and on very steep slopes the soil is classed as Alpine steepland soil. These are often shallow or skeletal soils with much rock. Little to no soil is found on coarse rock surfaces.

3.1.4 LENZ and Threatened Environment Classification

LENZ is an environmental classification developed by Manaaki Whenua Landcare Research (MWLR) that groups the New Zealand landscape into environments with similar soil, landform and climatic attributes. These physical attributes drive biodiversity and ecosystem variation across the landscape and are therefore helpful in understanding geographical extent of New Zealand's ecosystems and biodiversity. The ski area lies within five Land Environments of New Zealand (LENZ) units. The five LENZ units located within the ski field expansion area are depicted in Figure 16. The total mapped area of each unit is provided in Table 3. Overall, the footprint of the proposed ski field expansion will have a very low total area of effect on each of the LENZ units nationally.

Table 3: LENZ Units in the ski area

LENZ lvl4 Unit	Area within New Zealand (ha)	Area within ski field expansion area (ha)	% Disturbance
Q1.1a	100,752	12	0.01
Q1.1c	261,255	2.0	<0.01
Q1.2a	195,531	192	0.09
Q3.3a	74,076	56	0.08

Note: The "area within ski field expansion area (ha)" does not reflect the area of proposed direct disturbance rather it reflects the total area mapped within the study area on Figure 16.

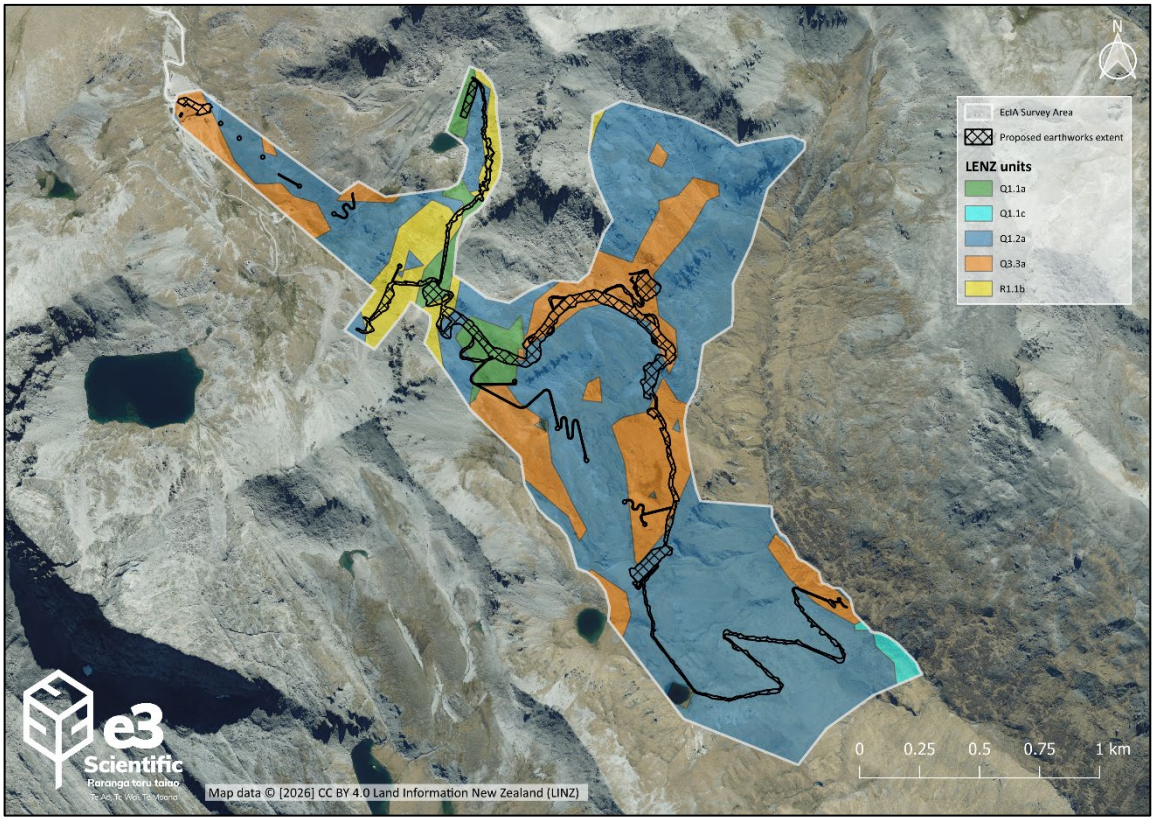

Figure 16: LENZ lvl4 units within ski field expansion area.

In an extension of the LENZ work, MWLR combined LENZ, the landcover database and protected area network to develop the Threatened Environment Classification (TEC) across New Zealand. Based on the combination of these databases the TEC categorised the landscape into 6 threat classes as follows:

- Category 1: <10 indigenous cover left
- Category 2: 10 – 20% indigenous cover left
- Category 3: 20 – 30 % indigenous cover left

- Category 4: >30% indigenous vegetation left, and <10% protected
- Category 5: >30% indigenous vegetation left, and 10-20% protected
- Category 6: >30% indigenous vegetation left, and >20% protected

All areas of disturbance are located within the lowest threat class (Category 6) with greater than 30% of the indigenous vegetation cover left and greater than 20% protected (see Figure 17). This shows on a national basis the environments associated with the ski field expansion area continues to contain relatively high indigenous cover and the associated biodiversity is under less pressure, particularly compared to lowland environments.

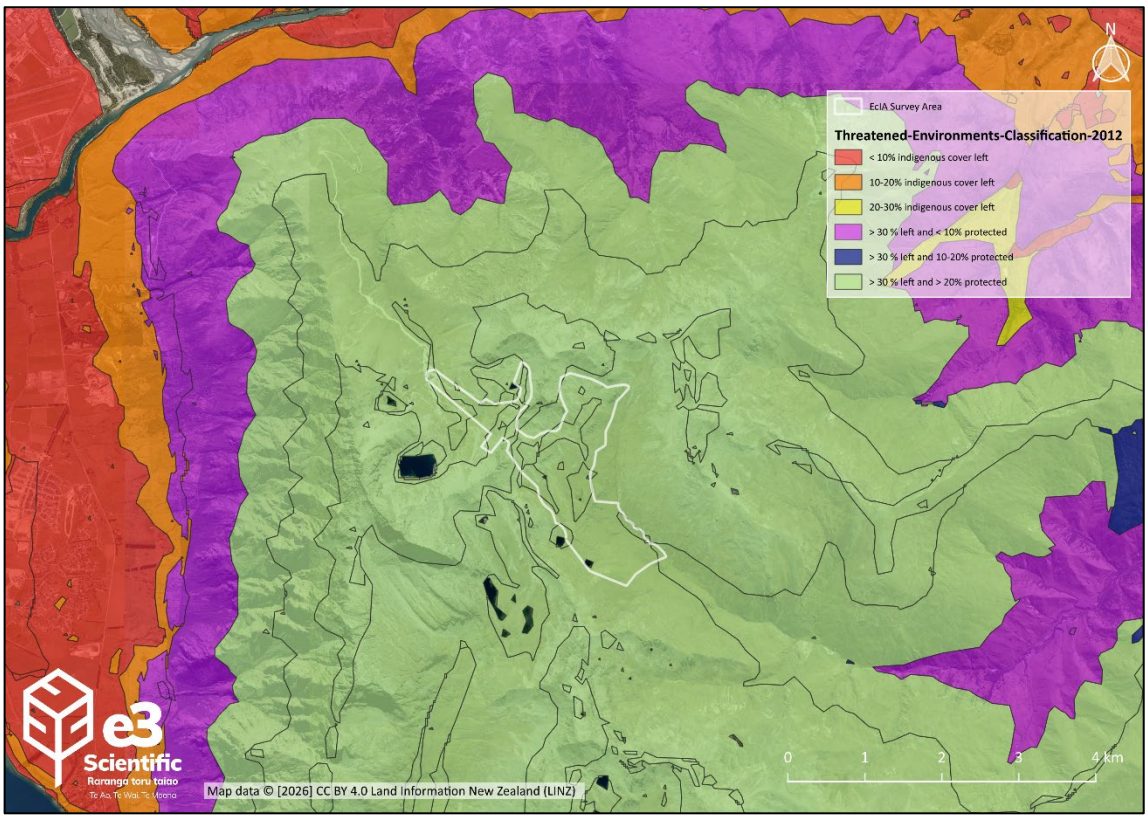

Figure 17: Threatened Environment Classification (Landcare Research, 2012).

3.1.5 Existing Ecological Knowledge

Vegetation

Characterising the vegetation and botanical values of the Rastus and Upper Doolans catchments has been the focus of multiple surveys for research purposes and also to support consent applications associated with development activities on the Remarkables ski field. Most notably are the extensive surveys of the Rastus Burn and Upper Doolans Catchment commissioned by NZSki in 2020. This work was undertaken by local ecologist/botanist Neill Simpson from the Conservation

Consultancy. Mr Simpson prepared detailed botanical descriptions and mapping of vegetation communities (See Figure 18 and 19).

The work previously recorded 247 indigenous species within botanical surveys of the upper Rastus Burn and Doolans catchments. Of the plants recorded, 89 species are either nationally or regionally classified as Data Deficient, At Risk, Threatened or Taxonomically Unresolved. It is noted that a greater survey range was undertaken previously (Simpson, 2021; Simpson, 2018); encompassing additional elevations and highly specialised localities that are not all represented within the study area. As such, it is anticipated that 69 of these identified species are located within the study area based upon known elevational occurrences and habitat preferences. e3s identified a further six species classified as At Risk or Threatened within the study area. Many of the recorded species are highly isolated in occurrence and are potentially not present within the study areas footprint. However, species that were undetected in e3s' 2025 field surveys were attributed to the relevant communities where they are known to occur but are likely to be in very low abundance.

Previous reports and the field work associated with this report identified 13 exotic species that are likely to be present within the study area in low abundance. However, species increase in prevalence as elevation decreases with many more species occurring below the ski field base building.

Fauna

Indigenous avifauna species recorded by e3s in the upper Rastus Burn (above 1600 m asl) and Upper Doolans Catchment include paradise shelduck (*Tadorna variegata*), pipits (*Anthus novaeseelandiae*), eastern falcon (*Falco novaeseelandiae novaeseelandiae*) and harrier hawk (*Circus approximans*). Kea (*Nestor notabilis*) have also been recorded on the Remarkables ski area but are now rarely sighted.

Lizard records were obtained from a desktop assessment and survey work of the study area and directly adjacent habitat over the over the 2024/25 and 2025/26 summers. This work identified only McCann's skink (*Oligosoma maccanni*) within the study area, where it occurs in multiple habitats at lower elevations; however, is only present in North-facing tussock grassland at higher elevations. A Lizard Assessment and Management Plan has been prepared and provides detailed information on lizard habitats, abundance and management (e3Scientific, 2026e).

A suite of taxa from a diverse range of orders (Blattodea, Diptera, Trichoptera, Coleoptera, Opilliones, Hymenoptera, Coleoptera, Craterostigmomorpha, Araneae, Hymenoptera, Plecoptera, Trombidiformes, Hemiptera, Poduromorpha, Trombidiformes, and Lepidoptera) are expected to be present. A number of taxa have been recorded from previous work within the Remarkables ski field. However, are largely restricted to wetland environments or within historic literature. Many species with potential historical distributions overlapping the site species are or have become highly range restricted and may not be present within the Project footprint. It is expected that the invertebrate assessment associated with the EcIA will significantly advance the invertebrate knowledge in the Doolans catchment. Invertebrates with threat status of Data Deficient, At Risk, Threatened or are otherwise Unclassified (but may have a corresponding threat classification if assessed) are depicted in Section 4.3.3. a full list of species identified is presented in Appendix D.

A full suite of pest species are present in the study area including deer, goats, chamois, rabbits, possums, hares, rodents, mice, stoats, ferrets and feral cats.

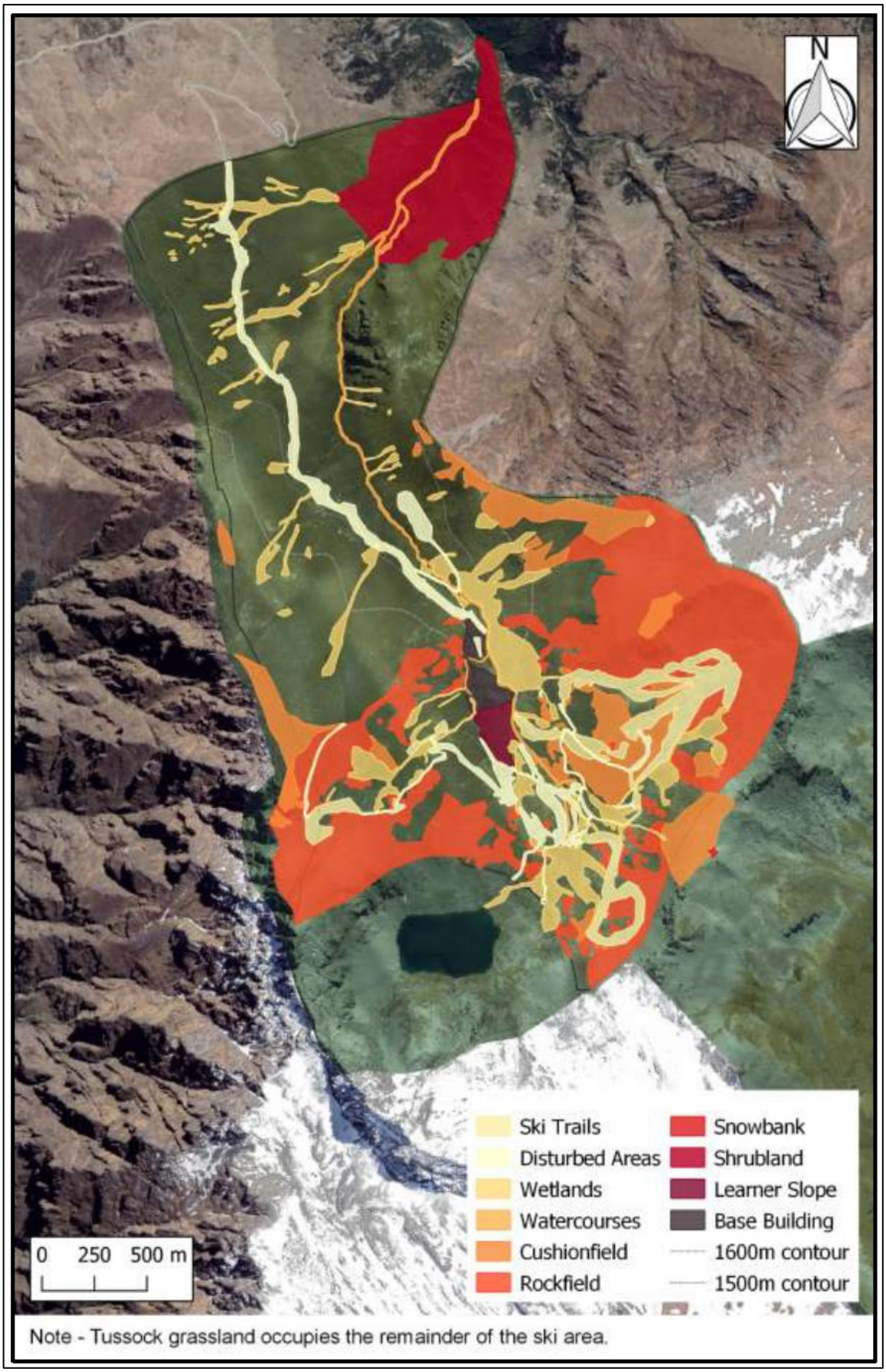

Figure 18: Remarkables Ski field Vegetation Communities mapped by Conservation Consultancy (Simpson, 2018) .

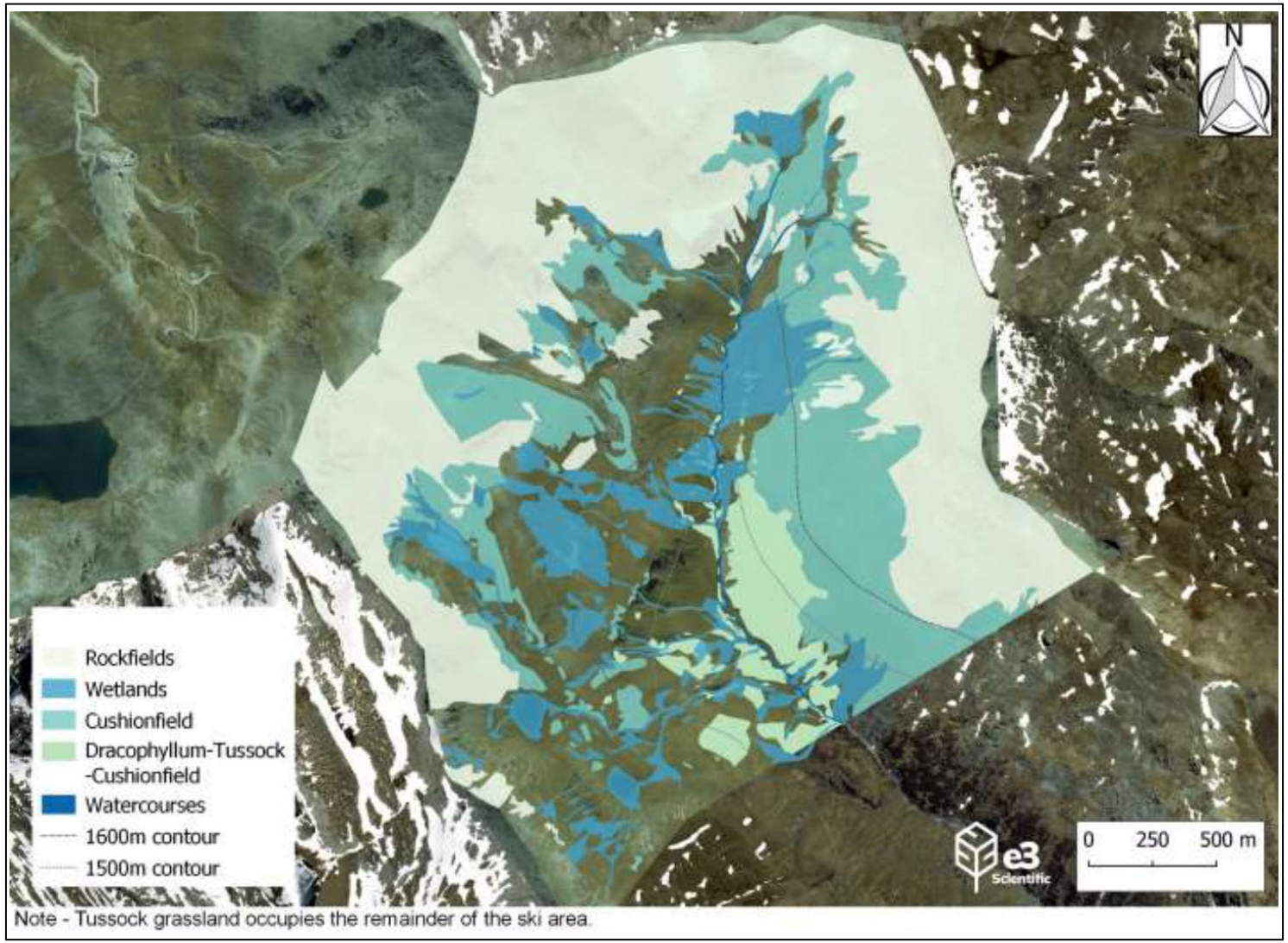

Figure 19: Upper Doolans Vegetation Communities mapped by Conservation Consultancy (Simpson, 2018).

4 Field Survey Results

The following section sets out the findings of the wetland delineation, vegetation, avifauna, herpetofauna and invertebrate surveys.

4.1 Wetland Delineation

In total, 45 wetland vegetation plots passed the rapid vegetation test i.e containing obligate (OBL) or facultative wetland (FACW) species totalling greater than 50% of the total vegetation cover. Dominant species included, *Oreobolus pectinatus* (OBL), *Schoenus pauciflorus* (FACW), *Caltha obtusa* (OBL), *Isolepis aucklandica* (OBL), *Carpha alpina* (OBL), and *Carex gaudichaudiana* (OBL).

Of the 44 comprehensive quadrats completed (areas of upland or marginal vegetation, generally dominated by Facultative (FAC) species; see Figure 20), 11 were assessed to be located within wetlands with the remaining 33 assessed as displaying upland characteristics. The number of sites that were assessed using rapid vegetation tests in conjunction with the vegetation quadrats completed within wetland sites indicate that the wetlands throughout the study area are dominated by Obligate species. It was subsequently noted that the boundaries of the wetlands were easily differentiable as a result of the species present, with very little wetland characteristics appearing within the areas dominated by *Chionochloa* spp. The results of the wetland assessment locations are detailed in Table 4 below, with quadrat data forms presented in Appendix E.

Table 4: Wetland delineation assessment location results.

Site No.	Assessment type	Vegetation Tool			Hydric Soils (Yes/No)	Wetland Hydrology (Yes/No)	Wetland (Yes/No)
		Dominance Test (Pass/Fail/Uncertain)	Prevalence Index (Pass/Fail/Uncertain)	Hydrophytic Vegetation (Pass/Fail/Uncertain)			
1	Rapid vegetation test	*Oreobolis pectinatus* (>50%). Saturated peat.					**Yes**
2	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
3	Rapid vegetation test	*Schoenus pauciflorus* (50%), *Caltha obtusa* (10%), & *Isolepis aucklandica* (10%). Peat A-horizon (<5 cm), reduced mineral B-horizon.					**Yes**
4	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
5	Rapid vegetation test	*Schoenus pauciflorus* (30%), *Caltha obtusa* (10%), & *Isolepis aucklandica* (30%), & *Euchiton traversii* (15%). Peat A-horizon (<5 cm), reduced mineral B-horizon.					**Yes**
6	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	No	No	**No**
7	Rapid vegetation test	*Schoenus pauciflorus* (70%) & *Caltha obtusa* (20%). Peat A-horizon (<5 cm), reduced mineral B-horizon.					**Yes**
8	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	No	No	**No**
9	Rapid vegetation test	*Schoenus pauciflorus* (80%), & *Caltha obtusa* (20%). 0-5 cm saturated peat, 5-12 mineral (5Y 5/1) w/ reduced iron, redox mottling and oxidised rhizosphere.					**Yes**
10	Rapid vegetation test	*Oreobolis pectinatus* (90%), *Carpha alpina* (10%), *Schoenus pauciflorus* (5%). 0-5 cm saturated peat, 5-12 mineral (2.5Y 5/1) w/ reduced iron					**Yes**
11	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	No	No	**No**
12	Vegetation quadrat	Pass (OBL / FACW)	Pass (2.17)	Pass	Yes	Yes	**Yes**
13	Vegetation quadrat	Pass (2/3 OBL)	Pass (2.64)	Pass	Yes	Yes	**Yes**
14	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
15	Vegetation quadrat	Pass (OBL / FACW)	Pass (1.95)	Pass	Yes	Yes	**Yes**

Site No.	Assessment type	Vegetation Tool			Hydric Soils (Yes/No)	Wetland Hydrology (Yes/No)	Wetland (Yes/No)
		Dominance Test (Pass/Fail/Uncertain)	Prevalence Index (Pass/Fail/Uncertain)	Hydrophytic Vegetation (Pass/Fail/Uncertain)			
16	Rapid vegetation test	*Oreobolis pectinatus* (60%), *Schoenus pauciflorus* (40%), & *Caltha obtusa* (10%). 0-6 cm peat, 6-20 saturated organic-mesic, 20+ mineral (5Y 4/1) w/ reduced iron, redox mottling and oxidised rhizosphere.					**Yes**
17	Rapid vegetation test	*Oreobolis pectinatus* (90%), *Plantago unibracteata* (2%), & *Abrotanella caespitosa* (5%). 0-10 cm saturated peat, 10-15 organic/humic, 15-20 mineral (10YR 4/2) w/ redox mottling, 20+ rock					**Yes**
18	Vegetation quadrat	Fail (FACU/FAC)	N/A[2]	Uncertain	No	No	**No**
19	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
20	Rapid vegetation test	*Oreobolis pectinatus* (20%), *Carpha alpina* (50%), *Caltha obtusa* (10%), & *Dracophyllum prostratum* (10%).					**Yes**
21	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
22	Rapid vegetation test	*Oreobolis pectinatus* (20%), *Carpha alpina* (5%), & *Schoenus pauciflorus* (70%). 0-6cm saturated peat, 6+ mineral (5Y 3/1) w/ iron staining					**Yes**
23	Rapid vegetation test	*Oreobolis pectinatus* (70%), *Caltha obtusa* (5%), & *Schoenus pauciflorus* (15%), & *Celmisia glandulosa* (20%). 0-25+ saturated peat (5YR 3/4).					**Yes**
24	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
25	Vegetation quadrat	Uncertain (50% OBL/FACU)	N/A[2]	Uncertain	Yes	Yes	**Yes**
26	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	No	No	**No**
27	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
28	Rapid vegetation test	*Schoenus pauciflorus* (15%), *Centrolepis pallida* (25%), *Euchiton lateralis* (15%). 0-8 cm humic/fluid, 8-12 mineral (5Y 4/1) w/ reduced iron.					**Yes**
29	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
30	Rapid vegetation test	*Oreobolis pectinatus* (40%), *Schoenus pauciflorus* (20%), *Caltha obtusa* (20%), & *Celmisia alpina* (5%). 0-10 cm saturated peat, 10-15 mineral (10YR 2/2), w/ redox mottling					**Yes**

Site No.	Assessment type	Vegetation Tool			Hydric Soils (Yes/No)	Wetland Hydrology (Yes/No)	Wetland (Yes/No)
		Dominance Test (Pass/Fail/Uncertain)	Prevalence Index (Pass/Fail/Uncertain)	Hydrophytic Vegetation (Pass/Fail/Uncertain)			
31	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
32	Rapid vegetation test	*Schoenus pauciflorus* (95%). 0-8 cm peat, 8-12 mineral (2.5Y 3/1)					**Yes**
33	Rapid vegetation test	*Schoenus pauciflorus* (10%), *Isolepis aucklandica* (200%), & *Euchiton lateralis* (15%), & *Juncus pusillus* (30%). 0-5 cm humic, 5-8 mineral (2.5Y 3/1) w/ high humic content.					**Yes**
34	Vegetation quadrat	Pass (OBL/FAC)	Pass (2.66)	Pass	Yes	Yes	**Yes**
35	Vegetation quadrat	Pass (FAC)	N/A[2]	Uncertain	No	No	**No**
36	Vegetation quadrat	Pass (OBL/FAC)	N/A[3]	Uncertain	Yes	Yes	**Yes**
37	Rapid vegetation test	*Schoenus pauciflorus* (80%), *Caltha obtusa* (10%), *Gaultheria parvula* (10%), & *Plantago unibracteata* (5%). 0-5 cm saturated peat, 5-10 humic (7.5YR 2.5/1).					**Yes**
38	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
39	Rapid vegetation test	*Oreobolis pectinatus* (5%), *Celmisia glandulosa* (10%), *Carpha alpina* (60%), *Schoenus pauciflorus* (15%), & *Abrotanella caespitosa* (5%). 0-6 cm saturated peat, 6-12 mineral (10YR 3/2) w/ redox mottling.					**Yes**
40	Rapid vegetation test	*Carpha alpina* (15%), *Schoenus pauciflorus* (60%), *Oreobolis pectinatus* (10%), & *Caltha obtusa* (10%). 0-4 cm mesic w/ high organic content, 4-20 mineral (10YR 4/1) w/ high humic content & mottles between ped face.					**Yes**
41	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	No	No	**No**
42	Rapid vegetation test	*Schoenus pauciflorus* (40%), *Oreobolis pectinatus* (40%), *Caltha obtusa* (10%), & *Plantago unibracteata* (10%). 0-6cm saturated peat, 6-15 mineral (5Y 5/1) w/ high humic content & redox mottling wihtin matrix.					**Yes**
43	Rapid vegetation test	*Oreobolis pectinatus* (70%), *Carex gaudichuadiana* (30%) & *Euchiton lateralis* (10%). 0-8 cm saturated peat, 8-20 humin-mesic (7.5YR 3/2).					**Yes**
44	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	No	No	**No**
45	Rapid vegetation test	*Oreobolis pectinatus* (60%), *Carex gaudichuadiana* (10%), & *Euchiton lateralis* (10%). 0-8 cm saturated peat, 8-35 mesic (5YR 3/4) w/ redox mottling & water table at surface.					**Yes**

Site No.	Assessment type	Vegetation Tool			Hydric Soils (Yes/No)	Wetland Hydrology (Yes/No)	Wetland (Yes/No)
		Dominance Test (Pass/Fail/Uncertain)	Prevalence Index (Pass/Fail/Uncertain)	Hydrophytic Vegetation (Pass/Fail/Uncertain)			
46	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
47	Rapid vegetation test	*Oreobolis pectinatus* (40%), *Carex gaudichuadiana* (40%), & *Euchiton lateralis* (5%). 0-10 cm saturated peat, 10-20, glade mineral (5Y3/1) w/ high humic content (2.5YR 2.5/1)					**Yes**
48	Rapid vegetation test	*Isolepis aucklandica* (80%), *Carex gaudichuadiana* (10%) & *Euchiton lateralis* (3%). 0-3 cm saturated peat, 3-10 highly reduced mineral (GLEY1 4/N) w/ mesic/fibric content.					**Yes**
49	Rapid vegetation test	*Oreobolis pectinatus* (60%), *Schoenus pauciflorus* (10%), *Caltha obtusa* (10%), & *Abrotanella caespitosa* (25%). 0+ cm perched peat.					**Yes**
50	Rapid vegetation test	*Oreobolis pectinatus* (50%), *Isolepis aucklandica* (20%), *Schoenus pauciflorus* (30%), *Caltha obtusa* (5%), & *Abrotanella caespitosa* (5%). 0-6 cm peat, 6+ mineral (10YR 5/1) w/ redox mottling.					**Yes**
51	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	No	No	**No**
52	Rapid vegetation test	*Oreoolis pectinatus* (50%), *Abrotonella caespitosa* (5%) & *Caltha obtusa* (10%). Peat soil w/ high water table.					**Yes**
53	Rapid vegetation test	*Oreobolis pectinatus* (15%), *Carex gaudichuadiana* (50%), & *Abrotanella caespitosa* (15%). Peat A-horizon, reduced mineral B-horizon.					**Yes**
54	Rapid vegetation test	*Oreobolis pectinatus* (>75%), *Schoenus pauciflorus* (25%), *Centrolepis pallida* (5%), & *Juncus pusillus* (5%). Peat soil w/ high water table.					**Yes**
55	Rapid vegetation test	*Oreobolis pectinatus* (40%), *Schoenus pauciflorus* (40%), moss (5%). Saturated peat A-horizon.					**Yes**
56	Rapid vegetation test	*Isolepis aucklandica* (>75%), *Juncus pusillus* (5%), & *Juncus novae-zelandiae* (5%). Saturated soils.					**Yes**
57	Rapid vegetation test	*Oreobolis pectinatus* (25%), *Schoenus pauciflorus* (25%), *Caltha obtusa* (25%), & *Ranunculus gracilipes* (5%). Saturated peat A-horizon.					**Yes**
58	Rapid vegetation test	*Oreobolis pectinatus* (20%), *Carex gaudichuadiana* (45%). Saturated peat.					**Yes**
59	Rapid vegetation test	*Caltha obtusa* (25%), *Celmisia glandulosa* (25%), *Oreobolis pectinatus* (25%), & *Schoenus pauciflorus* (25%). Peat A-horizon, reduced mineral B-horizon.					**Yes**

