

Ref: 24043
26 August, 2026



NZSki Limited

RE: e3s 24043 –Remarkables Upgrade and Doolans Expansion TEclA Stakeholder Response (CODC)

1 Purpose

NZSki received preliminary feedback from the Central Otago District Council (CODC) relating to a draft version of the Terrestrial Ecological Impact Assessment (TEclA; dated 10 April 2026) associated with the proposed Remarkables Upgrade and Doolans Expansion; the TEclA was subsequently updated prior to lodgement. Following lodgement, two Teams meetings on the 4th and 7th August 2026 were held with CODC. This memorandum has been prepared in response to the matters highlighted by CODC's expert(s) in their review of the draft TEclA and matters raised in the meetings. Matters of discussion include general assessment comments (Section 2.1), ecological survey methods (Section 2.2), ecological significance and value (Section 2.3), level of effects assessment (Section 2.4), and effects management (Section 2.5). These discussion topics are associated with the avifauna, terrestrial invertebrates, vegetation, and wetlands assessments described within the TEclA.

While e3Scientific is the primary author of this response, input has been provided by the project lead Entomologist Will Frost, and advisor John Marris, from Lincoln University regarding the invertebrate related queries.

2 Matters of Discussion

2.1 General Comments

Of particular concern is the permanent roading going through alpine seepage wetlands. This habitat loss and fragmentation can't be offset elsewhere due to the generally unmodified state of other comparable alpine habitats. This means that compensation is proposed for residual effects that remain above a "Low" level following all proposed on-site effects management actions. The compensation

package has yet to be specified, meaning that a final review of the overall effects management for this project cannot be made.

e3s response – e3s agree. Preparation of a compensation package was not within the scope of e3s' work. We note that the Proposed Conditions include the requirement to prepare Biodiversity Compensation Project and it is noted that the nature of the compensation (including the proposed conditions) is currently a matter of discussion between NZSki and DOC.

In general, the proposed effects management in the terrestrial EcIA relies heavily on management plans and the unspecified compensation package, which have not been reviewed at the time of writing this memo. This means that all discussion of effects management within this memo are preliminary and based only on the information in the terrestrial EcIA.

e3s response – e3s notes the management plan has since been prepared, however, was outside the scope of e3s' work. The magnitude of effects and subsequent level of effects assume a specific outcome from the management plan based on the mitigation measures detailed in Table 18 of the TEcIA. The Terrestrial Ecology Management Plan (TEMP) is expected to represent the mitigation measures of Table 18 and the proposed consent conditions, thus the residual effects can be understood via Table 18, the proposed consent conditions, and the TEMP.

2.1.1 Unmanaged Biodiversity Outcomes

Ecological effects that are assessed as being “minor” or lower except where otherwise protected by law (e.g. the Wildlife Act) are not subject to any further effects management. In addition, effects that are reduced to “minor” (or lower) are not factored into the compensation package. This leaves a very large number of low-level effects that are not fully managed. This means that overall, even if other effects are managed to a No Net Loss level, we expect that the project will result in a Net Loss of biodiversity. This is not in line with national policy directives such as the National Policy Statement for Indigenous Biodiversity (NPS-IB), the aim of which is to ensure no further decline of biodiversity.

Further, alpine ecosystems are highly vulnerable to multiple stressors, driven by factors such as slow growth rates, higher levels of climate-change driven warming, and unstable substrates. Alpine wetlands are especially vulnerable to multiple stressors, as they are impacted by both terrestrial and freshwater stressors. Even if the low-level effects are not individually dealt with by further management, there should be some

assessment of how these effects could interact or accumulate, with particular attention given to wetlands and climate change.

e3s response – e3s has followed the framework set out in the EIANZ guidelines. We agree that where a Low level of effect is observed this still represents an overall (low) Net Loss of biodiversity. Cumulative effects have been addressed in Section 6.9 of the TEClA.

2.1.2 Impacts Not Considered

There has been no specific consideration of the ongoing disturbance impact from the maintenance and use of ski trails in the Doolans, e.g. compaction of snow, increased snow depth and duration, and disturbance of vegetation in areas where snow is shallow. Snow on groomed ski slopes can be significantly harder and denser, with flow-on increases in the thermal conductance of the snow and longer periods of snow cover (Fahey et al., 1999). Vegetation types such as cushionfields and wetlands are particularly vulnerable to disturbance and compaction as a result of these activities (Fahey & Wardle, 1998). In addition, skiing in areas of shallow snow can disturb the underlying vegetation. This could be a particular issue where skiers travel off the main formed slope into areas of shallow snow. These impacts may occur over extensive areas and thus warrant serious consideration in the EclA.

e3s response – The proposed ski trails will be established atop areas proposed to be disturbed to establish the ski field expansion. Therefore, the compaction of snow within these areas will not have additional loss of vegetation within an area that will be fundamentally different post disturbance.

Thin snow coverage-imposed equipment damage is likely restricted to isolated locations, particularly convex slopes that are almost solely occupied by cushion field and tussock grassland communities. It is expected that within the context of the Ecological District this would reflect a Negligible magnitude of effect on the conservation of the communities and the values that are associated with them.

