WESTPOWER LTD PROPOSED WAITAHA HYDRO SCHEME

ASSESSMENT OF ENVIRONMENTAL EFFECTS

TERRESTRIAL INVERTEBRATES

Dated June 2025

Report prepared for Westpower Ltd

Report prepared by: Richard Toft, Entecol Ltd

Statement confirming compliance with the Environment Court's Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023

As an expert witness or peer reviewer, I have read, and I am familiar with the Environment Court's Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023.

I have prepared my, or provided input into, an assessment of effects for the Waitaha Hydro Scheme in compliance with the Code of Conduct and will continue to comply with it in this Fast-track Approvals Act process. In particular:

- my overriding duty is to assist the decision-maker impartially on matters within my expertise;
- unless I state otherwise, my assessment is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express; and
- I have not, and will not behave as, an advocate for the Applicants.

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1. INTRODUCTION

1.1 Westpower Ltd (**Westpower**) proposes a run-of-the-river hydro-electric power scheme (**Scheme**) for the Waitaha River, approximately 60km[1] south of Hokitika on the West Coast of the South Island, New Zealand.

1.2 The Scheme would be run-of-river with no instream storage. The proposed Headworks include a low weir and intake structure situated at the top of Morgan Gorge that will divert water into a pressurised tunnel and desander. The pressurised tunnel will convey the diverted water down to a Power Station below Morgan Gorge. Having passed through the turbines the diverted water will be returned via tailrace discharging to the Waitaha mainstem in the vicinity of the confluence of Alpha Creek. The Scheme is to divert up to a proposed maximum of 23 m^3/s (cumecs), whilst maintaining a minimum residual flow of 3.5 m^3/s immediately downstream of the intake. The hydro design includes a 10 m^3/s bypass valve to maintain water flow following Power Station outages. The abstraction reach would include approximately 2.5 km of the Waitaha River, including Morgan Gorge. Construction access to the headworks above Morgan Gorge would initially be via helicopter and / or on foot and then via the access tunnel (once it is completed), while an access road and transmission line corridor (average 15m in width) would be required from Waitaha Valley Road to the Power Station Site to enable a connection to the existing network. As part of this work, the existing transmission corridor, extending from the State Highway to the southern part of Waitaha Road would also be upgraded. A short access road will provide temporary access between the access tunnel portal and Construction Staging Area 1 (Headworks) during the construction phase. Further detail on the project as well as a description of the **Project Site** is set out in the **Project Overview Report** and the **Project Description**.

1.3 Entecol Ltd has been commissioned by Westpower Ltd (**Westpower**) to assess the potential effects of the Scheme on terrestrial invertebrates, with the exception of *Powelliphanta* land snails, which are covered in Buckingham, R. 2025 Waitaha Hydro Scheme: Assessment of effects on Terrestrial Fauna: bats, avifauna and *Powelliphanta* land snails (**Terrestrial Fauna Report**).

1.4 This report considers and assesses the values and the significance of the Project Site in relation to terrestrial invertebrates, the potential effects of the Scheme on terrestrial invertebrate values and how (if necessary) these effects are proposed to be avoided, mitigated or remedied.

2. EXISTING ENVIRONMENT

2.1 The Waitaha River is situated about 60 km south of Hokitika[2], and has a catchment that includes the Broomfield and Smythe Ranges, with numerous peaks above 2,100 m. The Scheme is predominantly on the north (true right) side of the Waitaha River from Macgregor Creek to Kiwi Flat, immediately above Morgan Gorge, approximately 17 km upstream from the SH6 bridge across the Waitaha River.

2.2 The proposed footprint of the Scheme includes both public and private land, with most of the terrestrial vegetation clearance required for the Scheme located within largely unmodified native

[1] Measured using local roads and tracks to the Power Station
[2] Measured using local roads and tracks to the Power Station

vegetation of the Waitaha Forest Conservation Unit administered by the Department of Conservation (**DOC**). Excellent general descriptions of the vegetation types and vertebrate faunal values present within the footprint and immediate surrounding areas are provided in TACCRA Ltd, 2025 Waitaha Hydro Scheme: Assessment of environmental effects - Terrestrial Flora (**Vegetation Report**) and **Terrestrial Fauna Report**.