Site No.	Assessment type	Vegetation Tool			Hydric Soils (Yes/No)	Wetland Hydrology (Yes/No)	Wetland (Yes/No)
		Dominance Test (Pass/Fail/Uncertain)	Prevalence Index (Pass/Fail/Uncertain)	Hydrophytic Vegetation (Pass/Fail/Uncertain)			
60	Rapid vegetation test	*Oreobolis pectinatus* (>75%). Peat A-horizon.					**Yes**
61	Rapid vegetation test	*Oreobolis pectinatus* (>50%), *Schoenus pauciflorus* (25%), *Juncus pusillus* (5%), *Celmisia alpina* (5%), *Caltha obtusa* (5%), & *Abrotanella caespitosa* (5%). Deep saturated peat.					**Yes**
WT1	Vegetation quadrat	*Pass (FACW/FAC)*	N/A[2]	Uncertain	*Yes*	*Yes*	**Yes**
WT2	Vegetation quadrat	*Fail (FACU)*	N/A[2]	Uncertain	*No*	*No*	**No**
WT3	Vegetation quadrat	*Pass (FACW/FAC)*	Pass (2.28)	Pass	*Yes*	*Yes*	**Yes**
WT4	Vegetation quadrat	*Fail (FACU)*	N/A[2]	Uncertain	*No*	*No*	**No**
WT5	Rapid vegetation test	*Oreobolis pectinatus* (15%), *Schoenus pauciflorus* (40%), Carpha alpina (35%), *Caltha obtusa* (5%), Celmisia glandulosa (10%), & Kelleria paludosa (2%). Saturated mesic A-horizon (2.5YR 2.5/3), humic B-horizon (5YR 2.5/2). Standing water.					**Yes**
WT6	Vegetation quadrat	*Fail (FACU)*	N/A[2]	Uncertain	*No*	*No*	**No**
WT7	Rapid vegetation test	*Caltha obtusa* (30%), Kelleria paludosa (10%), *Abrotanella caespitosa* (10%), & *Isolepis aucklandica* (40%). Saturated fibric A-horizon (2.5YR 2.5/3), humic B-horizon (10YR 2.5/1). Standing water.					
WT8	Vegetation quadrat	*Uncertain (50% FAC)*	N/A[2]	Uncertain	*Yes*	*Yes*	**Yes**
WT9	Vegetation quadrat	*Fail (FACU)*	N/A[2]	Uncertain	*No*	*No*	**No**
WT10	Rapid vegetation test	*Oreobolis pectinatus* (60%), *Carex gaudichuadiana* (10%), *Schoenus pauciflorus* (5%), & Celmisia alpina (2%). Saturated fibric A-horizon (2.5YR 2.5/2), mesic B-horizon (5YR 2.5/1). Standing water.					**Yes**
WT11	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	*No*	*No*	**No**
WT12	Rapid vegetation test	*Oreobolis pectinatus* (90%), *Carex gaudichuadiana* (2%), & Drosera arcturi (10%). Saturated fibric A-horizon (2.5YR 2.5/2), mesic B-horizon (7.5YR 3/3). Standing water.					
WT13	Rapid vegetation test	*Schoenus pauciflorus* (90%), & *Oreobolis pectinatus* (5%). Saturated fibric A-horizon, mesic B-horizon.					**Yes**
WT14	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	*No*	*No*	**No**

Site No.	Assessment type	Vegetation Tool			Hydric Soils (Yes/No)	Wetland Hydrology (Yes/No)	Wetland (Yes/No)
		Dominance Test (Pass/Fail/Uncertain)	Prevalence Index (Pass/Fail/Uncertain)	Hydrophytic Vegetation (Pass/Fail/Uncertain)			
WT15	Rapid vegetation test	*Oreobolis pectinatus* (95%), *Carex gaudichuadiana* (2%), *Schoenus pauciflorus* (3%), Celmisia alpina (1%), & Drosera arcturi (2%). Saturated mesic A-horizon (7.5 YR 2.5/2), humic B-horizon (5YR 3/2). Standing water.					**Yes**
WT16	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	*No*	*No*	**No**
WT17	Rapid vegetation test	*Oreobolis pectinatus* (70%), Celmisia alpina (20%), *Caltha obtusa* (3%), & *Abrotanella caespitosa* (3%). Humic peat A-horizon (7.5YR 2.5/2), mineral/ gravel B-horizon. Water table at 25cm.					**Yes**
WT18	Vegetation quadrat	*Uncertain (50% FAC)*	N/A[2]	Uncertain	*No*	*No*	**No**
WT19	Rapid vegetation test	*Oreobolis pectinatus* (70%), *Carex gaudichuadiana* (5%), *Schoenus pauciflorus* (5%), Carpha alpina (3%), & *Caltha obtusa* (2%). Saturated mesic A-horizon (7.5YR 2.5/2), humic B-horizon (10YR 3/1) with redox mottling. Standing water.					**Yes**
WT20	Rapid vegetation test	*Oreobolis pectinatus* (45%), *Schoenus pauciflorus* (5%) – overall 58% of the vegetative cover (moss and rock present). Saturated fibric A-horizon (7.5YR 2/2), mesic B-horizon (5YR 3/3). Standing water.					**Yes**
WT21	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	*No*	*No*	**No**
WT22	Vegetation quadrat	*Pass (2/3 OBL/FACW)*	Pass (2.66)	Pass	*Yes*	*Yes*	**Yes**
WT23	Vegetation quadrat	Fail (FACU)	N/A[2]	Uncertain	*No*	*No*	**No**
WT24	Vegetation quadrat	*Uncertain (50% FACW)*	N/A[2]	Uncertain	*Yes*	*Yes*	**Yes**
WT25	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	*No*	*No*	**No**
WT26	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	*No*	*No*	**No**
WT27	Rapid vegetation test	*Schoenus pauciflorus* (95%). Saturated mesic A-horizon (7.5YR 2.5/2), humic B-horizon (10YR 4/1).					**Yes**
WT28	Vegetation quadrat	N/A[1]	N/A[1]	Uncertain	*No*	*No*	**No**

N/A[1] - Dominant species not classified under NZWPISR 2021
N/A[2] - Cannot accurately determine due to too many species not having been classified under NZWPISR 2021. However, majority of the classified species are FAC, FACU or UPL.
N/A[3] - Cannot accurately determine due to too many species not having been classified under NZWPISR 2021. However, majority of the classified species are FAC, FACW or OBL.
Species wetland status rating recorded within rapid vegetation test, assessment sites:
OBL – *Oreobolis pectinatus, Celmisia alpina, Caltha obtuse, Juncus pusillus, Isolepis aucklandica, Carex gaudichuadiana, Plantago unibracteata,* Centrolepis pallida, and *Carpha alpina,* Drosera arcturi.
FACW – *Celmisia glandulosa, Schoenus pauciflorus, Abrotanella caespitosa, Juncus novae-zelandiae*, Ranunculus gracilipes, *Dracophyllum prostratum,* and *Euchiton lateralis.*
FAC – *Euchiton traversii* and *Gaultheria parvula.*

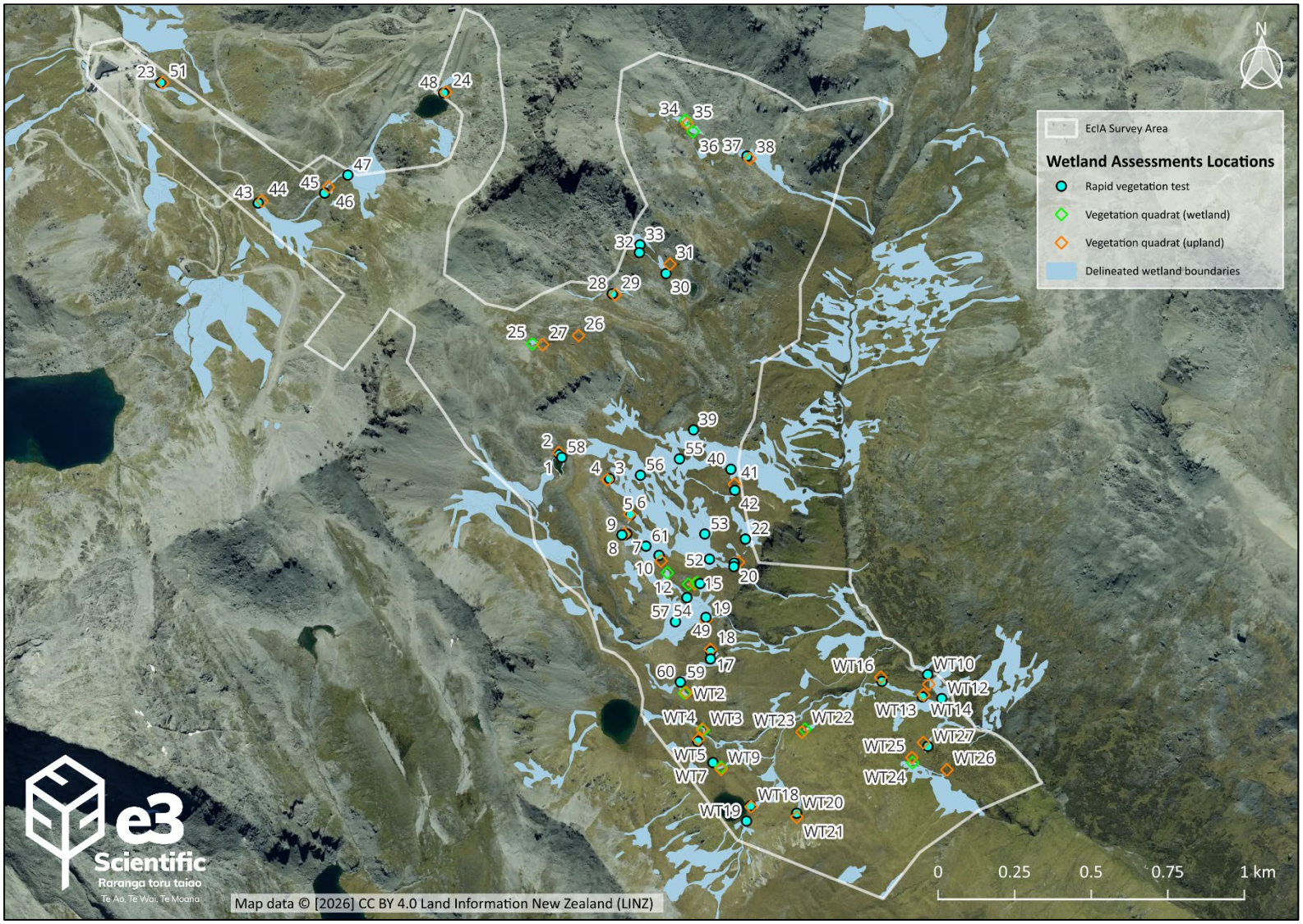

Figure 20: Wetland assessment results and delineated wetland boundaries [i].

[i] Wetland boundaries outside the study area extent have not been delineated are solely based upon aerial imagery and indicate likely wetland presence.

4.2 Flora

The vegetation and habitats present within the study area are typically representative of unmodified communities found throughout the Remarkables Conservation Area. The only exception is within disturbed environments associated with the Curvey Basin chairlift alignment, and access roads and trails in the Rastus Burn. These disturbed areas typically consist of bare ground, exotic species, and regenerating early colonising native species.

The vegetation has been categorised into a total of 12 distinct vegetation communities. Ecosystem types have been assigned to the applicable communities based upon the Singers and Rogers (2014) zonal environments and ecosystems. These are classified as one of five ecosystem types; AL1 (*Chionochloa* tussock grassland), AH2 (cushionfield and rock dominant substrates), WL9 (cushion bog and riparian wetland), VS7 (Dracophyllum scrub) and WL17 (seepage) based upon the physical and ecological characteristics present. Each community has been mapped based on aerial photographic interpretation and extensive ground truthing. Figure 21 shows the distribution of the 12 vegetation communities. The following section describes all 12 vegetation communities listing the dominant floristic components and species present that are listed as Threatened or At Risk. Full species lists for each community are provided in Appendix C.

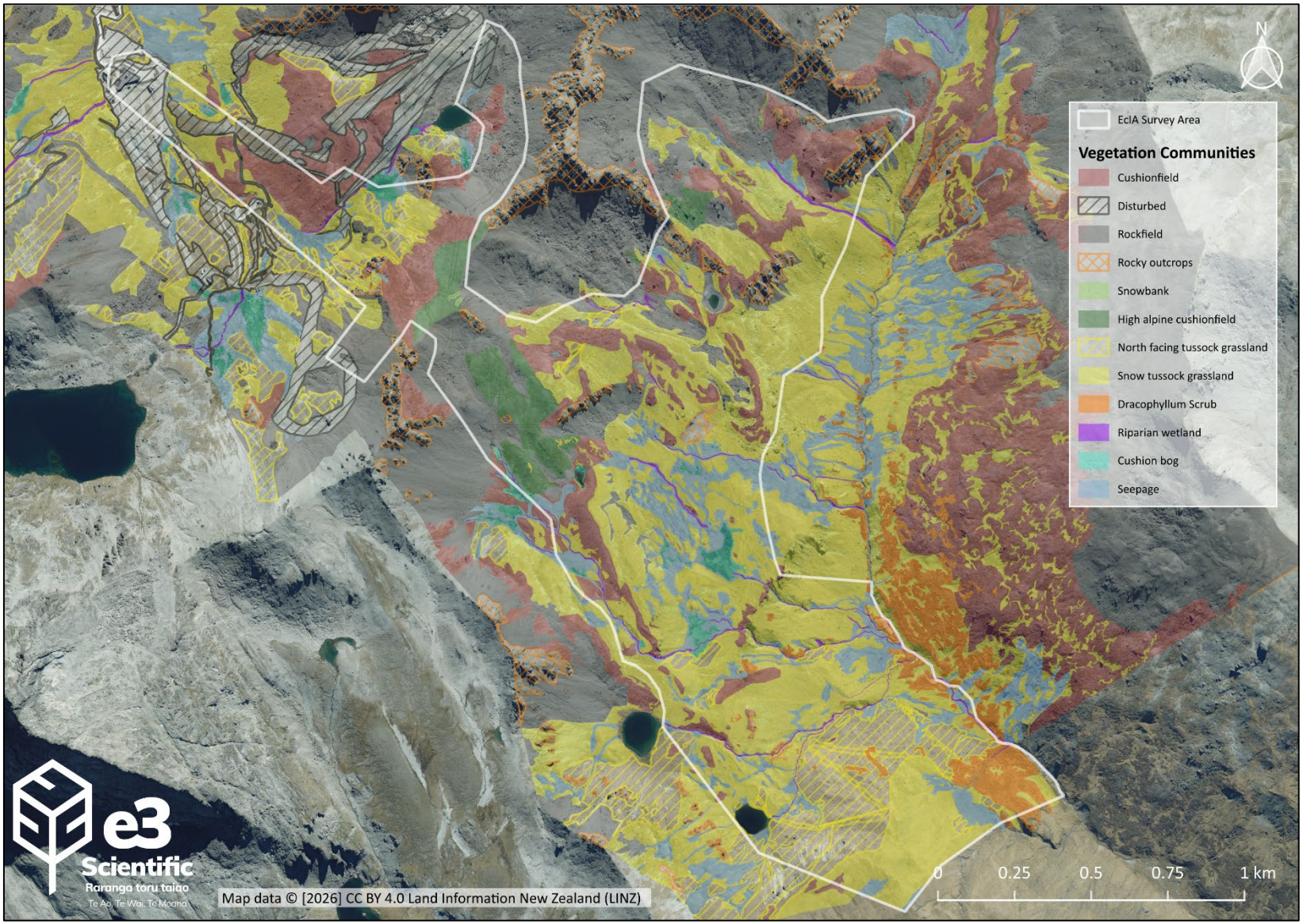

Figure 21: Vegetation communities within and adjacent to the study area.

4.2.1 Snow Tussock Grassland (AL1)

Snow tussock grassland is the dominant vegetation community present throughout the study area and wider Remarkables Ecological District at similar altitudes (see Figure 21 and Plate 1). *Chionochloa macra* is the dominant species above approximately 1600 m asl, with *Chionochloa rigida* becoming the more prevalent species below this elevation, with lesser amounts of *Poa colensoi* throughout all elevations. The inter-tussock community consists of a range of herbs and grasses including *Celmisia haastii, Dracophyllum muscoides, Epilobium alsinoides, Gautheria depressa, Raoulia grandiflora* and *Viola cunninghamii.* Greater than 99 % of the overall vegetation cover within this community consists of indigenous species, with isolated areas of bare ground, rock, and exotic herbs and grasses. It is noted that in areas of *Chionochloa rigida*, inter-tussock species abundance is considerably lower as a result of increased tussock litter.

Twenty-one Regionally/Nationally At Risk or Data Deficient species were recorded within the surveyed area or within previous studies completed within this community (see Table 5 and Figure 22 for species threat classification and their known locations).

Plate 1: Photographs of snow tussock grassland.

4.2.2 North Facing Tussock Grassland (AL1)

The north facing tussock grassland community is similar to the snow tussock grassland community, also being dominated by *Chionochloa macra.* However, due to factors such as increased solar exposure, slope, and wind induced evapotranspiration, the areas on north facing slopes tend to exhibit lower species diversity, with a higher abundance of drought tolerant native herbs and grasses. In these areas, snow tussock cover drops to approximately 50-80 % of the total

vegetation cover with *Poa colensoi, Rytidosperma pumilum, Raoulia grandiflora*, and *Viola cunninghamii* becoming more prevalent.

Eight Regionally/Nationally At Risk or Data Deficient species were recorded within the surveyed area or within previous studies completed within this community (see Table 5 and Figure 22 for species threat classification and their known locations).

Plate 2: Photographs of north facing tussock grassland vegetation community.

4.2.3 Dracophyllum Scrub (VS7)

Dracophyllum is highly characteristic of the montane to subalpine zone associated with the Ecological District, becoming increasingly prevalent below approximately 1400 m asl. *Dracophyllum rosmarinifolium* almost individually dominates the shrubland vegetation strata with scattered occurrences of *Chionochloa rigida* being present. Due to the nutrient poor characteristics of where this community occurs and heavy organic litter production, species diversity within the community is notably low. Commonly observed indigenous prostrate species include *Muehlenbeckia axillaris*, *Poa colensoi, Gaultheria depressa var. novae-zealandiae, Austroblechnum penna-marina subsp. alpina, Raoulia subsericea,* and *Austrolycopodium fastigiatum*; however, these species individually account for less than 1% of the overall vegetation cover.

No At Risk or Threatened species were observed or recorded during survey efforts or within previous studies undertaken in this community.

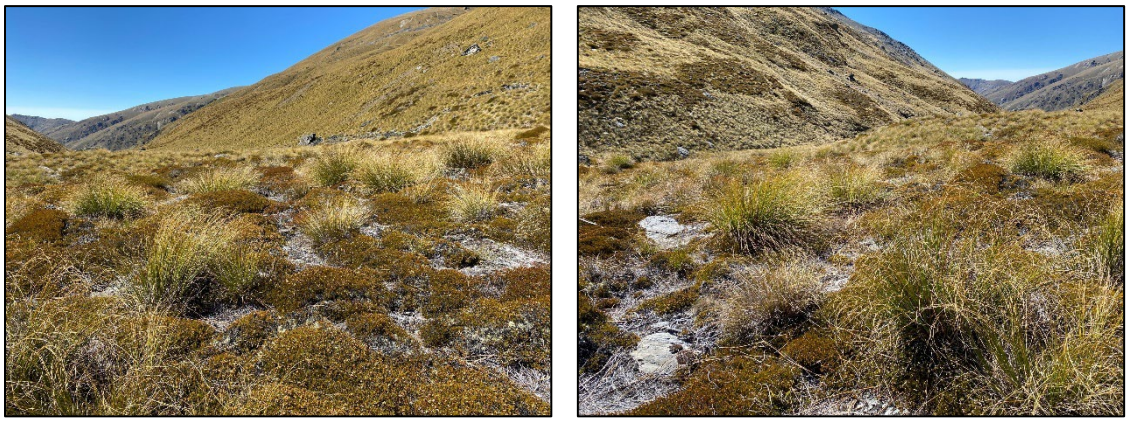

Plate 3: Photographs of *Dracophyllum* scrub vegetation community.

4.2.4 Cushionfield (AH2)

Cushionfield communities are scattered across the study area, becoming extensively prevalent along exposed ridges and knolls and alpine locations prone to drought or higher snowfall (see Figure 21 and Plate 4). These communities have developed in response to high wind and sun exposure with relatively stoney substrate, and shallow soil depths. The dominant species throughout this vegetation community are *Dracophyllum muscoides* with indigenous herbs, grasses and rushes including *Poa colensoi, Raoulia grandiflora, Luzula pumila, Abrotanella inconspicua, Rytidosperma pumilum, Leptinella goyenii, Hectorella caespitosa* and *Anisotome imbricata* common throughout.

Twenty-two Regionally/Nationally At Risk were recorded within the surveyed area or within previous studies completed within this community (see Table 5 and Figure 22 for species threat classification and their known locations).

Plate 4: Photographs of cushionfield vegetation community.

4.2.5 High Alpine Cushionfield (AH2)

A variation of the cushionfield community occurs across the high alpine areas within the study area (see Figure 21 and Plate 5), which are exposed to frost heave, snow accumulation and/or a high level of evapotranspiration. Within this community are micro sites of fellfield and snowbank forming across the variable gradients in substrate and climactic conditions. Key species throughout this vegetation community include *Phyllachne rubra, Carex pyrenaica* var. *cephalotes,* and *Raoulia aff. bryoides* with lesser amounts of *Dracophyllum muscoides, Poa colensoi, Raoulia grandiflora, Luzula pumila, Abrotanella inconspicua, Leptinella goyenii, Kellaria childii, Hectorella caespitosa* and *Anisotome imbricata* also present.

Twelve Regionally/Nationally At Risk species were recorded within the surveyed area or within previous studies completed within this community (see Table 5 and Figure 22 for species threat classification and their known locations).

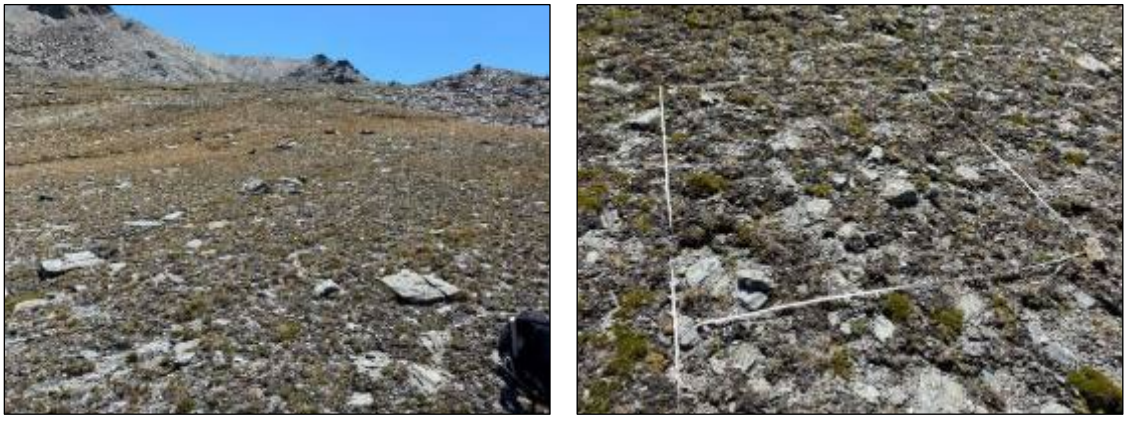

Plate 5: Photographs of high alpine cushionfield vegetation community.

4.2.6 Cushion Bog (WL9)

The lower faces of the Doolan's Basin are covered in numerous interconnected cushion bog, riparian, and seepage wetlands. Cushion bogs are present on relatively level or gently sloping ground within hill crests, basins, terraces, and adjacent to other wetland types. Enclosed within are small formations of string mire. The soils are predominantly peat and have high water tables, often exhibiting extensive areas of standing water. *Oreobolus pectinatus* is the most prevalent species throughout the cushion bog communities, with *Carex gaudichaudiana, Caltha obtusa* and *Abrotonella inconspicua* also abundant throughout.

Twenty Regionally/Nationally At Risk and three Threatened species were recorded within the surveyed area or within previous studies completed within this community (see Table 5 and Figure 22 for species threat classification and their known locations).

Plate 6: Photographs of Cushion bog vegetation community.

4.2.7 Riparian Wetland (WL9)

Riparian wetlands are present along the edges of streams throughout the Doolans catchment (see Figure 21 and Plate 7) and are characterized by being wet or saturated for at least part of the year; often occurring in association with ephemeral or intermittent creeks. *Oreobolus pectinatus* and *Schoenus pauciflorus* are the most dominant species with *Acaena saccaticupula, Caltha obtusa, Celmisia alpina, Celmisia sessiliflora, Centrolepis pallida, Coprosma perpusilla* subsp. *perpusilla, Craspedia lanata* var. *lanata, Euchiton lateralis, Poa colensoi* and *Viola cunninghamii* common throughout.

Nineteen Regionally/Nationally At Risk and four threatened species were recorded within the surveyed area or within previous studies completed within this community (see Table 5 and Figure 22 for species threat classification and their known locations).

Plate 7: Photographs of riparian wetland vegetation community.

4.2.8 Seepage (WL17)

Seepage wetlands are present throughout the lower faces of the Doolans Basin (see Figure 21 and Plate 7); occurring where groundwater emerges on hillsides or at the edge of slopes as a result of upwelling or subsurface geomorphological patterns. Throughout the study area seepages drain to or from other wetland classes connecting the large freshwater features. The most dominant species present throughout this vegetation community include *Schoenus pauciflorus. Oreobolus pectinatus,* and *Caltha obtusa.* A wide range of other indigenous herbs and grasses are common throughout seepage wetlands throughout the study area, however, generally occurring in lower abundance.

Twenty eight Regionally/Nationally At Risk or Data deficient, and five Threatened species were recorded within the surveyed area or within previous studies completed within this community (see Table 5 and Figure 22 for species threat classification and their known locations).

Plate 8: Photographs of seepage vegetation community.

4.2.9 Rockfield (AH2)

Rockfield communities are prevalent across the study area, particularly in the upper elevations where the ridgeline drops into the Doolans and Rastus Burn catchments (see Figure 21 and Plate 9). The rockfield areas have steep slopes prone to movement of the rock substrates, within avalanche prone areas, thus lacking suitable conditions for rapid vegetative stabilisation. Therefore, a significant proportion of these areas do not contain any vegetation. Where vegetation is present it is scattered, commonly accounting for less than 25 % of the total cover. Species commonly noted throughout this vegetation type include *Chionochloa macra, Epilobium tasmanicum, Hectorella caespitosa, Poa colensoi* and *Raoulia grandiflora*. Isolated areas occur as a subset of this community at lower elevations (below 1600 m asl) constituting deep seated rocky rubble/boulders with indigenous sprawling species (*Coprosma perpusilla* subsp. *perpusilla, Melicytus alpinus, Myrsine nummularia,* and *Pimelia notia*).

Six Regionally/Nationally At Risk species were recorded within the surveyed area or within previous studies completed within this community (see Table 5 and Figure 22 for species threat classification and their known locations).

Plate 9: Photographs of rockfield vegetation community.

4.2.10 Rocky Outcrop (AH2)

Rocky outcrop plant communities are present in small pockets across the landscape (see Figure 21 and Plate 10). They occur in areas where bedrock is exposed at or near the surface. These communities are defined by their harsh conditions including limited soil accumulation, nutrient poor environments, and exposure to the elements. As a result of these conditions, vegetation within rocky outcrop communities tends to be sparse and patchy. Prevalent species across these areas include *Poa colensoi, Luzula pumila, Leptinella goyenii, Veronica*

thompsonii, Hectorella caespitosa, Koelaria cheesemanii, Colobanthus buchananii, *Epilobium porphyrium* and *Agrostis muelleriana.*

Twenty-three Regionally/Nationally At Risk and one Threatened species were recorded within the surveyed area or within previous studies completed within this community (see Table 5 and Figure 22 for species threat classification and their known locations).

Plate 10: Photographs of rocky outcrop vegetation community.

4.2.11 Snowbank (AH2)

Three small areas of snowbank community were noted within the study area in high alpine areas which hold snow cover for up to seven months of the year (see Figure 21 and Plate 11). *Carex pyrenaica* var. *cephalotes, Dracophyllum muscoides, Kelleria childii* and *Poa colensoi* are prevalent species found within snowbank communities across the study area, alongside a range of other indigenous herbs and grasses.

Nine Regionally/Nationally At Risk species were recorded within the surveyed area or within previous studies completed within this community (see Table 5 and Figure 22 for species threat classification and their known locations).

Plate 11: Photographs of snowbank vegetation community.

4.2.12 Disturbed Vegetation

Areas of disturbed vegetation are limited to within the current ski area boundary in the Rastus Burn Basin (see Figure 21). Disturbed vegetation communities exist where ski trails, roads, carparks etc., have been developed. Bare ground is prevalent throughout this vegetation community, as well as scattered early colonising indigenous species and exotic grasses and herbs (see Plate 12). Commonly observed species include, *Acaena saccaticupula, Agrostis muelleriana, Chionochloa macra, Colobanthus buchananii, Luzula pumila, Poa colensoi, Raoulia grandiflora, Raoulia subsericea, Raoulia tenuicaulis, Rytidosperma pumilum,* and *Scleranthus uniflorus.*

Six Regionally/Nationally At Risk or Data Deficient species were recorded within the surveyed study area (see Table 5 and Figure 22 for species threat classification and its known locations).

Plate 12: Photographs of disturbed vegetation community.

Threatened and At Risk Plants

A total of 34 species recorded within the study area have a conservation status of 'At Risk' under the New Zealand Threat Classification System (NZTCS; de Lange *et al.*, 2024). One is Taxonomically Unresolved, one is Data Deficient and one is Threatened – Nationally Endangered. Many of these species have higher threat classification associated at the regional level (Jarvie *et al.*, 2025). A further 38 species are listed as Regionally At Risk, Data Deficient or Regionally Threatened under the Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025). Of the 15 vegetation communities mapped within the study area, 12 contain one or more plant species listed as either Nationally/Regionally At Risk or Threatened. The plant species are listed in Table 5 along with a description of their respective distribution within the study area. Figure 22 provides a plan showing the location of all recorded Nationally and Regionally At Risk and Threatened species. We note this plan is not a record of all Threatened and At Risk plants in the study area, due to limitations in survey coverage. Instead, it reflects recorded locations and provides an indication of presence within particular vegetation communities.

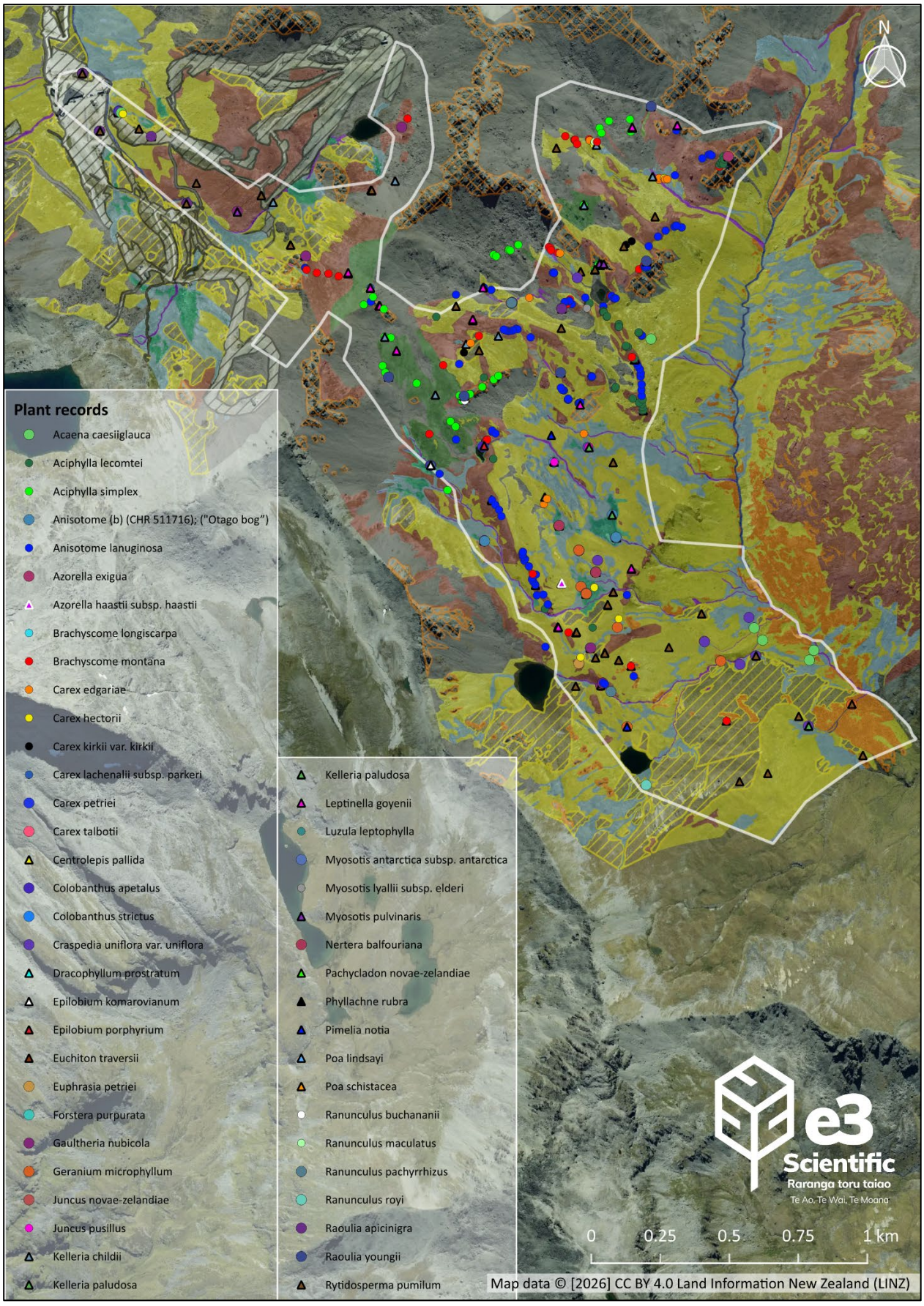

Figure 22: Location of Nationally and Regionally Threatened, At Risk, and Data Deficient flora species.