Similarly, the impact of any potential avalanche control within the Doolans has not been assessed. This is relevant to the terrestrial ecological values on-site, as avalanches can be a key part of the disturbance regime in New Zealand alpine environments (Burrows, 1988). Avalanche control can therefore alter the disturbance regime, causing vegetation communities to change over time (Rixen et al., 2007). It would be helpful if the report stated whether any avalanche control will occur. If such

control will occur there should be consideration of this as an additional ecological impact.

e3s response – Avalanche control will almost certainly occur within the boundaries of the active ski field to ensure the safety of the ski field goers. However, control areas will be restricted to areas where unstable or dangerous snow conditions are identified that could otherwise create an avalanche through natural mechanisms. The ski field does not propose to suppress avalanches (as is discussed in Rixen et al. (2007)), rather, control the timing of avalanches. Consequently, based on current information, no effect is anticipated that would alter the outcomes detailed within TEcIA.

2.1.3 Impact Area

It would be helpful throughout the report to know how much of the total 20.7 hectares of habitat loss occurs in the Doolans vs the Rastus Burn, as the two basins fall into different districts and are being reviewed separately by the relevant territorial authorities.

It would also be helpful for the vegetation loss to be broken down into permanent habitat loss vs areas that can be revegetated. This could be shown spatially in Figure 26.

e3s response – Additional alterations were made to the disturbance footprint prior to lodgement. The overall disturbance within terrestrial habitats is now cited as 17.7 ha with 15.94 ha occurring within High to Very High value vegetation communities and the other 1.76 ha occurring within areas of disturbed vegetation. In total, 14.82 ha of vegetation loss is proposed to occur within the CODC boundaries, of which all is High to Very High value. The remaining 2.88 ha is proposed to occur within the QLDC boundaries including all areas of disturbed vegetation.

Theoretically, the only areas that are unable to be revegetated are areas of infrastructure (i.e. permanent roads, towers, buildings, and the reservoir). This accounts for approximately 5.82 ha, with the remaining 11.88 ha potentially able to be revegetated.

Although vegetation remediation is expected to lessen the overall effect of the project, there is still expected to be a fundamental ecological change in the remediated vegetation at least temporarily, if not permanently. As such, all vegetation disturbance has been conservatively assessed as loss within the context of what is currently present.

Furthermore, where prior to mitigation (vegetation remediation), a greater than low level of effect is expected against a specific vegetation community, the proposed vegetation mitigation will not lower the magnitude or level of effect incurred in all but one of the vegetation communities. These effects remain an overall Net Loss, with Moderate level of residual effect observed across nine of the 13 vegetation communities. Mitchell Daysh has provided Biodiversity Compensation Project conditions, and the nature of the compensation (and proposed conditions) is currently being discussed between NZSki and DOC. It was not within e3s' scope to design or assess the proposed compensation to account for the residual effects.

2.1.4 Pump Station/Water Supply

A significant portion of the permanent vegetation clearance involved in this project is due to the proposed construction of a maintenance road and pipeline from the Doolans base building down to the water take at Doolans Creek. Notably, this additional roading for water take will remain permanently unvegetated. The explanation for the siting of this base station within the Doolan basin makes sense, however it would be good to understand if the possibility of pumping water from existing infrastructure in the Rastus Burn was considered. This would eliminate a significant length of roading/ pipeline from the project.

e3s response – This is specifically addressed within the Water Take Assessment of Effects (refer Section 5.7) (e3Scientific, 2026b): "Taking of additional flow from Lake Alta or the Rastus Burn was not considered viable due to the current water take in that catchment. Additionally, this would not be culturally sensitive due to water being sourced from one catchment and transferred to another."

2.1.5 Tarn 3 Reservoir

The freshwater EcIA contains the details of a tarn (Tarn 3) that will be turned into a storage reservoir for snow-making, potable water, and fire-fighting. Tarns are typically very high-quality habitats, and the construction of a new reservoir in lower-quality terrestrial habitat would be a more appropriate way to create a reservoir in line with the effects management hierarchy. However, the freshwater EcIA and site visit confirmed that Tarn 3 is of lower ecological value than the surrounding terrestrial ecosystems. As such, the use of Tarn 3 for a reservoir is an appropriate choice to minimise terrestrial habitat loss at the cost of a comparatively low-diversity tarn. Despite this, constructing the reservoir in a tarn still results in the loss of a natural inland wetland.

This would be prohibited under the National Environmental Standards for Freshwater; the Freshwater EclA should state this fact.

e3s response – Alpine tarns are classified based upon their formation of alpine lakes or pooling water in association with glacial features and on a wide range of erosion prone landforms. Although tarns are often synonymous with wetlands due to turf communities frequently forming around the edges, the presence of a tarn waterbody does not automatically qualify as a wetland (nor a natural inland wetland). Tarn 3 (as depicted within the FEclA) does not contain any hydrophytic vegetation or hydric soil characteristics associated within the margins of the water body. Furthermore, the tarn's substrate consists of predominantly shingle schist and recent accumulation of schist derived silt, with significant fluctuations in seasonal water table incapable of supporting hydrophytic vegetation or the development of hydric soils. Therefore, Tarn 3 does not meet the criteria of an inland natural wetland and should not be considered wetland loss.

