BLUEPRINT ECOLOGY

Project No: 2341

20 December 2023

West Coast Regional Council

388 Main South Road

Paroa

Greymouth 7805

Attention Rebecca Inwood inhill@xtra.co.nz

Dear Rebecca,

Westland Mineral Sands, Mananui: Section 92 Request: Ecology

We understand that Westland Mineral Sands Co. Ltd is applying for resource consents with West Coast Regional Council (WCRC), who have delegated authority from Westland District Council for processing mining applications, for a proposed sand mine at 713 Ruatapu Road, Ruatapu.

Blueprint Ecology Ltd have been requested to provide specialist ecological advice and support to WCRC with respect to processing the application, including reviewing the following documents:

- Mananui Mineral Sands Project Ecological Assessment (Keesing 2023)[1];
- Draft Fauna Management Plan[2]; and
- Rehabilitation Management Plan[3].

Following our review of these document, we have been directed to consider the following matters:

- Is the description of the ecological characteristics and values of the site accurate.
- Has the assessment of ecological significance been appropriately determined.
- Have all the potential adverse effects of the proposal been identified and addressed.
- Are the proposed measures to avoid, remedy or mitigate the identified adverse effects adequate.

[1] BlueGreen Ecology Limited 2023. Mananui Garnet Mine: Ecological Assessment. Report prepared by BlueGreen Ecology Limited for Westland Mineral Sands Co. Ltd.

[2] BlueGreen Ecology Limited 2023. Draft Fauna Management Plan. Report prepared by BlueGreen Ecology Limited for Westland Mineral Sands Co. Ltd

[3] Westland Mineral Sands Co. Ltd. Rehabilitation Management Plan. Mananui. Undated.

1. Methodology

A desktop assessment was undertaken to identify any ecological values in or near the site.

A site visit was undertaken on 22 November 2023 Rebecca Inwood (WCRC planning representative), Kate McKenzie (Tai Poutini Resources), Luke (Westland Mineral Sands Co. Ltd), and Tony Payne (Blueprint Ecology Ltd).

Mr Payne also undertook a site survey on 23 November 2023 to gain a more detailed understanding of the ecological features within the site.

All documents provided were reviewed and relevant information has been summarised and commented on in the following sections.

2. Ecological Values

2.1 Coastal Environment

Figure 5 in Keesing (2023) illustrates the extent of the coastal environment related to vegetation pattern. I agree with this delineation of the vegetation pattern.

2.2 Avifauna

The Keesing (2023) assessment and identification of avifauna species values and habitat within and surrounding the site includes a comprehensive list of the potential species that are likely to occur within the site, with the exception of 'At Risk – Declining' yellow-crowned parakeet | kakariki (*Cyanoramphus auriceps*) which inhabit the forest surrounding Lake Māhinapua Scenic Reserve (Boffa Miskell Ltd 2018)[5]. Kakariki nest in holes in large trees and the lowland mature forest on site and nearby may provide suitable nesting habitat.

I understand that the assessment of bird values and bird habitat within the site is subject to further investigation and a detailed avifauna survey is currently being undertaken.

The results of this survey will determine the ecological value of the habitats on site and inform whether any areas qualify as a Significant Natural Area (SNA) under the West Coast (WC) Regional Policy Statement (RPS) and/ or National Policy Statement for Indigenous Biodiversity 2023 (NPS-IB).

The Keesing (2023) assessment and identification of bird values and bird habitat within the site is currently inadequate to determine the actual or potential adverse ecological effects to birds.

2.3 Herpetofauna

The DoC publication (Whitaker & Lyall, 2004) used to inform lizard presence is 19 years old and does not include recent taxonomic updates nor provides an accurate assessment of any recent lizard records within or nearby the site.

The Keesing (2023) assessment includes an outdated threatened species classification for reptiles in New Zealand (Hitchmough et al 2015) instead of the most recent Threat Classification Series 35 (Hitchmough et al., 2021).

The assessment does not identify 'At Risk – Declining' Canterbury grass skink (*Oligosoma* aff. *Polychroma* Clade 4), or 'Threatened – Nationally Critical' Hokitika skink (*Oligosoma* aff. *Infrapunctatum* "Hokitika") as potentially occurring on site. These species occur within coastal lowland habitat including the vegetation communities on site with a distribution which includes the site (van Winkel et al., 2018)[7].

A review of recent records within the DoC herpetofauna database (December 20023) reveals Canterbury grass skink and West Coast green gecko (*Naultinus tuberculatus*) occurring within 500 m of the site in

[5]Lake Māhinapua Management Plan. 2018. Prepared by Boffa Miskell Limited November 2018.
[7] van Winkel, D, Baling, M & Hitchmough, R. 2018. Reptiles and Amphibians of New Zealand. A Field Guide. 366 p

similar habitats to that present on site. Based on these records there is a reasonable likelihood that these species are present on site where there is suitable habitat.

The habitat for native lizards is not fully detailed in the assessment – the relevant species occupy exotic pasture grass, divaricating bushes and shrubs, fernland, clearings or edges of forest such as the forest fragments within the proposed development footprint and take refuge beneath prostrate vegetation. They include highly cryptic species with poor detection rates using current best practice survey methods.

Overall, the Keesing (2023) assessment does not accurately describe the lizards species habitats, or accurately assess the potential presence of lizards within the site.

I understand that the assessment of lizard values within the site is subject to further investigation and a detailed lizard survey is currently being undertaken.

As with avifauna, the results of this survey will determine the ecological value of the habitats on site and inform whether any areas qualify as SNA. In absence of a detailed lizard survey of all potential habitat types within the site, the Keesing (2023) assessment and identification of lizard values and lizard habitat within the site is inadequate to determine the actual or potential adverse ecological effects to lizards.

2.4 Bats

Section 3.7 in Keesing (2023) states that the nearest recorded long-tailed bat population is located approximately 50km south of the study area near Harihari and the second nearest population approximately 100km north, near Reefton (O'Donnell, 2001).

The Department of Conservation bat records (May 2020) include a record of long-tailed bat (*Chalinolobus tuberculatus*) 8.4 km southwest of the site. The record is from 1997 within Totara Lagoon.

I understand that the assessment of bat values within the site is subject to further investigation and a detailed bat survey is currently being undertaken.

The results of this survey will determine the ecological value of the habitats on site and inform whether any areas qualify as SNA.

In absence of a bat survey of all potential habitat types within the site, the Keesing (2023) assessment and identification of bat values and bat habitat within the site is inadequate to determine the actual or potential adverse ecological effects to bats.

2.5 Terrestrial invertebrates

Section 3.8 in Keesing (2023) states "*There are no records of Powelliphanta lands snails in the study area, and none are expected in the absence of core habitat and good ground cover (Walker 2003). Furthermore, other large iconic at risk or threatened invertebrate species (e.g. Geodorcus helmsi (Helms stag beetle) or the Forest ringlet (Dodonidia helmsii)) are also very unlikely, because of the history of modification, such as the removal of the ground tier and middle tier*"

The Walker 2003 reference in Keesing (2023) is not referenced in full in the Ecological Assessment and it is assumed to be the paper referenced below[10].

I agree that most areas of the forests on site have become less suitable for terrestrial invertebrate species, such as land snails, through drainage of nearby farmland, trampling by domestic cattle, reduction of understory growth and duff biomass.

The Keesing (2023) assessment of terrestrial invertebrates accurately describes species and habitats of importance and the likelihood of these species occurring on site.

The Keesing (2023) assessment of terrestrial invertebrate values is adequate to determine the actual or potential adverse ecological effects.

[10] Walker, K. J. 2003: Recovery plans for Powelliphanta land snails. Threatened Species Recovery Plan 49. Department of Conservation, Wellington, x + 208 p. + 64 plates.

2.6 Wetlands

Keesing (2023) states *"No natural inland wetlands (as defined by the NPS freshwater management (2020)) were present west of the escarpment within pasture."*

During my site survey I identified numerous areas where natural inland wetlands are present west of the escarpment within pasture including remnant kahikatea swamp forest. My assessment included a 'Rapid Test' which involved noting the dominance and prevalence of hydrophytic (wetland) vegetation.