Table 5: Threatened and At Risk and Data Deficient plant species presence across vegetation communities.

Species	NZTCS Threat Category (de Lange et al., 2024)	Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025)	Vegetation Community Association												Occurrence within Vegetation Communities
			Snow Tussock Grassland	North Facing Tussock Grassland	Dracophyllum Scrub	Cushionfield	High Alpine Cushionfield	Cushion Bog	Riparian Wetland	Seepage	Rockfield	Rocky Outcrop	Snowbank	Disturbed Vegetation	
Acaena caesiiglauca[†]	Not Threatened	At Risk - RD	x	x					x	x					**All associated communities –** Widespread but in low abundance within all vegetation communities containing the species. Often occurring in in areas of moderate moisture or moderate – heavy shade/associated with large rock features.
Aciphylla lecomtei	At Risk – D	At Risk – RD	x			x						x			**Snow tussock grassland** – Generally isolated to rocky spurs, or areas of rocky substrate often containing higher abundance of rock; generally, only occurring in low densities at any recorded location. **Cushionfield** – Rarely recorded within the vegetation community, only occurring at lower elevations on the margins of cushionfield with either tussock or rocky outcrop assemblages. **Rocky outcrop** – Generally recorded across the top of rock bluffs in conjunction with small depressions or larger vegetative cover; often occurring in small groups within isolated areas of the wider community.
Aciphylla kirkii	Not Threatened	At Risk – RNU	x	x		x			x	x	x	x			**All associated communities –** Widespread and in moderate abundance within all vegetation communities apart from wetlands where it is in low abundance.
Aciphylla simplex	At Risk – NU	At Risk – RNU				x	x				x	x			**Cushionfield** – Isolated to highly rocky areas within the community, along ridge tops or areas with very little fine substrate. High alpine cushionfield – Very isolated with small individual plants occurring in areas adjacent more suitable A. simplex habitat. **Rockfield** – Largely restricted to more stable sites within the rockfields, where fine substrates are able to accumulate. Notably, these occur at the toe of steep slopes, gentler slopes, and where rock tors or boulders provide a buffer from upslope debris. **Rocky outcrop** – Present across extensive sections of rocky outcrop. Abundant where large older specimens were present. This species was generally located within the bluffs growing from crevices or small terraces within the outcrops.
Agrostis pallescens[†]	At Risk – NU	At Risk – RNU													Frequent in both Rastus and Doolans
Agrostis petriei[†]	Not Threatened	Regionally Data Deficient													Occasional in both Rastus and Doolans
Anisotome (b) (CHR 511716); "(Otago bog")[†]	Taxonomically Unresolved	N/A						x		x					**Cushion bog and seepage –** Occurs in a similar pattern across both wetland types. Where present it was minor part (<1%) of the vegetation cover intermixed densely occurring herbs and sedges.

Species	NZTCS Threat Category (de Lange et al., 2024)	Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025)	Vegetation Community Association											Occurrence within Vegetation Communities
			Snow Tussock Grassland	North Facing Tussock Grassland	Dracophyllum Scrub	Cushionfield	High Alpine Cushionfield	Cushion Bog	Riparian Wetland	Seepage	Rockfield	Rocky Outcrop	Snowbank	Disturbed Vegetation	
Anisotome lanuginosa	At Risk – NU	At Risk – RNU				x	x					x			**Cushionfield –** Recorded in almost all areas where cushionfield was present, being widely dispersed however making up a small portion of the overall vegetation cover. **High alpine cushionfield –** Occurs in low abundance; noted as individuals, scattered across small, isolated areas; most large fellfields are free of this species. **Rocky outcrop –** Recorded atop rocky outcrops in a similar pattern to that described in the cushionfield community above. This is a result of the communities often being adjacent each other and the tops of the rocky outcrops often displaying similar substrate and vegetation characteristics.
Azorella exigua[†]	At Risk – NU	At Risk – RNU				x	x								Listed in threatened species list but not in either Rastus or doolans species lists
Azorella haastii subsp. *haastii*	Not Threatened	At Risk – RNU	x			x						x			**Snow tussock grassland –** only recorded at one location, growing on low abundance amongst other inter-tussock species. often growing in rocky or shade heavy locations. Although not recorded elsewhere it is likely more widely dispersed within the study area.
Brachyscome longiscarpa	At Risk – NU	At Risk – RNU							x	x					**Seepage –** Only recorded in one seepage that is intermittently wet, where it was noted to be restricted to small dense patches.
Brachyscome montana	At Risk – NU	At Risk – RNU	x	x		x	x			x		x			**Snow tussock grassland and North facing tussock grassland –** Isolated patches occur widely with sprawling rosettes containing 10s to100s of rosettes. **Cushionfield and rocky outcrop –** Recorded in moderate abundance in isolated areas of both communities, becoming more prevalent at lower altitudes, around rock tors or within tussock margins offering additional shelter. **High alpine cushionfield –** Occurs in low abundance; noted as individuals, scattered across small, isolated areas; most large areas are free of this species **Seepage –** Not abundant within this community, preferring upland sites, however, it was recorded within ephemeral wetland areas; also occurring more prominently within the margins of this wetland type and other communities.
Carex edgariae	At Risk – NU	Threatened – RE							x	x					**Riparian wetland and seepage –** Often associated in areas of low flowing water forming adjacent the main channels and extending into upslope areas of seepages. The species is locally isolated within these communities, however where it is present it forms dense swards of 10 -100s of plants.
Carex enysii[†]	At Risk - NU	Regionally Data Deficient						x		x					Recorded in previous studies

Species	NZTCS Threat Category (de Lange et al., 2024)	Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025)	Vegetation Community Association											Occurrence within Vegetation Communities
			Snow Tussock Grassland	North Facing Tussock Grassland	Dracophyllum Scrub	Cushionfield	High Alpine Cushionfield	Cushion Bog	Riparian Wetland	Seepage	Rockfield	Rocky Outcrop	Snowbank	Disturbed Vegetation	
Carex hectorii	At Risk – NU	At Risk – RNU						x	x	x					**Seepage –** Locally isolated to small sections of the seepage community, generally occurring on faces of gentle slope and shallow subsoil.
Carex kirkii var. *kirkii*	At Risk – NU	Data Deficient	x	x										x	**Snow tussock grassland, north facing tussock grassland, and disturbed vegetation –** Locally abundant, occurring in drier soil, notably prone to, or have undergone, recent disturbance. Where present it accounts for a substantial portion of the inter-tussock vegetation.
Carex petriei	Not Threatened	At Risk – RNU							x	x					**Riparian wetland and seepage –** Present within small localised areas within lower elevations of both communities particularly within the Rastus Burn.
Carex lachenalii subsp. *parkeri*	At Risk – NU	At Risk – RNU											x		**Snowbank –** Recorded within the snowbank located atop the main ridge separating the Doolans and Rastus Burn catchments in a small dense patch. Although not recorded in other snowbank areas, it is likely that it is present in low abundance elsewhere within this community.
Carex parvispica†	At Risk - D	At Risk - RNU							x	x					Recorded in previous studies
Carex pterocarpa†	At Risk – NU	At Risk – RNU						x	x	x			x		Rare – recorded in previous studies, generally located within montane to subalpine elevations.
Carex purpurata†	At Risk – NU	At Risk – RNU	x							x					Rare – recorded in previous studies
Carex talbotii†	At Risk – D	Threatened – RV							x	x					Occasional in both Rastus and Doolans, generally at subalpine to low alpine elevations.
Celmisia ramulosa var. tuberculata	Not Threatened	At Risk – RNU										x			**Cushionfield –** Recorded as isolated or small group of plants within the vegetation community.
Centrolepis pallida	Not Threatened	At Risk – RNU						x	x	x					**Cushion bog, riparian wetland and seepage –** Present in localised small sections of the three wetland communities, generally occurring on gentle slopes.
Chaerophyllum aff. colensoi - (Oreomyrrhis sp. "bog") †	Taxonomically unresolved	N/A						x							Recorded in previous studies
Colobanthus apetalus†	Not Threatened	At Risk – RNU						x	x	x					**Cushion bog, riparian wetland and seepage –** Locally common in the communities that it occurs. Often occurring in scattered clumps intermixed with other sprawling species.

Species	NZTCS Threat Category (de Lange et al., 2024)	Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025)	Vegetation Community Association												Occurrence within Vegetation Communities
			Snow Tussock Grassland	North Facing Tussock Grassland	Dracophyllum Scrub	Cushionfield	High Alpine Cushionfield	Cushion Bog	Riparian Wetland	Seepage	Rockfield	Rocky Outcrop	Snowbank	Disturbed Vegetation	
Colobanthus strictus†	Not Threatened	At Risk - RD	x			x									Recorded in previous studies
Craspedia uniflora var. uniflora	Threatened – NE	Regionally Data Deficient						x	x	x					**Cushion bog, riparian wetland and seepage –** Occurs in a similar pattern across all three wetland types intermixed with herbs sedges and rushes, however less common in *Oreobolis pectinatus* dominated vegetation types. Where present it was minor part (<1%) of the vegetation cover but was locally abundant and present within a range of aspects and elevations.
Deschampsia chapmanii†	Not Threatened	Regionally Data Deficient						x							Recorded in previous studies
Deschampsia pusilla†	At Risk – NU	Regionally Data Deficient						x	x	x					Recorded in previous studies
Dracophyllum prostratum	Not Threatened	At Risk – RNU						x							**Cushion Bog –** Only recorded within the lower basins containing extensive cushion bog. The species was locally uncommon only being recorded within one of the vegetation quadrats.
Epilobium komarovianum	Not Threatened	At Risk – RNU						x	x	x					**Cushion bog, riparian wetland and seepage –** Occurs in a similar pattern across all three wetland types. Where present it was minor part (<1%) of the vegetation cover.
Epilobium porphyrium	Not Threatened	At Risk – RNU									x	x	x	x	**Rockfield, Rock outcrops, snowbank and disturbed vegetation –** Occurs in rocky terrain where fine substrate has accumulated. The habitat varied from drought prone to slightly wet indicating it is adaptable in its habitat preference. Where it was present it was found in low abundance, generally with a few individual plants.
Euchiton traversii	Not Threatened	At Risk – RNU						x		x					**Cushion Bog –** highly isolated in occurrence, with the Not Threatened *Euchiton lateralis* (prefers similar habitat) being the more abundant of the two species. Recorded in low abundance as scattered rosettes.
Euphrasia petrei†	Not Threatened	At Risk - RNU				x									Rare in both Rastus and Doolans
Festuca madida†	At Risk – NU	At Risk – RNU								x					Occasional in both Rastus and Doolans
Festuca matthewsii subsp. matthewsii†	Not Threatened	*Regionally Data Deficient*	x									x			Rare in both Rastus and Doolans

Species	NZTCS Threat Category (de Lange et al., 2024)	Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025)	Vegetation Community Association											Occurrence within Vegetation Communities
			Snow Tussock Grassland	North Facing Tussock Grassland	Dracophyllum Scrub	Cushionfield	High Alpine Cushionfield	Cushion Bog	Riparian Wetland	Seepage	Rockfield	Rocky Outcrop	Snowbank	Disturbed Vegetation	
Forstera purpurata	Not Threatened	At Risk - RNU							x						**Riparian Wetland –** Highly isolated to low alpine locations within the study area. Observed locations were consistent with faster flowing water/splash zone from waterfalls.
Gaultheria nubicola	Not Threatened	At Risk – RNU				x		x				x			**Cushionfield –** Locally abundant in cushionfield. Only recorded in two out of the 19 cushionfield quadrats. However, where it was present the species accounted for up to 75% of the total vegetation cover. **Cushion bog –** Occurred in one vegetation quadrat where it accounted for less than 1% of the total vegetation cover. The species was noted to occur in low abundance near to the quadrat. **Rocky outcrop –** Occurred in a similarly density and occurrence to that of the cushion bog community. The plants recorded are likely as a result of adjacent cushionfield areas where similar substrates and conditions are present within the top terrace section of the rocky outcrop community.
Gentianella amabalis†	Not Threatened	AT Risk - RNU						x		x					**Cushion Bog and seepage** – occurring in scattered abundance favouring low gradients habitats.
Geranium microphyllum	At Risk – NU	Unclassified	x					x		x					**Cushion Bog and seepage –** *Geranium microphyllum* is isolated, often occurring in drier areas within the wetland types in association with shade inducing plants such as *Chionochloa macra*/*C*. rigida. **Snow tussock grassland –** where it occurs within tussock grassland it is only present where higher moisture content is available favouring low slopes and transitional zones from wetland habitats.
Geum pusillum†	At Risk – NU	At Risk – RNU					x						x		Recorded in previous studies
Gunnera dentata	Not Threatened	AT Risk - RNU							x	x					**Riparian wetland and seepage –** localised in occurrence, only being present at lower elevations within the study area (<1500 m asl). Where is it present it is locally abundant, however is extremely sparse within the landscape.
Juncus pusillus	At Risk – NU	Threatened – RV						x		x					**Cushion bog and seepage –** *Juncus pusillus* is widespread within both wetland types and likely underrepresented in Figure 22 given its extremely small size and often being interspersed with *Carex gaudichaudiana*.
Kelleria childii	Not Threatened	At Risk – RNU	x			x	x				x	x	x		**All associated communities –** Widespread within all vegetation communities containing the species. Often occurring in scattered clumps.
Kelleria paludosa	Not Threatened	At Risk – RNU						x	x	x					**Cushion bog and seepage –** Widespread within both communities, often occurring as sprawling vegetation. Notably abundant within the wider community within all cushion bog quadrats and present within four out of five of the seepage quadrats completed. **Riparian wetland –** Less common than in the cushion bog and seepage communities, however, still present in in isolated occurrences.

Species	NZTCS Threat Category (de Lange et al., 2024)	Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025)	Vegetation Community Association												Occurrence within Vegetation Communities
			Snow Tussock Grassland	North Facing Tussock Grassland	Dracophyllum Scrub	Cushionfield	High Alpine Cushionfield	Cushion Bog	Riparian Wetland	Seepage	Rockfield	Rocky Outcrop	Snowbank	Disturbed Vegetation	
Lachnagrostis albida[†]	At Risk - NU	At Risk - RNU				x									Recorded in previous studies
Lachnagrostis uda[†]	At Risk – NU	At Risk – RNU						x	x	x					Recorded in previous studies
Leptinella albida	At Risk – NU	At Risk – RNU				x									**Cushionfield –** previously recorded within Rastus Burn. Although not recorded within the Doolans catchment, similar habitat is present.
Leptinella goyenii	Not Threatened	At Risk – RNU				x	x						x		**Cushionfield and high alpine cushionfield –** Widespread within both vegetation communities, being one of the dominant species of the community; particularly within the Doolans catchment. **Snowbank –**Lower abundance within this community generally occurring along gentle sloped areas, often adjoining one of the other two communities.
Lobelia linnaeoides[†]	Not Threatened	AT Risk – Regionally Naturally Uncommon	x												Occasional in both Rastus and Doolans
Luzula colenso[†]*i*	Not Threatened	At Risk - RNU				x									Recorded in previous studies
Luzula leptophylla	At Risk – NU	At Risk – RNU						x							**Cushion Bog –** Widespread and likely underrepresented in Figure 22 given its often small size and often being interspersed with similarly coloured *Juncus pusillus*.
Myosotis bryonoma[†]	At Risk - NU	At Risk - RNU						x		x					**Cushion bog and seepage –** Rare in both Rastus and Doolans being intermixed with prostrate herbs mosses and sedges.
Myosotis antarctica subsp. antarctica[†]	At Risk - NU	At Risk - RNU				x	x					x		x	**Cushionfield, high alpine cushionfield, and rocky outcrop –** Generally highly localised in its occurrence with scattered plants occurring often association with shaded or loose, fine substrate. **Disturbed vegetation –** locally uncommon; only being recorded within one location within the vegetation community. Where it was recorded it was actively colonising loose fine substrates subject to snow and water runoff/erosion.
Myosotis lyallii subsp. *elderi*	At Risk – NU	At Risk – RNU	x			x						x*			**Cushionfield and rocky outcrop –** Only one record within each community. Occurs in small, isolated rosettes often concentrated in areas less than 4 m^2. **Snow tussock grassland –** Recorded in localised populations within this community in ephemeral flow paths.
Myosotis pulvinaris	Not Threatened	At Risk – RNU				x	x					x	x		**Cushionfield, high alpine cushionfield, snowbank and rocky outcrop –** Generally localised in its occurrence within all the communities,

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			Snow Tussock Grassland	North Facing Tussock Grassland	Dracophyllum Scrub	Cushionfield	High Alpine Cushionfield	Cushion Bog	Riparian Wetland	Seepage	Rockfield	Rocky Outcrop	Snowbank	Disturbed Vegetation	
															Restricted areas of rocky terrain, often in highly exposed locations occurring in low abundance at recorded sites.
Nertera balfouriana†	Not Threatened	At Risk - RNU							x	x					Recorded in previous studies
Pachycladon novae-zelandiae	Not Threatened	At Risk – RNU										x			**Rocky outcrop –** Restricted to low elevation sections of the rocky outcrop community; only recorded within the northern Doolans catchment along spurs adjoined by rockfield and cushionfield. Only one record of the plant was noted within the 2025 field surveys however it is known to be present north of this location.
Phyllachne rubra	Not Threatened	At Risk – RNU				x	x					x	x		**Cushionfield and high alpine cushionfield –** Widespread and a dominant component of both vegetation communities, particularly within the Doolans catchment **Rocky outcrop and snowbank –** Lower abundance within this community generally occurring along gentle sloped areas, often adjoining one of the other two communities.
Pimelea notia	Not Threatened	At Risk – RNU	x	x											**Snow tussock grassland and north facing tussock grassland –** Within both communities *Pimelia notia* is locally abundant; occurring as large sprawling mats in areas where rock is prevalent within the tussock vegetation.
Poa lindsayi	Not Threatened	At Risk – RD	x	x								x		x	**Snow tussock grassland and north facing tussock grassland –** Occurs in very low abundance within the alpine environment. Generally located in shallow drought prone soils with sparse snow tussock cover. No records were noted within these communities. However, it is known to be present within tussock grassland within the Remarkables Conservation Are and therefore likely to be present in low abundance. **Rocky outcrop –** Generally occurs in isolated locations intermixed with short tussock species (i.e. *Poa colensoi* and *Rytidosperma pumilium*). **Disturbed vegetation –** Where this species occurs within areas of disturbed vegetation, it locally abundant. Although it make up a small portion of the overall community it is scattered over large areas and occurring multiple assessed quadrats.
Poa schistacea	Not Threatened	At Risk – RNU										x			**Rocky outcrop –** Generally occurs at higher elevations in overhangs or recently disturbed substrate. Where present it is not abundant and occurs as scattered plants.
Poa tonsa†	Not Threatened	At Risk – RNU	x												Occasional in both Rastus and Doolans
Ranunculus buchananii	At Risk – D	Threatened – RV										x			**Rocky outcrop –** Only recorded in one location within the surveyed area, being a sheltered south facing hole within a highly mobile bluff escarpment. It is possible that the species is also present elsewhere in

Species	NZTCS Threat Category (de Lange et al., 2024)	Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025)	Vegetation Community Association												Occurrence within Vegetation Communities
			Snow Tussock Grassland	North Facing Tussock Grassland	Dracophyllum Scrub	Cushionfield	High Alpine Cushionfield	Cushion Bog	Riparian Wetland	Seepage	Rockfield	Rocky Outcrop	Snowbank	Disturbed Vegetation	
															similar habit, however, was not picked up in the surveys as a result of the terrain being highly inaccessible.
Ranunculus maculatus	At Risk – NU	At Risk – RNU						x	x	x					**Cushion bog, riparian wetland and seepage –** Recorded throughout all three wetland types; occurring in areas where the hydric soils are newly forming atop gravel/shingle substrates. Area generally contained less than 20 cm of peat or exhibited low annual peat accumulation. It often occurs in small bog sections, nearby waterways or in small changes in the aspect profile where water accumulates near surface.
Ranunculus pachyrrhizus[†]	Not Threatened	At Risk - RNU							x	x			x		**Riparian wetland, seepage, and Snowbank –** Generally occurs in areas in ephemerally or intermitently high moisture on low to moderate slope. It is isolated within the landscape occurring in low abundance. However where it is present it can be locally common.
Ranunculus royi[†]	Data Deficient	Threatened – RV						x	x	x					**Cushion bog, riparian wetland and seepage –** Present in highly localised area, generally occurring on gentle slopes. Where it is present limited individuals were recorded making up a extremely small portion of the wider community.
Raoulia apicinigra	Not Threatened	At Risk - RNU							x		x			x	**All associated communities** – commonly found in areas of active erosion and disturbance preferring flat or slightly sloping gravel or rocky substrate.
Raoulia hectorii var. mollis[†]	At Risk – NU	At Risk – RNU								x		x			Recorded in previous studies
Raoulia subulata[†]	Not Threatened	At Risk - RNU				x						x			Recorded in previous studies
Raoulia youngii[†]	Not Threatened	At Risk - RNU				x									Occasional in both Rastus and Doolans
Rytidosperma pumilum	Not Threatened	At Risk – RD	x	x		x	x				x	x		x	**All associated communities –** Commonly found and dispersed throughout the study area occurring as a minor part (1-5%) of a majority of the quadrats completed within communities where it was recorded. Where present it is generally locally abundant.
Shawia cymbifolia	Not Threatened	At Risk - RNU	x	x											**Snow tussock grassland and north facing tussock grassland –** Occurs in very low abundance, only being present within areas of Chionochloa rigida tussock grassland. It generally prefers moderate to steep slopes being highly drought tolerant.
Taraxacum zealandicum[†]	At Risk - D	Not Threatened	x												Recorded in previous studies

Species	NZTCS Threat Category (de Lange et al., 2024)	Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025)	Vegetation Community Association												Occurrence within Vegetation Communities
			Snow Tussock Grassland	North Facing Tussock Grassland	Dracophyllum Scrub	Cushionfield	High Alpine Cushionfield	Cushion Bog	Riparian Wetland	Seepage	Rockfield	Rocky Outcrop	Snowbank	Disturbed Vegetation	
Veronica ciliolate var. fiordensis†	At Risk - NU	At Risk – RNU				x	x					x			Recorded in previous studies
Veronica hectorii subsp. demissa†	Not Threatened	At Risk - RNU	x									x			Recorded in previous studies

*Although not recorded during field work, potentially also present in rocky outcrop areas.

† Recorded in previous studies but not observed by e3s during this assessment

At Risk – NU, At Risk – Naturally Uncommon

At Risk – RNU, At Risk – Regionally Naturally Uncommon

At Risk – D, At Risk – Declining

At Risk – RD, At Risk – Regionally Declining

Threatened - NE, Threatened – Nationally Endangered

Threatened – RV, Threatened – Regionally Vulnerable

Threatened – RE, Threatened – Regionally Endangered

4.3 Fauna

The site includes a variety of suitable habitats potentially utilised by a range of indigenous faunal species. The following section sets out the fauna recorded during the bird, lizard and invertebrate surveys completed. The fauna findings are also supported by local knowledge of populations and distribution within the region and desktop review of scientific literature, and New Zealand Bird Atlas (Cornell Lab of Ornithology, 2025).

4.3.1 Avifauna

The indigenous avifauna species observed or known to be found within the Remarkables alpine environments include the eastern falcon (*Falco novaeseelandiae* subsp. *novaeseelandiae*), Australasian harrier (*Circus approximans*), paradise shelduck (*Tadorna variegata*), kea (*Nestor notabilis*), southern black-backed gull (*Larus dominicanus* subsp. *dominicanus*) and New Zealand pipit (*Anthus novaeseelandiae* subsp. *novaeseelandiae*). Excluding kea, these species were all observed during ecological survey work in the Doolans Creek area. Figure 23 shows locations across the study area where avifauna observations were recorded, and Table 6 provides further detail on each species and the use of the habitat.

In total, 108 five-minute bird counts were undertaken across the study area. Forty-two of the surveyed locations recorded no avifauna species within an observable distance of the location. The remaining 30 assessment sites recorded at least one individual. In total, six indigenous and three exotic species were either heard or observed. Walkthrough surveys recorded an additional eight locations with birds present; noting that where species were already recorded at a 5mbc location or walkthrough location they were not recorded thereafter.

New Zealand pipit were the most abundant bird species throughout the study area, being recorded on 23 separate occasions (with one to four birds recorded at each observation) within a range of habitats. Paradise shelducks and southern black-backed gull were recorded in moderate abundance, being recorded in seven and five locations respectively. Both species were repeatedly observed in the same locations. Additional species-specific observational notes are provided in Table 6.

Eastern falcon were observed on multiple occasions patrolling large extents of both the Rastus Burn and Doolans Catchments. Based upon repeat sightings it was determined that up to three pairs had territorial ranges that overlapped the proposed study area or directly adjacent habitat. The distinct areas included the Upper Rastus Burn (encompassing the Lake Alta, Curvy Basin, and Sugar Basin area above approximately 1600 m asl), Lower Rastus Burn (along the valley and adjacent faces below the Remarkables base building, observed to approximately 1300 m asl), and headwaters of the Doolans Creek Right Branch including the montane to subalpine faces. Given the known ranges of eastern falcon, it is possible that the two sightings within the Upper and Lower Rastus Burn are either the same bird or pair.

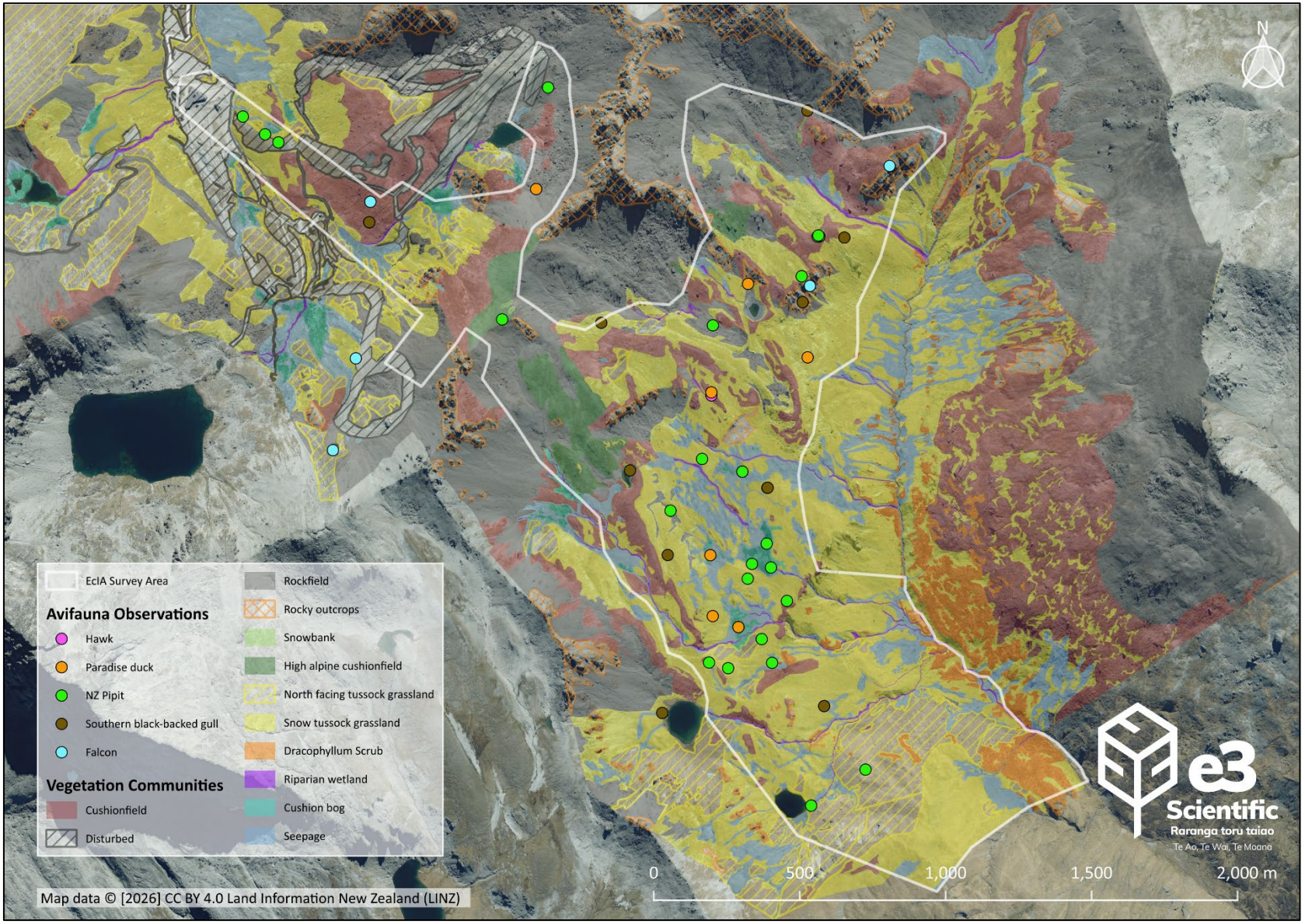

Figure 23: Location of avifauna observations.

Table 6: Occurrence and threat status of indigenous avifauna species.