A major remaining concern with the conversion of a natural tarn into a lined reservoir is that groundwater from Tarn 3 (which lacks an outlet) may currently be re-emerging as seepages further downhill. Lining the tarn could therefore impact these seepages, which are very high-value vegetation communities. Good reasons were given on the site visit for why the tarn is unlikely to be connected to these seepages (particularly that the seepages occur much further down the slope than if they were fed by the tarn) and this explanation should be included in either the terrestrial or freshwater EclA.

e3s response – This is specifically addressed within the Water Take Assessment of Effects (refer Section 3.4.1 and 5.6 (e3Scientific, 2026b), which states:

"Unlike the other Tarns, Tarn 3 does not have wetlands directly downstream; the closest downgradient wetlands are 260 m to the east (Figure 5). Seepage wetlands downstream of Tarn 3 occur at the break in slope above Doolans Creek and are not in obvious connection to the tarn. They are likely sourced from a much larger catchment area than the tarn. If losses from the tarn were feeding downgradient wetlands, they would be expected to present at the break in slope directly south-east below the tarn, however there are no wetlands present in this area. This is in contrast to the other studied tarns which have permanent areal extent and are inferred to be in connection with groundwater and hence downgradient wetlands. Wetlands downstream of Tarn 2 are approximately 28 m from the Tarn and joined by a water way, while Tarn 1 is adjacent to downstream wetlands (Figure 3)."

"The reservoir is to be constructed in the location of an existing tarn. The flow into the tarn is to be diverted into an armoured swale around the northern side of the tarn which will also prevent any upgradient flows directly entering the reservoir. This will allow the water that previously fed the tarn to infiltrate to ground in close proximity to the existing tarn.

There are no downgradient wetlands that will be affected by loss of seepage due to lining this tarn. The nearest downgradient wetlands are ~260 m from the tarn (see Section 3.4.1), and are therefore outside of the 100 m buffer required for assessment under the NES-FM."

2.2 Ecological Survey Methodology and Results

2.2.1 Vegetation and Flora

2.2.1.1 Vegetation surveys

The vegetation surveys use cover classes (1-6) rather than % cover estimates. Cover classes are appropriate for informing the classification and ecological values of vegetation communities, although % cover estimates would be preferable if any of these plots will be re-visited for ongoing monitoring.

The number of plots was high (103), but these were all 2x2 metres, meaning the total plot area was a relatively small 412 m². However, additional plants searches were conducted in a 10 metre radius around each plot, so the total area surveyed is much higher. 2x2m plots are appropriate for low-statured herbfield and cushion vegetation, but larger plots (5x5m or 10x10m) would typically be used for taller vegetation such as tussock grassland and shrubland. The large number of plots (and additional 10 metre search radius around each plot) does mitigate the small size of these plots for the purpose of describing the vegetation communities, however they are not appropriate for ongoing monitoring.

The report should state whether the vegetation survey plots were assessed purely to inform vegetation/flora values on-site, or whether they will also be used for ongoing monitoring.

The report should include rarefaction curves for each vegetation community. This would give a sense of the total expected plant diversity for each community and would help to inform whether an appropriate level of search effort has been undertaken.

e3s response – The plots were used to inform the prevalence and relative abundance within the community and are not proposed to be used for future monitoring. The number of quadrats assessed per community is relative to the occurrence of the vegetation community within the study area. Therefore, it is noted that due to the isolated occurrence of multiple of the vegetation communities, a limited number of spatially distinct quadrats were able to be undertaken. Subsequently, the survey undertaken in some of these less prevalent communities, represents areas of less floristic variation as a result of limited occurrence within ecological variables (i.e. slope, elevation, aspect and ecotones).

Rarefaction curves have been produced below (see Figure 1). The two curves that do not flatten off as much as would be expected are an artifact of the limited occurrence and/or altitudinal ranges, of those particular vegetation communities. Specifically, the Rocky Outcrop community has a small spike in the last surveyed quadrat, which was at a lower altitude and included some species that do not occur within the typical altitude of this vegetation community in the study area, and would not be expected to continue to provide additional species within the comparable habitat. The Snowbank community curve also appears to still be trending upward, however, the total area of snowbank within the study area is significantly smaller and a comparatively high percentage of the localities it occurs at were surveyed. Additionally, no disturbance of the snowbank community is proposed to occur. Although, the rarefaction curves represent all species observed as a result of e3s' survey efforts, additional species were attributed to the communities and accounted for throughout the TEcIA as a result of, walkthrough observations and review of reports and surveys completed by Simpson (2018; 2021; and 2022).