To provide transparency and objective data as part of the site survey I applied the Ministry for the Environment (MfE) Wetland Delineation Protocols (2022) in areas which met the Rapid Test, which included the following:

- Apply the Vegetation Tool (Clarkson 2014) method cited in the NPS-FM 2022 Wetland Assessment Protocol.
- Complete an assessment for hydric soils using the established guideline (Fraser et al, 2018) and identify the presence or absence of hydrology indicators as per MfE's Hydrology Tool (2021).
- Assess modified wetlands around drains, ponds or other constructed water bodies to check if they meet the criteria for exclusion (c).
- Assess wetlands in pasture areas using the Pasture Exclusion Assessment Methodology (2022) and the National List of Exotic Pasture Species (2022) to check if they meet the criteria for exclusion (e).

Photographs of wetlands within the proposed development footprint are provided below.

Based on a review of aerial photographs there are numerous areas on the property westward of the escarpment where surface water is present and/ or there is a distinct change in vegetation community such that there are indications that these areas potentially meet the definition of a natural inland wetland.

The Keesing (2023) assessment and identification of natural inland wetlands as defined in the National Policy Statement for Freshwater Management 2020 Amendment No 1 (December 2022) (NPS-FM) within the site is not accurate.

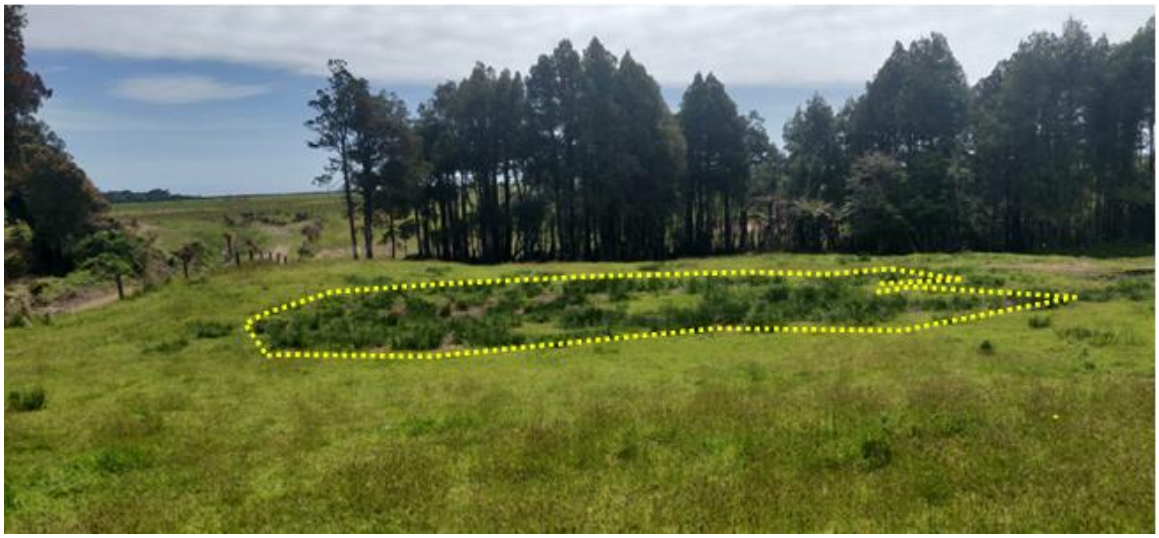

Plate 1. A natural inland wetland within the proposed development footprint (in yellow area).

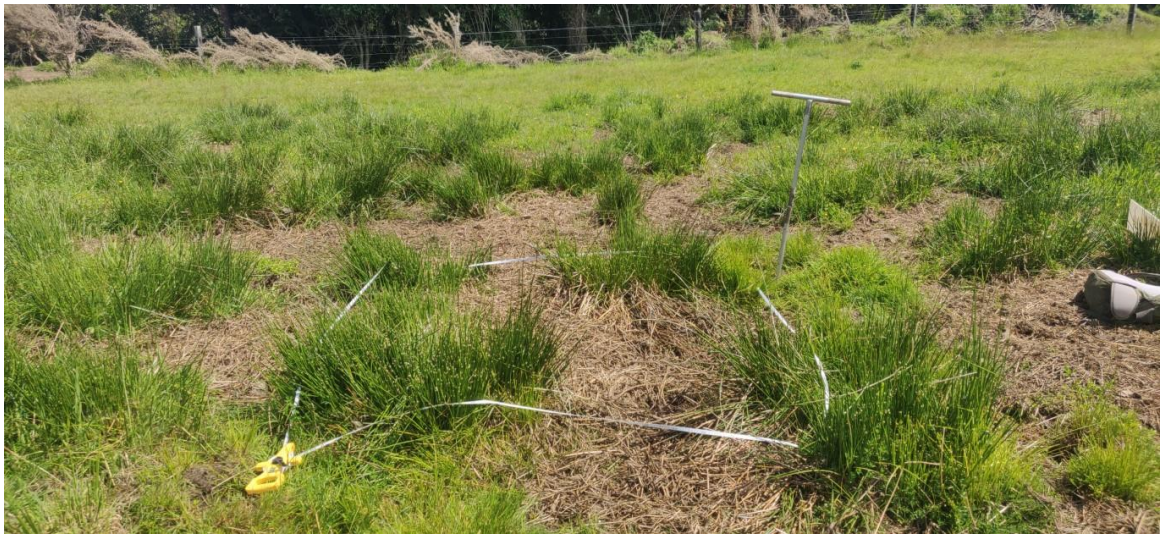

Plate 2. A Clarkson 2014 plot undertaken within representative vegetation within a natural inland wetland within the proposed development site. The plot was entirely FACW = facultative wetland and OBL = obligate wetland species. This area meets the dominance and prevalence test, has hydric soil, meets the wetland hydrology indicator test and is a natural inland wetland.

Plate 3. A saturated, hydric soil within the natural inland wetland within the proposed development footprint in **Plate 4**.

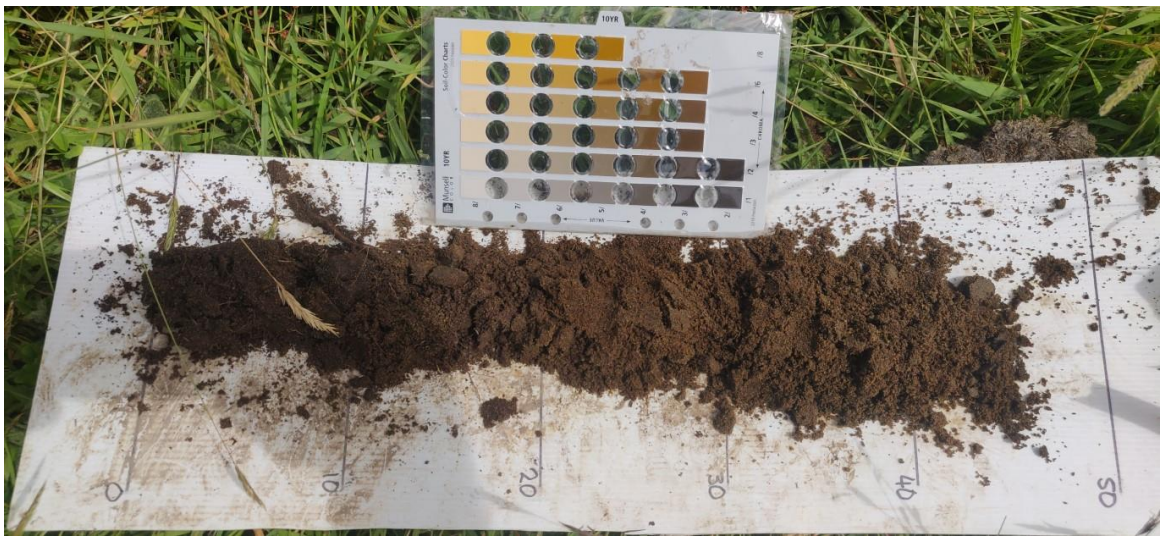

Plate 4. For reference, a dry non-hydric, upland soil taken approximately 15 m upgradient outside of the natural inland wetland in **Plate 3**.