Species	NZTCS Conservation Status (Robertson *et al.*, 2021)	Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025)	Likelihood of Occurrence	Frequency of Occurrence	Notes
Eastern falcon/kārearea (*Falco novaeseelandiae* subsp. *novaeseelandiae)*	Threatened – Nationally Vulnerable	Threatened – Regionally Vulnerable	Present (observed)	Resident year round	Suitable nesting and foraging habitat is present. An individual was observed within the headwaters of the Doolans Creek Right Branch on two occasions, flying over rocky outcrop/cushion field communities. Another pair was also recorded nesting in the upper Curvey Basin (outside the study area), frequently foraging across the proposed lift line and wider Rastus Burn catchment. Potential nesting habitat is largely restricted to the lower altitudes with rocky cover or dense shrubby cover. Foraging habitat is present throughout all vegetation communities where prey species are found (predominantly indigenous or exotic passerines, however, to a lesser extent may feed on larger invertebrates and mice).
NZ pipit/pīhoihoi *(Anthus novaeseelandiae novaeseelandiae)*	At Risk -Declining	Not Threatened	Present (observed)	Resident year round	Suitable nesting habitat is present within the tussock grassland communities (snow tussock grassland and north facing tussock grassland). Foraging habitat is present within the various wetland communities (seepage, cushion bog) and cushionfield communities (cushionfield and high alpine cushionfield); predominantly feeding on small invertebrates. This species was observed at various elevations and is highly dispersed throughout the proposed study area. This being said, only two records were observed (each an individual bird) at 1850 and 1930 m asl. All other pipit records were below 1700 m asl. This being said, numbers of pipit within the Doolans catchment were low compared to similar altitudes in the Rastus Burn catchment. Pipit have been observed elsewhere to increase their foraging altitude as seed and prey species become more available with increasing temperature. As such, a lower population number can potentially be attributed to colder less productive aspects being more prevalent within the Doolans catchment and less suitable breeding habitat being available as a result of prolonged snow cover at higher elevations.
Paradise shelduck/pūtangitan	Not Threatened	Not Threatened	Present (observed)	Resident during	Suitable nesting and foraging habitat present. Unfledged ducklings were observed within tussock grassland located within the southern

Species	NZTCS Conservation Status (Robertson *et al.*, 2021)	Conservation Status of Indigenous Vascular Plants in Otago (Jarvie *et al.*, 2025)	Likelihood of Occurrence	Frequency of Occurrence	Notes
gi (*Tadorna variegata)*				Spring – Autumn	part of the study area. Additionally, individuals were observed on multiple site visits across a range of vegetation communities including snow tussock grassland, cushionfield, cushion bog wetland, seepage, and rockfield communities.
Kea *(Nestor notabilis)*	Threatened - Nationally Endangered	Threatened – Regionally Critical	Low	Infrequent foraging	Kea prefer to nest below the tree line within ground cavities within rocks, overhangs, or at tree bases with less frequent occurrence in the low alpine areas. Preferable roost sites do not generally hold snow for extended periods given the egg laying dates are from early winter to early summer. Therefore, only low-quality nesting habitat is present. Suitable habitat for foraging is present with kea having fairly large foraging territories (covering up to 4 km²). Occasional kea records are observed during winter periods and are predominantly juvenile birds (non-breeding); with individuals lured as a result of the increased activity in the area and scavenging potential. No kea were observed in the study area during more than 700+ field hours in a range of conditions including dawn, dusk, and night observations. It is possible that kea infrequently utilise the site.
Australasian harrier / kāhu *(Circus approximans)*	Not Threatened	Not Threatened	Present (observed)	Infrequent foraging	Suitable foraging habitat present throughout a range of vegetation communities where prey species may be present (opportunistic feeders, eating passerines, rodents, other small mammals, and invertebrates). Observed once flying overhead within the southern part of the study area. Kāhu generally breed at lower altitudes within lowland wetlands and shrubland and are therefore not expected to breed within the study area.
Southern Black-backed Gull/karoro (*Larus dominicanus dominicanus)*	Not Threatened	Not Threatened	Present (observed)	Resident during Spring – Autumn	Suitable nesting and foraging habitat is present during warmer months. Generally, nests at lower altitudes (on riverbeds, farmland or coastal areas) however, are also known to nest at such elevation in grassy or shingly areas. Observed on multiple site visits across a range of vegetation communities (snow tussock grassland, cushionfield, and cushion bog wetland). Also noted on multiple occasions was a still dependant juvenile bird begging from parents within the lower Doolans area indicating it was potentially raised nearby.

4.3.2 Herpetofauna

[redacted]

[redacted]

4.3.3 Invertebrates

Using the lowest resolved taxonomic unit while removing hierarchical double-counting; the assessment of specimens from the invertebrate sampling within the Doolans area, as well as field observations, provided identification of 120 distinct taxa, from 15 Orders and 64 Families.

The commonly observed species were: *Celatoblatta quinquemaculata, Anoteropsis hilaris, Sigaus australis, Hemideina maori, Hemiandrus focalis,* and *Mecodema politanum*. A full list of invertebrates identified can be found in Appendix D.

Species richness differed markedly among methods. Pitfall trapping yielded the highest richness, with 82 taxa, followed by light trapping with 44 taxa, and hand collection with 36 taxa.

Patterns of method-specific taxa indicated strong sampling differentiation. Pitfall trapping produced 71 taxa unique to that method. Examples include the species *Nysius huttoni* and *Priocnemis nitidiventris*, the genus *Clubiona*, and the families Therevidae and Chrysomelidae. This indicates that pitfall traps were particularly effective at sampling ground-dwelling Hemiptera, Hymenoptera, spiders, and various beetle and fly families.

Light trapping recorded 43 taxa unique to that method, with many moth species represented exclusively in this dataset including *Scoparia rotuella*, *Scoparia niphospora*, *Proditrix megalynta*, *Peripyra sanguinipuncta*, and *Xanthorhoe occulta*. Hand collection was implemented to collect species that may not be detected during light trapping or pitfall sampling methods. This method yielded 24 taxa unique to that method, including species such as *Dasyuris micropolis*, *Anagotus latirostris*, *Inophloeus inuus*, and *Tauroscopa notabilis*, as well as the genus *Aoraia*. These taxa are associated with vegetation or microhabitats and are not as actively ground dwelling as many other terrestrial invertebrates and therefore are less effectively sampled by passive trapping.

Overall, pitfall trapping contributed the greatest absolute richness, while light trapping contributed a high proportion of unique nocturnal taxa. Hand collection supplemented both methods by detecting additional taxa not captured by passive trapping. Together, the three methods provided complementary sampling coverage and substantially increased total observed taxonomic richness.

In total, there are 25 invertebrate species either unclassified or classified as Data Deficient, At Risk, or Threatened identified in desktop review or field surveys. Seventeen species were recorded during the invertebrate surveys and a further eight were potentially present based on desktop review. *Protodendrophagus sp. 1, Asaphodes stinaria,* and *Xanthorhoe bulbulata* have all been excluded from further assessment due to the unlikely presence of each species within the disturbance footprint. Notable species are rare species, as assessed by the Department of Conservation's Threat Classification system and/or have not been formally assessed but based on expert judgement, could potentially have a threat

classification greater than Not Threatened if assessed. Figure 25 below provides the location of the notable species found, while Table 7 provides a description of each recorded notable species.

Please note, where species are depicted within Figure 25, locations are indicative of where species are associated with a community but does not show their full extent within the study area.

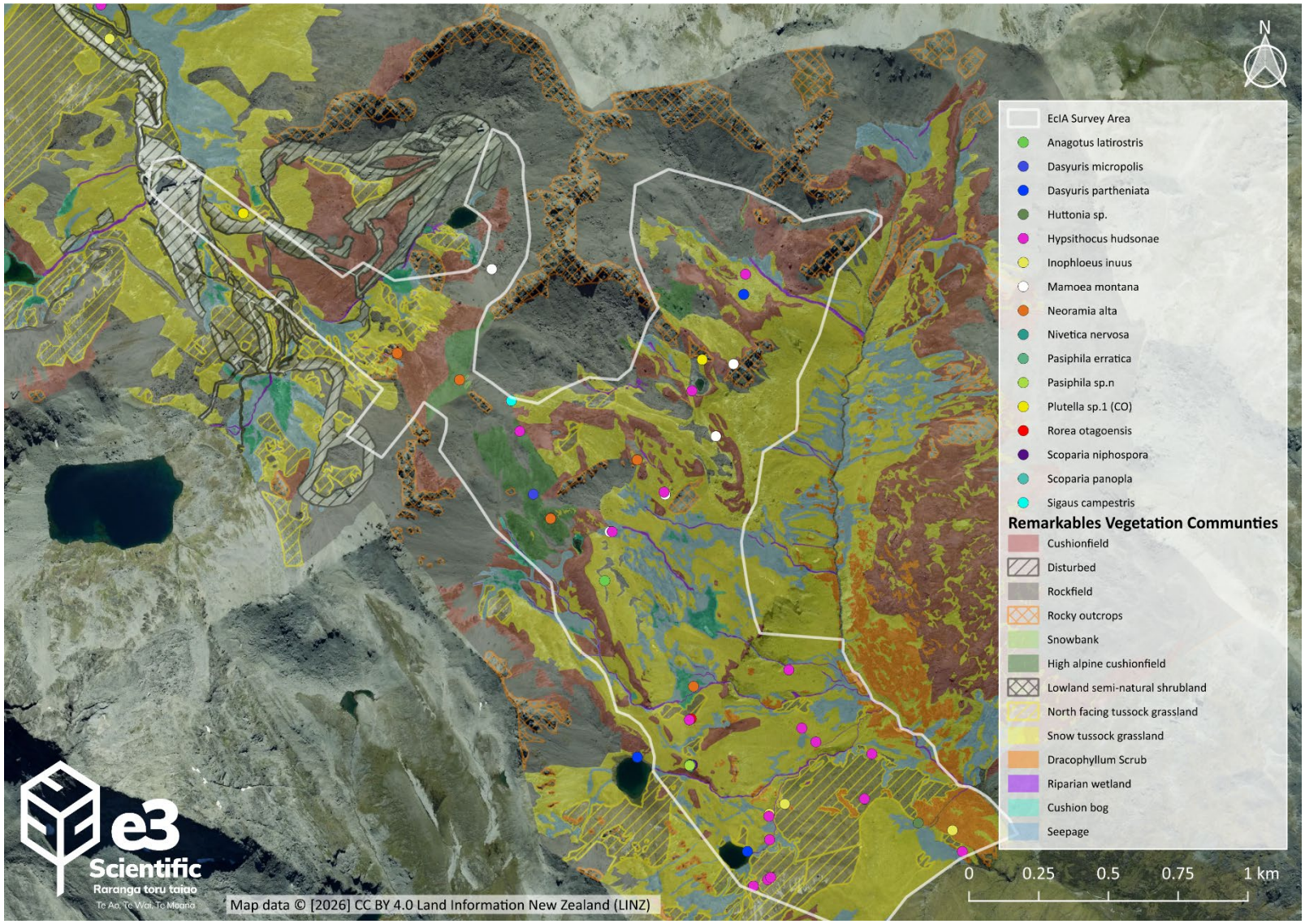

Figure 25: Location of Unclassified, Data Deficient, At Risk, Threatened invertebrate species.

Table 7: Unclassified, Data Deficient, At Risk, Threatened invertebrate species within the study area.

Species	NZTCS Conservation Status[1]	Likelihood of Occurrence	Notes[2]
Dasyuris partheniata	At Risk – Declining	Present (observed)	*Dasyuris partheniata* is a day flying geometrid moth. The specimen collected was found at rest on *Chionochloa macra*. However, the larvae of this species is associated with plant species of the *Aciphylla* genus; with no known preference of Aciphylla species all have been considered for potential habitat association. Within the tussock grassland communities Aciphylla species include *A. kirkii, A. lecomtei, A. aurea and A. 'lomond'. A. simplex* is also recorded within multiple communities of the study area. It has therefore been assessed as occurring within the following vegetation communities: snow tussock grassland and north facing tussock grassland, cushionfield, high-alpine cushionfield, seepage, rockfield, Dracophyllum scrub and rocky outcrop.
Plutella sp.1 (CO)	At Risk – Declining	Present (observed)	*Plutella* sp.1 (CO) is a small day flying moth. The specimen collected was found at rest on *Chionochloa macra*. However, the larvae of this species is associated with plant species of the Brassicaceae family. Given the species recorded location, and the known species within the adjacent areas, it is assumed that the moth is most likely host dependant on *Pachycladon novae-zelandiae*. However, plants within the *Cardamine* Genus cannot be ruled out as a host species. *Pachycladon novae-zelandiae* is largely restricted to isolated, south facing areas within the rocky outcrop vegetation community occurring in low abundance and not recorded within the southern section of the study area. Cardamine species were commonly found within gravely sections within the margins of the waterways and newly forming riparian wetlands, particularly within the southern portion of the study area. As the species host plant has not yet been confirmed, subsequent assessments relating to the *Plutella* species have been attributed to the communities containing both potential host plants.
Sigaus campestris	At Risk – Declining	Present (observed)	*Sigaus campestris* is an alpine grasshopper from the Family Acrididae, *S. campestris* was known to be far more abundant historically and has been threatened by land use changes (Trewick *et al.,* 2022). The specimen found was located within a contiguous patch of snow tussock grassland. It is expected to be restricted to the snow tussock grassland community.
Hypsithocus hudsonae	At Risk – Naturally Uncommon	Present (observed)	*Hypsithocus hudsonae* is a melanised alpine shield bug from the Family Pentatomidae, likely common in the right habitat within montane areas but considered naturally uncommon. Records were observed in both tussock grassland and seepage communities with multiple specimens occurring collection.
Neoramia alta	At Risk – Naturally Uncommon	Present (observed)	*Neoramia alta* is a cryptic species from the family *Stiphidiidae,* this species is known from high elevations and alpine areas. It is considered more common than previously thought and has been recorded throughout Bannockburn and the Remarkables (Sirvid *et al.,* 2021). Specimens were collected at various sites within the high alpine being associated with both distinct cushions field communities. One record was also collected within the drier areas of the cushion bog community.
Mamoea montana	Data Deficient	Present (observed)	*Mamoea montana* is a species from the family Desidae. This spider is possibly range restricted but has not been provided with a full threat status due to the lack of records, possibly signifying its rarity (Sirvid *et al.,* 2021). Specimens were collected at various sites throughout the study area and were observed to be generalists through the wider environment. Observations noted that they were present in reasonable numbers and occasionally associated with a prey species of cave weta (*Pharmacus notabilis*).

Species	NZTCS Conservation Status[1]	Likelihood of Occurrence	Notes[2]
Rorea otagoensis	Data Deficient	Present (observed)	*Rorea otagoensis* is similar to *M. montana,* also from the Family Desidae. This spider is also possibly range restricted and has not been provided with a full threat status due to the lack of records (Sirvid *et al*., 2021*)*. Specimens were collected within both the cushionfield and snow tussock grassland communities.
Anagotus latirostris	Unclassified [3]	Present (observed)	*Anagotus latirostris* is a species from the weevil Family Curculionidae; seemingly restricted to montane to subalpine areas within Central Otago. The specimen was collected within the snow tussock grassland community. It is expected to be restricted to the snow tussock grassland community.
Inophloeus inuus	Unclassified [4]	Present (observed)	*Inophloeus inuus* is a species from the weevil family Curculionidae; seemingly restricted to montane to subalpine areas. The specimen was only collected below 1500 m asl with multiple others observed nearby at similar elevation. This species was recorded and is expected to occur within the *Chionochloa rigida* tussock grassland below 1500 m on various aspects containing extensive coverage of *Dracophyllum rosmarifolium* and *Aciphylla aurea*.
Taenarthrus capito	Unclassified [4]	Moderate	Specimens are known from the Otago Lakes District, including the Remarkables, the Old Man Range, the Dunstan range, as well as the Catlins. At its known sites the habitat for this species is cold-water stream margins and tarns (riparian and cushion bog vegetation) where rocks or rubble lie in the splash zone. Such streams may be within forest/shrub vegetation, open grassland or almost bare fell-field. Several streamside and lakeside sites have been examined around Lake Wakatipu. No specimens were found there but the lake level has been raised for river control since the original collection.
Duvaliomimus walkeri	Unclassified [3]	Moderate	The trechine *Duvaliomimus walkeri*, a co-inhabitant with *Taenarthrus capito* at other sites, is still common at lakeside sites around Queenstown. The species is known from a wide variety of other sites all close to and above the tree line (770–1850 m) in the cold and exposed Otago ranges of southern New Zealand. Two records from the Catlins hills are anomalous in that they are at low altitude and the broadleaf forest vegetation is very different from the Nothofagus forest, tussock grasslands or fell-field flora of the higher sites. Expected to occur or was collected within snow tussock grassland, north facing tussock grassland, cushion bog, riparian wetland, and rocky outcrop vegetation communities.
Protodendrophagus sp. 1	Unclassified [4]	Low	Status unknown, currently only known from the ridgeline between the top of Shadow Basin and Double Cone within cushionfield vegetation.
Asaphodes stinaria	Threatened – Nationally Critical	Very Low	Similar to *Xanthorhoe bulbulata,* it was once prolific and is now undergoing substantial decline. It was seen in 2015 and has been collected from a range of localities around Queenstown. The host plant is unknown for this species, however it has been collected various times from within grassland communities containing species of the *Festuca* Genus. Given *Festuca* and associated plants that occur in conjunction are generally restricted to montane sites is considered highly unlikely that the species will be present within the study area.
Xanthorhoe bulbulata	Threatened – Nationally Critical	Very Low	A day flying moth, this species was historically considered prolific throughout many grassland areas in New Zealand, with one of the last known sightings within the Remarkables post office in 1979. Its host plant is unknown. The species has undergone an extensive range contraction for unconfirmed reasons although it is likely attributed to a decline of its host plant. This species is considered potentially present within the lower montane zone (montane extending from approximately 250 – 900 m asl at the sites latitude (Wardle, 1991)). As most species within the study area are restricted to above the montane zone and have generally undergone low levels of modification comparatively to lower elevations within the surrounding ecological regions; it is assessed as very unlikely that the species is present within the study area.

Species	NZTCS Conservation Status[1]	Likelihood of Occurrence	Notes[2]
Xanthohoe frigida	Threatened – Nationally Vulnerable	High	This species has been found in and around the Remarkables and is considered potentially present around the Doolans area. *X. frigida* is believed to feed on *Pachycladon*. *Pachycladon novae-zelandiae* is the only species in the *Pachycladon* genus known to occur within the study area and as noted above is largely restricted to isolated, south facing areas within the rocky outcrop vegetation community occurring in low abundance and not recorded within the southern section of the study area.
Pyrausta comastis	Threatened – Nationally Vulnerable	Moderate	This species is extremely cryptic. It was last seen around the tops of the Ben Lomond track, with the potential to inhabit areas within the Doolans. Its host plant is unknown; however, it is a day flyer associated with the fringes of tarns (cushion bog vegetation).
Peripatus sp. Remarkables	Unclassified[4]	Moderate	Status unknown. A record was noted within cushionfield, occurring along the ridge separating shadow basin from Lake Alta. Although the recorded location is outside the proposed disturbance footprint its recent discovery means it distribution both locally and nationally is not yet known.
Subantarctia centralis	Data Deficient	Present (observed)	A montane species known from tussock grassland and rockland. It has only reliably been collected from one possibly two historic localities.
Huttonia sp.	Unclassified	Present (observed)	An undescribed species of a very cryptic spider genus and family. Little is known about the entire family grouping of this species, and it is impossible to determine whether it would be rare. Given that we did not see it in the first round of pitfalls, it is likely more common in the lower areas of the site. Based upon the recorded location it is expected to be present within tussock grassland, Dracophyllum scrub, and/or seepages.
Dasyuris micropolis	At Risk – Declining	Present (observed)	A lower montane to alpine specific day flying species. Suspected of being a species that feeds on *Veronica*. Given it was collected within cushionfield vegetation at an elevation greater than 1700 m asl it is potentially associated with *Veronica densifolia* or *Veronica thompsonii* both of which are widespread with the cushion field, high alpine cushionfield and rocky outcrop communities.
Nivetica nervosa	At Risk, Declining	Present (observed)	An alpine-specific species that is found throughout the South Island but in very localised areas. This is an alpine wetland-specific species that may be found in or around natural wetland zones. The host plant species are unknown.
Scoparia panopla	Unclassified[4]	Present (observed)	A large species of crambid which can be seen on the wing in January. It is not commonly observed or recorded, but it has a distribution through multiple areas of the South Island. Possibly a range-restricted species. The host plants for this species is unknown, but it would likely be a *Poa or Chionochloa species,* or possibly a small herb associated with tussock grassland.
Scoparia niphospora	Unclassified[4]	Present (observed)	A January flying crambid very fleetingly recorded these days. This one is probably more likely to be on a grass or small herb like those listed under *S. panopla,* but it is hard to be certain due to the lack of studies on this species and genus.
Pasiphila eratica	Unclassified[3]	Present (observed)	Only known from the Otago and Southland regions. Despite being a fairly recognisable species (with reddish flashes), it has not been recorded very commonly in recent times. This species is believed to be associated with *Veronica odora* however, may be associated with other *Veronica* species or similar herbaceous species. *Veronica odora* has not been recorded within the study area however, *Veronica* species are generally recorded within the tussock grassland, seepage and cushionfield communities.
Pasiphila sp.n	Unclassified[4]	Present (observed)	Very different in form and size to any of the other *Pasiphila* species collected and not documented in Hudson's catalogues, the species records of Pasiphila from LUNZ, or NZAC. It may be a range-restricted and local species,

Species	NZTCS Conservation Status[1]	Likelihood of Occurrence	Notes[2]
			but this is hard to say with certainty. If this is an undescribed species, it's distribution both locally and nationally is not yet known.

[1] Conservation status' as per (Sirvid *et al.,* 2020), (Trewick *et al.,* 2022), (Hoare *et al*., 2015), and (Trewick *et al*., 2014).

[2] For the purposes of this report where a species has a known or potential host pant located, is known to occur within a particular community, or has been collected from a specific vegetation community this community has been used for subsequent assessment in Section 5.

[3] Tentatively assigned the classification of At Risk – Naturally Uncommon given it is largely range restricted to montane to alpine environments, with limited land modification or disturbance within its recorded elevation range.

[4] Tentatively assigned the classification of At Risk – Data Deficient due to the lack of recorded biological information, however specimens have been recorded across a wide range of habitat and ecological regions.

5 Ecological Significance and Value

The assessment of significance of the ecological values associated with the study area are based on the following:

- New Zealand's Department of Conservation guidelines for assessing significant ecological value, Science for Conservation 327 (Davis , Head, Myers, & Moore, 2016);
- The Ecological Impact Assessment (EcIA) EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems, 2nd edition (Roper-Lindsay et al., 2018);
- National Policy Statement for Indigenous Biodiversity (NPS-IB) Appendix 1: Criteria for identifying areas that qualify as Significant Natural Areas (SNAs) (Ministry for the Environment , 2023); and
- The QLDC District Plan Chapter 33: Criteria for assessing ecological significance (Queenstown Lakes District Council, 2024);
- CODC District Plan, Schedules 19.6.1 and 19.6A, identified 'Area[s] of Significant Natural Value' (SN) (Central Otago District Council, 2008).

5.1 Individual Species

The national and/or regional threat classification of the flora and faunal species present within the study area has been provided above in Table 5 (plants), Table 6 (birds) and Table 7 (invertebrates). The threat classifications have been obtained from the National and Regional (Otago) threat classification series. The ecological value of these individual species has been assessed based upon the EIANZ guidelines as follows:

- Threatened – National Critical, Nationally Endangered, Nationally Vulnerable, or Nationally Increasing = **Very High** ecological value;
- At Risk – Declining = **High** ecological value;
- At Risk – Recovering, Relict, or Naturally Uncommon, Data Deficient, and locally important or locally uncommon = **Moderate** ecological value;
- Not Threatened = **Low** ecological value.
- Unclassified species have been given a provisional classification and value (as above) based on expert opinion and a likely threat assessment outcome.

Where the national and regional threat classification differ the higher of the two threat classifications has been applied when assigning ecological value. All relevant species have been listed in Table 8 below with their associated ecological value. It is important to note that regardless of threat status, all indigenous avifauna and herpetofauna species are protected under the Wildlife Act 1953, and mitigation measures for their protection are therefore required (see Section 7).

Table 8: Ecological value of individual species

Flora	Ecological Value
Acaena caesiiglauca	High
Aciphylla lecomtei	High
Aciphylla kirkii	Moderate
Aciphylla simplex	Moderate
Agrostis pallescens	Moderate
Anisotome lanuginosa	Moderate
Anisotome "Otago Bog"	Moderate
Azorella exigua	Moderate
Azorella haastii subsp. *haastii*	Moderate
Brachyscome montana	Moderate
Brachyscome longiscarpa	Moderate
Carex edgariae	Very High
Carex enysii	Moderate
Carex hectorii	Moderate
Carex lachenalii subsp. *parkeri*	Moderate
Carex kirkii var. *kirkii*	Moderate
Carex petriei	Moderate
Carex parvispica	High
Carex pterocarpa	Moderate
Carex purpurata	Moderate
Carex talbotii	Very high
Celmisia ramulosa var. tuberculata	Moderate
Centrolepis pallida	Moderate
Chaerophyllum aff. Colensoi (a) (CHR 215836; "bog")	Moderate
Colobanthus apetalus	Moderate
Colobanthus strictus	High
Craspedia uniflora var.uniflora	Very High
Deschampsia pusilla	Moderate
Deschampsia chapmanii	Moderate
Dracophyllum prostratum	Moderate
Epilobium komarovianum	Moderate
Epilobium porphyrium	Moderate
Euchiton traversii	Moderate
Euphrasia petriei	Moderate
Festuca madida	Moderate
Festuca mathewsii	Moderate

Forstera purpurata	Moderate
Gaultheria nubicola	Moderate
Gentianella amabilis	Moderate
Geranium microphyllum	Moderate
Geum pusillum	Moderate
Gunnera dentata	Moderate
Juncus pusillus	Very High
Kelleria childii	Moderate
Kelleria paludosa	Moderate
Lachnogrostis uda	Moderate
Leptinella albida	Moderate
Leptinella goyenii	Moderate
Lobelia linnaeoides	Moderate
Luzula colensoi	Moderate
Luzula leptophylla	Moderate
Luzula traversii var. tenuis	Very High
Myosotis antarctica subsp. antarctica	Moderate
Myosotis bryonoma	Moderate
Myosotis lyallii subsp. *elderi*	Moderate
Myosotis pulvinaris	Moderate
Nertera balfouriana	Moderate
Pachycladon novae-zelandiae	Moderate
Phyllachne rubra	Moderate
Pimelea notia	Moderate
Poa lindsayi	High
Poa schistacea	Moderate
Poa tonsa	Moderate
Ranunculus maculatus	Moderate
Ranunculus buchananii	Very High
Ranunculus pachyrrhizus	Moderate
Ranunculus royi	Very High
Raoulia hectorii var. mollis	Moderate
Raoulia subulata	Moderate
Raoulia youngii	Moderate
Rytidosperma pumilum	High
Shawia cymbifolia	Moderate
Taraxacum zealandicum	High
Veronica ciliolata var. fiordensis	Moderate
Veronica hectorii subsp. demissa	Moderate
Avifauna	
Eastern falcon (*Falco novaeseelandiae* subsp. *novaeseelandiae)*	Very High
NZ pipit (*Anthus novaeseelandiae* subsp. *novaeseelandiae)*	High
Paradise duck (*Tadorna variegata)*	Low
Kea *(Nestor notabilis)*	Very High
Australasian harrier *(Circus approximans)*	Low
Southern black-backed gull (*Larus dominicanus)*	Low
Herpetofauna	
McCann's skink (*Oligosoma maccanni)*	Low
Invertebrates	

Dasyuris partheniata	High
Plutella sp.1 (CO)	High
Sigaus campestris	High
Hypsithocus hudsonae	Moderate
Neoramia alta	Moderate
Mamoea montana	Moderate
Rorea otagoensis	Moderate
Anagotus latirostris	Moderate
Inophloeus inuus	Moderate
Taenarthrus capito	Moderate
Duvaliomimus walkeri	Moderate
Xanthohoe frigida	Very High
Pyrausta comastis	Very High
Peripatus sp. Remarkables	Moderate
Subantarctia centralis	Moderate
Huttonia sp.	Moderate
Dasyuris micropolis	High
Nivetica nervosa	High
Scoparia panopla	Moderate
Scoparia niphospora	Moderate
Pasiphila eratica	Moderate
Pasiphila sp.	Moderate

5.2 Vegetation Communities

A description of the vegetation communities is provided in Section 4. Table 9 provides an assessment of vegetation communities against the NPS-IB, DOC, EIANZ, and QLDC assessment matters. Where Moderate, High or Very High value species are present within and actively use the vegetation communities (see Section 4.3), weighting has been allocated under the Rarity criterion.

The entire study area within the CODC boundary is mapped as an area of Significant Natural Value in the District Plan. The area is listed in Schedules 19.6.1 and 19.6A, being identified as an 'Area of Significant Natural Value' in the Central Otago District Plan; recognised as containing plants or fauna with ecological values that require protection and include any wetland over 800 metres above sea level.

For the purposes of the assessment under the EIANZ guidelines, NPS-IB and DOC assessment criteria, the Rarity and Distinctiveness matters (referred to as Special Features within the DOC criteria) will be assessed together. QLDC' Significant Natural Area (SNA) assessment criteria assess each matter separately and have been addressed as such within Table 9.

Table 9: Review of ecological significance criteria for each vegetation community.