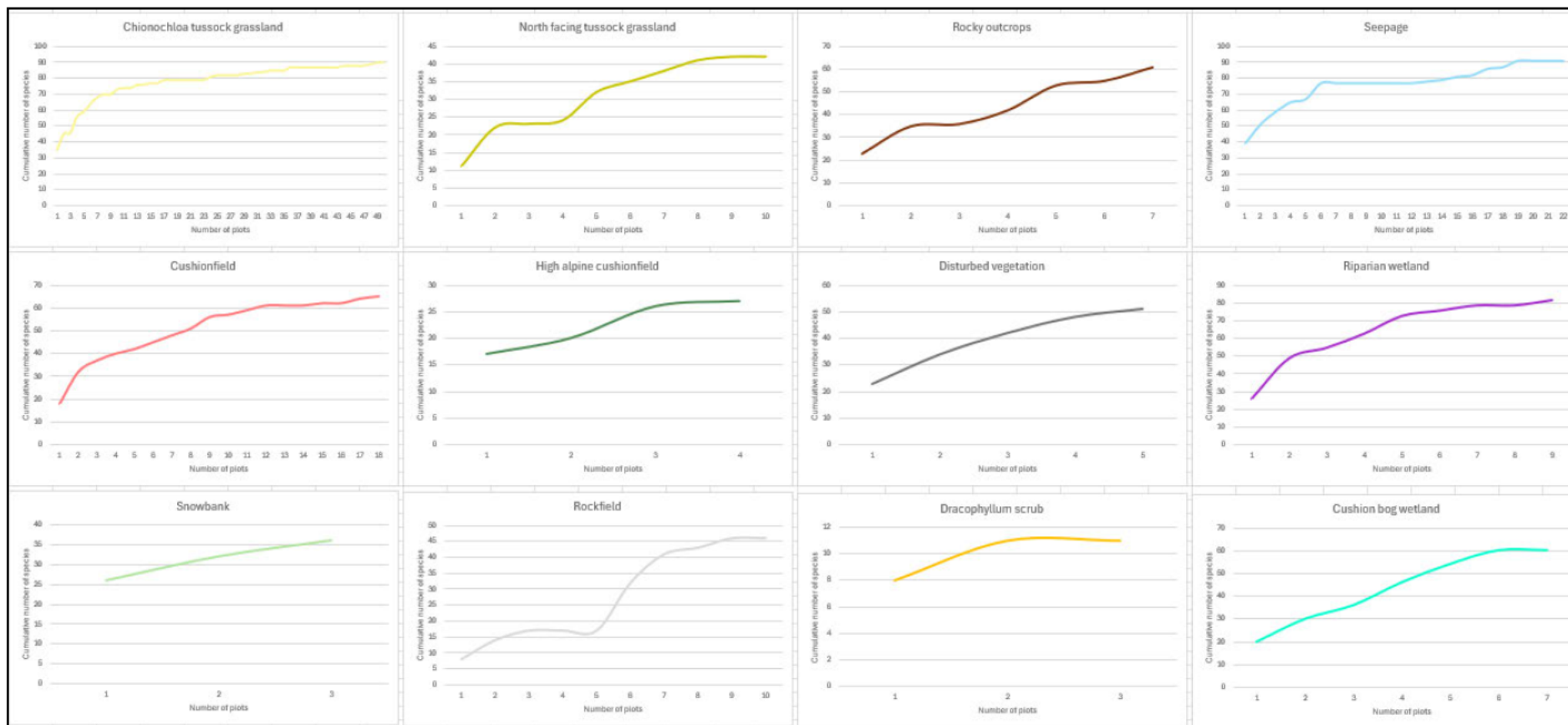


Figure 1: Rarefaction curves for each vegetation community.

2.2.1.2 Wetlands

The method section states that 45 rapid vegetation tests were carried out, while the results section states there were 54.

e3s response – This was corrected prior to lodgement of the final TEcIA report. Overall, 45 rapid tests were completed.

2.2.1.3 Vegetation Mapping for Wider Ecological District

It is good to see an attempt made at quantifying the magnitude of habitat loss by estimating the total cover of these vegetation types across the Ecological District (ED), however there are a number of issues with the machine-learning (ML) approach taken here.

One key issue is that all the training data for the ML model comes from a single contiguous area at the far-northern end of the Remarkables ED. The ED is long and narrow, running north-south, so environmental conditions further south are likely to be different from the Queenstown end. The training data also covers an area that is likely to be more modified than elsewhere in the ED. The ML model only uses aerial imagery, so incorporation of environmental layers to account for climatic and topographic influences on vegetation would help improve the ability of the model to predict vegetation occurrence further from the training data location. Nevertheless, extrapolation into unsampled areas is generally considered to be a poor approach in statistical modelling.

Relative to the previous issue, there does not appear to have been any quantitative validation or ground-truthing of the ML vegetation prediction. Given the concerns around the training data not being generalisable to the rest of the ED, it is important that this is done. If ground truthing cannot be done, then the ML results should at least be quantitatively compared against existing vegetation mapping, such as the Otago Current and Potential Ecosystems datasets or the Manaaki Whenua Potential vegetation data (Manaaki Whenua - Landcare Research, 2012; Wildland Consultants, 2020); however these datasets are relatively coarse and likely to miss small/scattered ecosystems such as wetlands). It is not essential for predicted vegetation cover to be highly precise, but it does need to be demonstrated that the model is not consistently over-estimating or under-estimating certain vegetation types.

e3s response – e3s recognise the imperfections of the modelling used and do not assume that the output of the model provides Ecological District scale accuracy across

all localities. However, standard methods of assessing the magnitude of effect ordinarily implemented by ecologists within Ecological Impact Assessments are highly qualitative and generally provide significantly reduced resolution and accuracy than the actual ecological effects. The intention of undertaking a level of geospatial analysis against comparable vegetation communities within an area recognised to contain comparable ecological values (the Ecological District), is to provide an increased level of accuracy when assessing the magnitude of effect compared to standard methods ordinarily implemented by ecologists.

In acknowledgement of the limitations of the Random Forest model, the following actions were undertaken to manage bias associated with the training data and its position within the Ecological District; noting that this helped improve the overall accuracy of the output data.