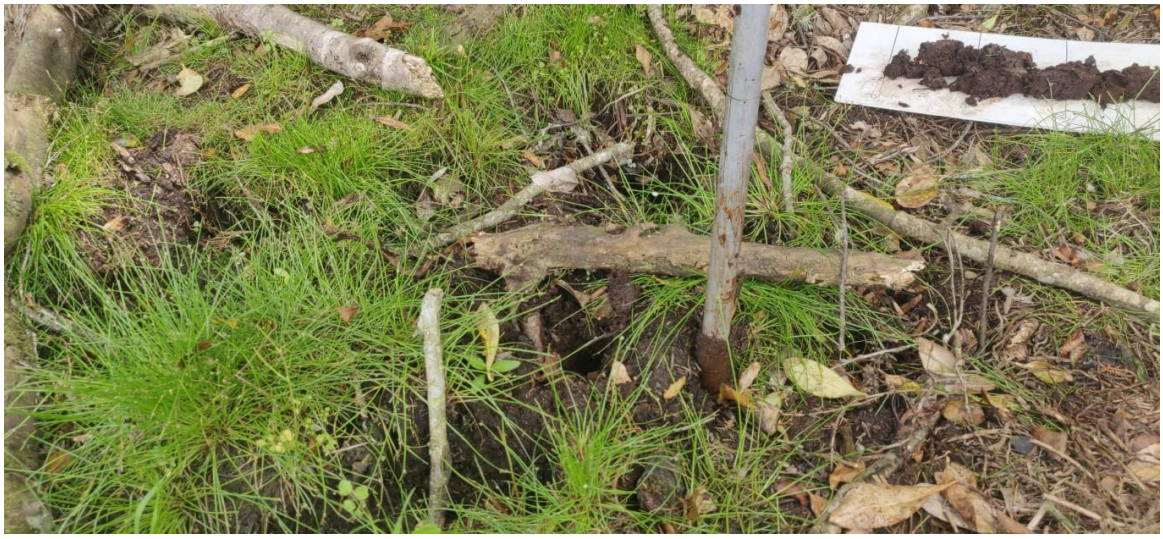

Plate 5. Wetland FACW species *Isolepis reticularis* the dominant ground cover within a portion of the remnant kahikatea swamp forest within the proposed development footprint.

Plate 6. Remnant kahikatea swamp forest within the proposed development footprint.

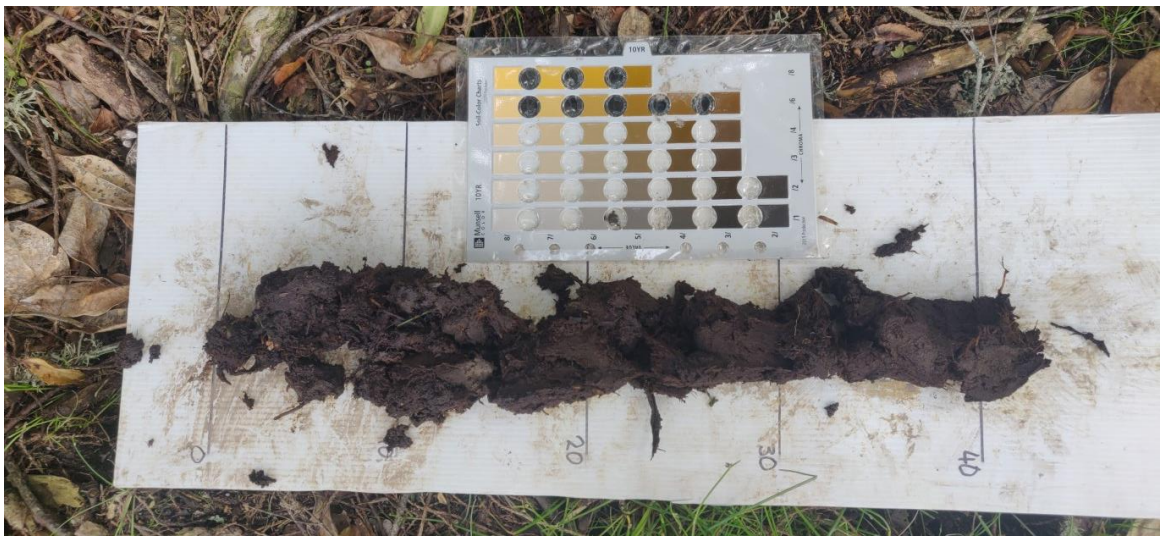

Plate 7. Saturated hydric soil from beneath the remnant kahikatea swamp forest within the proposed development footprint.

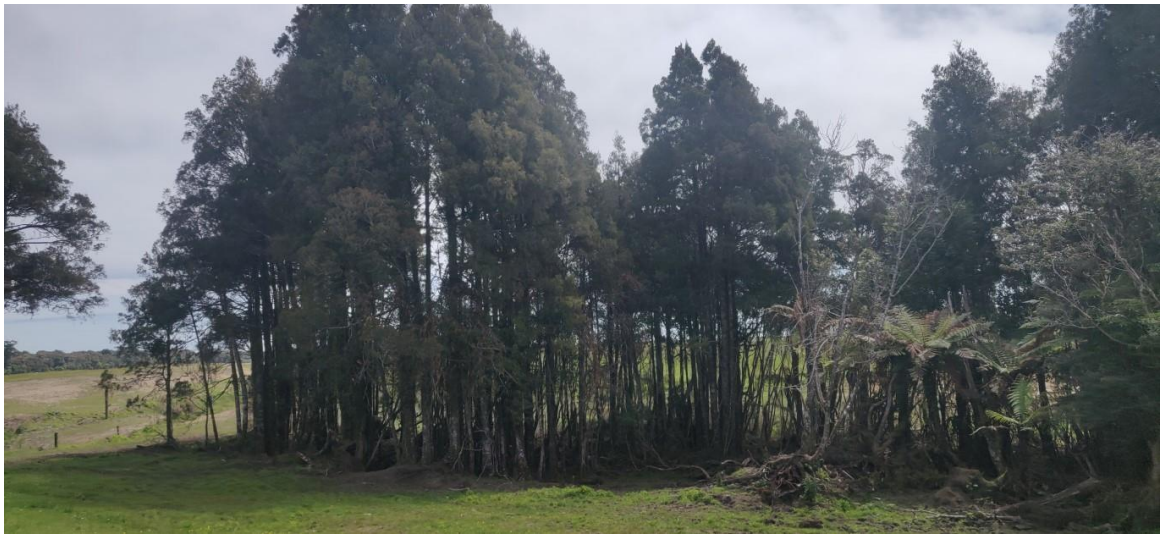

Plate 8. Another patch of remnant kahikatea swamp forest within the proposed development footprint.

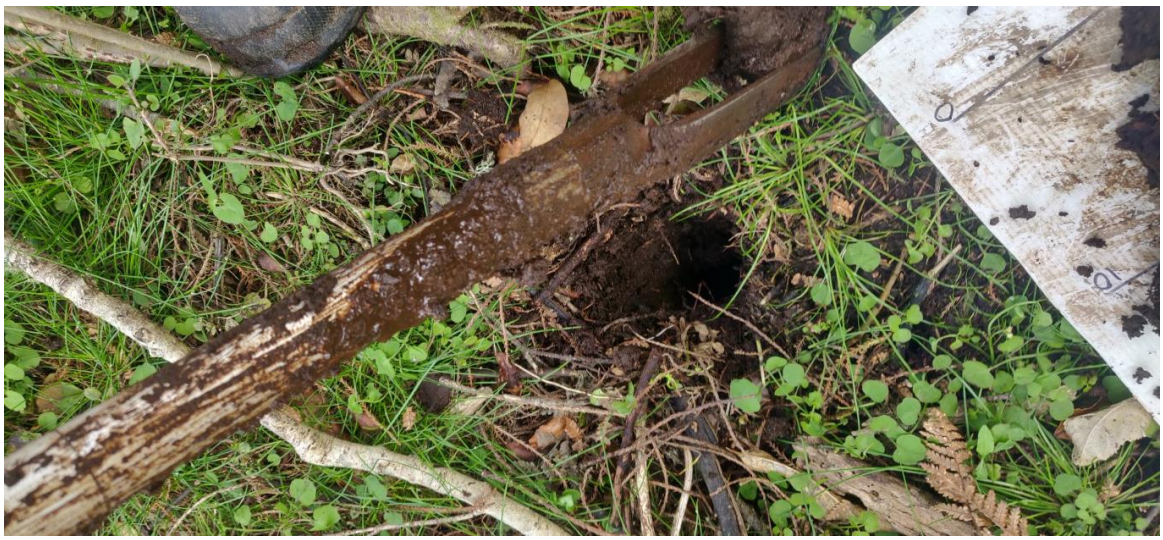

Plate 9. Evidence of a shallow groundwater table (approximately 20-30 cm below ground level) within the remnant kahikatea swamp forest within the proposed development footprint. Note the FACW wetland species *Isolepis reticularis*.