Snow Tussock Grassland						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	The vegetation present is typical of the structure and composition of native cover found in these communities at similar altitudes in the Remarkables Ecological District. Indigenous species dominate.	High	High	Yes	Yes	Yes
Naturalness	The vegetation is highly natural being dominated by indigenous species with only four exotic species recorded within 12 of the 49 quadrats assessed in the snow tussock grassland community. Introduced faunal species observed were present in low abundance, however, were widespread and included: house mice (*Mus musculus*), Norwegian rats (*Rattus norvegicus*), hedgehog (*Erinaceus europaeus*), skylark (*Alauda arvensis*), redpoll (*Acanthis flammea*), chukar (*Alectoris chukar*), red deer (Cervus elaphus), fallow deer (*Dama dama*), and chamois (*Rupicapra rupicapra*). Stoats (*Mustela erminea*) are also highly likely to be present. These introduced species will affect indigenous biodiversity present within the study area as a result of browse and/or predation. However, no disturbance characteristics were observed that would result in considerable change to the ecological function of the community.	High	N/A	N/A		N/A
Rarity	Snow tussock grassland is not considered to be a rare ecosystem and is the most extensive vegetation community throughout the Ecological District. Additionally, this community is located within a LENZ Land Environment containing greater than 30% indigenous cover left and greater than 20% protected. The community contains 21 plant species that are classified as At Risk – Naturally Uncommon, and six that are At Risk – Declining (see Table 5). Additionally, the vegetation community contains important foraging and nesting habitat for the At Risk - Declining pipit and other exotic passerines and land fowl; it is therefore, the most suitable hunting habitat for the Threatened – Nationally Vulnerable kārearea. One At Risk – Naturally Uncommon, two Data deficient, three At Risk – Declining, and seven Unclassified invertebrate species were recorded within the snow tussock grassland (see Table 7). Of the Unclassified invertebrate species two have been provisionally assigned as At Risk – Declining, four Data Deficient, and one At Risk – Naturally Uncommon.	High	Very High	Yes		Yes
Distinctiveness	The vegetation community does not contain any species that are at their distribution limits, endemic to the Ecological Region or District, or that have developed as a result of unique environmental conditions. The community and many species contained within it are dispersed across large ranges within the montane to alpine areas across the South Island.			No		
Diversity and Pattern	The indigenous plant species diversity in this community is relatively high, with 80 different species recorded within the completed vegetation quadrats. While *Chionochloa macra* generally accounted for more than 50% of the total cover, with some locations reaching 100% coverage, inter-tussock species occurred as a result in small shifts in underlying soil, hydrological, and ecological gradients	High	Moderate	Yes		Yes

	reflecting slight changes throughout the community. These inter-tussock species were generally located in low abundance; each accounting for approximately 1-5% of the total cover.					
Ecological Context	This vegetation community is part of a continuous area of indigenous vegetation within the surrounding mountains allowing movement and dispersal of species throughout the range. The vegetation provides an important buffer from more disturbed/exotic communities within the Rastus Burn Basin. The area provides important foraging and breeding habitat for a range of At Risk and Threatened indigenous avifauna and invertebrate species.	High	High	Yes		Yes
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**Very High**	**Yes**	**Yes**	**Yes**

North facing tussock grassland						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	The vegetation is typical of the structure and composition of native cover found in these communities at similar altitudes in the Remarkables Ecological District. Indigenous species dominate. However, the community is less diverse than non-north facing tussock aspects.	High	High	Yes	Yes	Yes
Naturalness	The vegetation is highly natural, dominated by indigenous species, with three exotic species recorded within two of the nine quadrats assessed in this community. Introduced fauna species were not observed however these species are highly likely to utilise this habitat. Introduced faunal species will have affected indigenous biodiversity present and will suppress indigenous species populations. Notwithstanding this point, disturbance was not observed that is likely to result in considerable change to the ecological function of the community.	High	N/A	N/A		N/A
Rarity	North facing tussock grassland is not considered to be a rare ecosystem and widely dispersed throughout the Ecological District. Additionally, this community is located within a LENZ Land Environment containing greater than 30% indigenous cover left and greater than 20% protected. The community contains five plant species that are classified as At Risk – Naturally Uncommon, and two that are At Risk – Declining (see Table 5). Additionally, the vegetation community contains moderate quality foraging habitat and low-quality nesting habitat for the At Risk - Declining Pipit and therefore also the Threatened karearea. One At Risk – Naturally Uncommon, two Data Deficient, two At Risk – Declining, and five Unclassified invertebrate species were recorded within the vegetation community (see Table 7). Of the unclassified species two have been provisionally assigned as At Risk – Declining, two Data Deficient and one At Risk – Naturally Uncommon.	High	Very High	Yes		Yes
Distinctiveness	The vegetation community does not contain any species that are at their distribution limits, endemic to the Ecological Region or District, or that have developed as a result of unique environmental conditions. The community and many species contained within it are dispersed across large ranges within the montane to alpine areas across the South Island.			No		
Diversity and Pattern	The indigenous species diversity of north facing tussock grassland within the study area is lower than that of other tussock grassland dominated communities; with other areas displaying a higher degree of habitat complexity intersecting a greater number of ecological niches (variability in soils conditions, periods of direct solar exposure, elevation, and therefore, introduce more niches for additional diversity). In total, 37 indigenous plant species were recorded within this vegetation community. The species and community composition slightly changes along the altitudinal gradient, as well as being shaped by exposure to wind, sun and soil depth.	High	Moderate	Yes		Yes
Ecological Context	This north facing tussock grassland is connected to large areas of snow tussock grassland within the montane to alpine zone. However, the occurrences of north facing tussock grassland within the Doolans catchment are isolated forming small disjunct communities. Comparatively areas on northern aspects within the Rastus Burn are larger and more widely dispersed. This community provides habitat through part of the lifecycle for a range of locally important faunal species,	Medium	Moderate	Yes		Yes

	including the Not Threatened McCann's Skink as well as a range of At Risk, Data Deficient, and locally important invertebrate species.					
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**High**	**Yes**	**Yes**	**Yes**

Dracophyllum scrub						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	The vegetation is typical of the structure and composition of native cover found in these communities at similar altitudes in the Remarkables Ecological District. Indigenous species dominate.	High	High	Mapped extent of community is not present within District boundary	Yes	Yes
Naturalness	The vegetation is highly natural, dominated by indigenous species, with no exotic species recorded within the surveyed quadrats. Red deer are common at lower elevation where the community occurs, and preferred tracks have been walked by deer damaging small amounts of vegetation. This said, limited browse was observed within the community due to the dominant species being unpalatable.	Medium-High	N/A			N/A
Rarity	Dracophyllum shrubland is not considered to be a rare ecosystem and covers extensive land below 1400 m asl within the Ecological District. Additionally, this community is located within a LENZ Land Environment containing greater than 30% indigenous cover left and greater than 20% protected. No At Risk or Threatened plant species were recorded in this community. Additionally, the vegetation community contains Low quality foraging habitat and low-quality nesting habitat for the At Risk - Declining Pipit and also the Threatened kārearea. One Unclassified (provisionally assigned a Data Deficient classification) and one At Risk – Declining invertebrate species was recorded within the vegetation community (see Table 7).	Medium	Moderate			Yes
Distinctiveness	The vegetation community does not contain any species that are at their distribution limits, endemic to the Ecological Region or District, or that have developed as a result of unique environmental conditions. The community and many species contained within it are dispersed across large ranges within the montane to alpine areas across the South Island.					
Diversity and Pattern	The indigenous species diversity of Dracophyllum scrub is lower than that of most other vegetation communities within the study area. The community, however, has naturally low diversity due to high moisture deficits and *Dracopyhllum* species contributing to low soil pH. In total, 10 indigenous plant species were recorded within this vegetation community. The species and community composition has little to no observable ecological variation across physical environment characteristics (wind, sun exposure, soil depth, substrate type).	Medium	Moderate			Yes
Ecological Context	This vegetation community is connected to large areas of Dracophyllum scrub, forming a mosaic of habitat with snow tussock grassland and cushionfields at lower elevations (montane to low alpine zone). This community provides habitat through part of the lifecycle for a range of locally important faunal species, including the McCann's Skink as well as a Data Deficient, and locally important invertebrate species.	Medium	Moderate			Yes
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**High**	**N/A**	**Yes**	**Yes**

Cushionfield						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	The areas of cushionfield within the study area are representative of this community in the alpine environment in the Ecological District. Indigenous species dominate, and the typical composition and structure of species found within this community are present.	High	High	Yes	Yes	Yes
Naturalness	Little to no disturbance has occurred within the community, apart from a few lightly indented tracks from recreation use resulting in isolated plant loss. The elevation at which the community occurs likely limits the encroachment of exotic species as evident by only three exotic species found within five of the 18 vegetation quadrats completed within the area (each accounting for less than 1% of the total cover). Notably, the quadrats where exotic species were recorded were all located at lower elevations (all below 1700 m asl, with the top range of the community observed at approximately 1870 m asl). No disturbance characteristics were observed that would result in any considerable change to the ecological function of the community.	High	N/A	N/A		N/A
Rarity	Cushionfields are not considered to be a rare ecosystem. Additionally, this community is located within a LENZ Land Environment containing greater than 30% indigenous cover left and greater than 20% protected. The community contains 19 plant species that are classified as At Risk – Naturally Uncommon, three that are At Risk – Declining, and one that is Threatened (see Table 5). Additionally, the vegetation community contains some moderate quality foraging habitat for the At Risk - Declining pipit and therefore some periodic hunting habitat for the Threatened – Nationally Vulnerable kārearea. Periodic foraging by the Threatened – Nationally Endangered kea may occur on invertebrates and fruiting plants/roots. One At Risk – Naturally Uncommon, one At Risk – Declining, three Data Deficient, and one Unclassified invertebrate species were recorded (see Table 7). The unclassified invertebrate species is provisionally assigned as At Risk – Naturally Uncommon.	High	Very High	Yes		Yes
Distinctiveness	*Anisotome lanuginosa* is endemic to the Otago region and the Remarkables Ecological District is the western extent of its natural range. The community does not contain any other species at their distribution limits, or that are endemic to the Ecological Region or District. Species presence and composition has developed in response to shallow soils and extreme climatic exposures.			Yes		
Diversity and Pattern	The level of natural diversity within this community is high with a total of 61 indigenous plant species recorded. Species abundance is generally dominated by *Dracophyllum muscoides* with consistent prevalence of a range of species in lower abundance. The community is present across a range of elevations and aspects. However, cushionfield generally occurs in similar geological/topographical features and soil gradients, forming on shallow soil structures in exposed spurs ridges and faces.	High	Moderate	Yes		Yes
Ecological Context	The areas of cushionfield within the study area are moderate in size forming contiguous communities across alpine terraces, spurs and slopes. Cushionfield is likely to provide important foraging habitat for a range of At Risk avifauna and invertebrate species during some stage of their life cycle.	High	High	Yes		Yes
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**Very High**	**Yes**	**Yes**	**Yes**

High Alpine Cushionfield						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	The areas of high alpine cushionfield are representative of the Ecological Districts high alpine environments. Indigenous species dominate, and the typical composition and structure of species found within this community are present.	High	High	Mapped extent of community not present within District boundary	Yes	Yes
Naturalness	Little to no disturbance has occurred within the community, apart from a few lightly indented tracks from recreation use resulting in isolated plant loss. The elevation at which the community occurs likely inhibits the encroachment of exotic species as evident by no exotic species being found within the vegetation quadrats completed within the area. Additionally, no disturbance characteristics were observed that would result in any considerable change to the ecological function of the community.	High	N/A			N/A
Rarity	High alpine cushionfields are not considered to be a rare ecosystem. Additionally, this community is located within a LENZ Land Environment containing greater than 30% indigenous cover left and greater than 20% protected. The community contains 11 plant species that are classified as At Risk – Naturally Uncommon, and one that is At Risk – Declining (see Table 5). Additionally, the vegetation community contains low quality foraging habitat for the At Risk – Declining pipit, and low abundance of larger invertebrates (wet and grasshoppers). Therefore, limited hunting habitat for the Threatened – Nationally Vulnerable kārearea is present (given lizards and exotic passerines are also either absent or in very low numbers). One At Risk – Naturally Uncommon, two At Risk – Declining and three Data Deficient invertebrate species were recorded (see Table 7).	High	High			Yes
Distinctiveness	*Anisotome lanuginosa* is endemic to the Otago region and the Remarkables Ecological District is the western extent of its natural range. The vegetation community does not contain any other species at their distribution limits, or that are endemic to the Ecological Region, or District. However, species presence and composition has developed as a result of shallow topsoils, extreme climatic exposures, and/or soil deficiencies.					
Diversity and Pattern	The level of natural diversity is considered moderate containing a total of 31 indigenous plant species. Species abundance is dominated by 5-10 species, with other species being scattered/less abundant. The complex patterns and distribution of species forming isolated fellfield and snowbanks within this community are representative of the variability in soil structure and moisture accumulation.	High	High			Yes
Ecological Context	The areas of high alpine cushionfield are moderate in size forming contiguous formations across high elevation terraces and various aspects providing linkages across alpine elevation for species dispersal. The areas are likely to provide important foraging habitat for a range of At Risk invertebrate species during some stage of their life cycle.	High	High			Yes
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**Very High**	**N/A**	**Yes**	**Yes**

Cushion Bog						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	The cushion bog communities within the study area are typical of those in alpine habitat within the Ecological District. The community contains many of the indigenous plant species expected to be present, and indigenous species dominate.	High	High	Yes	Yes	Yes
Naturalness	The areas are highly natural being dominated by dense coverage of indigenous species. Only two quadrats recorded exotic species in or around the assessment areas, accounting for less than 1% of the total vegetation cover. Some areas have observable, isolated pugging as a result of ungulate access. This has also resulted in low level browse of herbaceous species. Pugged areas have sustained minor damage to the floristic values.	High	N/A	N/A		N/A
Rarity	Cushion bogs are a naturally uncommon ecosystem (Holdaway *et al*., 2012). This vegetation community contains nineteen plant species that are classified as At Risk – Naturally Uncommon, one that is At Risk Declining, and three that are Threatened (see Table 5). The At Risk - Declining pipit is likely to rely on the community for important foraging habitat and therefore the Threatened kārearea is likely to hunt across the cushion bogs. Two At Risk – Naturally Uncommon (one provisionally assessed), the provisionally Data Deficient *Taenarthrus capito*, and the At Risk – Declining *Nivetica nervosa* were all recorded, and the Threatened – Nationally Vulnerable *Pyrausta comastis* is considered potentially present (see Table 7).	High	Very High	Yes		Yes
Distinctiveness	*Myosotis bryonoma* is endemic to the Otago region and the Remarkables Ecological District is the western extent of its natural range. Cushion bog formation is unique, requiring long periods of time to build complex hydrological and soil structures as a result of specific slope and altitudinal factors. Additionally, specialised plants were noted within the community that have developed as a result of these unique environmental factors.			Yes		
Diversity and Pattern	Cushion bog wetlands occur in a range of sizes and shapes within the study area and are only above approximately 1500 m asl. The diversity of plant species is high containing 59 different species with only one exotic species recorded. Vegetation cover and abundance is dominated by the five native species, with lesser amounts of the other species. Due to the highly specific environmental conditions required to form cushion bogs species generally occur across similar ecological or physical gradients with minimal variation across locations.	High	Moderate	Yes		Yes
Ecological Context	Cushion bog wetland communities provide important hydrological connectivity to neighbouring communities and form an important buffer in water runoff protecting adjacent and downstream environments from increased water accumulation, sedimentation and/or erosion. Cushion bogs were observed to be important feeding habitat for pipit. Additionally, the area is likely important habitat for At Risk and Threatened invertebrate and avifauna species during some part of their life cycle.	High	High	Yes		Yes
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**Very High**	**Yes**	**Yes**	**Yes**

Riparian wetland						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	The riparian wetland communities within the study area are typical of those in alpine habitat within the Ecological District. The community contains many of the indigenous plant species expected to be present and indigenous species dominate.	High	High	Yes	Yes	Yes
Naturalness	Riparian areas within the existing Remarkables ski area boundary contain modifications with roads passing through or overtop the wetlands, however, retaining hydrological connection. Exotic vegetation was noted in low abundance across the Doolans catchments with five exotic species recorded in four quadrats (accounting for less than 1% of the total vegetation cover). The Rastus Burn has a notably higher introduction of exotic species particularly where vegetation adjoins disturbed areas. There are few exotics relative to indigenous plant species.	High	N/A	N/A		N/A
Rarity	Wetlands are considered nationally rare following historic disturbance. Ninety percent of all pre-human wetlands have been lost nationally (Ausseil, et al., 2008). This vegetation community contains sixteen plant species that are classified as At Risk – Naturally Uncommon, three that are At Risk-Declining, and 4 that are Threatened (see Table 5). The At Risk – Declining *Plutella sp.1 (CO),* provisionally At Risk – Naturally *Uncommon Duvaliomimus walkeri,* and provisionally Data Deficient *Taenarthrus capito* were recorded or are expected to utilise the riparian wetlands for foraging more than periodically.	High	Very High	Yes		Yes
Distinctiveness	The vegetation community does not contain any species that are at their distribution limits, are endemic to the Ecological Region or District. However, multiple plant species present are specialised to higher altitude wetter environments, occurring in high abundance.			Yes		
Diversity and Pattern	There is a high concentration of species diversity within localised and/or small widths of vegetation, containing 81 different species, with 76 indigenous and five exotic species. Vegetation cover and abundance is consistently dominated by five to ten native species, with lesser amounts of the remaining species. Species occur across similar ecological or physical gradients but with some variation occurring as a result of the hydrology as the substrate graduates to upland soils.	High	High	Yes		Yes
Ecological Context	Riparian wetlands provide the connectivity between terrestrial and freshwater ecosystems throughout the study area. They provide important hydrological functions, moderating stream flows, maintaining water quality and water storage.	High	High	Yes		Yes
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**Very High**	**Yes**	**Yes**	**Yes**

Seepage						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	The seepage wetland community is typical of those in alpine habitat containing many of the indigenous plant species expected to be present at a similar elevation within the Ecological District and indigenous species dominate.	High	High	Yes	Yes	Yes
Naturalness	Seepages within the existing Remarkables ski area boundary contain modifications with roads passing through or overtop the wetlands, however, retaining hydrological connection. Seepages are limited in overall scale and areas within the Doolans but are far more natural comparatively. Some areas have observable, isolated pugging as a result of ungulate access. This has also resulted in low level browse of herbaceous species. Exotic vegetation was noted in low abundance across both catchments likely imported (particularly in the Doolans) by recreational use of the area.	High	N/A	N/A		N/A
Rarity	Seepages are a naturally uncommon ecosystem in New Zealand and are classified as Endangered (Holdaway, Wiser, & Williams, 2012). Seepages contain 26 plant species that are classified as either At Risk – Naturally Uncommon, Data Deficient, three that are At Risk – Declining, and five that are Threatened (see Table 5). At Risk pipit and/or Threatened kārearea are expected to utilise the seepages for foraging periodically. Additionally, the At Risk – Naturally Uncommon *Hypsithocus hudsonae* was noted within the community in multiple locations with the At Risk – Declining *Dasyuris partheniata* also potentially present. Two Unclassified invertebrate species were recorded within the vegetation community (Table 7). (one provisionally assigned a Data Deficient classification and one At Risk – Naturally Uncommon)	High	Very High	Yes		Yes
Distinctiveness	The vegetation community does not contain any species that are at their distribution limits, are endemic to the Ecological District or Region. However, multiple plant species present are specialised to higher altitude wetter environments and occur in high abundance.			Yes		
Diversity and Pattern	The diversity of plant species is locally high, containing 88 different species, 81 of which are indigenous and seven exotic species. Vegetation cover and abundance is dominated by up to ten species, with lesser amounts of the remaining species. Notable variation in species prevalence and abundance occurs in response to slope and hydrology, however, similar patterns were observed across the elevation range.	High	High	Yes		Yes
Ecological Context	The vegetation community is a part of a larger and interconnected series of freshwater systems; both supplying and being supplied by the extensive network of waterways and other wetland types within the site. This community allows plant and faunal dispersal through a range of elevations and provides habitat for the At Risk – Naturally Uncommon *Hypsithocus hudsonae* during part of their life cycle.	High	High	Yes		Yes
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**Very High**	**Yes**	**Yes**	**Yes**

Rockfield						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	The rockfield communities are typical of those in alpine habitat within the Ecological District. The community contains many of the indigenous plant species expected to be present, with plant species highly isolated to the more stable slopes.	High	High	Yes	Yes	Yes
Naturalness	The community is largely undisturbed and due to it's steep slopes with highly mobile rocky substrates often lacking soil or fine sediment accumulations it is highly resistant to the encroachment of exotic weeds with only one exotic species observed at one location. Animal and recreational tracks are present within the community due to the rock and soil surface being loose and more easily disturbed. However, tracks are generally not permanent, with movement induced by snow, rock, wind and precipitation often resulting in only temporary disturbance.	High	N/A	N/A		N/A
Rarity	The rockfield habitat is not considered to be a rare ecosystem and is located within a LENZ Land Environment containing greater than 30% indigenous cover left with over 20% protected. The community contains four plant species that are classified as At Risk – Naturally Uncommon and one that is At Risk – Declining (see Table 5). The vegetation community contains important habit for the Data Deficient *Mamoea montana,* and *Subantarctia centralis* (see Table 7) and potentially the At Risk – Declining *Dasyuris partheniata.*	High	High	Yes		Yes
Distinctiveness	The vegetation community does not contain any species at their distribution limits or that are endemic to the Ecological District or Region. Specialised plant species were noted within the community, having developed as a result of unique environmental factors and adaptations.			Yes		
Diversity and Pattern	The natural diversity within the rockfield communities is moderate with 47 indigenous species recorded across the ten vegetation quadrats completed within the community. However, the plants are restricted to isolated more sheltered or gentle slopes. Habitat gradients are relatively contiguous with limited variations observed in inhabitable terrain.	High	Moderate	Yes		Yes
Ecological Context	The rockfield vegetation community does not provide connectivity for dispersal of species. The area does provide a buffering function to adjacent areas with regard to weed introduction, being largely uninhabitable for many exotic species. The areas is likely to provide important habitat for the Data Deficient *Mamoea montana* during part of their life cycle.	Medium	Moderate	Yes		Yes
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**High**	**Yes**	**Yes**	**Yes**

Rocky outcrop						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	Whilst less extensive than other communities within the study area, this community is typical of rocky, alpine habitat in the Ecological District. This community is dominated by indigenous pre-human flora assemblages with little to no exotic encroachment.	High	High	Yes	Yes	Yes
Naturalness	The community is largely undisturbed and due to it's extreme exposure in many cases is resistant to exotic weeds with no exotic species recorded within the surveyed quadrats. Additionally, the exposure nature provides a buffer to browse from the introduced ungulate species dispersed throughout the Remarkables Conservation Area.	High	N/A	N/A		N/A
Rarity	Rocky outcrop habitat is not considered to be a rare ecosystem. Additionally, this community is located within a LENZ Land Environment containing greater than 30% indigenous cover left and greater than 20% protected. The community contains twenty plant species that are classified as At Risk – Naturally Uncommon, three that are At Risk – Declining, and two that are Threatened (see Table 5). Periodic foraging by the Threatened – Nationally Endangered kea may occur on invertebrates and fruiting plants/roots. Additionally, the vegetation community contains important habit for the Threatened – Nationally Vulnerable kārearea. One Unclassified (provisionally assigned as At Risk – Declining), one Data Deficient, and three At Risk – Declining invertebrate species were recorded within the vegetation community with the Threatened – Nationally Vulnerable *Xanthohoe frigida* likely to be present as a result of its potential host species being recorded within the community (see Table 7).	High	Very High	Yes		Yes
Distinctiveness	The vegetation community does not contain any species at their distribution limits or that are endemic to the Ecological Region or District. A number have plants are locally restricted to this vegetation community as a result of the unique soil substrates and exposure to extreme environmental factors.			Yes		
Diversity and Pattern	This community has a naturally high level of diversity (with 58 indigenous species recorded within vegetation quadrats), pattern and complexity particularly given its highly restricted to small areas within the study area. Multiple variations of the community are present encompassing a large altitudinal range and adjoining a large range of other vegetation types. The substrates within the community range from organic to vertical bluffs with small terraces encompassing large vertical gradients within small linear distances. Rocky outcrops provide a large range of potential ecological niches which both flora and fauna species have exploited.	High	High	Yes		Yes
Ecological Context	The rocky outcrop community provides connectivity along lateral spurs and along ridge tops; providing shelter, nesting and foraging habitat for faunal species. The areas are therefore considered important habitat for the population of fauna species during part of their life cycle. Additionally, the position within the landscape provides a mechanism for dispersal across large areas for many specialised plant species. The rocky bluffs provide a protection ungulate browse.	High	High	Yes		Yes
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**Very High**	**Yes**	**Yes**	**Yes**

Snowbank						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	Snowbank communities represent a small proportion of the study area, however, the community is typical of high alpine vegetation in the Ecological District, representing largely pre-human indigenous vegetation cover and assemblages.	High	High	Mapped extent of community is not present within District boundary	Yes	Yes
Naturalness	The vegetation community remains unmodified across the site and species assemblages observed were all indigenous. There was evidence to indicate exotic fauna species within the landscape have altered the snowbank ecology.	High	N/A			N/A
Rarity	Snowbanks are considered a naturally uncommon ecosystem in New Zealand (Holdaway, Wiser, & Williams, 2012). The community contains nine plant species that are classified as Naturally Uncommon (see Table 5).	High	High			Yes
Distinctiveness	Snowbank communities are covered in snow beyond the period normally experienced by the surrounding landscape (up to seven months of the year) and tend to stay more saturated. Therefore, the community includes species (i.e. *Carex pyrenaica var. cephalotes*) that have developed due to unique environmental factors. The community does not contain any species known to be at their distributional limit.					
Diversity and Pattern	The vegetation community contains an expected moderate level of natural diversity with 36 indigenous species recorded across the three vegetation quadrats completed within the community. No exotic species were observed. The opportunity for ecological gradients and complexity are limited by their small extent.	High	Moderate			Yes
Ecological Context	This vegetation community does not provide a significant connective, dispersal or buffering function; being comparatively small in size and compact in shape, occurring in isolated unconnected patches throughout the landscape.	Low	Low			No
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**High**	**N/A**	**Yes**	**Yes**

Disturbed vegetation						
Matter	**Rationale**	**DOC Rating**	**EIANZ Score**	**QLDC Criteria**	**CODC Criteria**	**NPS-IB Criteria**
Representativeness	All disturbed vegetation within the study area contains early successional indigenous species with a moderate abundance of exotic herbs and grasses. The community is assessed as atypical of alpine vegetation at similar elevations within the Ecological District.	Low/Medium	Low	No	Mapped extent of community is not present within District boundary	No
Naturalness	The vegetation community is directly induced as a result of ski field activities and with exotic flora species scattered throughout. The disturbance regime within the community is relatively frequent as large areas within the community are actively maintained as ski field infrastructure. The area lacks cover and food sources to support indigenous fauna species.	Medium	N/A	N/A		N/A
Rarity	This community is located within a LENZ Land Environment containing greater than 30% indigenous cover left and greater than 20% protected. The community contains three plant species classified as Naturally Uncommon and two species classified as At Risk - Declining (see Table 5). The vegetation community is not considered an important habitat for any of the locally Threatened, At Risk, or Data Deficient fauna species.	Medium	High	Yes		Yes
Distinctiveness	The vegetation community does not contain any species that are at their distribution limits, endemic to the Ecological District or Region, or that have developed as a result of unique environmental factors.			No		
Diversity and Pattern	The vegetation community contains a moderate level of diversity comparative to the indigenous vegetation communities that would have been present prior to disturbance. Approximately ten species dominate the majority of the vegetation cover. However, 45 indigenous species (many of which only occur in one quadrat), as well as a further five exotic species were recorded within the vegetation quadrats. In some areas, modified rock is the dominant cover.	Medium	Moderate	No		No
Ecological Context	The vegetation community does not provide a significant connective, dispersal or buffering function. The areas consist of fragmented individual indigenous plants and contribute to the spread of exotic grasses and herbs into surrounding areas.	Low	Low	No		No
Overall EIANZ Ecological Value Score and Significance Criteria Met (Yes/No)		**Yes**	**Moderate**	**Yes**	**Yes**	**Yes**

5.3 Summary of Ecological Values

The vegetation and habitats within the study area have been assessed using the criteria outlined at the beginning of Section 6 with rationale for the assessment matters provided in Table 9. Table 10 summarises the assessment below. Overall, the site has a range of vegetation communities, of which, all satisfy the significance criteria under the DOC guidelines, QLDC District Plan, CODC District Plan, and NPS-IB. The ecological values within the respective vegetation communities are High or Very High with only the Disturbed community with a lower ecological value score.

Table 10: Summary of vegetation ecological value and significance.

Vegetation Community	Assessment Criteria				
	DOC	QLDC	CODC	NPS-IB	Overall EcIA Score
Snow tussock grassland	Yes	Yes	Yes	Yes	Very High
North facing tussock grassland	Yes	Yes	Yes	Yes	High
Dracophyllum scrub	Yes	Yes	Yes	Yes	High
Cushionfield	Yes	Yes	Yes	Yes	Very High
High alpine cushionfield	Yes	Yes	Yes	Yes	Very High
Cushion bog wetland	Yes	Yes	Yes	Yes	Very High
Riparian wetland	Yes	Yes	Yes	Yes	Very High
Seepage	Yes	Yes	Yes	Yes	Very High
Rockfield	Yes	Yes	Yes	Yes	High
Rocky outcrop	Yes	Yes	Yes	Yes	Very High
Snowbank	Yes	Yes	Yes	Yes	High
Disturbed vegetation	Yes	Yes	Yes	Yes	Moderate

6 Ecological Impact Assessment

The ecological impact assessment (EcIA) is set out in the following series of tables:

- Table 14: Ecological effect on vegetation communities
- Table 15: Ecological effect of habitat loss on birds, lizards and invertebrates
- Table 17: Noise and Light effects on birds, lizards and invertebrates

As discussed in Section 2.3, the EcIA is based on the ecological values that may be affected by the Project and the magnitude of the effect at both the vegetation/habitat and species level. e3s notes that the impact assessment set out in the tables does not account for management measures to mitigate ecological effects (see Sections 7 and 8). However, the impact assessment includes avoidance measures that have been built into the design through an iterative process to minimise effects on the most sensitive ecological values. The work NZSki has completed to reduce the development footprint and avoid more sensitive ecological values is described in the Assessment of Environmental Effects (AEE; Mitchell Daysh, 2026). Notably, corridors where ecological values cannot be avoided, earthworks extents are limited only to the essential requirements for installation of roading and services. Similarly, trail earthworks are limited in extent to only occurring in areas of unsafe or unfavourable topography that cannot otherwise be filled or reshaped with accumulated snow. Examples of avoidance measures that are incorporated into the project design include:

- Avoidance of wetlands as much as possible. Where necessary crossings occur at narrow points in the wetland minimising disturbance and allowing construction design such that hydrological connectivity is maintained.
- Temporary access trails to Gondola towers have been designed to avoid all wetlands.
- Road construction incorporates retaining walls to minimise loss of rock downslope onto neighbouring vegetation. An example of this design is along the track from the top of Sugar Basin to Helicopter Ridge where road design decisions have been made to significantly reduce the loss of the rock downslope.
- Locating the Doolans base building on stable gentle terrain, reducing cut volumes and the need for retaining structures.

6.1 Magnitude of Effect

Assigning the magnitude of the ecological effect follows Table 8 of the EIANZ guidelines. The magnitude of effect and ecological value inform the level of effect of each respective value. The assessment matrix is provided in Table 10 of the EIANZ guidelines and has been reproduced below in Table 11 for ease of consideration.

Table 11: Criteria for describing level of effects (from Roper-Lindsay et al., 2018).

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

The following information is provided to support the magnitude of effect assessment.

The assessment of the magnitude of effect was assigned a range of thresholds relative to the percentage of disturbance. The percentage has been calculated based upon the analysis undertaken in Section 2.2 with disturbance/development relative to the extent of vegetation communities within the Ecological District. The magnitude is aligned with the EIANZ guidelines and are as follows in Table 12.

Table 12: Magnitude of Effect Thresholds.

Percentage of ED affected	Magnitude of effect	EIANZ Guidelines Rationale
0 – 0.01 %	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.
>0.01 – 0.5 %	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.
>0.5 – 2.5%	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.
>2.5 – 5 %	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.
>5 %	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.

A percentage loss of species coverage for faunal species cannot be reliably extrapolated to the scale of the Ecological District purely based upon the presence of vegetative habitat. Where a percentage of the effected individual species cannot be quantified via calculation, the above rationale has been applied to assess the relative magnitude of effect based upon the perceived alteration and overall loss of habitat the species may undergo and how many individuals are expected to be impacted.

6.1.1 Contextualising the Loss of Vegetation/Habitat

To assist with assigning a magnitude of effect on vegetation communities, an understanding of the percentage loss is required. For the purpose of this assessment, we have used the Remarkables Ecological District as the reference area as the vegetation across this Ecological District is expected have similar ecological/physical characteristics. Based upon this premise, e3s completed a mapping exercise of the Ecological District to understand the areal extent of vegetation present. e3s notes there is an altitudinal shift in the occurrence of species and community association located within the study area and a clear ecological change occurs at approximately 1,500 m asl. At this elevation *Chionochloa* tussock grassland species dominance changes from *C. rigida* and *Dracophyllum* shrubland (below 1500 m) to *C. macra* and more prostrate vegetation types (above 1500 m). Similarly, wetland types become cushion dominant and cushionfield/rockfields become more heavily dominated by more drought and frost/snow tolerant species. As such quantifying the scale of disturbance at an Ecological District scale can only be achieved by limiting the assessment to elevations that could naturally contain comparable habitat and species assemblages comparable to that within the disturbance area.

The methodology completed to map vegetation above 1100 metres elevation within the Ecological District is set out in Section 2.2.3 and a map showing the extent of the vegetation is provided in Figure 5. The approach involved the mapping of Singers and Rogers (2014) zonal environments and ecosystems at a landscape scale. This is a coarser categorisation than mapped in the area of the skifield expansion and consolidates the 12 vegetation communities described in Section 4 to seven classes (see Table 13). The table also provides an understanding of the percentage of each fine scale mapped unit within the Singers and Rogers classification which has then been used to provide an understanding of the areal extent of these communities within the Ecological District. This approach assumes that the ratio of higher resolution communities to

the coarser Singers and Rogers (2014) categories remains relatively consistent across the Ecological District. The mapping work and analysis has enabled a consideration of the percentage loss of each vegetation community.

Table 13: Vegetation community classification alignment.

Singers & Rogers Classification	Total Area (ha) in Ecological District - above 1500 m asl	Total Area (ha) in Ecological District -1100-1500 m asl	Vegetation communities described in ski area expansion	% of Singers and Rogers	Total Area (ha) in Ecological District Above 1100 m asl
AL1 - Narrow-leaved and slim snow tussock tussockland/ shrubland	3233.50	6849.08	Snow tussock grassland	69.99	7056.84
			North facing tussock grassland	30.01	3025.74
VS7 - *Dracophyllum rosmarinifolium* scrub	N/A - does not occur above 1500 m	3769.22	Dracophyllum scrub	100.00	3769.22
AH2 [cushion dominant]	3102.55	N/A - does not occur below 1500 m	Cushionfield	92.70	2876.26
			High alpine cushionfield	7.20	222.39
			Snowbank	0.10	3.90
AH2 [rockfield dominant]	8816.92	2316.65	Rockfield	85.50	11133.57
			Rocky outcrop	14.50	1614.90
WL9/WL17 – Cushion/ Schoenus pauciflorus sedgeland	1611.24	5274.38	Cushion bog	7.30	504.68
			Riparian wetland	5.20	361.04
			Waterways	7.10	487.37
			Seepage	80.40	5532.54
Unclassified	436.14	2203.72	Disturbed vegetation	100.00	2639.86

6.1.2 Department of Conservation Guidelines

The Department of Conservation guidelines for assessing significant ecological values set out three management criteria (long-term ecological viability, fragility and threat, management input). e3s have included the criteria to rationalise the potential magnitude of effect of each vegetation community described.