- Use of training data to extrapolate percent of occurrence within coarsened vegetation classes (e.g. wetlands) are acknowledged to introduce bias in the presence of a wetland subclass. Therefore, percentage of vegetation communities lost within the ED is presented at two levels, the Singers and Rogers ecosystem types and the mapped vegetation communities resulting from e3s data.
- Assessment of individual units by expert interpretation via aerial imagery of areas beyond the surveyed training data area and manual correction and/or re-running of models based upon correction data.
- Splitting of Random Forest analysis across two representative elevations (>1500 and 1500-1100 m asl) where specific ecological communities are restricted. Therefore, limiting the over-estimation of vegetation communities that only occur within one elevational range.
- Use of wetness index, DEM slope analysis, and flow accumulation modelling for identifying tarns and wetlands (which were overlaid and compared against model outputs rather than incorporated directly into the model).

While these measures improved the overall accuracy of the modelling, the resulting output does not present a perfect representation of all vegetation types; rather, it provides a tool for quantifying the relative extent of individual vegetation types across the Ecological District. The Random Forest output was not intended to independently define final ecological unit boundaries; rather, it forms one component of a broader assessment process, and its outputs have been considered alongside other evidence. Accordingly, this output should be interpreted as one of several inputs used to inform the magnitude of effect. Additional considerations include expert interpretation, local

ecological knowledge, comprehensive field studies within the study area, and comparison to data sets and aerial imagery displaying similar vegetation classes.

It is also noted that the polygons produced largely correlate to that of the Otago Current and Potential Ecosystems datasets and the Manaaki Whenua Potential vegetation data (Manaaki Whenua - Landcare Research, 2012; Wildland Consultants, 2020). However, these two datasets are significantly more aggregated across the AL1 classification accounting for a large portion of habitat above 1500 m asl, displaying as tussock grassland that is in reality occupied by rock and cushionfield dominated communities, particularly within the central to southern extent of the ED. Thus, the AL1 class underestimates the amount of AH2 ecosystem types particularly within areas of cushioned, which the site and ED specific Random forest analysis undertaken by e3s adjust for.

The use of this vegetation mapping in assigning magnitudes to the effects of habitat loss also assumes that other parts of the ED above 1100m have not been cleared. This assumption should be explicitly stated and justified in the EcIA.

These issues have potentially substantial impacts on the level of effect assigned to the loss of various habitats, as magnitudes of habitat loss are based directly on these estimates.

e3s response – The model does not make this assumption and has specifically characterised “Extra (Disturbed)” as a separate community (refer Figure 8 of the TEcIA).

2.2.1.4 Rare Plants

In Figure 22, it is not clear whether the different shapes and outlines of the species symbols have specific meanings. It would be useful if they represented plants with a national threat status vs those with only a regional threat status, or At Risk vs Threatened vs Data Deficient.

e3s response – The symbology has unique identifiers for each species in the legend. Subsequently, shape or colour does not have specific threat classification or Regional/National denotation; particularly, given National and Regional status' for many plants are different.

The number of vegetation communities is 12, however on page 45 (paragraph 2) and at various other points throughout the report, a different (usually higher) number of vegetation types is referenced.

e3s response – Twelve vegetation communities is correct and has been rectified in the TEcIA prior to lodgement.

2.2.2 Fauna

2.2.2.1 Invertebrates

The main concern with the invertebrate methods is the narrow seasonal sampling window. In 2025 all invertebrate fieldwork occurred between 25 February and 10 March, and in 2026 between 19 January and 1 February. These limitations are discussed in Section 2.4.3 of the EcIA. While a desktop review may help to account for species that are active at other times of year, this remains a major limitation that is likely to bias assessment of invertebrate values on-site towards species that are detectable in late summer to early autumn.

e3s response – Given the scope of TEcIAs and limitations in alpine sampling (discussed further below), invertebrate surveys are never expected to detect all invertebrate taxa. Consequently, given these standard limitations, a desktop review was completed to support fieldwork surveys. The primary focus for both surveys and desktop review, was upon groups of invertebrates that can be quantitatively assessed under the New Zealand Threat Classification System (NZTCS) and those that may be susceptible to environmental change as a result of behavioural or life cycles dependencies.

For the target Lepidoptera species, the sampling period of February-March was preferable, falling well within the flight periods for the majority of taxa. This is similarly reflected for Orthoptera and Coleoptera taxa, with work undertaken during periods of weather when these taxa are active. Due to the nature of unfavourable and unpredictable weather conditions in alpine zones, weather windows were maximised within periods of favourable weather. Noting that sampling generally cannot be completed earlier or later due to extensive coverage of snow and variable wind and rain temperatures during spring and autumn months. It is acknowledged that there may be a small series of taxa which are under-represented by alpine sampling timeframes. However, as is common, this is dealt with via desktop review, with a larger range of additional taxa incorporated via desktop review, with a focus on identifying species with a threat classification greater than Not Threatened under the NZTCS

and/or that are considered to be of ecological significance within the context of the Ecological District, and whose conservation may be at increased risk as a result of the project.

For the invertebrate results (Section 4.3.3), it would be useful to have a paragraph or table that gives a high-level summary of the relative invertebrate values in each vegetation type.

e3s response – The final lodged TEcIA provides an updated summary of terrestrial invertebrate values in Section 4.3.3. Specific species of significance have been included in Table 7 noting their habitat preference and occurrence within the vegetation communities. Total occurrence of all Not Threatened species within each of the vegetation communities was not undertaken noting that many are generalists.