2.7 Watercourses

The assessment and classification of watercourses within the site is accurate.

2.8 Terrestrial Vegetation

Figure 6 in Keesing (2023) is of a scale and picture quality that the vegetation boundaries are indistinct and eligible. This makes reviewing this aspect of the report difficult and as such I have provided what I believe are the correct references to vegetation communities described by Keesing (2023).

In general, the community types appear accurate consisting of broadleaved–podocarp alliances of varying arrangements, however some portions of the vegetation communities which appear to be referred to as 'kahikatea treeland in pasture (#8)', 'Kamahi/ kahikatea (#12)' and 'Kamahi broadleaf (#13) are best described as lowland kahikatea swamp forest.

Keesing (2023) describes the indigenous vegetation within the proposed development footprint as consisting of seven forest fragment that total 4.2 ha. I calculated c. 5.1 ha of forest fragments within the proposed development footprint by delineating areas of mature forest in recent aerial photographs (**Figure 1**).

The forest fragments in pasture are described in Section 4.1.1 in Keesing (2023) as follows:

"The pasture forests have greatly reduced ground cover and middle tier representation, and reduced amounts of epiphyte (such as kiekie and filmy ferns) and this decreases their ecological function, integrity, their representativeness and sustainability and so their ecological value."

I agree in part with Keesing (2023) that some of the forest fragments have a greatly reduced ground cover and middle tier representation due to stock grazing. However, this is not the case for all areas within the forest fragments within the proposed development footprint. Within at least two of the mature forest fragments within the proposed development footprint there is dense kareao (*Ripogonum scandens*) which appears to have prevented, or at least significantly limited, stock access and there is a visible increase in ground tier and middle tier representation, species diversity, biomass and a notable increase in filmy ferns and a range of native mosses (e.g., *Dawsonia superba*) which require high humidity and generally only persist in forest systems with high ecological integrity (**Figure 2**).

Section 4.1.1 in Keesing (2023) states "*two surveys to the south in the DoC managed area (Swimmers Beach and Bellbird walk (Jane & Donaghy 2006)) recorded 97 and 82 native species, and around 70-80 of those in the lower tiers*."
The full reference for Jane & Donaghy 2006 has not been provided and I am unaware of this study. New Zealand's most extensive research on New Zealand's forest and shrublands that I'm aware of includes an analysis of data collected from the subset of 1177 20 x 20 m grid-based sample plots (Landcare Research 2013)[13]. From the data collected in this research, kāmahi-podocarp forest has a mean species richness of 53 ± 8.9. I consider this to be a more accurate assessment of species richness for this forest type.

In the most southeastern forest fragment, I recorded 49 native vascular plant species which included a typical range of indigenous forest species expected to occur in a kamahi-podocarp forest, including mature trees, smaller sub-canopy trees, tree ferns, understory shrubs, ground ferns, seedlings, small herbs, grasses, and epiphytes including the locally uncommon *Tmesipteris sigmatifolia* (**Figure 3**). I note that the plant shown in Figure 9 of Keesing (2023) is not *Tmesipteris sigmatifolia*, but rather appears to be a common clubmoss *Phlegmariurus varius*. In addition to the two 'Threatened' *Metrosideros* species identified in Keesing (2023), white rātā (*Metrosideros diffusa*) 'Threatened – Nationally Vulnerable' is also within the proposed development footprint.

I recorded 36 vascular plant species in a discrete area within the largest forest fragment where stock damage was absent/ limited by kareao. This area also comprised a typical suite of indigenous forest plant species, with intact forest tiers and the usual structure and biomass expected in lowland kāmahi-podocarp forest with high ecological integrity. This area of the forest is resilient to external threats (e.g., stock access, weeds), supports adequate functional diversity and all expected biodiversity components are present and well interconnected.

Due to closed canopy, lack of disturbance from stock, size and compact shape, these two forest fragments function as sustainable communities and habitats within the landscape.

The Keesing (2023) assessment of terrestrial vegetation values within the site does not accurately describe the full spectrum of forest values within the development footprint and does not adequately assess ecological integrity. In turn, the assessment does not accurately assess the ecological value of these areas or the relevant significance criteria in the WC RPS or NPS-IB.

[13] Allen RB, Bellingham PJ, Holdaway RJ, Wiser SK 2013. New Zealand's indigenous forests and shrublands. In Dymond JR ed. Ecosystem services in New Zealand– conditions and trends. Manaaki Whenua Press, Lincoln, New Zealand.

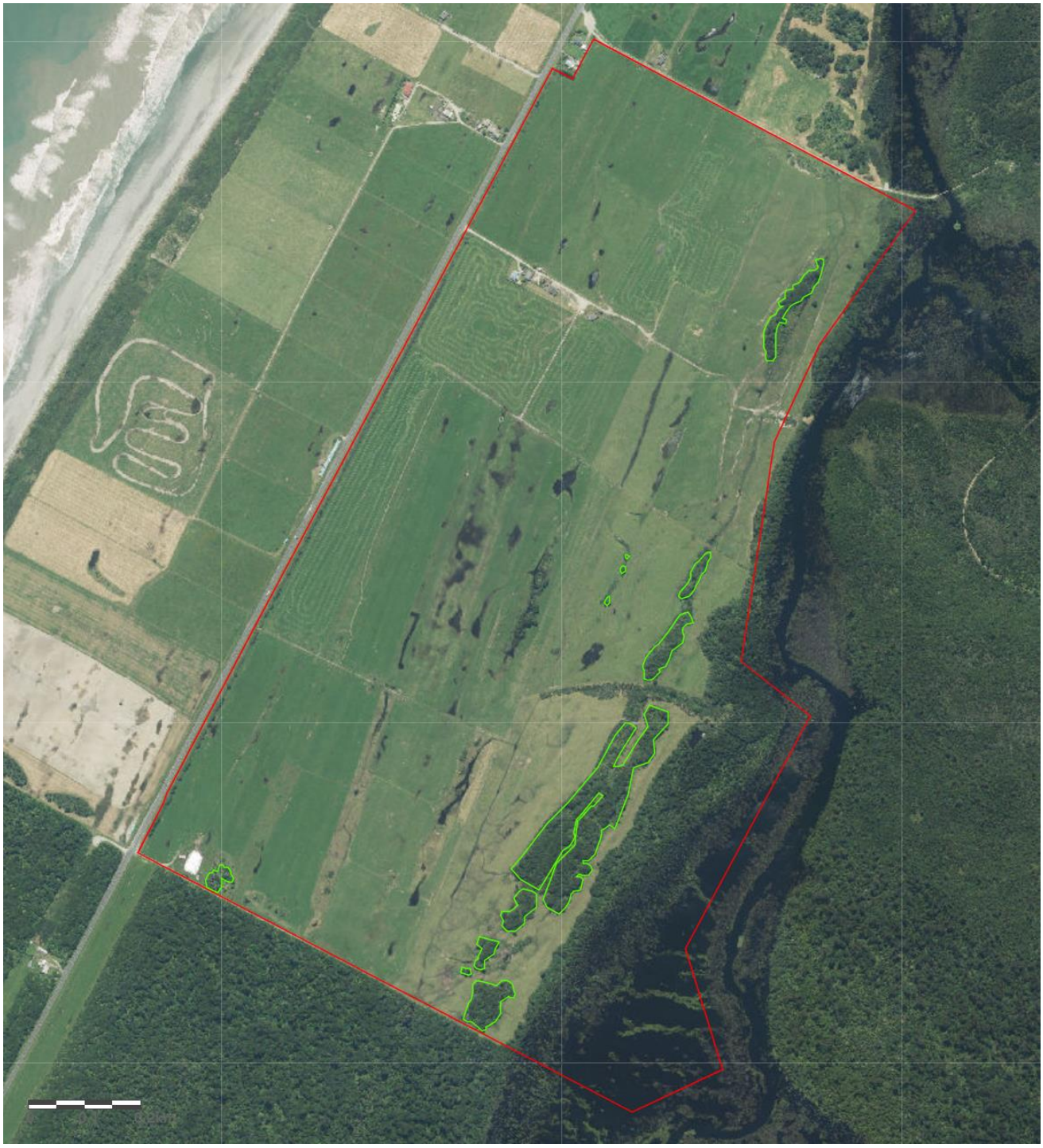

Figure 1. Forest fragments within the proposed development footprint (green areas), site boundary (red line).