Fragility and Threat

The vegetation communities are all susceptible to environmental change, however, the fragility of each community is dependent on the community resilience to change. All of the vegetation communities contain plant species adapted to the elevation within the study area and are generally slow growing, cold tolerant, perennial plants with short periods of seasonal growth at subalpine-alpine altitudes. Likewise, given the reduced growing season species located within the community are more susceptible to change, often occurring at a lower carrying capacity and/or producing less seed/offspring than similar species at lower elevations. Similarly, the vegetation and associated habitat require a longer period of time to regenerate; subsequently allowing fast growing annual plants to establish and compete for resources. Threats to the ecological function include, browse, weed introduction, predation and climate change (including change in temperatures, growing season, snowpack/precipitations conditions).

Snow tussock and north facing tussock grassland is resilient to change from weed infestation as they have a densely vegetated ground cover inhibiting weed germination and growth. Cushionfield, high alpine cushionfield, rockfield, and rocky outcrops are exposed to extreme environmental conditions and unfavourable substrates and therefore more resilient to colonisation by weeds. In contrast, the hydrologically dependent communities (cushion bog wetland, riparian wetland, seepage and snowbank) are more susceptible to disturbance with many of the wetlands containing moisture rich organic soils with favourable conditions for exotic weed growth. Exotic species that establish within the peat dominated systems are not peat forming species and are capable of fundamentally changing hydrological and ecological function. Wetlands are also more susceptible to tracking by both machinery and foot traffic, with wetland communities susceptible to trampling and pugging of the soil structure.

Management Input

Retention of all existing vegetation and associated ecology would require minimal management input in the long term provided no alteration of the existing

communities occur. In its current condition, management input will likely only require precautionary weed and pest control to ensure exotic species do not become established and expand their range. The proposed skifield expansion will result in disturbance to the ecology and will require a moderate to high level of management input, particularly to manage effects on the margins (edges) of the disturbed vegetation. Management input to maintain the ecology of the undisturbed vegetation will include ecological monitoring and active management including mammalian pest, weed control, and rubbish collection.

Long-term Ecological Viability

The vegetation communities are assessed as self-sustaining with a high long-term viability. It is noted that gradual increase in exotic species abundance is likely in the long term, particularly as the climate warms.

Under the proposed skifield expansion, the long-term ecological viability of the vegetation is high albeit with some local loss and degradation occurring on the margins of effected communities. Evidence of this outcome can be seen on the Remarkables ski field where a full suite of vegetation communities have been maintained.

6.2 Vegetation Loss

The proposed earthworks associated with the development are depicted in Figure 26, with the ecological impact assessed in Table 14 below.

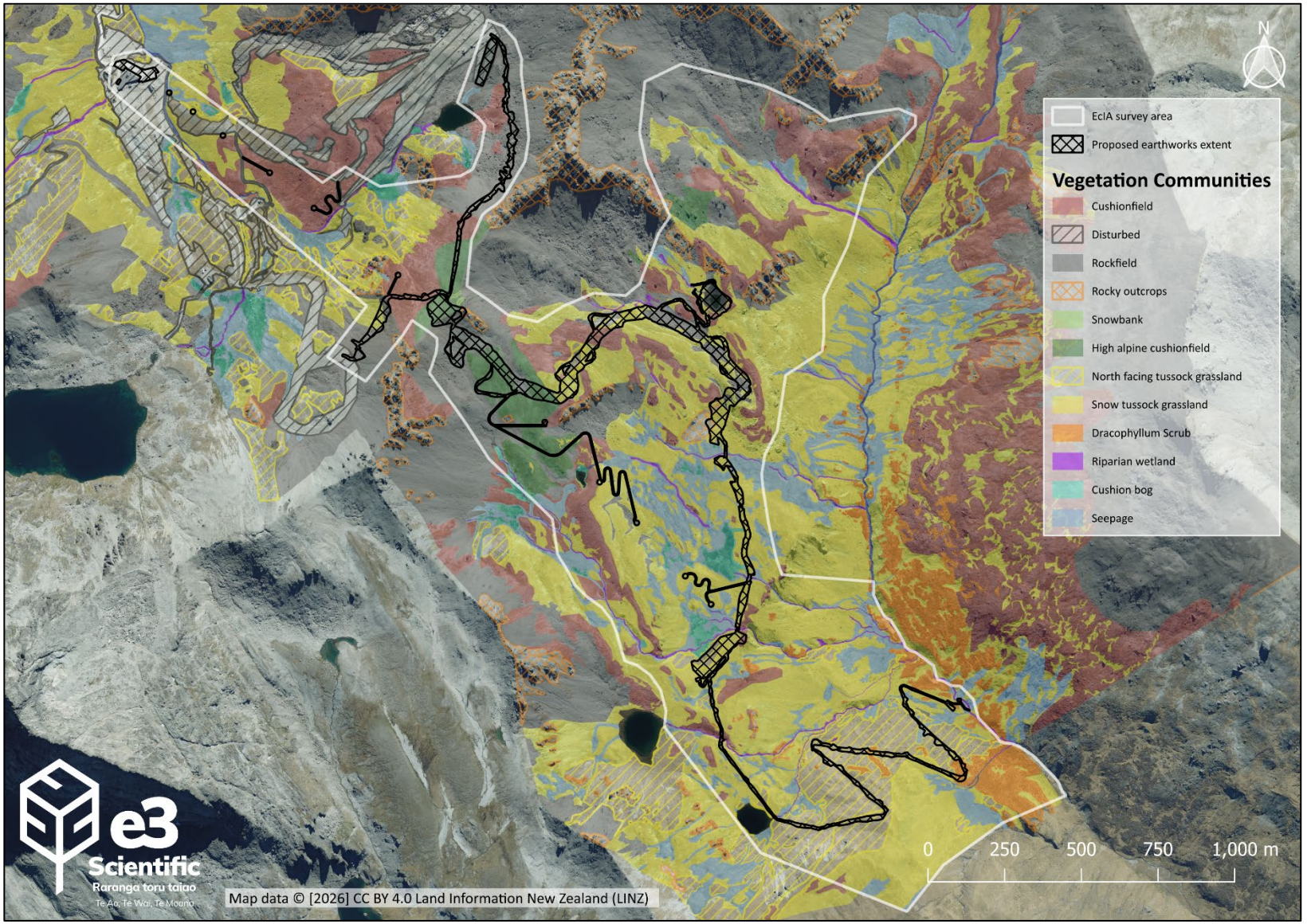

Figure 26: Proposed earthworks within each vegetation community.

Although, the vegetation directly adjacent to the proposed works is not proposed to be actively disturbed, edge effects are likely to result in vegetation damage/loss. Earthworks such as road construction, cut-and-fill platforms, and service trenches create abrupt habitat boundaries. These newly formed edges alter microclimatic conditions by increasing light penetration, wind exposure, temperature fluctuations, and soil moisture loss, which can stress shade-adapted or moisture-dependent native species. Disturbed soils along the edge are also more susceptible to erosion, nutrient leaching, and compaction, further reducing plant establishment and root stability. In many cases, edge environments favour fast-growing, opportunistic, or invasive species that outcompete indigenous vegetation, leading to shifts in species composition and reduced biodiversity. Within the context of the study area, change is only expected to be observable within the first two metres of a community, affecting less than 50% of the vegetation cover within this two-metre area. This vegetation alteration has been accounted for within the overall magnitude of effect relating to vegetation loss and is provided in Table 14.

Table 14: Ecological impact assessment on vegetation communities

Vegetation community	Ecological Value	Ecosystem Classification (Singers & Rogers, 2014)	Area within ED (ha) Above 1100 m asl		Maximum direct disturbance area (ha)		Maximum edge effects disturbance area (ha)		Percentage of vegetation community lost within the ED (%)[v]		Magnitude of effect	Rationale	Level of effect	Further mitigation required (yes/no)[vi]
Snow tussock grassland	Very High	AL1 [Snow tussock grassland]	10082.58	7056.84	7.84	5.5322	1.05	0.72	0.10	0.09	Low	The overall percentage of loss of this vegetation community and habitat is assessed as low with reference to its extent in the Ecological District. Extensive areas of this community will be retained in close proximity to the areas of loss. This said, there is still some loss and is therefore assessed as a minor shift in the baseline ecological conditions.	Moderate	**Yes**
North facing tussock grassland	High			3025.74		2.3068		0.33		0.09	Low	The overall percentage of loss of this vegetation community and habitat is assessed as low with reference to its extent in the Ecological District. Extensive areas of this community will be retained in close proximity to the areas of loss. This said, there is still some loss and is therefore assessed as a minor shift in the baseline ecological conditions.	Low	**No**
Dracophyllum scrub	High	VS7	3769.22		0.15		0.03		0.01		Low	The disturbance footprint is small compared to the extent of this community within the alpine zone of the Ecological District. Extensive areas of this community will be retained in close proximity to the areas of loss. This said, there is still some loss and is therefore assessed as a minor shift in the baseline ecological conditions.	Low	**No**
Cushionfield	Very High	AH2 [cushion dominant]	3102.55	2876.26	3.18	1.2651	0.46	0.25	0.12	0.05	Low	The disturbance footprint is small compared to the extent of this community within the alpine zone of the Ecological District. Extensive areas of this community will be retained in close proximity to the areas of loss. This said, a small area of loss will occur and is therefore assessed as a minor shift in the baseline ecological conditions.	Moderate	**Yes**

[v] Percentage of total area disturbed (maximum direct disturbance and edge effects disturbance area combined).

[vi] Further mitigation is required where the level of effect as assessed by EIANZ guidelines for each value is greater than Low.

Vegetation community	Ecological Value	Ecosystem Classification (Singers & Rogers, 2014)	Area within ED (ha) Above 1100 m asl		Maximum direct disturbance area (ha)		Maximum edge effects disturbance area (ha)		Percentage of vegetation community lost within the ED (%)[v]		Magnitude of effect	Rationale	Level of effect	Further mitigation required (yes/no)[vi]
High alpine cushionfield	Very High			222.39		1.9164		0.21		0.96	Moderate	The high alpine cushionfield community is confined to high ridgelines and is less well represented in the Ecological District. Less than 2 ha of this community will be removed but the percentage of disturbance within the ED is higher relative to most of the communities affected by the development. The higher disturbance footprint presents a higher ecological effect to the vegetation and habitat.	High	**Yes**
Snowbank	Very High			3.90		0.00		0.001		0.024	Negligible	The snowbank community is constrained and makes up a small areal extent of the vegetation within the Ecological District. Direct disturbance to snowbanks will be avoided and the indirect effects are expected to affect less than 7 m^2. As such it is expected to be largely indistinguishable from pre disturbance function and composition.	Low	**No**
Rockfield	Very High	AH2 [rock dominant]	11133.57	11133.57	4.54	4.38	0.47	0.46	0.05	0.04	Low	Rockfield is one of the most widespread communities in the Ecological District. The extent of this community means the rockfield is more disturbed than other communities described in the ecological assessment. Although proposed disturbance of the community is comparatively high it represents a small proportion of the available habitat both within Ecological District. The rockfield disturbance will result in a minor shift in population sizes of associated species.	Moderate	**Yes**
Rocky Outcrop	Very High			450.02		0.16		0.01		0.04	Low	The rocky outcrop community is present in moderate abundance within the Ecological District. The design of the ski field infrastructure has purposefully avoided rocky outcrops as much as practicable. Although the community supports a high density of At Risk and Threatened plants and fauna, the scale of disturbance limits the effect with localised shifts in biodiversity density.	Moderate	**Yes**
Cushion bog wetland	Very High	WL9	6885.62	504.68	0.26	0.003	0.07	0.003	0.005	0.001	Low	The design of the development has largely avoided wetlands and therefore the disturbance of wetlands	Moderate	**Yes**

Vegetation community	Ecological Value	Ecosystem Classification (Singers & Rogers, 2014)	Area within ED (ha) Above 1100 m asl		Maximum direct disturbance area (ha)		Maximum edge effects disturbance area (ha)		Percentage of vegetation community lost within the ED (%)[v]		Magnitude of effect	Rationale	Level of effect	Further mitigation required (yes/no)[vi]
Riparian wetland	High			361.04		0.03		0.009		0.01	Low	is small. Given the extent of wetlands within the study area and the Ecological District, the magnitude of effect is low resulting in a low to moderate ecological effect.	Low	**No**
Waterway*	N/A			487.37		0.02		0.006		0.005	N/A		N/A	
Seepage	Very High	WL17		5532.54		0.20		0.05		0.005	Low		Moderate	**Yes**
Disturbed Vegetation	Moderate	Unclassified	2639.86	2639.86	1.26		0.14		0.02	0.05	Low	The vegetation community is of a highly disturbed nature and will largely be indistinguishable from pre disturbance composition. This said minor losses to indigenous serial communities and isolated At Risk flora species will occur, therefore representing a minor shift in baseline conditions.	Low	**No**

*Waterways (non-vegetated) could not be accurately differentiated from all wetland types within the RF analysis. As such, totals have been calculated to ascertain how much of the projected vegetation cover is contained within the RF class. As the waterways are fundamentally a freshwater ecosystem and do not support terrestrial species the effects of the area loss have not been considered within this assessment.

6.3 Fragmentation and Infrastructure Impediment

The effects of fragmentation are contingent on the level of unnatural alteration of the vegetation and surrounding landscape. Therefore, the Rastus Burn and Doolans catchment are expected to have different ecological effects due to the level of alteration that has occurred.

The establishment of large infrastructure, notably the lift terminals, expansion to the existing base building and construction of the Doolans base building represent impediments to both falcon and pipit that are both susceptible to window strike. Unmitigated, the infrastructure may result in the loss of a small portion of the birds present within the surrounding landscape. The magnitude of effect is therefore assessed as Low for both species resulting in a Low level of effect for pipit and a Moderate level of effect for falcon.

The ecological effects are most prominent on plant species, vegetation communities and ground dwelling invertebrates which may incur small range reductions. The magnitude of effect on ground dwelling invertebrate's species is assessed as Low. All other faunal species are flight-capable and able to traverse larger distances. The proposed fragmentation is minimal with respect to these species and is unlikely to incur any observable change in the population and dispersal ability of available habitat by these airborne species. The effects of fragmentation and the effect is therefore considered Negligible. Similarly, snow tussock grassland is so widely dispersed within the ED that the areas of disturbance are unlikely to have an observable reduction of the population and dispersal ability of species within it as a direct result of fragmentation.

Of the 12 identified vegetation communities, seven occur in either isolated or scattered instances (North Facing Tussock Grassland, *Dracophyllum* scrub, Cushionfield, High Alpine Cushionfield, Rockfield, Rocky Outcrop, and Disturbed Vegetation). Ecological processes of dispersal within these habitats require the ability to be mobilised/travel greater distances between sites or be more adapted to localised environmental niches (as is the case for ground dwelling invertebrates and many plant species). Where disturbance intersects or adjoins these communities, minimal fragmentation is expected to occur and only a slight shift in localised species abundance and function is expected.

The magnitude of effect on all above vegetation communities and associated ground dwelling invertebrates is assessed as Low within the Rastus Burn given the level of existing landscape alteration already undertaken. However, the magnitude of effect within the Doolans is assessed as Moderate for these values given its high level of naturalness. All invertebrates affected in the above seven communities have assigned ecological values of High, Moderate or Low.

Therefore, the level of effect within the Ratus Burn is assessed as Very Low for Low ecological values, Low level of effect for High and Moderate ecological values and Moderate level of effect for Very High ecological values. The level of effect within the Doolan's for these species/communities is assessed as High for High and Very High ecological values, Moderate level of effect for Moderate ecological values and Low level of effect for Low ecological values.

The effects of fragmentation on Snowbank communities (and associated invertebrates) is considered Negligible as the communities are not being actively fragmented as a result of the proposed works. The level of effect is therefore assessed as Very Low.

The remaining three communities (cushion bog wetland, riparian wetland, seepage) are all associated with hydrological movement throughout the landscape being widely dispersed and interconnected, forming continuous tracts of vegetative cover and pathways for dispersal for a range of species. Although the direct disturbance is limited, fragmentation of these communities will result in more noticeable alteration to the function of the surrounding habitat and the ability of species to utilise and disperse within them comparatively to the present baseline. The magnitude of effect for these communities and susceptible species is assessed as High across both catchments, given their ecological importance. The level of effect is therefore assessed as Very High (High magnitude of effect and a Very High ecological value for all communities).

6.4 Weed Introduction/Mobilisation

The majority of the plant communities are dominated by indigenous vegetation with exotic species in low abundance in all vegetation communities apart from the areas of disturbed vegetation in the Rastus Burn. Disturbed areas in the Rastus Burn catchment have a slightly higher prevalence of exotic species in adjoining

trails and within or fringing disturbed habitat. Notwithstanding this point, weeds remain at low levels in the Rastus Burn.

The proposed earthworks and continued operation/increased frequency of use within undisturbed vegetation risks introducing and expanding the abundance and distribution of exotic species into directly affected areas as well as adjacent and ecologically connected areas. The vegetation communities are all highly susceptible to competition from exotic species.

The magnitude of effect on already disturbed areas is assessed as Moderate. Although the ecology of the disturbed area is unlikely to change as a result of increased exotic coverage, as disturbed areas provide little ecological function to the wider landscape, disturbed areas generally adjoin more natural communities and therefore, may aid in the dispersal of exotic species into these more sensitive areas.

The magnitude of effect resulting from weed introduction within highly natural vegetation communities (all communities apart from disturbed vegetation) is assessed as High. Without mitigation there is a risk of weeds expanding into these communities, resulting in a fundamental change in the composition of the vegetation. The level of effect within highly indigenous communities is assessed as Very High, based upon a High magnitude of effect and ecological values ranging from High to Very High.

6.5 Sedimentation

Vegetation clearance and earthworks activity could result in the mobilisation of sediment onto neighbouring vegetation, wetlands and watercourses. This effect is most prevalent during and immediately following the earthworks phase but sediment mobilisation from exposed surfaces will continue to be a risk to neighbouring vegetation, wetlands and waterways. This is a medium to long term risk and unmitigated, will cause ecological change until surfaces are revegetated.

The magnitude of effects is likely to have two differentiable outcomes based on the hydrological connectivity of the community. Communities that are permanently, seasonally or periodically wet (cushion bog, riparian wetland, seepage, and snowbank) are likely to experience higher level of sedimentation

due to more preferential flow paths within or directly linked to the communities, often occurring as collection points for localised surface runoff. Additionally, sediment deposition can smother plants. As such, sedimentation into these habitats creates areas where exotic species can easily colonise without competition. The magnitude of effect of the sedimentation of these highly susceptible vegetation types without management is assessed as Very High. The level of effect is therefore assessed as Very High (based on High and Very High ecological values).

Upland communities are less susceptible to sedimentation often observing localised sediment migration adjacent exposed or disturbed soils. Sedimentation of upland communities is less likely to change the floristic composition compared to wetland environments. However, sediment deposition into the upland environments is still capable of inducing vegetation loss and increased competition from exotic colonisers. The magnitude of effect for upland vegetation types is assessed as Moderate. The level of effect is subsequently assessed as Moderate for disturbed areas (Moderate ecological value) and High for all other areas (based upon High and Very High ecological values).

To mitigate the effects of sediment movement and deposition e3s recommends an erosion and sediment control management plan is developed, implemented and closely monitored for both construction and post construction phases of the project.

6.6 Habitat Loss

When assessing the loss of habitat associated with each species all contributing vegetation communities have been attributed to the species for both reproductive and foraging habitat. Avifauna are highly mobile and can be reliant on a number of different vegetation communities and prey species for their survival. Direct disturbance can be attributed within the nesting habitat as this is the only time where disturbance may result in the physical harm or death of avifauna species. Invertebrates on the other hand are more habitat specific with many having host plant species.

6.6.1 Avifauna

NZ Falcon (*Falco novaeseelandiae*) have been recorded to have home ranges from 4 km^2 to 15 km^2 (Seaton , 2007). However, it has been noted that range

generally decreases in open habitat (Holland & Mccutcheon, 2007), with eastern falcon distances between nests being on average 3.8 to 13.7 km apart with the closest being 1.5 km apart. Given the size of the home ranges and observations made by e3s ecologists, it is likely that there is only 1 pair of falcon present in the alpine environment of the Rastus Burn and only 1 pair in the Upper Doolans catchment.

Given the home ranges of falcon, it is likely birds present in the area will feed on mammalian, passerines and invertebrate species throughout the Doolans and Rastus Burn. Given the relatively small area of disturbance compared to falcon home ranges, the magnitude of the effect is characterised as low.

In total 23 NZ pipit were observed during site walk throughs and completion of 5-minute bird counts (5mbc). The number of pipits observed reduced with altitude. This observation is shown in the 5mbc data with 14 birds recorded in the 32 completed below 1700 m asl and 3 birds recorded during the 42 completed above this elevation. Given the variability in pipit numbers the effect of the proposed ski field expansion will vary with elevation and has been accounted for in the effects assessment in Table 13.

6.6.2 Herpetofauna

No skink species were recorded, or are expected to be present, within the earthworks footprint in the Rastus Burn. McCann's skink are only located within north facing tussock grassland above 1600 m within the study area and are widespread across aspects and communities below this altitude. Skink density in the Doolans increases substantially below approximately 1600 m. Likely skink habitat intersects with approximately 3.46 ha in the Doolans catchment, directly impacting approximately 300-600 individual McCann's skinks. Additional impacts are likely through indirect impacts on lizards in adjoining habitat. These impacts are discussed further in the Lizard Assessment and Management Plan.

6.6.3 Invertebrates

Where species are host plant specific the occurrence of that species has been used to inform the loss of functional habitat (informed by the vegetation quadrats completed within each vegetation type). This said, where host species represent a percentage cover of less than 1 % of the total cover; the habitat loss is noted as a maximum potential loss. However, is likely to be considerably less than the

calculated total. Where host associations are unknown or species are non-host specific the proposed disturbance of the vegetation community is attributed to the calculation of habitat loss.

Table 15: Ecological effect of habitat loss on birds, lizards and invertebrates.

Species	Ecological Value	Habitat usage	Area Lost (ha)		Magnitude of Effect		Level of Effect		Rationale	Further mitigation required (Yes/No)[vii]
			Doolans	Rastus	Doolans	Rastus	Doolans	Rastus		
Avifauna										
Eastern falcon (*Falco novaeseelandiae novaeseelandiae)*	Very High	Nesting	0.158	0.000	Negligible	Negligible	Low	Low	Based upon the known nest locations and observed preference of habitat the proposed areas of disturbance are not proposed within known nesting locations. Additionally, the clearance of suitable habitat occurs at higher elevation generally and is less preferable for nesting due to higher levels of snow accumulation within the breeding season. The proposal is therefore unlikely to shift baseline conditions of both the Doolans and Rastus Burn catchments regardless of the varying areas of loss experienced within the respective catchments.	**Yes***
		Foraging (high quality)	6.340	0.756	Low	Negligible	Moderate	Low	The pair located within the Doolans catchment may lose 6.3 ha of high-quality foraging habitat with the pair located in the Rastus Burn losing approximately 0.7 ha. The areas of disturbance are expected to account for less than 1% of the home ranges of the falcon present. As such, the disturbance is unlikely to have any observable effect on the overall population size given the low density of falcon at this elevation.	**Yes**
		Foraging (low quality)	2.303	0.004	Negligible	Negligible	Low	Low	Comparatively the low-quality habitat within both catchments is expected to be utilised very infrequently and is of a relatively small area (2.3 ha and 0.004 ha respectively).	**No**
NZ pipit (*Anthus novaeseelandiae novaeseelandiae)*	High	Nesting above 1700 m	0.394	0.201	Negligible	Negligible	Very Low	Very Low	The disturbance of nesting habitat (snow tussock grassland) is proposed above 1700 m asl. However, pipit are extremely unlikely to nest at higher elevations due to limited suitable habitat and limited food resources during the early part of the breeding season. Additionally, these effects are only likely to occur within the Doolans Catchment as no disturbance of this habitat is proposed within the Rastus Burn.	**No**
		Nesting below 1700m	4.870	0.000	Moderate	Negligible	High	Very Low	The disturbance of nesting habitat (snow tussock grassland) between the elevations of 1550 and 1700 m asl is proposed. There is extensive suitable tussock grassland habitat within the wider Ecological District. However, as much of the earthworks/vegetation clearance must be undertaken within the breeding season (August – February) there is a risk to nesting individuals. Additionally, given the low abundance of pipit within this environment compared to other sites at similar elevations, small losses in population have a larger impact on the overall population. This disturbance is only likely to have effects within the Doolans, with no disturbance of suitable habit proposed within the Rastus Burn.	**Yes**
		Foraging above and below 1700 m	9.983	1.525	Moderate	Low	High	Low	Maintaining various elevations of food are important within the breeding season of alpine adapted fauna species. Food availability progresses in elevation as the season continues due to slightly delayed plant winter dormancy and seed production. The loss of foraging habitat is only a minor shift in baseline conditions for areas within the Rastus Burn given extensive tussock grassland habitat is present at similar elevations within the Ecological District. This said, the area of loss within the Doolans is more than three times as much and is of highly natural character resulting in an increased magnitude of effect.	**Yes**
Kea (*Nestor notabilis*)	Very High	Nesting/ Foraging	0.000	0.000	Negligible	Negligible	Low	Low	Kea are not expected to reside within the proposed disturbance area given its unsuitable nesting habitat. Additionally, based upon	**No**

[vii] Further mitigation is required where the level of effect as assessed by EIANZ guidelines for each value is greater than Low or unless otherwise required by the Wildlife Act.

Species	Ecological Value	Habitat usage	Area Lost (ha)		Magnitude of Effect		Level of Effect		Rationale	Further mitigation required (Yes/No)[vii]
			Doolans	Rastus	Doolans	Rastus	Doolans	Rastus		
									recent observational data kea are infrequently observed within the Remarkables ski field area; young juveniles are sighted infrequently and a breeding population is currently not known in the area. As such the loss of habitat is a low level of effect.	
Australasian harrier / kāhu (*Circus approximans*)	Low	Nesting	0.000	0.000	Negligible	Negligible	Very Low	Very Low	Australasian harriers are not expected to breed within the study area. As a result, there is no effect on the nesting habitat of this species. Harriers may experience a slight change to the foraging conditions however the disturbance is unlikely to change the habitat usage. The change is also highly unlikely to have any effect on known range or population size of the species.	**No**
		Foraging	9.276	1.765	Low	Low	Very Low	Very Low		**No**
Southern black-backed gull/karoro (*Larus dominicanus dominicanus*)	Low	Nesting	0.521	0.000	Low	Low	Very Low	Very Low	Given paradise duck and southern black-backed gull are both highly adaptable and capable of nesting in close proximity to disturbance, each will both undergo a small shift in available nesting and foraging habitat. Although slight changes to the species habitat usage and distribution within the wider habitat may occur, this is unlikely to have any observable implications on the range or species population.	**No**
		Foraging	9.987	1.528	Low	Low	Very Low	Very Low		**No**
Paradise shelduck/pūtangitangi (*Tadorna variegata*)	Low	Nesting	0.521	0.000	Negligible	Negligible	Very Low	Very Low		**No**
		Foraging	6.005	0.206	Low	Low	Very Low	Very Low		**No**
Herpetofauna										
McCann's skink (*Oligosoma maccanni*)	Low	Breeding and foraging	3.460	0.000	Low	N/A	Very Low	N/A	No skink species were recorded or are expected to be present within the habitat proposed to be disturbed within the Rastus Burn. McCann's skink habitat estimated to be impacted in the Doolans catchment is approximately 3.46 ha, and 300-600 individuals. The local population is not expected to be adversely affected due to the extent of available habitat, wide geographic distribution and relatively small proportion impacted.	**Yes***
Invertebrates										
Dasyuris partheniata	High	Host specific association	0.083		Low		Low		The species is host specific with Aciphylla species. In total, Aciphylla account for 0.69% (snow tussock grassland), 0.44% (north facing tussock grassland), 0.44% (cushionfield), 0.25% (high alpine cushionfield), 0.16% (seepage), 0.5% (rockfield), 0.67% (Dracophyllum scrub) and 0.71% (rocky outcrop) of the vegetation cover. Within the Ecological District the loss of habitat is a slight change with Aciphylla species found widely throughout a range of habitat types.	**No**
Plutella sp.1 (CO)	High	Host specific association	0.001		Moderate		High		This species is host specific with Pachycladon and/or Cardamine species; both species occur in low abundance (<1% of the total cover) and are highly isolated to specific areas even within the communities in which they occur. The plants are therefore less prevalent and likely to have greater implications on the species population and prevalence within the Ecological District.	**Yes**
Sigaus campestris	High	Community association breeding and foraging	7.772		Moderate		High		All of these species are ground dwelling and unlikely to be able to move away from excavation developments and are likely to lose a number of individuals during the development. Additionally, all of the species are either classified or tentatively assigned a threat status of At Risk – Declining, At Risk – Naturally Uncommon, or Data Deficient. As a result, the removal of the proposed respective areas of habitat may have a detrimental impact on the species population or distributional range within the Ecological District.	**Yes**
Hypsithocus hudsonae	Moderate	Community association breeding and foraging	7.976		Moderate		Moderate			**Yes**
Neoramia alta	Moderate	Community association breeding and foraging	3.185		Moderate		Moderate			**Yes**
Rorea otagoensis	Moderate	Community association	7.721		Moderate		Moderate			**Yes**

Species	Ecological Value	Habitat usage	Area Lost (ha)		Magnitude of Effect		Level of Effect		Rationale	Further mitigation required (Yes/No)[vii]
			Doolans	Rastus	Doolans	Rastus	Doolans	Rastus		
		breeding and foraging								
Anagotus latirostris	Moderate	Community association breeding and foraging	10.954		Moderate		Moderate			**Yes**
Duvaliomimus walkeri	Moderate	Community association breeding and foraging	7.772		Moderate		Moderate			**Yes**
Inophloeus inuus	Moderate	Host specific association	0.012		Moderate	N/A	Moderate	N/A	*Inophloeus inuus* are only present within the proposed disturbance area within the Doolans catchment. Therefore, no effects are expected to be observed within the Rastus Burn catchment. The species is host specific to Aciphylla genus suspected to be host dependant on *A. aurea* or A. 'lomond' as multiple were collected from locations containing these species. This species will spend large periods of time on one Aciphylla plant. Additionally, they are extremely slow moving and will not be able to move away from excavation developments and are likely to lose a number of individuals during the development. Given the species is not well known (tentatively assigned a threat status of Data Deficient), the removal of the proposed areas of habitat may have an unforeseen detrimental impact on the species population or distributional range within the Ecological District.	**Yes**
Taenarthrus capito	Moderate	Community association breeding and foraging	0.036		Low		Low		The species habitat (tarn and stream margins) is being largely retained with very minor alterations to the habitat occurring within the study area. Additionally, this species is known to be present at lower altitudes. As such, it is highly unlikely that the proposed disturbance will have an impact on the species population or distributional range within the Ecological District.	**No**
Mamoea montana	Moderate	Community association breeding and foraging	7.967		Moderate		Moderate		*Mamoea montana* is ground dwelling and unlikely to be able to move away from excavation developments and are therefore likely to lose a number of individuals during the development. Given the species in not well known (classified as Data Deficient), the removal of a large area of habitat may have an unforeseen detrimental impact on the species population or distributional range within the Ecological District.	**Yes**
Xanthohoe frigida	Very High	Host specific association	0.0003		Low		Moderate		This species is host specific with Pachycladon species, which occur in low abundance (<1% of the total cover) and are highly isolated to specific areas even within the communities in which they occur. None of which were recorded within the disturbance footprint to date. The plants are not prevalent, and therefore loss of plants is likely to have greater implications on the species population and prevalence within the Ecological District.	**Yes**
Pyrausta comastis	Very High	Host plant unknown but is associated with tarns and cushion bogs	0.003		Low		Moderate		The host plant is not known. As such a community level association for both breeding and foraging has been used as a default. The disturbance for the species is isolated occurring as very minor on the fringes of the cushion bog community.	**Yes**
Peripatus sp. (Remarkables)	Moderate	Community association breeding and foraging	1.265		High		Moderate		Very little about this species is known including an accurate range. This said, it has not been recorded within the proposed disturbance area but was first noted within similar habitat and elevation to that found within the site. Given its limited known abundance/range	**Yes**

Species	Ecological Value	Habitat usage	Area Lost (ha)		Magnitude of Effect		Level of Effect		Rationale	Further mitigation required (Yes/No)[vii]
			Doolans	Rastus	Doolans	Rastus	Doolans	Rastus		
									disturbance, if present the disturbance could potentially have a impact on the population within the Ecological District.	
Subantarctia centralis	Moderate	Community association breeding and foraging	12.153		High		Moderate		*Subantarctia centralis* is ground dwelling and unlikely to be able to move away from excavation developments and are therefore likely to lose a number of individuals during the development. Given the species population is not well understood (classified as Data Deficient) and has only ever been reliably recorded from one location prior to this record, the removal of the proposed area of habitat may have unforeseen impacts on the species population and/or distributional range within the Ecological District.	**Yes**
Huttonia sp.	Moderate	Community association breeding and foraging	5.816		High		Moderate		This is an undescribed species and therefore an accurate range or assessment of rarity is also unknown. Given its limited known abundance/range distribution; the disturbance could potentially have a proportionally high impact on the population and/or distributional range within the Ecological District.	**Yes**
Dasyuris micropolis	High	Host plant unknown but is associated with a species in the genus *Veronica* within cushion field communities	0.054		Low		Low		The species is host specific with a *Veronica* species. In total, *Veronica* account for 1.55% (cushionfield), 1.5% (high alpine cushionfield), and 3.2% (rocky outcrop) of the vegetation cover (accounting for total cover of approximately 1.96% across all associated communities). Given the host species is likely highly characteristic and widespread within the Ecological District the magnitude of effect is considered Low; the loss of habitat is a slight change in ecological conditions.	**No**
Nivetica nervosa	High	Host plant unknown but is associated with wetland communities	0.7451		Low		Low		The host plant is not known. As such a community level association for both breeding and foraging has been used as a default. No disturbance is proposed within the tarn community, minor loses occurring within the fringes of the cushion bog community and slight change occurring within the riparian wetlands, and seepages. Cumulatively, the expected maximum change is assessed as a minor shift in baseline ecological conditions for the species within the Ecological District.	**No**
Scoparia panopla	Moderate	Host plant unknown but is likely associated with tussock grassland communities	7.772		Moderate		Moderate		The host plant for both species is not known. As such a community level association for both breeding and foraging has been used as a default. Although the community in which each species host plant is widespread; given both species are not well known (tentatively assigned a threat status of Data Deficient), the removal of the proposed areas of habitat may have an unforeseen detrimental impact on the species population or distributional range within the Ecological District. Due to the uncertainty the magnitude of effect is slightly higher than it may be if the host species was known.	**Yes**
Scoparia niphospora	Moderate	Host plant unknown but is likely associated with tussock grassland communities	7.772		Moderate		Moderate			**Yes**
Pasiphila eratica	Moderate	Host plant unknown but is potentially associated with *Veronica odora* or other species of the genus *Veronica*	0.108		Low		Low		The species is host specific with a *Veronica* species. In total, *Veronica* account for 1.55% (cushionfield), 1.50% (high alpine cushionfield), and 3.29% (rocky outcrop), 0.10% (rockfield), 0.05% (seepage), <0.11% (north facing tussock grassland), and 0.90% (snow tussock grassland) of the vegetation cover (accounting for total cover of approximately 0.72% across all associated communities). The species is not well known (tentatively assigned a threat status of Data Deficient), However, Veronica species are widespread being recorded in a number of vegetation communities; ech species is generally not prevalent across more than three vegetation types.	**No**

Species	Ecological Value	Habitat usage	Area Lost (ha)		Magnitude of Effect		Level of Effect		Rationale	Further mitigation required (Yes/No)[vii]
			Doolans	Rastus	Doolans	Rastus	Doolans	Rastus		
									Therefore, as the species will likely be host specific to a singular species of plant the area calculation estimated for this species is significantly greater than the observed loss associated with the species habitat.	
Pasiphila sp.	Moderate	Host plant and community association unknown	Unknown		High		Moderate		This is potentially an unknown species and therefore an accurate range or assessment of rarity is also unknown. Given its limited known abundance/range distribution; the disturbance could potentially have a proportionally high impact on the population and/or distributional range within the Ecological District.	**Yes**

*The Wildlife Act 1953 necessitates further protection against the harm of indigenous species regardless of Low level of effects assessment under EcIA criteria. No species of invertebrates found within the study area are listed within the Wildlife Act 1953 under Schedule 7 and are therefore not subject to the same protection as other indigenous species.