2.2.2.2 Lizards

The methods and results sections are quite brief, presumably there will be more detail in the upcoming lizard management plan (LMP). There were 66 Gee's minnow traps used, with 5,470 trap days in total. The only species found in the Doolans was McCann's skink at lower elevations (Oligosoma maccanni; Not Threatened).

There is a clear altitudinal cutoff for lizard habitat in the Doolans above approximately 1550 metres altitude, however patchy lizard habitat extends to much higher altitudes in the Rastus Burn. A good explanation was given for this difference during the site visit: longer periods of snow cover in the south-facing Doolans prevent lizards from occupying higher altitudes. On-site discussion also noted that only a very small number of lizards were present at higher altitudes in the Rastus Burn. It would be helpful for these facts to be discussed in the report, although this may be covered in the upcoming LMP.

e3s response – Sampling effort was 66 trap zones, each containing 20 gee-minnow, totalling 1,320 individual traps and 5,470 trap-days. Information is detailed within the LMP which had not been provided at the time of this feedback but has since been completed and lodged with the substantive Fast Track application.

2.3 Ecological Significance and Value

The assessments of ecological significance and value are generally reasonable. However, this section misses two vegetation types that can be classified as Naturally Uncommon Ecosystems (NUEs).

Much of the area mapped under the rockfield vegetation type would fall within the “scree of acidic rocks” Naturally Uncommon Ecosystem (NUE). While this vegetation type is already assessed as having a “High” value score, this may increase further based on the NUE classification.

The rocky outcrops would similarly be classified within the “cliffs, scarps and tors of acidic rocks” NUE.

e3s response – e3s acknowledges the above and has updated Section 5.2 (Table 9) of the TEClA to reflect this. However, Naturally Uncommon species and ecosystems are assigned an ecological value under the EIANZ guidelines of Moderate. Given the already High and Very High EIANZ rarity scores of the Rockfield and Rocky Outcrop communities respectively, it would not increase the overall significance assessment of the vegetation communities, nor change the outcomes of the TEClA.

2.4 Level of Effects Assessment

2.4.1.1 Vegetation and Flora

Riparian wetland is given a “High” ecological value and consequently a “Low” level of effect for loss of this vegetation in Table 14. However, in Tables 10 it is given a “Very high” ecological value, in which case the level of effect should be “Moderate”. I assume that Table 10 gives the correct ecological value.

e3s response – Correct. The TEClA will be updated to reflect this in Table 14 and 18.

2.4.1.2 Fauna

The only level of effect that needs more explanation is the “Low” level of effect of habitat fragmentation/infrastructure impediment on ground insects. There is no table breaking down the impacts of habitat fragmentation on fauna (e.g. showing magnitude

of effect, level of effect, Doolans vs Rastus Burn). A table similar to Tables 15 and 17 for habitat fragmentation effects on fauna would be helpful.

e3s response – The following text will be updated within the TEcIA to provide further clarity:

“Ground dwelling terrestrial invertebrates are likely to exhibit extremely small or isolated home ranges and are therefore not expected to traverse large distances (Auger, Pottier , Mathieu , & Franck, 2024). Subsequently, it is not expected that there will be significant differentiation between the effects felt across the two catchments. Thus, the effect of habitat fragmentation on ground dwelling insects is assessed as having a Low magnitude of effect across both catchments.”

2.5 Effects Management

2.5.1 Proposed Effects Management

2.5.1.1 Avoidance/minimisation

The report states that no wetland will be crossed to build the gondola towers (page 100). Based on the site visit, my understanding is that an area of wetland surrounding a tarn outlet (Tarn 2 from the freshwater EcIA) will be crossed by one of the temporary access trails.

e3s response – The outlet of Tarn 2 (as described in the FEcIA) does not have wetlands associated with the outlet and is an intermittent stream with permeable shingle substrate. e3s re-confirms no wetlands will be crossed to build the gondola towers.

I do not agree that long-term ecological viability of the vegetation is high (page 107), especially regarding weeds. Climate change, disturbance from works, and ongoing traffic suggests a high and increasing risk of weed invasion. Weed invasion does not occur linearly so the fact that invasion has not occurred yet in the existing ski field may not predict future invasion potential. Additionally, NZSki may currently be doing a good job of controlling weeds, but there is no guarantee that this will continue to be the case. More broadly, the ongoing presence of pre-development vegetation communities in the Rastus Burn does not mean that these communities have retained the same level of ecological resilience; these communities could be close to a tipping point or may be highly vulnerable to future impacts.

e3s response – Long term viability is determined by a system's ability to retain its ecological health and values over time with minimal management input. The long-term viability is considered High where a robust weed control programme is routinely and successfully implemented to limit the spread and introduction of species. This was not explicitly stated and will be updated within the TEcIA. The harsh conditions of the NZ alpine environment make weed introduction and spread difficult, aiding in its ecological long-term viability. Without any management input, the long-term viability is likely to change over time in response to weed introduction and dispersal. However, it is expected, given the highly natural composition of the vegetation communities and limited bare ground, the ecosystem will have a level of long-term viability of its indigenous biodiversity. As such, without any management input, the long-term viability is assessed as Moderate.