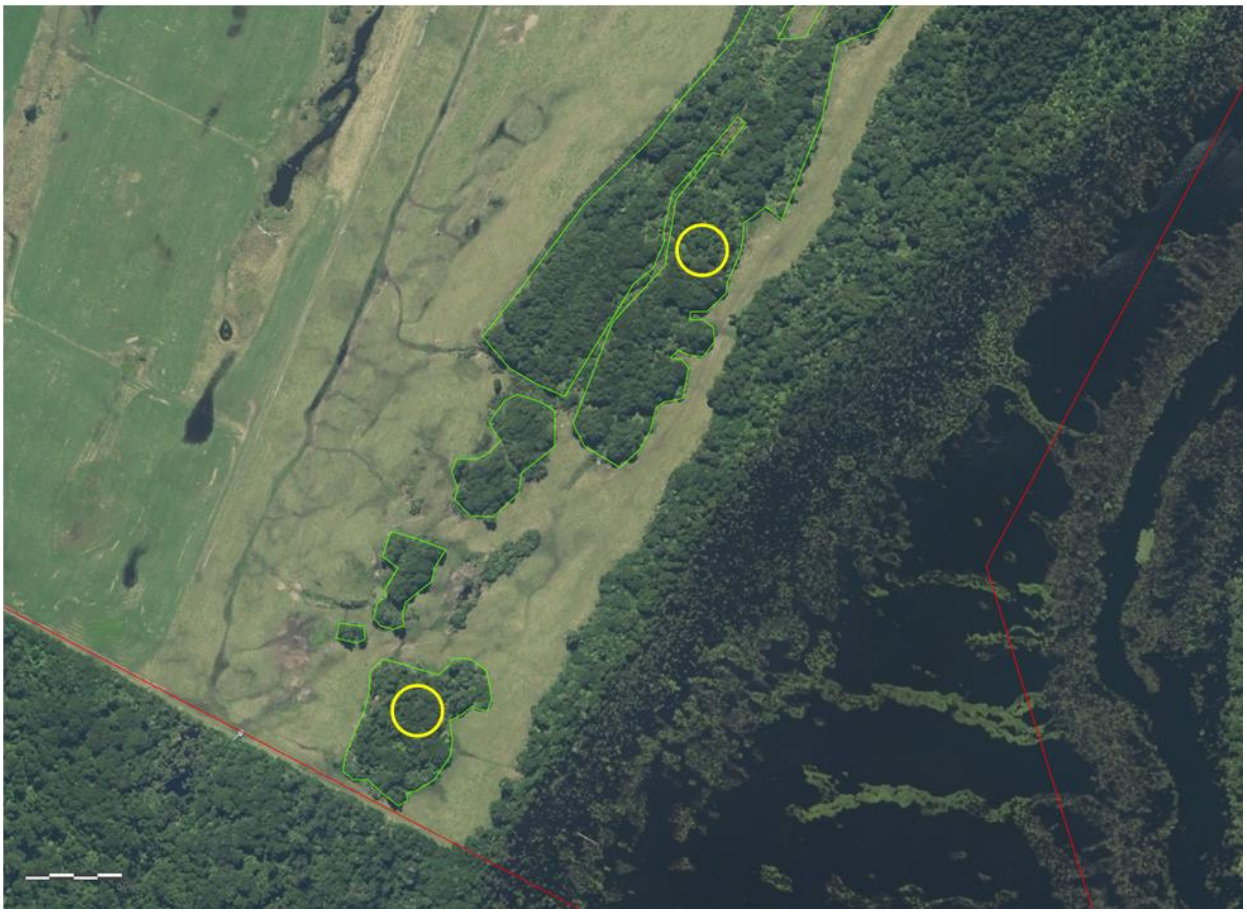

Figure 2. Forest fragments within the proposed development footprint (green areas), areas with high ecological integrity (yellow circles), site boundary (red line).

Figure 3. (left) *Tmesipteris sigmatifolia* recorded within the proposed development footprint **(right)** Figure 9 in Keesing (2023).

Plate 10. The largest 3.33 ha fragment of mature lowland forest within the proposed development footprint.

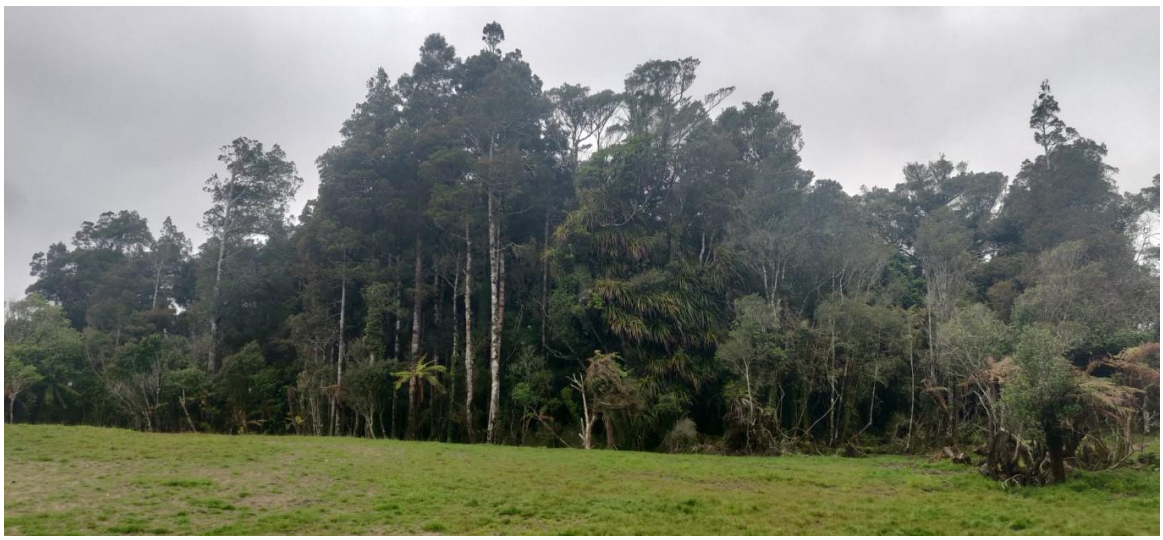

Plate 11. The southeastern 0.5 ha fragment of mature lowland forest.

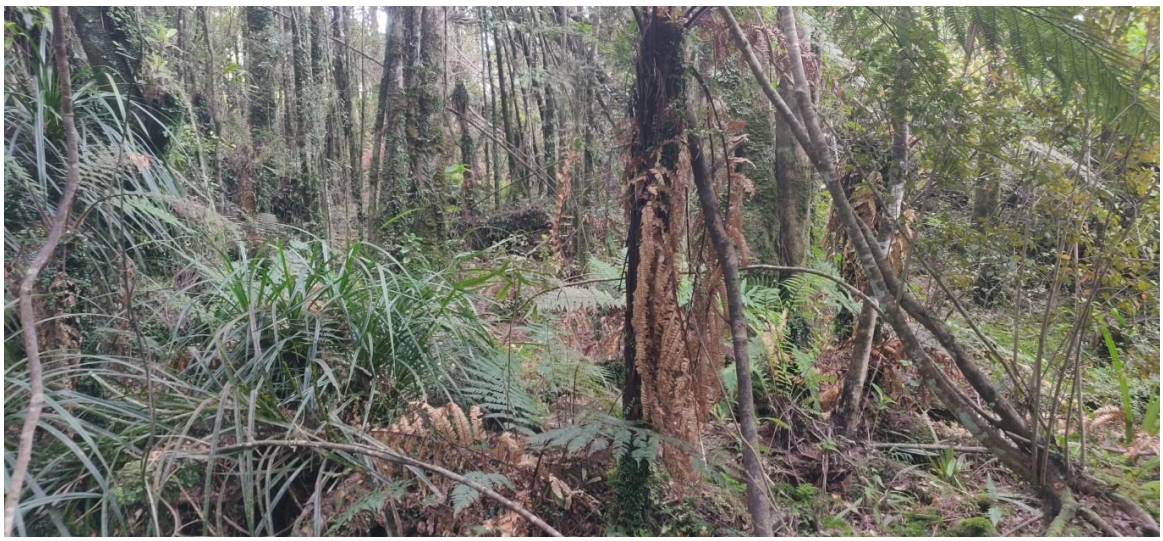

Plate 12. The diverse and intact understory within the southeastern 0.5 ha fragment of mature lowland forest.