6.7 Loss of Taonga Species

Eight taonga plant species have been identified within proposed disturbance areas and/or the wider study area. Four of the taonga plant species already hold a threat classification of greater than Not Threatened under either the National and/or regional threat classification document (denoted with '*' in Table 16).

Similarly, pīhoihoi/New Zealand pipit, kārearea/New Zealand falcon, pūtakitaki/pūtangitangi/paradise shelduck, kea and kāhu/Australasian harrier are all listed as taonga faunal species. Outside of their taonga status Pīhoihoi/New Zealand pipit have an associated ecological value of High. Kārearea/New Zealand falcon and kea have an associated ecological value of Very High and have been assessed as such (see Section 6.6 and 6.8). In contrast, kāhu/Australasian harrier and pūtakitaki/pūtangitangi/paradise shelduck have Low ecological value under the EIANZ guidelines. However, the magnitude of effect on both kāhu and pūtakitaki/pūtangitangi is assessed as Negligible and Low respectively with regard to both direct and indirect effect on the species (see Section 6.6 and 6.8) and as such no discernible effects are expected to occur within the study area or wider landscape.

e3s understands that all taonga species are culturally and locally important. While some of these species have an ecological value ascribed to them under the EIANZ assessment methodology, e3s has not attempted to assign a value for cultural purposes as this is a matter that is best addressed by mana whenua. Potential measures to mitigate the impacts on these taonga could include the translocation of identified taonga plant species into nearby and ecologically comparable habitat. Methods for undertaking this could be similar to that of Threatened, At Risk, or Data Deficient species (see Table 18 for applicable potential mitigation measures). Notwithstanding the above, identification of culturally appropriate mitigation is best addressed by mana whenua. e3s therefore does not address such matters further within this report.

The associated plant species and the communities in which the taonga species occur in are provided in Table 16 below.

Table 16: Taonga plant species.

Species	Community association
Taramea/*Aciphylla aurea*	Snow tussock grassland, north facing tussock grassland, and *Dracophyllum* scrub.
Taramea/ Taramea/*Aciphylla kirkii**	Snow tussock grassland, north facing tussock grassland, cushionfield, rockfield, rocky outcrop, riparian wetland, and seepage
Taramea/*Aciphylla lecomtei**	Snow tussock grassland, cushionfield, and rocky outcrop
Taramea/*Aciphylla "Lomond"*	Snow tussock grassland, north facing tussock grassland, and *Dracophyllum* scrub.
Taramea/*Aciphylla simplex* *	Cushionfield, high alpine cushionfield, rockfield and rocky outcrop.
Wīwī/*Juncus pusillus**	Cushion bog, seepage, and riparian wetland
Wīwī/*Juncus novae-zelandiae*	Cushion bog, and seepage
Koromiko/kōkōmuka/*Veronica salicifolia*	Riparian wetland

6.8 Indirect Disturbance

The following possible indirect effects may be associated with the construction and operation of the proposed ski field expansion. The effects assessment is set out in Table 17.

6.8.1 Noise

The proposed development is expected to generate elevated noise levels during both the construction (through use of blasting/ rock braking, excavation, use of construction machinery and hand tools) and operational phases. The Doolans catchment is largely free from motorised vehicles and the current ambient noise levels are very low. The Rastus Burn has experienced construction and operational noise as the Remarkables ski field has developed; however, the area still retains low ambient noise levels.

Based on the anticipated activity type and rural context, it is likely that noise effects will extend beyond the site boundary and may affect nearby habitat of indigenous species. Anthropogenic noise is known to have both direct and indirect impacts on avian communities by interfering with their communication

abilities which is fundamental for social interaction, sexual selection, parent offspring interactions and perception of predators (Richard *et al.,* 2021).

Similarly, anthropogenic noise sources are documented to create noise that overlaps with the frequency ranges of signals and cues used by terrestrial invertebrates in a number of orders (Raboin & Elias, 2022). Examples of activities include traffic on roads and railways, and development (compressor noise <20–5000 Hz), (Raboin & Elias, 2022). Blasting however, could produce a wave spectrum in the band from 20 to 20000 Hz (Pyra & Kłaczyński, 2019). Noise can have implications for masking (rendering females unable to detect or locate males for mating (Schmidt, Morrison, & Kunc, 2014), as well as distraction, increased stress in particular species, decreased lifespans and likely has implications for the ability of invertebrates to habituate to particular anthropogenic noise (Barber, Crooks, & Fristrup, 2009).

Short-Term Construction Noise

Construction activities will involve high-noise machinery, including earthmoving equipment, heavy vehicles, and various construction tools associated with site preparation and building works. These activities are expected to occur during standard working hours. Potential ecological effects include:

- Habitat avoidance or displacement due to aversion to noise;
- Disruption of breeding, nesting, or foraging behaviour, particularly during peak activity periods for birds, lizards and other wildlife; and
- Acoustic masking, where noise interferes with communication, territory defence, or predator/prey detection.

Long-Term Operational Noise

Once operational, the development may generate ongoing noise from the operation of ski lifts, snow groomers, use of explosives for avalanche control, winter/summer vehicular movements and human presence. Unlike construction noise, operational noise is chronic and may occur across a wider daily timeframe depending on site use. Potential ecological effects include:

- Ongoing habitat degradation due to persistent noise exposure, leading to reduced occupancy by noise-sensitive fauna;
- Long-term shifts in species composition, favouring disturbance-tolerant species and resulting in a loss of biodiversity; and
- Barrier effects, where noise discourages fauna from using adjacent habitat or moving across the site, potentially fragmenting ecological connectivity.

6.8.2 Light

Artificial light at night is known to interfere with bird behaviour by altering their circadian rhythm, increase daily vigilance behaviour and foraging times, effecting navigation, and causing deviation towards and collision with artificially lit structures (Richard, et al., 2021). Changes in behaviour can be harmful to species due to an increase in energy use effecting survival, changing mating pattern for unfavourable evolution, and speeding up reproductive behaviour and physiology.

The contrast to the surrounding environment may disrupt natural behavioural patterns, particularly for nocturnal or crepuscular species unaccustomed to such illumination. Artificial lighting is also likely to interfere with the flight paths of birds flying across the valley, particularly species that rely on natural cues for navigation or are sensitive to glare, likely impacting predation and hunting/foraging behaviours. Elevated light levels will also attract nocturnal invertebrates into the site shifting them away from host plants and suitable habitat. This can have widespread negative effect on all species that rely on insects for food or pollination. Overseas studies have shown that nocturnal Lepidoptera are attracted to artificial light but also experience a decline in feeding behaviour when exposed to the light (van Langevelde, van Grunsven, Veenendaal, & Fijen, 2017). The light also causes navigational disruption and confusion. The effects of light are unlikely to affect day flying species. Other nocturnal invertebrate species including species within the Onychophora (velvet worm) order experience avoidance of light (Beckmann, et al., 2015).

6.8.3 Construction Material

Other than kea, all other fauna species are not likely to be detrimentally affected by construction materials. Lead (Pb) is known to adversely affect the nervous, renal, gastrointestinal, and reproductive systems causing sickness and death in high concentrations to kea and is actively sought out and consumed. Additionally lead leaching has the potential to affect a large range of biota as it bioaccumulates in organisms. Unmitigated the magnitude of effect is assessed as High resulting in a Very High level of effect.

6.8.4 Increased Human Presence and Ski Field Operation

Increased human presence is likely to be observed due to an increased capacity of facilities as well as increased access to previously remote locations within the

study area. Notably, presence of operational staff and infrastructure will be an ongoing presence year-round. Likewise, human presence is likely to increase effects of transportation (strike) to and from the ski field as well as incidental and intentional disturbance of flora and fauna, particularly higher traffic areas. This can trigger a startling response or area avoidance behaviours. Similarly, increased foot traffic may impact sensitive vegetation by trampling. Increased human generated waste/litter is apparent in conjunction with all disturbed locations within the established ski field boundaries.

Ecological effects relating to the potentially impacted flora are assessed below with further consideration of the implications to fauna species given in Table 17.

Incidental trampling of sensitive vegetation is likely to occur in limited occurrence as a result of increase accessibility and increase frequency of usage. This said, it is likely to occur at a low rate and therefore represents a small shift in baseline conditions across all communities (assessed as a Low magnitude of effect). For plant communities and species assessed as having an ecological value of High or lower the level of effect is assessed as Low. However, for communities and Threatened species assessed as having an ecological value of Very High the level of effect is assessed as Moderate.

Large ski field litter has the potential to smother small areas of sensitive vegetation. Examples include crash padding, signage and barrier materials. Given the limited occurrence these objects are only likely to have any potential observable impact on highly sensitive and isolated vegetation plant species (Very High value/ Threatened) plant species), resulting in a Low magnitude of effect. Threatened species occur in the cushionfield, cushion bog, riparian wetland, and rocky outcrop communities. The level of effect in these occurrences is therefore assessed as Moderate. Elsewhere, the magnitude of effect is assessed as Negligible as the loss is likely to be highly isolated and of very few more commonly prevalent species. The level of effect is therefore assessed as Low for these communities.

Table 17: Indirect effects (Noise, Light and Increased human presence) on birds, lizards and invertebrates.

Species	Ecological value	Location**	Construction noise		Operational noise		Light		Increased human presence and skifield operation		Rationale	Further mitigation required yes/no[viii]
			Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level		
Avifauna												
Eastern falcon (*Falco novaeseelandiae* subsp. *novaeseelandiae)*	Very High	Doolans Valley & Rastus Burn	Low	Moderate	Negligible	Low	Negligible	Low	Negligible	Low	Falcon located within the Rastus Burn have adapted to the operational noise and general disturbance of the ski field and as such will likely be more resilient to construction and operational noise and light effects. It is also noted that, falcon are highly adaptable to urban environments locally. Additionally, increased operational noise and human presence or use of anthropogenic lighting or explosives (for avalanche control) is likely to occur during the winter and largely not affect the population or use of habitat given this is outside the main breeding season. Furthermore, falcon are accustomed to human presence and move to lower elevations during snow covered months. Construction noise may startle or cause temporary dispersal of the nesting pair which could cause abandonment of a nest or harm to unfledged chicks. However, this has not been observed during the recent Shadow Basin expansion. The effects of falcon located within the Doolans Valley may be slightly higher due to the limited disturbance and level of noise experienced within the more sheltered catchment. However, the effects are likely to remain Low given the effects of construction are temporary and the low the number of birds impacted respective to their abundance in the surround landscape and Ecological District. Light is expected to have little to no effects on breeding/foraging birds as the only anthropogenic light proposed during night hours will be associated with the snow grooms and snow gun operation, both being restricted to the winter operation months. No external construction or operational lighting is proposed during summer months. In autumn, only if due to unforeseen and uncontrollable circumstances that summer construction is delayed will there be lighting in the morning and evening. In the first instance, lighting will only occur after sunrise and	**Yes**

[viii] Further mitigation is required where the level of effect as assessed by EIANZ guidelines for each value is greater than Low or unless otherwise required by the Wildlife Act.

Species	Ecological value	Location**	Construction noise		Operational noise		Light		Increased human presence and skifield operation		Rationale	Further mitigation required yes/no[viii]
			Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level		
											before sunset. Then, only if absolutely required, will lighting be used before sunrise or after sunset.	
NZ pipit (*Anthus novaeseelandiae* subsp. *novaeseelandiae)*	High	Doolans Valley	Moderate	High	Low	Low	Negligible	Very Low	Low	Low	The majority of the works within the Rastus Burn is located at higher altitudes that is poor nesting habitat. However, the construction and operational phases may deter use of the habitat. The effects are expected to be more prevalent within the Doolans Valley as the population is less used to anthropogenic disturbance. The use of blasting and daily construction noise through the breeding season is likely to displace birds. The effects of operational noise is expected to be minimal as it is experienced at a lower decibel and unlikely to have a wide-reaching effect. We note pipit remain in present on the Remarkables and Coronet Ski fields during operation over the winter season indicating the birds are tolerant of operational noise and the presence of people. In summary, the ski field expansion is unlikely to detrimentally effect the pipit populations. Light is expected to have little to not effects on breeding/foraging birds as the only anthropogenic light proposed during night hours will be associated with the snow grooms and snow gun operation, both being restricted to the winter operation months. No external construction or operational lighting is proposed during summer months. In autumn, only if due to unforeseen and uncontrollable circumstances that summer construction is delayed will there be lighting in the morning and evening. In the first instance, lighting will only occur after sunrise and before sunset. Then, only if absolutely required, will lighting be used before sunrise or after sunset.	**Yes**
		Rastus Burn	Low	Low	Low	Low	Negligible	Very Low	Low	Low		**No**
Paradise duck (*Tadorna variegata)*	Low	Doolans Valley & Rastus Burn	Low	Very Low	Low	Very Low	Negligible	Very Low	Low	Very Low	Paradise shelducks are highly adaptable often raising young in close proximity to areas of human activity. The ducks are only likely to be present during the snow free months and therefore not exposed to effects associated with ski field operation.	**No**

Species	Ecological value	Location**	Construction noise		Operational noise		Light		Increased human presence and skifield operation		Rationale	Further mitigation required yes/no[viii]
			Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level		
Kea *(Nestor notabilis)*	Very High	Doolans Valley	High	Very High	High	Very High	High	Very High	High	Very High	Kea are highly intelligent and inquisitive birds that are likely to be drawn into unusual or new activities by noise and visual cues, including light and objects/structures. Without mitigation kea may cause direct or inadvertent harm to themselves and detrimentally alter their natural behaviour. These effects are likely to be more detrimental within the Doolans catchment due to no other large scale anthropogenic disturbance having occurred to date and as a result of the valley having a wider viewshaft to undisturbed terrain that may support kea year-round or periodically. Of particular concern is the treatment of rubbish and increased human interaction that may result learned behaviour that is poor for kea health.	**Yes**
		Rastus Burn	Low	Moderate	Low	Moderate	Low	Moderate	Moderate	High		**Yes**
Australasian harrier *(Circus approximans)*	Low	Doolans Valley & Rastus Burn	Low	Very Low	Negligible	Very Low	Negligible	Very Low	Negligible	Very Low	Australasian harrier are highly adaptable often raising young in close proximity to areas of human activity. Harrier are only likely to be present during the snow free months. Operational use may slightly alter habitat usage, however, current baseline conditions are not expected to change.	**Yes***
Southern black-backed gull (*Larus dominicanus dominicanus)*	Low	Doolans Valley & Rastus Burn	Low	Very Low	Negligible	Very Low	Negligible	Very Low	Negligible	Very Low	Southern black-backed gull are highly adaptable, often raising young in close proximity to areas of human activity. Operational use may slightly alter habitat usage; however, the gulls are still likely to reside in similar numbers and distribution to the current baseline conditions.	**No**
Herpetofauna												
McCann's skink *(Oligosoma maccanni)*	Low	Rastus Burn and Doolans	Low	Very Low	Low	Very Low	Low	Very Low	Low	Very Low	Noise, during the construction phase may result in temporary hearing loss (Wilkening , 2014), causing lizards to move away (be displaced) from preferred retreat, foraging and basking sites. Displacement may elevate predation and reduce survival of lizards during extreme weather. The scale and significance of effects of noise, vibration and dust on individuals affected is not possible to ascertain with certainty, but there may be an effect (even if temporary) for a small number of individuals.	**Yes***
Invertebrates												

Species	Ecological value	Location**	Construction noise		Operational noise		Light		Increased human presence and skifield operation		Rationale	Further mitigation required yes/no[viii]
			Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level		
Dasyuris partheniata	High	Doolans Valley & Rastus Burn	Moderate	High	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low	Lepidoptera have developed adaptations like sound-absorbing scales and specialized hearing to evade predators and to forage and communicate. Construction and ongoing operational noise (particularly in high traffic areas) may affect their ability to differentiate acoustic signals, leading to adverse effects on their survival, reproduction, and foraging. Lepidoptera abundance may therefore be affected by construction activities. *Xanthohoe frigida, Pyrausta comastis, Nivetica nervosa, Scoparia panopla and Scoparia niphospora* are nocturnal, whereas *Dasyuris partheniata, Dasyuris micropolis* and *Plutella sp.1 (CO)* are diurnal. The day active species are highly unlikely to be affected by artificial light. However, the nocturnal species are likely to be attracted to artificial light and may experience a decline in feeding behaviour as well as confusion and difficulty navigating. Both nocturnal species are summer active. Given the artificial lighting will predominantly occur during winter operations these species are unlikely to experience detrimental effects. In autumn, only if due to unforeseen and uncontrollable circumstances that summer construction is delayed will there be lighting in the morning and evening. In the first instance, lighting will only occur after sunrise and before sunset. Then, only if absolutely required, will lighting be used before sunrise or after sunset.	**Yes**
Plutella sp.1 (CO)	High	Doolans Valley & Rastus Burn	Moderate	High	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Xanthohoe frigida	Very High	Doolans Valley & Rastus Burn	Moderate	High	Low	Moderate	Negligible (winter) High (summer)	Low (winter) Very High (summer)	Negligible	Low		**Yes**
Pyrausta comastis	Very High	Doolans Valley & Rastus Burn	Moderate	High	Low	Moderate	Negligible (winter) High (summer)	Low (winter) Very High (summer)	Negligible	Low		**Yes**
Dasyuris micropolis	High	Doolans Valley & Rastus Burn	Moderate	High	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Nivetica nervosa	High	Doolans Valley & Rastus Burn	Moderate	High	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Scoparia panopla	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Scoparia niphospora	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Pasiphila eratica	Moderate	Doolans Valley &	Moderate	Moderate	Low	Low	Negligible (winter)	Very Low (winter)	Negligible	Very Low		**Yes**

Species	Ecological value	Location**	Construction noise		Operational noise		Light		Increased human presence and skifield operation		Rationale	Further mitigation required yes/no[viii]
			Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level		
		Rastus Burn					Low (summer)	Low (summer)				
Pasiphila sp.	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Sigaus campestris	High	Doolans Valley & Rastus Burn	Moderate	High	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low	Invertebrates are known to be detrimentally affected by light with nocturnal species likely to avoid areas of ongoing light occurrence. Notwithstanding this point, all species are expected to be surface active during snow free months when lighting associated with ski field operations will be reduced. Minimal or limited constancy of noise is essential to the breeding, hunting, predation, avoidance and overall health of many ground dwelling invertebrate species; without specific research it is assumed that the species present will be similarly adversely affected. The effects will be most apparent during the construction phase. However, ongoing usage and noise pollution of high traffic areas is also likely to invertebrate populations. The increase in human activity has the potential to slightly alter the presence of species due to trampling of host plants or habitat. It is expected that the effects of human activity will be largely unobservable given the small range of most species and limited physical interaction with ground dwelling species. Of note *Inophloeus inuus* is only known to occur below the base building and is associated with *Chionochloa rigida* and larger *Aciphylla* species. Although, the effects described above are still relevant they are situated further away from the development activity and effects are therefore likely to be limited with no change to current baseline conditions expected.	**Yes**
Hypsithocus hudsonae	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Neoramia alta	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Mamoea montana	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Rorea otagoensis	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Anagotus latirostris	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Inophloeus inuus	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**No**

Species	Ecological value	Location**	Construction noise		Operational noise		Light		Increased human presence and skifield operation		Rationale	Further mitigation required yes/no[viii]
			Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level	Magnitude	Effect Level		
Taenarthrus capito	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Duvaliomimus walkeri	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Peripatus sp. Remarkables	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Subantarctia centralis	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**
Huttonia sp.	Moderate	Doolans Valley & Rastus Burn	Moderate	Moderate	Low	Low	Negligible (winter) Low (summer)	Very Low (winter) Low (summer)	Negligible	Very Low		**Yes**

*The Wildlife Act 1953 necessitates further protection against the harm of indigenous species regardless of Low level of effects outcomes. No species of invertebrates found within the study area are listed within the Wildlife Act 1953 under Schedule 7 and are therefore not subject to the same protection as other indigenous species.

**The location has been split for species avifauna due to the location affecting the magnitude at which the species may respond to activity as a result of historic habituation. Consideration has also been given to species ranges and presence within each catchment. Therefore, ground dwelling invertebrates are likely to experience the effects at a similar magnitude regardless of their location.

6.9 Cumulative Effects

The current extent of vegetation loss associated with the existing Remarkables ski area is approximately 60.60 ha. This area equates to less than 0.16% of the comparable vegetation above 1100 metres elevation in the Ecological District. The additional area of disturbance associated with the Doolans expansion covers an area of approximately 15.94 ha. This would equate to 0.04% of the Ecological District above 1100 metres. Given the cumulative effect on the ecological values of the subalpine and alpine environments remains low at less than 0.2%, e3s considers the Doolans expansion represents a Low cumulative effect on the ecology of the Ecological District.

7 Residual Effects

Residual effects occur where the level of effect as assessed by EIANZ guidelines for each value is greater than Low. Alternatively, low residual effects may require further mitigation where they are specifically protected by law.

It is noted that the mitigation proposed for each affected ecological value below is imperative in reducing the impacts of the disturbance of the proposed project. The outcomes of the mitigation measures proposed represent the furthermost effort to reduce the ecological impacts to an overall Low Level of effect. However, although the mitigation measures may reduce the overall ecological impact of the project the assessment may not reflect a change in the Level of effect as applied under the EIANZ guidelines.

Table 18: Assessment of Residual Effects.

Effect	Value Affected	Level of Effect[i] (Doolans)	Level of Effect[i] (Rastus)	Mitigation/Avoidance Measure	Change in Level of Effect (Yes/No)	Residual Level of Effect

Vegetation Loss	High alpine cushionfield	High		A Vegetation, Weed, Invertebrate, and Wetland Management Plan will be prepared and implemented. The plan will ensure mitigatory actions are completed to achieve high plant survival rates. To accomplish this, the plan will clearly define the methodology, actions and targets required to implement and achieve the following:
				• The alignment of the proposed disturbance footprint will be delineated and marked out prior to surveys being undertaken.
				• All areas of disturbance will be surveyed by a suitably qualified ecologist to record the location of all species to be translocated. This includes any variation to the footprint that may occur during construction.
				• All At Risk – Declining and Threatened plant species must be translocated into suitable and comparable nearby habitat or remediated substrates (see Table 5 for a list of species).
				• All clusters of At Risk- Naturally Uncommon and Data Deficient plant species must be translocated into suitable and comparable nearby habitat or remediated substrates, to a maximum of 500 clusters of each species (see Table 5 for a list of species).
				• All batter slopes/exposed surfaces are to be revegetated as contiguous mats utilizing all removed vegetation within the trail footprint (not otherwise subject to recommendations 4 & 5) in accordance with the approved DOC/NZSki revegetation protocols (see Appendix G). In addition, the following controls shall be adhered to:
				  • Where practicable, excavated vegetation shall be placed within one movement onto a suitable rehabilitation surface.
				  • Where a single movement is not possible, vegetation should only be stored upright and for no longer than 1 day before being placed onto a suitable rehabilitation surface.
				  • Rehabilitation sites shall be designated and approved prior to receiving any excavated vegetation.
				  • All works are to be carried out by contractors experienced in vegetation translocation and rehabilitation and work with the appointed ecologist.
					Yes	**Moderate**

	Snow tussock grassland, cushionfield, rockfield, rocky outcrop, cushion bog wetland, and seepage	Moderate			**No (slight reduction)[ii]**	**Moderate**
Fragmentation – vegetation communities	Cushionfield, high alpine cushionfield, rocky outcrop	N/A	Moderate		**No (slight reduction)[ii]**	**Moderate**
	North facing tussock grassland, *Dracophyllum* scrub, cushionfield, high alpine cushionfield, rockfield, rocky outcrop	High	N/A		**No (slight reduction)[ii]**	**High**

				• All species-specific plant translocations are to achieve a minimum 60% survival rate after 7 years. Community translocation/remediation is to meet a 60% indigenous cover. All areas of vegetation translocation and remediation are to be monitored on an annual basis for 3 years and then biennially for a further 4 years. The monitoring shall be undertaken by a Suitably Qualified and Experienced Ecologist. Where monitoring identifies insufficient survival within 7 years, the following measures will be implemented on an experimental basis and continued where success is observed: o Direct sowing or dispersal of indigenous locally sourced seed into disturbed substrate, in areas of low survival to supplement indigenous cover and encourage recolonisation. • All plant translocations and remediation actions are to be implemented and overseen in consultation with suitably qualified and experienced project ecologist. The ecologist will provide contractors with training and regular briefing regarding expectations of remedial work and is responsible for evaluating and where required, enacting further mitigation measures.		
	Cushion bog, riparian wetland, and seepage	Very High		• All mitigation as per vegetation loss (see above) is to be undertaken. In addition, the following actions will be incorporated within the Vegetation/ Invertebrate, Weed and Wetland Management Plan: • All hydrological function and connectivity of all wetlands and streams will be maintained. • Designs will be provided for each stream/wetland crossing. Designs shall include, proposed drawings, methodology, materials, equipment, lengths, hydrological assessment/flow, and rehabilitation required. • All wetland and stream crossing designs will be reviewed by a Hydrologist and Ecologist and approved prior to any works commencing and be inspected once complete to ensure the design is implemented correctly and is functioning as anticipated. Checks will ensure ecological and hydrological function is maintained; checks will be undertaken immediately after completion and again 12 months later by a Hydrologist and Ecologist.	**Yes**	**Moderate**
Infrastructure Impediment	Eastern falcon (*Falco novaeseelandiae novaeseelandiae*)	Moderate		• External window finishes will be designed to break up the line of sight, therefore, reducing bird strike. Monitoring of bird strike will occur for the first five years, and if any bird strike of Threatened or At Risk species is recorded, further deterrent measures must be implemented, such as applying high-contrast markers like tape, decals, or UV-reflective films to windows. Additional deterrent measures must be put in place if further bird strike occurs of Threatened or At Risk species.	**Yes**	**Low**

Weed introduction/ mobilisation	Disturbed areas	Moderate	• Weed management will be incorporated into the Vegetation, Weed, Invertebrate, and Wetland Management Plan. The management plan will achieve the following: o No new exotic species are introduced to the wider landscape. o Existing exotic species are controlled to ensure no increase in current population/distribution. o Detail actions for undertaking incursion response and monitoring both during the construction and ongoing operations phases of the project. • To minimise the potential for the spread of exotic weeds, no soil from outside the study area is to be brought onto the site. • Prior to any machinery or equipment entering the study area it must be cleaned and checked for soil that could potentially contain seeds or exotic plants. To mitigate this risk a quarantine area should be established near the Remarkables ski field base to enable checks and cleaning of machinery before moving onto the ski field. • No soil is to be moved upslope more than 100 vertical metres, or between catchments. • No disturbance is to occur outside the proposed earthworks extent unless this could result in a reduced footprint. Any changes shall be checked by an ecologist prior to proceeding with the works.	**Yes**	**Low**
	Snow tussock grassland, north facing tussock grassland, *Dracophyllum* scrub, cushionfield, high alpine cushionfield, cushion bog, riparian wetland, seepage, rockfield, rocky outcrop and snowbank	Very High		**Yes**	**Low**
Sedimentation	Disturbed areas	Moderate	• All unvegetated trail surface are to be finished with large coarse rock rather than fine gravels. • All earthworks are to be managed to mitigate the risk of runoff and sedimentation into adjacent watercourses, wetlands and vegetation. A specific sediment and erosion control management plan to mitigate the risk of runoff into wetlands, watercourses, and onto neighbouring vegetation is to be prepared and approved by a Hydrologist and Ecologist prior to works commencing. This management plan is to include a drainage plan, which will ensure that as the topography is altered, long term sediment runoff is also managed. • All stockpiled material is to be contained within the disturbance footprint and not to be deposited atop any indigenous vegetation.	**Yes**	**Low**
	Snow tussock grassland, north facing tussock grassland, Dracophyllum scrub, cushionfield, high alpine cushionfield, rockfield, and rocky outcrop	High		**Yes**	**Low**
	Cushion bog, riparian wetland, seepage, and snowbank.	Very High		**Yes**	**Moderate**[iii]
Habitat loss – avifauna	Eastern falcon (*Falco novaeseelandiae novaeseelandiae*) nesting	Low	• All mitigation as per vegetation loss (see above) to be undertaken in addition to; • Where works take place within the breeding season for karearea (August-May) or pihoihoi (August-February), nesting habitat within the disturbance footprint for both species are to be	**No (slight reduction)** [ii]	**Low**