I have concerns regarding the wetland crossings and the claim that these will have no impact on wetland hydrology. The works plans show that two of the four wetland crossings on the way down to the Doolans base building (crossings 2 and 4) will have flows re-routed to other crossings. There are at least four more wetland crossings on the access road down to the water take. This will certainly impact downslope hydrology and therefore the seepage communities. In my opinion there also needs to be an explanation for how the crossings will retain both the same permeability and retention as current peat substrate. If crossings don't have appropriate permeability, they will cause ponding of uphill wetlands. If crossings do not have appropriate retention, then they will reduce the water-holding capacity of the wetlands. The effects management proposes monitoring to ensure hydrology remains the same, but does not specify what additional management should happen if it turns out that hydrology has been impacted. It also remains to be seen what this monitoring is and whether it is sufficient to detect these changes.

e3s response – The wetland crossings do not propose redirecting flow to another drainage point. e3s notes the management plan has since been prepared, however, was outside the scope of e3s' work. The magnitude of effects and subsequent level of effects assume a specific outcome from the management plan based on the mitigation measures detailed in Table 18 of the TEcIA. The Terrestrial Ecology Management Plan (TEMP) is expected to represent the mitigation measures of Table 18 and the proposed consent conditions, thus the residual effects can be understood via Table 18, the proposed consent conditions, and the TEMP. Therefore, designed crossings must ensure the same permeability and hydrological retention as the peat substrate.

There needs to be more consideration of the risk of sediment release into the large cushion bog located approximately 200-300 metres north of the proposed Doolans base building. This wetland sits in a basin that could collect sediment from almost every direction. Sediment could fill in/block the system of terraced pools that this wetland comprises, permanently altering the hydrology in a way that is not such a risk for the smaller, flat or sloping wetlands elsewhere in the Doolans. A map of the areas of earthworks that will occur directly uphill of wetlands should be provided so that this effect can be better assessed, and so that extra care is taken in these areas during works. There also needs to be consideration of what management actions can be taken if sediment does get into these wetlands (this might be in the forthcoming Sediment and Erosion Control Management Plan). There is also an ongoing risk of pollution as a result of leaks from vehicles along the access road after works finish. The access road design needs to avoid or minimise the risk of pollutants or sediment getting into wetlands.

e3s response – Agree, the issues raised will need to be detailed within the site-specific Erosion and Sediment Control Plan (ESCP). As noted elsewhere, the magnitude of effects and subsequent level of effects assume a specific outcome from the management plan based on the mitigation measures detailed in Table 18 of the TEcIA. The Erosion and Sediment Control Plan (ESCP) is expected to represent the mitigation measures of Table 18 and the proposed consent conditions, thus the residual effects can be understood via Table 18, the proposed consent conditions, and the ESCP. Furthermore, e3s have assessed that even following the successful implementation of an ESCP, that the effects on wetland systems will still have a Moderate residual level of effect.

2.5.1.2 Remediation

A significant amount of re-vegetation and transplanting is proposed for this project as a method of remedying vegetation/habitat loss. The site visit showed some impressive instances where the original vegetation had been re-established following earthworks. A seepage wetland that had increased in size following revegetation was particularly surprising. Nevertheless, it would be useful to know if the “disturbed vegetation” community in the Rastus Burn represents the expected condition of the revegetated areas in the Doolans. This community had the lowest ecological value of any vegetation type assessed, with reduced indigenous vegetation cover and diversity.

e3s response – The Disturbed Vegetation community represents the vegetative composition of areas that cannot be actively revegetated. Noting that many of the

examples depicted as 'Disturbed Vegetation' within the TEcIA have not been actively disturbed recently and have experienced years of regeneration. Areas of active revegetation are expected to have a higher indigenous coverage.

Some evidence or explanation for why the 60% survival requirement for plants in revegetated areas was chosen—and whether it is likely to be achievable—would be useful. The report suggests direct sowing/dispersal of seeds into areas where this is not achieved, but does not consider the risk that direct sowing/dispersal could also fail. The report should consider the possibility that both methods of revegetation may fail, and amend the residual level of effect to reflect this risk.

e3s response – NZSki has been undertaking translocation and remediation of large tracks of vegetation, as well as specific species, since first establishing the ski field in 1985. The 60 % survival rate for translocations is derived from what e3s considers the minimum acceptable survival accounting for the harsh receiving environment conditions. Furthermore, 60 % indigenous coverage within seven years is based upon e3s observations of high-quality remediation areas and subsequent survival within the Rastus Burn. Further assessment of remediation has been undertaken by Simpson (2018; refer Appendix H of the TEcIA). It is expected that 60 % survival for species specific translocations and 60 % indigenous coverage can be achieved provided the work is undertaken to a high level. Noting, that some level of natural regeneration will occur within the proposed seven years post disturbance period and recolonise areas of bare ground.

Should the revegetation areas fail to reach 60 % survival and cover, and direct sowing/dispersal also is ineffective, the pre-mitigation effects are expected to be observed with respect to the associated level of effect (i.e. there will be a significant increase in the overall Net Loss of ecological values).