Plate 13. Dense kareao which appears to have prevented stock access to some parts of the largest 3.33 ha fragment of mature lowland forest within the proposed development footprint.

Plate 14. The diverse and intact understory where stock access has been prevented by kareao within the largest 3.33 ha fragment of mature lowland forest within the proposed development footprint.

Plate 15. The open and degraded understory where stock access has not been prevented by kareao within the largest 3.33 ha fragment of mature lowland forest within the proposed development footprint.

3. Determination of Significance

3.1 Terrestrial Vegetation

The interior of the 0.5 ha southeastern forest fragment and central 3.3 ha forest fragment have ecological integrity that is typical of the character of the ecological district and retain a moderate range of species expected for that habitat type in the ecological district. In the absence of any empirical data to contradict my site observations, these vegetation communities appear to meet the NPS-IB 'representativeness' criteria and qualify as SNA under the NPS-IB.

I disagree with parts of the Keesing (2023) assessment of significance for the terrestrial vegetation within the proposed development footprint and some of these areas may meet the SNA criteria in the WC RPS and NPS-IB.The Keesing (2023) assessment of significance for terrestrial vegetation of the escarpment forest is a fair representation of the values and assessment against the relevant significance criteria and I agree with the conclusion that this forest meets the SNA criteria in the WC RPS and NPS-IB.

3.2 Fauna

The Keesing (2023) assessment makes assumptions and assessments of fauna values that are flawed. An example of this is the assessment assumes lizards are present, but not 'Threatened' or 'At Risk' species. The Keesing (2023) assessment however does not accurately assess the potential lizard species that could be present on site, including 'At Risk – Declining' Canterbury grass skink and 'Threatened – Nationally Critical' Hokitika skink, both of which inhabit exotic pasture grass, nor does the assessment identify nearby records of Canterbury grass skink or 'Threatened – Nationally Vulnerable' West Coast green gecko.

In absence of fauna survey data, a precautionary approach should be taken when assessing significance for the 5.1 ha of lowland forest within the proposed development footprint (as required in Policy 3 of the NPS-IB). Some areas and margins of the lowland forest provide potential habitat for a range of significant fauna including 'At Risk – Declining' Canterbury grass skink, 'Threatened – Nationally Critical' Hokitika skink, 'At Risk – Declining' forest gecko (*Mokopirirakau granulatus*), 'Threatened – Nationally Vulnerable' West Coast green gecko, and the mature trees may provide potential habitat for 'Threatened – Nationally Critical' long-tailed bat and 'At Risk – Declining' kākāriki. If a precautionary approach were adopted, these vegetation communities could meet the WC RPS rarity/distinctiveness criteria b) and NPS-IB rarity criteria a) and qualify as SNA.

The results of the fauna surveys will determine the ecological value of the habitats on site and inform whether any areas qualify as SNA.

3.3 Wetlands

The Keesing (2023) assessment of significance of the wetland below the escarpment forest is accurate and I agree that it meets most of the significance criteria in the WC RPS and NPS-IB and it should be considered a Schedule 1 – Significant wetland in the Regional Land Water Plan.

The Keesing (2023) assessment of significance for natural inland wetlands does not identify any natural inland wetlands within the proposed development footprint and therefore no significance assessment has been undertaken.

3.4 Watercourses

The Keesing (2023) assessment of significance for watercourses within the proposed development footprint is a fair reflection of the ecological values and is satisfactory.

4. Assessment of Effects

4.1 Wetlands

The proposed development will have direct effects on natural inland wetlands. This effect is not identified in Keesing (2023).

With regards to wetland hydrology and discharges, I am reliant on the information provided by the applicants' experts (Rekker & Etheridge 2023). If the hydrologist assessment is accurate, I agree with the assessment and the interpretation of the effects in Keesing (2023) that the wetland habitat east of the escarpment will not be affected and any likely impact associated with a discharge would have a negligible effect that would be unmeasurable in terms of an adverse effect.

If the proposed activity does not affect the aquitard of the wetland to the south of the site within the Māhinapua Lake Scenic Reserve then there will also be no direct adverse effects to this system and any potential indirect effects are likely to be negligible.

4.2 Terrestrial Vegetation

The proposed development footprint does not avoid indigenous terrestrial ecological values that potentially meet the SNA criteria and proposes to clear c. 5.1 ha of mature lowland forest fragments.

The ecological value of these forest fragments has all been assessed as 'low' ecological value in the Keesing (2023) assessment. This assessment of ecological value does not consider that some forest fragments are typical and characteristic of the structure and composition that would naturally be found in a community of that type within the ecological district or that a locally uncommon species (*Tmesipteris sigmatifolia*) is present. The ecological value of two remnants is at least 'moderate' and could be of higher ecological value depending on what native fauna species are present seasonally or permanently.

The Keesing (2023) assessment provides a range of scales in which to assess the magnitude of the effect, ranging from the forest type estimated to be remaining in the Hokitika Ecological District (ED), the dune terraces between Ruatapu and Hokitika inland to Woodstock, and at a site scale.

The magnitude of the effects the assessment should consider the same ecosystem that is proposed to be lost - mature kamahi-podocarp forest within the coastal plain in the ED. It is unclear what proportion of the original extent of mature lowland kamahi-podocarp forest within the coastal plain remains in the ED, however when considering the extent of this forest in relation to the Lake Mahinapua DoC Scenic Reserve the magnitude of effect considered to be 'low'.

4.3 Noise and Light

The effects of the noise level in the Mahinapua wetland complex has not been fully considered when the mine is proposed to be operating nearby (e.g., when 30 m away). It is unclear what the full duration of operation within close proximity to the wetland is and whether this will occur during the breeding season for 'Threatened – Nationally Critical' Australasian bittern (*Botaurus poiciloptilus*) and 'At Risk – Declining' South Island fernbird (*Poodytes punctatus punctatus*).

Artificial light at night is considered a growing threat to bat species due to its potential impacts on circadian cycles, increased predation risk, and avoidance behaviour. It is not entirely clear from the assessment what the predicted light pollution is on the adjacent Lake Mahinapua DoC Scenic Reserve and Lake Mahinapua wetland complex. Furthermore, the effect of the proposed lighting and how it may degrade potential bat habitat within the nearby adjacent Lake Mahinapua DoC Scenic Reserve when the proposed mining activity is 10 m away is not assessed in Keesing (2023). I note that there are a number of large emergent podocarps in the Lake Mahinapua DoC Scenic Reserve nearby the site boundary and it is possible that these, and other mature trees, could provide an important maternal roost for long-tailed bat. In addition, the Keesing (2023) assessment does not assess the potential effects of increased lighting to transiting long-tailed bats which may use the forest on the eastern portion of the site as a corridor.

It is unclear what monitoring/ management is proposed if the plant lighting results in seabirds being affected, and whether the processing plant proposes to turn off lights from dusk until dawn during the fledging period for Tāiko (*Procellaria westlandica*).

The Keesing (2023) assessment adequately assesses potential effects to invertebrates associated with lighting.

4.4 Avifauna

The Keesing (2023) assessment of potential effects to avifauna has been well considered with regards to forest species, with the exception of kakariki. I agree with the conclusion that the level of effect is 'very low' to forest species if appropriate fauna management is undertaken. As per the section above, potential effects and management responses to wetland species and seabirds requires further clarification.

4.5 Herpetofauna

The proposed 'trap and transfer' (or more commonly referred to as lizard mitigation translocation or salvage) of lizards will not avoid harm as stated in Keesing (2023) but rather minimise it. Current tools only capture a proportion of the population which is estimated to be low by the Department of Conservation Technical Advisory Group.

Potential adverse effects are proposed to be minimised, but still have the potential to effect 'Threatened – Nationally Critical', 'Threatened – Nationally Vulnerable' and 'At Risk – Declining' indigenous lizard species. The potential loss of even a single individual with a 'Threatened' status is considered to be a significant ecological effect, which should be interpreted as a more than minor ecological effect. Therefore, this potential effect cannot be reduced to zero or the magnitude to 'low' as assessed in Keesing (2023), unless an extensive and thorough effort is undertaken to confidently assure that highly cryptic, low-density species are not present within the proposed development footprint. Such an extensive and thorough effort has not been demonstrated in the effects assessment.

In the absence of an accurate desktop lizard assessment or lizard survey, and when considering the extent of potential lizard habitat within the site and adopting a precautionary approach to the assessment (as required in the NPS-IB), the potential ecological effect to indigenous lizards is 'moderate to high' or 'more than minor'.