	Eastern falcon (*Falco novaeseelandiae novaeseelandiae*) foraging – high quality	Moderate		surveyed ahead of time (no longer than 8-days (including non-working days) prior to disturbance) and any nests identified. Where construction activities could cause direct disturbance to a nesting individual the following actions will be undertaken: o If possible, works will establish exclusion zones and avoid the area until chicks have fledged (200 m for falcon and 50 m for pipit or otherwise instructed by the project ornithologist). o Where eggs have already hatched and chicks are present, an exclusion will be established around the nest until chicks have fledged (200 m for falcon and 50 m for pipit or otherwise instructed by the project ecologist/ornithologist). o Where this is not possible, the nest and/or chicks are to be moved to a suitable, nearby alternative location and monitored to ensure nest is not abandoned; if abandoned, chicks will be immediately delivered to a local rehabilitation facility capable of caring for the birds. o If the nest cannot be moved and if construction activities may cause harm to the adult birds, the nest (and eggs if present) is to be destroyed, and the area disturbed as early in the season as possible to disperse the adults and allow for renesting elsewhere (only to be undertaken as a last resort). o All associated work will be undertaken and managed by a suitably qualified and experienced Ecologist/Ornithologist and undertaken in accordance with best practice capture, handling and release measures set out in the Department of Conservation's New Zealand National Bird Banding Scheme bird bander's manual. o A Wildlife Act Authority (permit) is to be obtained for any direct disturbance/destruction of avifauna or their nests. o Where concern for the safety of any indigenous avifauna or that of personnel becomes relevant, the project Ecologist/Ornithologist will be contacted immediately. • All staff will be trained in appropriate falcon interaction and etiquette.	**No (slight reduction)** [ii]	**Moderate**
	NZ pipit (*Anthus novaeseelandiae novaeseelandiae*) nesting below 1700m – Doolans only	High	N/A		**Yes**	**Low**
	NZ pipit (*Anthus novaeseelandiae novaeseelandiae*) foraging above and below 1700 m - Doolans	High	N/A		**No (slight reduction)** [ii]	**High**
Habitat loss – herpetofauna	McCann's skink (*Oligosoma maccanni*)	Very Low	N/A	• A LMP has been prepared as a requirement of Wildlife Act 1953 obligations, that describes the lizard values, sets out the ecological effects of development activities and provides measures to manage the impacts on herpetofauna and their habitat.	**No**	**Very Low**
Habitat loss – invertebrates	*Plutella* sp.1 (CO), and *Sigaus campestris*	High		• All mitigation as per vegetation loss (see above) is to be undertaken. In addition, the following actions will be incorporated within the Vegetation, Weed, Invertebrate, and Wetland Management Plan:	**No (slight reduction)** [ii]	**High**

	Hypsithocus hudsonae, Neoramia alta, Rorea otagoensis, Anagotus latirostris, Duvaliomimus walkeri, Mamoea montana, Xanthohoe frigida, Pyrausta comastis, Peripatus sp. (Remarkables), Subantarctia centralis, Huttonia sp., Scoparia panopla, Scoparia niphospora, and Pasiphila sp.	Moderate		• All invertebrate host specific plant species (not otherwise specifically covered in the above mitigation measure and where the residual effect on the invertebrate species is greater than low) are to be translocated in accordance with the same methodology for At Risk – Declining and threatened plant species. This relates to all species within the *Cardamine* genus, *Aciphylla aurea* and *Aciphylla 'lomond'*. • All vegetation community remediation shall be undertaken in proximity as close as possible to the donor site to retain invertebrate biodiversity in remediated and adjacent habitat and species genetic diversity across spatially differentiable locations. • All plants must be translocated in tracts of vegetation material as large as possible to ensure as much of the habitat and ground dwelling terrestrial invertebrates are preserved and are to recolonise or dispersal into comparable habitat post-movement.	**No (slight reduction)** [ii]	**Moderate**
	Inophloeus inuus	Moderate	N/A		**Yes**	**Low**
Construction material and design (Doolans &Rastus Burn)	Kea (*Nestor notabilis*)	Very High		• No lead-based materials or finishes will be used in construction or maintenance of any infrastructure.	**Yes**	**Low**
Construction noise	Eastern falcon (*Falco novaeseelandiae* subsp. *novaeseelandiae)*	Moderate			**No**	**Moderate**
	NZ pipit (*Anthus novaeseelandiae* subsp. *novaeseelandiae)*	Moderate			**No**	**Moderate**
	Kea *(Nestor notabilis)*	Very High	Moderate		**No**	**Moderate**
	Dasyuris partheniata, Plutella sp.1 (CO), Xanthohoe frigida, Pyrausta comastis, Dasyuris micropolis,	High	High		**No**	**High**

	Nivetica nervosa, Sigaus campestris					
	Scoparia panopla, Scoparia niphospora, Pasiphila erotica, Pasiphila sp., Hypsithocus hudsonae, Neoramia alta, Mamoea montana, Rorea otagoensis, Anagotus latirostris, Inophloeus inuus, Taenarthrus capito, Duvaliomimus walkeri, Peripatus sp. Remarkables, Subantarctia centralis, and *Huttonia sp.*	Moderate	Moderate		**No**	**Moderate**
Operational noise	Kea (*Nestor notabilis*)	Very High	Moderate	Where kea are observed within or nearby either catchment during development seasons, the following measures have been informed by the Kea Conservation Trust **(Kea Conservation Trust, 2015)** will be undertaken under supervision of a suitably qualified and experienced ecologist/ornithologist: • All tools, consumable items, and loose or soft constructions material will be secured in a way that is inaccessible to kea. • Interactions are minimised where possible to reduce potential habituation. • If kea become a nuisance kea safe 'playgrounds can be installed to distract kea during work hours. • All measures will remain in place until risks are removed from potential kea interaction.	**Yes**	**Low**
Increased human presence and skifield operation	Kea (*Nestor notabilis*)	Very High	High	• Signage will be erected in all areas of high visitor traffic detailing appropriate kea interaction and etiquette. • All staff will be trained in appropriate kea interaction and etiquette.	**Yes**	**Low**
	All threatened plant species	Moderate		To reduce plant community degradation, species smothering and harmful ingestion of rubbish by kea: • No rubbish bins are to be stored externally within Doolans or Rastus Burn catchments.	**Yes**	**Low**

			• Annual rubbish collections will be undertaken within and adjacent all tracks and ski area infrastructure.		

[i] The values depicted represents the level of effect prior to implementation of further mitigation measures

[ii] The proposed mitigation measures are constrained by the physical limitations apparent in working in such an unfavourable environment. Vegetation remediation and rare species translocation, even when completed to a high level is likely observe loss of a significant portion of the vegetation (up to 50%) and overall biodiversity. Appendix H provides examples and monitoring results of previously undertaken vegetation transfer and translocation in relation to development projects within the Remarkables Ski Field. These effects are likely to be observed in the short to medium term; until natural regeneration of the remediated substrates can occur. As such, the effects still represent a loss or alteration to one or more key elements/features of the existing baseline conditions and given the potential loss of biodiversity and/or rare species may still have a distinguishable change to the population or range of a number of ecological values.

[iii] Previous development project within the existing ski field have observed that even with erosion and sediment control measures implemented some minor degradation of adjacent receiving environments is likely as a result of sediment mobilisation. These are expected to be extremely minor and isolated in most cases presenting a nearly indistinguishable change in upland communities resulting in a change to a Negligible magnitude of effect. However, this presents a higher risk in hydrologically connected vegetation communities that will observe a slightly higher degree of alteration. The magnitude of effect in these communities is likely only reduced to Low.

7.1 Summary of Residual Effects

Implementation of mitigation measures set out Table 18 will reduce the overall ecological impact of the proposed disturbance on a number of significant ecological values. However, due to the higher level of naturalness and scale of the proposed development residual effects are unavoidable. Following mitigation, residual effects are observed at a degree of Very Low, Low, and Moderate to High level of effect.

The proposal is likely to result in residual effects relating to vegetation and habitat loss, fragmentation, and indirect disturbance of faunal species during construction periods within and directly adjacent the disturbance. Additional effects are likely to be observed McCann's skink, necessitating further action under the Wildlife Act 1953, with is detailed within the LMP (e3Scientific, 2026e). Cumulatively this represents a considerable loss in ecological function and biodiversity within the disturbance footprint at the Ecological District scale. It is noted, credible opportunities for offsetting within a harsh alpine environment have not been identified. This is because neighbouring subalpine and alpine areas contain relatively undisturbed vegetation and habitats that are unlikely to benefit from implementation of offsetting measures, such as habitat protection or restoration measures.

In accordance with the effects management hierarchy, where offsetting of more than minor residual adverse effects is not possible, biodiversity compensation should be implemented. NZSki is proposing the establishment of a biodiversity project which will provide a compensatory package for the Project. Currently, Table 18 reflects the overall loss of terrestrial values, prior to the details of the compensatory measures being confirmed and implemented.

8 Conclusions and Recommendations

The Remarkables Expansion Project will result in the direct disturbance of approximately 15.9 ha of high to very high-quality vegetation and habitat in the upper Rastus Burn and Upper Doolans catchments. The EcIA has completed detailed geospatial analysis to contextualise the effect with respect to the Remarkables Ecological District. This assessment found that the percentage loss is greatest for high altitude cushionfields (0.96%) with the loss less than 0.09% for the remaining communities. Overall, loss is expected to account for approximately 0.05% of comparable habitats above 1100 m asl within the Ecological District.

Avoidance of sensitive habitat has been integral to the development of the Project with the direct disturbance of wetlands being reduced to as low as practicable through project design. Overall, the total disturbance to wetlands is slightly over 2000 square metres. Detailed engineering consideration has also ensured that direct disturbance is as low as possible.

Ecological effects remain unavoidable in a project such as this where clearance of high and very high value vegetation and habitat is required. To ensure ecological effects are minimised as much as possible the following recommendations are proposed:

1. A Vegetation, Weed, Invertebrate, and Wetland Management Plan will be prepared and implemented. The plan will ensure mitigatory actions are completed to achieve high plant survival rates, no weed introduction, retention of hydrological function, and preservation of invertebrate biodiversity. To accomplish this, the plan will clearly define the actions, methodology, and targets required to implement and achieve the actions set out in recommendations 2-22.
2. The alignment of the proposed disturbance footprint will be delineated and marked out prior to ecological surveys being undertaken.
3. All areas of disturbance will be surveyed by a suitably qualified ecologist to record and delineate the location of all species to be translocated. This includes any variation to the footprint that may occur during construction.
4. All At Risk – Declining and Threatened plant species must be translocated into suitable and comparable nearby habitat or remediated substrates as per recommendation 7 (see Table 5 for a list of species).

5. All clusters of At Risk - Naturally Uncommon and Data Deficient plant species must be translocated into suitable and comparable nearby habitat or remediated substrates as per recommendation 7, to a maximum of 500 clusters of each species (see Table 5 for a list of species).
6. All invertebrate host specific plant species (not otherwise specifically covered in recommendations 4 & 5 and where the residual effect on the invertebrate species is greater than Low) are to be translocated in accordance with the same methodology for At Risk – Declining and Threatened plant species. This relates to all species within the *Cardamine* genus, *Aciphylla aurea* and *Aciphylla 'lomond'*.
7. All batter slopes/exposed surfaces are to be revegetated as contiguous mats utilising all removed vegetation within the trail footprint (not otherwise subject to recommendations 4 & 5) in accordance with the approved DOC/NZSki revegetation protocols (see Appendix G). In addition, the following controls shall be adhered to:
    i. Where practicable, excavated vegetation shall be placed within one movement onto a suitable rehabilitation surface.
    ii. Where a single movement is not possible, vegetation should only be stored upright and for no longer than 1 day before being placed onto a suitable rehabilitation surface.
    iii. Rehabilitation sites shall be designated and approved prior to receiving any excavated vegetation.
    iv. All works are to be carried out by contractors experienced in vegetation translocation and rehabilitation, and work with the appointed ecologist.
8. All vegetation community remediation shall be undertaken as close as possible to the donor site to retain invertebrate biodiversity in remediated and adjacent habitat, and species genetic diversity across spatially differentiable locations.
9. All plants must be translocated in tracts of vegetation material as large as possible to ensure as much of the habitat and ground dwelling terrestrial invertebrates are preserved and are able to recolonise or disperse into comparable habitat post-movement.
10. All species-specific plant translocations are to achieve a minimum 60 % survival rate after 7 years. Community translocation/remediation is to meet a 60 % indigenous cover. All areas of vegetation translocation and remediation shall be monitored on an annual basis for 3 years and then biennially for a further 4 years. The monitoring shall be undertaken by a

suitably qualified and experienced ecologist. Where monitoring identifies insufficient survival within 7 years, the following measures will be implemented on an experimental basis and continued where success is observed:

i. Direct sowing or dispersal of indigenous locally sourced seed into disturbed substrate, in areas of low survival to supplement indigenous cover and encourage recolonisation.

11. All plant translocations and remediation actions are to be implemented and overseen in consultation with a suitably qualified and experienced project ecologist. The ecologist will provide contractors with training and regular briefing regarding expectations for remedial work and is responsible for evaluating and where required, enacting further mitigation measures.
12. All hydrological function and connectivity of all wetlands and streams will be maintained.
13. Designs and methodology will be provided for each stream/wetland crossing. Designs shall include, proposed drawings, methodology, materials, equipment, lengths, hydrological assessment/flow, and rehabilitation required.
14. All wetland and stream crossing designs will be reviewed by a Hydrologist and Ecologist and approved prior to any works commencing and be inspected once complete to ensure the design is implemented correctly and is functioning as anticipated. Checks will ensure ecological and hydrological function is maintained; checks will be undertaken immediately after completion and again 12 months later by a Hydrologist and Ecologist.
15. Weed management will be incorporated into the Vegetation, Weed, Invertebrate, and Wetland Management Plan. The management plan will achieve the following:
    i. No new exotic species are introduced to the wider landscape.
    ii. Existing exotic species are controlled to ensure no increase in current population or distribution.
    iii. Detail actions for undertaking incursion response and monitoring both during the construction and ongoing operations phases of the project.
16. To minimise the potential for the spread of exotic weeds, no soil from outside the study area is to be brought onto the site.

17. No soil is to be moved between catchments or upslope from the area adjacent the base building. Additionally, soil should not be moved more than 100 vertical metres upslope from any other area.
18. Prior to any machinery or equipment entering the study area it must be cleaned and checked for soil that could potentially contain seeds or exotic plants. To mitigate this risk a quarantine area should be established near the Remarkables ski field base to enable checks and cleaning of machinery before moving onto the ski field.
19. No disturbance is to occur outside the proposed earthworks extent unless this could otherwise result in a reduced footprint within the same vegetation community. Any changes shall be reviewed and agreed upon by an ecologist prior to proceeding with the works.
20. All unvegetated trail surfaces are to be finished with large coarse rock rather than fine gravels.
21. All earthworks are to be managed to mitigate the risk of runoff and sedimentation into adjacent watercourses, wetlands and vegetation. A specific erosion and sediment control management plan to mitigate the risk of runoff into wetlands, watercourses, and onto neighbouring vegetation is to be prepared by suitably qualified and experienced expert and approved by a Hydrologist and Ecologist prior to works commencing. This management plan is to include a drainage plan, which will ensure that as the topography is altered, long term sediment runoff is also managed.
22. All stockpiled material is to be contained within the disturbance footprint and not to be deposited on to any indigenous vegetation.
23. Where works take place within the breeding season for karearea (August-May) or pihoihoi (August-February), nesting habitat within the disturbance footprint for both species are to be surveyed ahead of time (no longer than 8-days prior to disturbance) and any nests identified. Where construction activities could cause direct disturbance to a nesting individual the following actions will be undertaken:
    i. If possible, works will establish exclusion zones and avoid the area until chicks have fledged (200 m for falcon and 50 m for pipit or otherwise instructed by the project ornithologist).
    ii. Where eggs have already hatched and chicks are present, an exclusion will be established around the nest until chicks have fledged (200 m for falcon and 50 m for pipit or otherwise instructed by the project ecologist/ornithologist).
    iii. Where this is not possible, the nest and/or chicks are to be moved to a suitable, nearby alternative location and monitored to ensure

the nest is not abandoned; if abandoned, chicks will be immediately delivered to a local rehabilitation facility capable of caring for the birds.

iv. If the nest cannot be moved and if construction activities may cause harm to the adult birds, the nest (and eggs if present) is to be destroyed, and the area disturbed as early in the season as possible to disperse the adults and allow for renesting elsewhere (only to be undertaken as a last resort).

v. All associated work will be undertaken and managed by a suitably qualified and experienced Ecologist/Ornithologist and undertaken in accordance with best practice capture, handling and release measures set out in the Department of Conservation's New Zealand National Bird Banding Scheme bird bander's manual.

vi. A Wildlife Act Authority (permit) is to be obtained for any direct disturbance/destruction of avifauna or their nests.

24. Where concern for the safety of any indigenous avifauna or that of personnel becomes relevant, the project Ecologist/Ornithologist will be contacted immediately.
25. All staff will be trained in appropriate falcon interaction and etiquette.
26. External window finishes will be designed to break up the line of sight, therefore, reducing bird strike. Monitoring of bird strike will occur for the first five years, and if any bird strike of Threatened or At Risk species is recorded, further deterrent measures must be implemented, such as applying high-contrast markers like tape, decals, or UV-reflective films to windows. Additional deterrent measures must be put in place if further bird strike occurs of Threatened or At Risk species.
27. A LMP has been prepared that characterises the lizard values, sets out the ecological effects of development activities and provides measures to manage the impacts on herpetofauna and direct disturbance of their habitat.
28. No lead-based materials or finishes will be used in construction or maintenance of any infrastructure.
29. Where kea are observed within or nearby either catchment during development seasons, the following measures will be undertaken under supervision of a suitably qualified and experienced ecologist/ornithologist:

iv. All tools, consumable items, and loose or soft constructions material will be secured in a way that is inaccessible to kea.

v. Interactions are minimised where possible to reduce potential habituation.

vi. If kea become a nuisance kea safe 'playgrounds' can be installed to distract kea during work hours.

vii. All measures will remain in place until risks are removed from potential kea interaction.

30. Signage will be erected in all areas of high visitor traffic detailing appropriate kea interaction and etiquette.
31. All staff will be trained in appropriate kea interaction and etiquette.
32. To reduce plant community degradation, species smothering and harmful ingestion of rubbish by kea:

viii. No rubbish bins are to be stored externally within Doolans or Rastus Burn catchments.

ix. Annual rubbish collections will be undertaken within, and adjacent to, all tracks and ski area infrastructure.

Notwithstanding the recommendations above, based on the EcIA guidelines Moderate to High residual ecological effects are expected. The following characterises these ecological effects:

- Direct loss of 13.46 ha of indigenous vegetation characterised as a Moderate level of residual effect.
- Fragmentation of indigenous vegetation in the Rastus Burn is assigned a Moderate level of residual effect
- Fragmentation of indigenous vegetation in the Doolans is assigned a High level of residual effect as the vegetation remains largely intact.
- Sedimentation of wetland communities is assigned a Moderate level of effect even when erosion and sediment controls are implemented
- A Moderate level of effect on falcon based on a slight change to habitat conditions with respect to a pipit (bird of prey).
- A High level of effect on pipit below 1700 metres in the Doolans.
- A Moderate to High level of effect of habitat loss on invertebrates
- Construction noise effects on eastern falcon, NZ pipit and kea are assigned as Moderate and Moderate to High for invertebrates.

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Appendices

Appendix A: Scheme Plans

the remarkables
Queenstown • New Zealand

Rastus Burn Access Roads & Utility

E400 Series

FOR FASTRACK APPLICATION

SOUTHERN LAND
DEVELOPMENT CONSULTANTS

REVISION	DESCRIPTION	DATE
G	For Information	28/11/25

Level 2 Brownston House, 21 Brownston St., Wanaka, Ph: (03) 443 5577, Email: contact@southernland.co.nz, www.southernland.co.nz

CSNZ

Remarkables Ski Area Upgrades & Doolans Basin Expansion
General Arrangements
Section Cover

nzski

SURVEYED	DATE	CHECKED	DATE	SCALE	
-	-	MB	07/03/25	DATUM & LEVEL	
DRAWN	DATE	APPROVED	DATE	DRAWING REFERENCE	REVISION
AJHB/TN	28/11/25	AJHB	28/11/25	A30043_E7	G

Sheet E401

GONDOLA TERMINAL
BOTTOM TERMINAL
TOWER 1
TOWER 2
TOWER 3
TOWER 4
TOWER 5
TOWER 6
TOWER 7
TOWER 8
TOWER 9
TOWER 10
TOWER 11
TOWER 12
BASE BUILDING
Existing Sugarbowl lift
Existing Shadow Basin Lift
Existing Alta lift
Existing Curvey Basin lift
Existing snow fence
Existing terrain park
Halfpipe
4WD ACCESS TRACK AND SKIER RETURN TRAIL
Scree Slope
Rocky Bluffs
Swan Lake
Rastus Burn Creek
QLDC
CODC
TEMPORARY ACCESS TRACK
DOOLANS ACCESS GONDOLA
Existing 4WD access tracks
Heli Ridge
MID-STATION AREA
4WD ACCESS TRACK FROM CURVEY BASIN TO MID-STATION

ECOLOGY LEGEND:

- Cushion Bog
- Cushionfield
- Cushionfield Heatflux
- Dracophyllum shrubland
- Rockfield
- Rocky Outcrop
- Tussock Grassland
- Tussock North Facing
- Waterway
- Wetland Riparian
- Wetland Seepage

FOR FAST-TRACK APPLICATION
NOT FOR CONSTRUCTION

SOUTHERN LAND
DEVELOPMENT CONSULTANTS
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REVISION	DESCRIPTION	DATE
H	For Consent	30/01/26
I	For Consent	05/03/26
J	For Consent	16/04/26
K	For Consent	06/05/26

Remarkables Ski Area Upgrades & Doolans Basin Expansion
Rastus Burn Access Roads & Utilities
Overall

nzski

SURVEYED -	DATE -	CHECKED AJHB	DATE 06/05/26
DRAWN TN/MS	DATE 06/05/26	APPROVED AJHB	DATE 06/05/26

SCALE 1:4,500 @ A3
DATUM & LEVEL NZTM
LEVEL IN TERMS OF DVD58
ORIGIN OIT XI DP XXXXX RL = XXX.XX
DRAWING REFERENCE A30043_E7
REVISION K

Sheet E402

GONDOLA TERMINAL
BOTTOM TERMINAL
TOWER 1
TOWER 2
TOWER 3
TOWER 4
TOWER 5
TOWER 6
TOWER 7
TOWER 8
TOWER 9
TOWER 10
TOWER 11
TOWER 12
BASE BUILDING
MID-STATION AREA
Existing Sugarbowl lift
Existing snow fence
Existing terrain park
Halfpipe
4WD ACCESS TRACK AND SKIER RETURN TRAIL
Scree Slope
Rocky Bluffs
Swan Lake
Rastus Burn Creek
Existing Alta lift
Existing Curvey Basin lift
Shadow Basin Lift
DOOLANS ACCESS GONDOLA
Heli Ridge
QLDC
CODC
1700

RETAINING WALL REQUIRED APPROXIMATELY 15m LONG AND UP TO 2.3m HIGH. REFER TO CONSTRUCTION MANAGEMENT FRAMEWORK

RETAINING WALL REQUIRED APPROXIMATELY 25m LONG AND UP TO 2.3m HIGH. REFER TO CONSTRUCTION MANAGEMENT FRAMEWORK

RETAINING WALL REQUIRED APPROXIMATELY 25m LONG AND UP TO 2.3m HIGH. REFER TO CONSTRUCTION MANAGEMENT FRAMEWORK

TRAIL WIDENING THROUGH AREA OF LARGE ROCKS

RETAINING WALL REQUIRED APPROXIMATELY 190m LONG AND UP TO 3.5m HIGH. REFER TO CONSTRUCTION MANAGEMENT FRAMEWORK

RETAINING WALL REQUIRED APPROXIMATELY 180m LONG AND UP TO 3.5m HIGH. REFER TO CONSTRUCTION MANAGEMENT FRAMEWORK

RETAINING WALL REQUIRED APPROXIMATELY 40m LONG AND UP TO 2.0m HIGH. REFER TO CONSTRUCTION MANAGEMENT FRAMEWORK

TEMPORARY ACCESS TRACK
TEMPORARY ACCESS TRACK
TEMPORARY ACCESS TRACK
Existing 4WD access tracks
4WD ACCESS TRACK FROM CURVEY BASIN TO MID-STATION

ECOLOGY LEGEND:

- Cushion Bog
- Cushionfield
- Cushionfield Heatflux
- Dracophyllum shrubland
- Rockfield
- Rocky Outcrop
- Tussock Grassland
- Tussock North Facing
- Waterway
- Wetland Riparian
- Wetland Seepage

Elevations Table

Min. Depth	Max. Depth	Colour
-14.00	-12.00 m	
-12.00	-10.00 m	
-10.00	-8.00 m	
-8.00	-6.00 m	
-6.00	-4.00 m	
-4.00	-2.00 m	
-2.00	0.00 m	
0.00	2.00 m	
2.00	4.00 m	
4.00	6.00 m	
6.00	8.00 m	
8.00	10.00 m	
10.00	12.00 m	
12.00	14.00 m	

Earthworks Notes:

- Refer to ***Construction Management Framework*** for Earthworks Volumes

FOR FAST-TRACK APPLICATION
NOT FOR CONSTRUCTION

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H	For Consent	30/01/26
I	For Consent	05/03/26
J	For Consent	16/04/26
K	For Consent	06/05/26

Remarkables Ski Area Upgrades & Doolans Basin Expansion
Rastus Burn Access Roads & Utilities
Cut & Fill

nzski

SURVEYED	DATE	CHECKED	DATE
-	-	AJHB	06/05/26
DRAWN	DATE	APPROVED	DATE
TN/MS	06/05/26	AJHB	06/05/26

SCALE: 1:4,500 @ A3
DATUM & LEVEL: NZTM
LEVEL IN TERMS OF DVD58
ORIGIN OIT XI DP XXXXX RL = XXX.XX
DRAWING REFERENCE: A30043_E7
REVISION: K

Sheet E406

ROOF AREA 1: ~2637m²
ESTIMATED Q= 47 l/s
DISCHARGE VIA DOWNPIPES
TO EXISTING
STORMWATER SYSTEM.

GONDOLA TERMINAL

BOTTOM TERMINAL

TOWER 1

TOWER 2

TOWER 3

TOWER 4

TOWER 5

TOWER 6

TOWER 7

TOWER 8

TOWER 9

TOWER 10

TOWER 11

TOWER 12

BASE BUILDING

Existing Sugarbowl lift

Existing snow fence

Existing terrain park

Halfpipe

4WD ACCESS TRACK AND SKIER RETURN TRAIL

Scree Slope

Rocky Bluffs

Swan Lake

QLDC

CODC

Existing Shadow Basin Lift

Rastus Burn Creek

Existing Alta lift

Existing Curvey Basin lift

DOOLANS ACCESS GONDOLA

Heli Ridge

SINGLE CROSSFALL TO OUTSIDE OF FORMATION
ALLOWING EXISTING SHEET FLOW TO BE RETAINED

TEMPORARY ACCESS TRACK

EXISTING DRAINAGE FROM CURVEY TO BASE TO BE UTILIZED ALONG TRACK

Existing 4WD access tracks

ROOF AREA 2: ~500m²
ESTIMATE Q = 10l/s
FLOW TO BE DIVERTED TOWARD
THE NEW ROADSIDE CHANNEL
AND DISTRIBUTED TO SURROUNDING
AREAS ON THE QLDC SIDE

SINGLE CROSSFALL TO OUTSIDE OF FORMATION
ALLOWING EXISTING SHEET FLOW TO BE RETAINED

MID-STATION AREA

4WD ACCESS TRACK
FROM CURVEY BASIN
TO MID-STATION

ECOLOGY LEGEND:

- Cushion Bog
- Cushionfield
- Cushionfield Heatflux
- Dracophyllum shrubland
- Rockfield
- Rocky Outcrop
- Tussock Grassland
- Tussock North Facing
- Waterway
- Wetland Riparian
- Wetland Seepage

General Notes:

- Refer to ***Remarkables Ski Area Doolans Expansion Stormwater Concept Report*** prepared by Stantec New Zealand Limited.

FOR FAST-TRACK APPLICATION
NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	DATE
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SOUTHERN LAND
DEVELOPMENT CONSULTANTS

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Remarkables Ski Area Upgrades & Doolans Basin Expansion
Rastus Burn Access Roads & Utilities
Stormwater

nzski

SURVEYED -	DATE -	CHECKED AJHB	DATE 06/05/26
DRAWN TN/MS	DATE 06/05/26	APPROVED AJHB	DATE 06/05/26

SCALE 1:4,500 @ A3

DATUM & LEVEL NZTM
LEVEL IN TERMS OF DVD58
ORIGIN OIT XI DP XXXXX RL = XXX.XX

DRAWING REFERENCE A30043_E7

REVISION K

the remarkables
Queenstown • New Zealand

Doolans Access
Roads, Trails & Utilities

E500 Series

FOR FASTRACK APPLICATION

SOUTHERN LAND
DEVELOPMENT CONSULTANTS

REVISION	DESCRIPTION	DATE
G	For Information	28/11/25

Level 2 Brownston House, 21 Brownston St., Wanaka, Ph: (03) 443 5577, Email: contact@southernland.co.nz, www.southernland.co.nz

CSNZ

Remarkables Ski Area Upgrades & Doolans Basin Expansion
General Arrangements
Section Cover

nzski

SURVEYED	DATE	CHECKED	DATE	DRAWING REFERENCE	REVISION
-	-	MB	07/03/25	A30043_E7	G
DRAWN	DATE	APPROVED	DATE		
AJHB/TN	28/11/25	AJHB	28/11/25		

Sheet E501

TOWER 9
TOWER 10
TOWER 11
TOWER 12
ACCESS TRACK FROM CURVEY BASIN TO MID-STATION
MID-STATION AREA
RESERVOIR
Boundary
TOWER 13
4WD ACCESS TRACK
INTERMEDIATE GROOMED SKI TRAIL WITH SNOWMAKING
TOWER 14
4WD ACCESS TRACK
QLDC
OODC
Boundary
TOWER 15
INTERMEDIATE GROOMED SKI TRAIL WITH SNOWMAKING
Boundary
DOOLANS ACCESS GONDOLA
TOWER 16
REFER SHEET 105 FOR GROOMED TRAIL LAYOUT
DOOLANS EXPANSION AREA BOUNDARY
Doolans Creek
TOWER 17
TOWER 18
TOWER 19
PROPOSED LIFT STATION - SEE LIFT DESIGN
RETURN TERMINAL
PROPOSED DOOLANS BASE BUILDING
PROPOSED LEARNERS SLOPE
4WD ACCESS TRACK TO WATER INTAKE

ECOLOGY LEGEND:
- Cushion Bog
- Cushionfield
- Cushionfield Heatflux
- Dracophyllum shrubland
- Rockfield
- Rocky Outcrop
- Tussock Grassland
- Tussock North Facing
- Waterway
- Wetland Riparian
- Wetland Seepage

FOR FAST-TRACK APPLICATION
NOT FOR CONSTRUCTION

SOUTHERN LAND
DEVELOPMENT CONSULTANTS

REVISION	DESCRIPTION	DATE
H	For Consent	30/01/26
I	For Consent	06/03/26
J	For Consent	16/04/26
K	For Consent	06/05/26

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Remarkables Ski Area Upgrades & Doolans Basin Expansion
Doolans Access, Roads, Trails & Utilities
Overall

nzski

SURVEYED	DATE	CHECKED	DATE
-	-	AJHB	06/05/26
DRAWN	DATE	APPROVED	DATE
TN/MS	06/05/26	AJHB	06/05/26

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REVISION: K