2.5.2 Fauna

Many of the concerns regarding the uncertainty around re-vegetation and transplanting also apply to the transfer of vegetation for invertebrate habitat. Notably, there is no monitoring proposed for invertebrates in transplanted habitat, and no additional management action proposed if invertebrate populations decline following transplanting.

e3s response – Only three species of terrestrial invertebrates with a threat classification greater than Not Threatened are expected to sustain a Low level of effect prior to

mitigation (the remaining species will incur a higher level of effect). The three species are expected to incur a Low level of effect due to either very small disturbance of their host species or associated vegetation community (refer Table 15 of the TEClA for further detail). Only one additional species is expected to observe a reduction in the level of effect as a result of the proposed mitigation; as the host species, upon which it remains for the majority, if not all of its life, is specifically required to be translocated. All other terrestrial invertebrate species are expected to incur a greater level of habitat loss with residual effects being High for two species and Moderate for a further 14 species, representing a considerable Net Loss of terrestrial invertebrate values.

Many of the Threatened, At Risk, or Data Deficient invertebrate species will be isolated in occurrence and/or seasonally associated with the attributed habitat type. Undertaking comparative survey efforts post works is unlikely to provide comparative results for most of the invertebrate species of concern unless extensive baseline invertebrate quantification is undertaken. All other terrestrial invertebrate species are Not Threatened and are not otherwise protected by the Wildlife Act 1953. Therefore, the effects are assessed to incur a Low to Very Low level of effect and therefore, do not require further mitigation. Given the above rationale, and that the mitigation proposed is not expected to result in a reduction in the magnitude of effect in all but one species, extensive post works monitoring is not warranted.

Notwithstanding the above, the Terrestrial Ecology Management Plan (TEMP) must detail the methods to ensure remediation is undertaken in a way that ensures as high as practicable survival rates of terrestrial invertebrates can be achieved.

2.5.3 Cumulative Effects

The cumulative effects analysis assumes that there has been no habitat loss in the alpine regions of the Remarkables ED outside of the Remarkables Ski Field. This assumption needs to be explicit and evidenced.

e3s response – The assessment of cumulative effects specifically assesses the past and potential effects of NZSki operations within the ED. This disturbance can be calculated and is attributable to the ski field operation boundaries and the boundaries of the proposed expansion, thus highlighting the impact of current and future development. It has not accounted for the alteration of the wider ED resulting from the establishment of unofficial access paths and vehicle tracks (being the other main cause of anthropogenic habitat modification within the ED). Overall, the ED has experienced minimal direct disturbance. Therefore, the cumulative effects of present and potential

ski field development in conjunction with other activities remain a Low cumulative effect within the context of the Ecological District.

2.5.4 Residual Effects

In my opinion, the residual level of effect for fragmentation of wetlands should be higher than “Moderate”. I consider that hydrological function will still be impacted by the crossings (discussed above), and similar effects management actions for upland vegetation communities never bring the residual effect down more than one level (e.g. from “High” to “Moderate”). There are similar issues for weed introduction risk and the sedimentation of wetlands, which are brought down from “Very high” to “Low” and “Moderate”, respectively. The other residual effects all appear to have been appropriately assessed, with the caveat that vegetation/habitat loss effects may be under-estimated due to the magnitude estimation issues discussed above.

e3s response – As highlighted by the reviewer, the TEcIA assessment of upland vegetation communities only ever decreases in the level of effect by a maximum of one level (i.e. “High” to “Moderate”). Upland systems are expected to incur a significantly larger loss of functional habitat compared to the wetland communities and therefore, the fragmentation effects are expected to remain comparatively higher. Furthermore, comparison of upland to wetland systems is not directly applicable due to the hydrological connectivity and its potential to effect greater unknown extent of habitat, being the primary reason for an elevated magnitude of effect and resulting level of effect of wetland communities. As hydrological connectivity of the wetland habitats is retained, the effects are significantly reduced and therefore, observe a greater change in the resulting magnitude and level of effect.

Similar rationale can be applied to the consideration of weed introduction and mobilisation, whereby, the mitigation measures, where implemented successfully, will resolve the reasoning for an elevated magnitude and level of effect prior to mitigation.

In the executive summary, it is stated that the level of residual effect from vegetation fragmentation is “Moderate” in the Rastus Burn and “High” in the Doolans, but also says that the vegetation remains largely intact in the Doolans. It is not clear if this is a mistake, or if it is saying that the vegetation in the Doolans is currently intact and will therefore incur a high impact from fragmentation. It is also not clear how the overall effect levels for habitat fragmentation were arrived at in the executive summary; habitat fragmentation effect levels are separated into impacts on different vegetation types in Table 18.

e3s response – The intention of the Executive Summary statement is that vegetation in the Doolans is currently intact and will therefore incur a higher impact from fragmentation.

The following will be included in an updated version of the TEclA where residual effects from fragmentation are expected to occur following mitigation:

- *Fragmentation of Cushionfield, High Alpine Cushionfield, and Rocky Outcrop vegetation communities in the Rastus Burn are assigned a Moderate level of residual effect.*
- *Fragmentation of North Facing Tussock Grassland, Dracophyllum Scrub, Cushionfield, High Alpine Cushionfield, Rockfield, and Rocky Outcrop vegetation communities in the Doolans are assigned a Moderate level of residual effect.*
- *Fragmentation of Cushion Bog, Riparian Wetland, and Seepage vegetation communities across both catchments are assigned a Moderate level of residual effect.*



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