4.6 Freshwater Fish

The Keesing (2023) assessment of potential effects to freshwater fish addresses the effects of displacement during the proposed clearance of drains, potential upward recolonisation of fish and has provided a draft fish management plan. It is often not possible to avoid all native fish mortalities during a fish salvage, and this potential effect is proposed to be minimised, not avoided as stated in section 7.2.6 in Keesing (2023).

'At Risk – Declining' brown mudfish (*Neochanna apoda*) occur within the Hokitika District and their habitat includes swamp forests, dune swamps and they are also found in slow flowing drains and boggy paddocks. There is potential brown mudfish habitat within the proposed development footprint and this has not been identified or addressed in the Keesing (2023) assessment. The area of potential mudfish habitat is small and the likelihood of this species occurring in this area is low but not entirely implausible.

It would be useful to either undertake a survey for brown mudfish or incorporate the appropriate methods for the salvage of this species as part of the draft fish management plan (i.e., in accordance with the Department of Conservation survey methodology Ling et al 2013)[14]

Whilst not explicitly stipulated in Keesing (2023), we agree that the level of effect to native fish is 'very low' if appropriate fish management is undertaken.

4.7 West Coast Regional Plan

I agree with the Keesing (2023) assessment of the proposed activity in relation to RPS Policy 7.2 provided Threatened species are not recorded within the proposed development footprint during any proposed subsequent fauna surveys.

5. Remedy / Ecological Benefits Program

The proposed remedial management actions are not assessed against the full extent or value of ecological features within the proposed development footprint (e.g., natural inland wetlands, value of forest ecosystems) and does not adequately assess the type of biodiversity; amount of biodiversity; equivalence over time, or spatial context. Therefore, the claims of the proposed ecological benefits providing an ecological net-gain are not accurate.

A net-gain outcome generates biodiversity values that are greater than they would be without the impact or the remedial actions and clear measurements for the equivalence of all biodiversity values should be provided to demonstrate how this is achieved. The Keesing (2023) assessment does not provide an accepted or objective method for quantifying the value of biodiversity impacted against the proposed

[14] Ling, N.; O'Brien, L.K.; Miller, R.; Lake, M. 2013: A revised methodology to survey and monitor NewZealand mudfish. Department of Conservation, Wellington (unpublished).

mitigation. Without providing an objective method, at face value the proposed remedial management actions appear to result in a significant adverse residual ecological effect.

The proposed remedial management actions are not at the point of impact and therefore are not mitigation. As proposed, the remedial management actions should be considered a biodiversity offset that account for residual adverse ecological effects. Any biodiversity offset proposed for residual adverse effects should apply the principles in Appendix 3 of the NPS-IB and meet the relevant policies and objectives in the WC RPS and Te Tai Poutini Plan (TTPP).

In summary, my assessment of the proposed remedial management actions are provided in **Table 1**.

Table 1

Proposed Remedial Benefit	Comment
Protection of the high value eastern wetland and escarpment, including the forest / wetland restoration area (ca. 20 ha).	The eastern wetland and majority of the adjacent forest are already afforded protection under the Resource Management (Stock Exclusion) Regulations 2020. Due to meeting the SNA criteria, by virtue many protections also exist within the RPS, TTPP, and NPS-IB. This proposed action does not provide any meaningful additional ecological benefit.
Physical protection of the above systems via cessation of livestock access to the escarpment and wetland through fencing the forest/wetland restoration area off from the farm.	The eastern wetland and majority of the adjacent forest are already afforded protection under the Resource Management (Stock Exclusion) Regulations 2020. This does not provide any meaningful additional ecological benefit.
Animal pest control in the escarpment forests (Ca 12 ha for possum, mustelids and feral cats) and new restored forest edges during the consent period.	This area is not shown on any plans. 12 ha of animal pest control will provide a meaningful temporary benefit to biodiversity. However, this benefit will be subsequently lost over time once the animal pest control program stops. This does not provide a long-term additional net ecological benefit and is not a commensurate time scale for the proposed loss of biodiversity values (some of which exceed 100 years). Unless provided in perpetuity, this does not provide any meaningful additional ecological benefit.
No "loss of extent" of forest through an equivalent area of new (replacement) forest of the same composition along the western edge of the of escarpment forest. That forest will be created through direct transfer, use of nursery grown species and managed natural regeneration from the overhanging escarpment forest and salvage.	By my calculation the proposed mitigation measures will result in a loss of extent of c. 0.35 ha and loss of forest ecosystems and habitats that have in places taken over 100 years to develop. I understand that the vegetation direct transfer methodology will not transfer mature trees and these ecological values will be lost. The proposed mitigation will result in a net loss of ecological values and extent.
There will be, due to the revegetation area, an increase in the resilience of the escarpment forest and increases of functional performance of that forest to buffer the eastern wetland.	Agreed. There will be an increase in resilience of the escarpment forest and increases of functional performance of that forest to buffer the eastern wetland, but this ecological benefit does not adequately mitigate or offset the proposed loss of mature forest values and extent.
The Kessing (2023) summary of remedial actions on pg 61, states "There is likely to be two new indigenous wetlands developed, summing around 1 ha and involving the propagation and planting of four or five sedge taxa from nursery stock and translocation of raupo and harakeke from local sources." However on pg 60 Kessing states there will be three possible wetlands totalling 2.37ha with these shown in Figure 17 .	It is unclear what extent of wetland creation is proposed. The Keesing (2023) assessment does not accurately identify effects to natural inland wetlands and therefore the overall ecological gain/loss to wetland extent and value is unknown.

7. Draft Fauna Management Plan

7.1 Fish rescue

The general requirements are aligned with typical fish rescue protocols, however it lacks sufficient detail for a Native Freshwater Fish Relocation Plan - due to these aspects being unknown at this time, e.g., timing and duration of fish capture, specific and detailed methodologies used to ensure all fish are captured, transportation methodology, specific fish relocation sites, biosecurity protocols, when reporting will be provided to WCRC etc.

7.2 Nesting bird management

The general requirements are aligned with typical nesting bird management, with the exception of the options provided if nests are located. If active nests of native birds are located the third option provided should only be undertaken if a relevant Wildlife Act Authority is provided by the DoC for the disturbance of absolutely protected wildlife.

A detailed description of the nesting bird survey methodology should also be provided.

7.3 Lizard management

The proposed lizard management is grossly inadequate to ensure a protective benefit for lizard species and habitats within the site, as a required by DoC when authorising a Wildlife Act Authority for the disturbance, harm, and accidental killing of native lizards. We note that if any lizards are recorded within the proposed development footprint, irrespective of threat status, a Wildlife Act Authority is required from the DoC.

In the event that lizards are recorded as part of the proposed lizard survey and the applicant is granted consent to clear lizard habitat, the applicant should follow an appropriate mitigation process determined by the DoC.

For context, the following is a standard consent condition required for lizard management, and I would recommend that this level of detail is required as part of a Lizard Management Plan prepared for the proposed activity.

Prior to the commencement of any vegetation removal works within lizard habitat areas identified by a herpetologist, the consent holder must submit a Lizard Management Plan (LMP) prepared by a suitably qualified and experienced ecologist/herpetologist to the Council's Compliance Monitoring Officer for certification in conjunction with the Council's Ecologist. When developing the LMP the herpetologist will consider and work through the mitigation hierarchy of avoid, remedy, mitigate, offset, or compensate. The LMP should include measures to avoid and minimise adverse effects prior to considering salvage, mitigation, offsetting or compensation.

The LMP must be able to demonstrate no net loss (e.g. population maintained or enhanced) in the lizard populations of each species of native lizard present on the site through the implementation of the plan through mitigation or offsetting/compensation (assuming that avoidance is not possible). While this may be done on the same site or at an appropriate alternative site.

The LMP must address the following (as appropriate):

- *Credentials and contact details of the ecologist/herpetologist who will implement the plan.*
- *Timing of the implementation of the LMP.*
- *Descriptions of all potential effects of the development on lizard habitat (the area of habitat to be modified or lost), along with the species and estimated numbers of individual lizards that are likely to be affected.*
- *The proposed strategy to reduce, mitigate, or otherwise offset potential adverse effects on lizards resulting from the proposed development should be described. The management approach selected may include any suitable combination of salvage, relocation, monitoring, pest animal control, site rehabilitation, habitat enhancement, compensation, biodiversity offsetting, compensation, or other appropriate measures.*

- *Limitations in the capability to monitor lizards and measure benefits from commonly utilised mitigation strategies (e.g. salvage and release of lizards into newly-created habitats) should be considered and acknowledged in the LMP*
- *If salvage is proposed the habitat(s) that lizards are transferred to (either on site or at an alternative site, as the case may be) will need to continue to be able to support viable native lizard populations for all species present pre-development.*
- *A description of methodology for survey, trapping and relocation of lizards including but not limited to: salvage protocols, relocation protocols (including method used to identify suitable relocation site(s)), nocturnal and diurnal capture protocols, supervised habitat clearance/transfer protocols, artificial cover object protocols, and opportunistic relocation protocols.*
- *A description of the relocation site, including discussion of:*
    - *Provisions for additional refugia if required e.g. depositing salvaged logs, wood or debris for newly released skinks that have been rescued;*
    - *any protection mechanisms (if required) to ensure the relocation site is maintained (e.g.) covenants, consent notices etc;*
    - *any ecosystem weed and pest management to ensure the relocation site is maintained as appropriate habitat.*
- *Monitoring methods, including but not limited to baseline surveying within the site, baseline surveys outside the site to identify potential release sites for salvaged lizard populations and lizard monitoring sites, ongoing annual surveys to evaluate translocation success, and pre and post translocation surveys.*
- *Pest management effort for rodents and hedgehogs to be undertaken for 5 years following release at the release site(s) of significant populations (i.e., breeding populations with 10 or more individuals). Pest management must follow current best practice techniques for rat and hedgehog control and include, but not be limited to, bait stations and DOC 200 trap lines positioned within a zone of up to 200 metres radius from the release sites, and monitoring of effectiveness of pest control and/or any potential adverse effects on lizards associated with pest control.*
- *A post-vegetation clearance search for remaining lizards.*

A suitably qualified and experienced ecologist/herpetologist approved to oversee the implementation of the LMP must certify that the lizard related works have been carried out according to the certified LMP within one month of completion of the vegetation clearance works and if needed again when all actions in the LMP are completed.

Upon completion of works, all findings resulting from the implementation of the Lizard Management Plan must be recorded by a suitably qualified and experienced ecologist/herpetologist approved by the council on an Amphibian/Reptile Distribution Scheme (ARDS) Card (or similar form that provides the same information) which must be sent to Council as well as the department of Conservation.

All works on site must comply with the certified LMP.

7.3 Bat management

The proposed bat management is in general accordance with industry best practice outlined in the Bat Management Framework set out by the DoC.

The Bat Management Framework protocols aim to provide clear procedures that are to be followed prior to the removal of all trees in the proposed area of vegetation clearance, with the goal of avoiding mortality or injury to long-tailed bats during clearance activities. The proposed bat management protocols are appropriate for the proposed activity.

In the event that bats are recorded as part of the proposed bat survey, and the applicant is granted consent to clear bat habitat, the applicant should follow an appropriate mitigation process determined by the DoC.

8. Rehabilitation Management Plan

My review of the Rehabilitation Management Plan (RMP) is focused on aspects relating to ecology and does not include a review on the adequacy of the overall management considerations, soil conservation, Erosion Sediment Control, or methods for mining activities.

In general, the RMP does not provide any relevant objectives or sufficient detail to ensure that aspects of remedial planting, animal pest management, weed management or wetland construction will be achieved. It does not provide sufficient detail to assure the proposed ecological mitigation benefits claimed in the Keesing 2023 ecological effects assessment will be achieved.

9. Conclusion

The description of the ecological characteristics and values of the site are not completely accurate. The assessment of ecological significance has not been appropriately determined for some areas of native forest within the proposed development footprint and do not accurately consider all native fauna values.

The potential adverse effects to natural inland wetlands, indigenous vegetation and fauna have not been fully addressed and the proposed measures to avoid, remedy or mitigate the identified adverse effects are not adequate.

Further information is required from the applicant to determine if the adverse effects of the proposed sand mining activities have been sufficiently avoided, minimised, mitigated, offset, or compensated. The following questions could form the basis of a Section 92 request for further information:

1. Can the applicant please provide a survey for all lizard, long-tailed bat, avifauna populations across all habitat types within the site in order to assess potential effects? The surveys should consider the appropriate season and survey temperatures for the relevant species within the Hokitika District, and have adequate methods, effort and coverage to lead to conclusions regarding the importance of habitat types across the site, species present/ absent and the significance of potential effects.
2. Following the outcome of the surveys, can the applicant please provide an ecological assessment of the potential and actual direct or indirect adverse effects to all relevant fauna species potentially present on site and their habitats?
3. Can the applicant please provide an assessment of natural inland wetland within the site in accordance with the Ministry for the Environment (MfE) Wetland Delineation Protocols (2022)?
4. If natural inland wetlands are within the proposed development footprint and are proposed to be removed, can the applicant please provide an assessment against the WC RPS, TTPP, NPS-FM and National Environmental Standards for Freshwater Amendment Regulations (No 2) 2022?
5. Can the applicant please undertake an assessment of ecological integrity within the areas identified in Figure 2 to determine whether they meet the NPS-IB representativeness criteria? The assessment should include, but not be limited to, quantitative data of forest composition, structure and functions. The assessment should assess ecological integrity as per the definition within the NPS-IB, as follows:

   ecological integrity *means the extent to which an ecosystem is able to support and maintain its:*
   (a) composition (being its natural diversity of indigenous species, habitats, and communities); and
   (b) structure (being its biotic and abiotic physical features); and

   (c) functions (being its ecological and physical processes).

6. Following the outcomes of any further vegetation and fauna surveys, if any area within the proposed development footprint meets the SNA criteria in the WC RPS or NPS-IB, can the applicant please provide an assessment of the proposed activities in relation to the relevant policies and objectives within the WC RPS (e.g., Section 7), Te Tai Poutini Plan (e.g., ECO-P7) and NPS-IB?
7. Following the outcomes of any further vegetation and fauna surveys, can the applicant provide an updated ecological effects assessment in accordance with the Environment Institute of Australia and New Zealand (EIANZ) Ecological Impact Assessment guidelines (Roper-Lindsay, et al. 2018) ?
8. Can the applicant please provide an accepted and objective method for quantifying the value of biodiversity impacted and mitigated and/ offset with clear measurements for the equivalence of all

relevant biodiversity values? If the proposed activity includes a biodiversity offset, can the applicant please provide a biodiversity offset in accordance with the principles in Appendix 3 of the NPS-IB and describe how the offset meets the relevant policies and objectives within the WC RPS (e.g., Section 7) and TTPP (e.g., ECO-P9)?

9. Can the applicant please clarify what monitoring/ management is proposed if the plant lighting results in seabirds being affected, and whether the processing plant proposes to turn off lights from dusk until dawn during the fledging period for Tāiko (*Procellaria westlandica*)?
10. Can the applicant please provide an updated RMP for the implementation of forest planting/ revegetation and wetland creation including:
    - A programme for the timing and implementation of forest planting/ direct vegetation transfer;
    - Details of the methods for wetland creation;
    - Details of enrichment and replacement planting, including a programme/ timeframe to ensure a plant success rate of at least 80% canopy cover is achieved within 5 years for planting;
    - Details of the methods for direct vegetation transfer;
    - A plan demonstrating the areas where the required forest planting is to be implemented;
    - A detailed planting plan including but not limited to details of plant species, size, grade, density, number and relative composition (for pioneer and enrichment species);
    - Details of eco-sourcing (plants that have been sourced and propagated from the Hokitika Ecological District) and how plants are appropriate for the location;
    - Details of and a programme for maintenance, monitoring and measuring success of the required forest planting for a minimum period of five years;
        - The specific targets, timeframes, methodologies and measures/ criteria to determine the success of the forest planting;
        - Measures outlining how the legal and physical protection of the mitigation planting will be achieved in perpetuity;
        - Details of the on-going maintenance of the planting including, but not limited to, the replacement of plants, future management, and control of pest plants;
        - Details of how plants will be protected from pest animals.

I trust that this provides the information that the Council has requested.

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Tony Payne

Principal Ecologist[15]

https://d.docs.live.net/faec131baeb9dcc6/active projects/2341 westland mineral sands^j wst/working/2341_westland mineral sands mananui_section 92_ecology_20dec23.docx

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