2.3 Invertebrate communities are strongly associated with vegetation types, and the indigenous vegetation types in the Scheme footprint are contiguous with that in large areas of the Waitaha Catchment and widely represented within both the Wilberg and Harihari Ecological Districts and common to many valleys within central Westland (**Vegetation Report**). It is therefore sensible to predict that the terrestrial invertebrate communities within these vegetation types are also well represented in the Westland District and West Coast Region.

2.4 The indigenous vegetation impacted by the Scheme is largely undisturbed and contains terrestrial invertebrate communities that are also of high natural integrity. However, the lower reach of the Waitaha, from the confluence of Macgregor Creek, has seen considerably more human disturbance and is adjacent to agricultural land, and as such includes more adventive invertebrate species associated with both the adventive vegetation and the livestock.

2.5 The riparian margins of rivers are very dynamic systems with specific habitat types and there are a range of terrestrial invertebrate species that are especially adapted to live in these highly dynamic habitats, such as the Therevidae (stiletto flies) that breed in the loose sandy substrates that are deposited and maintained by occasional flood events. Such habitats are also intrinsically uncommon in the landscape as they exist only as narrow ribbons along the margins of rivers. These riparian margins were therefore a key focus of the terrestrial invertebrate survey.

Investigations

2.6 A search for any existing information on previous terrestrial invertebrate surveys of the Waitaha area was conducted using both the BUGZ database (Bibliography of New Zealand Terrestrial Invertebrates – online) and online resources such as iNaturalist and Google searches.

2.7 Two entomologists conducted a field survey at the Waitaha site over the period 13–17 February 2013. Weather was generally fine with mild temperatures (12 to 20 ºC), with occasional cloudy periods and a few light showers. The time of year and weather that included both sunny periods and humidity were conducive to good levels of invertebrate activity.

2.8 As discussed above (2.5), a primary focus for this survey were the riparian margins of the Waitaha River. Some riparian specialists, such as stiletto flies (Diptera: Therevidae) are thought to be restricted to specific geographical areas or are known from just single individuals and listed as “Data Deficient” in DOC’s threat classification system. Tiger beetles are another characteristic element of riparian margins (and other open habitats) with potential for rare species. The riparian habitat is also potentially affected by the Scheme through direct disturbance and if there were to be changes in river flow and sediment deposition dynamics.

2.9 In contrast to the riparian margins, the surrounding native forest habitats are extensive and contiguous in this part of Westland and the extent of disturbance caused by the Scheme is relatively small in comparison to the invertebrate habitat of this type available.

Figure 1: Malaise trap positioned south of Macgregor Creek, on old boulder fields adjacent to forest.

2.10 Manual collection techniques included sweep-netting, beating vegetation, and lifting rocks, logs and other refuges to search for invertebrates. A night search with headlights was undertaken in an area of forest at Kiwi Flat.

2.11 Five Malaise traps (**Figure 1**) were deployed to intercept both flying insects and some insects crawling across the ground. These were set up on the first day of the trip and collected again after three days. They were positioned on a boulder field near Macgregor Creek, in regrowth forest to the south of the Macgregor Creek and Waitaha confluence, on the riparian/forest margin at the powerhouse site, on riparian/forest margin directly above Morgan Gorge, and amongst low vegetation of the Kiwi Flat flood plain (**Figure 2**).

2.12 Ultra-violet light traps were set up to attract nocturnal flying insects at 6 locations (**Figure 2**). Two were positioned on the true right of Macgregor Creek, one to the south of the Macgregor confluence, in forest to the east of Kiwi Flat hut, on a raised area over-looking Kiwi Flat (immediately west of the hut) and amongst the toe toe (*Austraderia* spp.*)* and *Carmichaelia* flood plain vegetation at the confluence of Whirling Waters. The traps had light sensors to turn them on at dusk and were left for one night at each location. Open areas were favoured for UV light traps to maximise the effective collecting range of the lights.

2.13 The UV traps consist of a set of clear plastic cross-vanes with a string of UV LEDs around the central crossing point. The vanes are set up over a bucket containing water with a little detergent. The UV light attracts various groups of night-flying insects, especially moths, small flies and small wasps, which encounter the vanes and fall or fly into the bucket. Those that contact the water sink due to the detergent reducing the surface tension.

2.14 On 17 February 2013, manual collecting of invertebrates was undertaken on a riparian area of shingle and sand immediately upstream from the State Highway bridge to get a comparison of key riparian insects, particularly stiletto flies and tiger beetles, found at these lower reaches of the Waitaha River.

2.15 The specimens collected were sorted to species, family or order depending on available taxonomic resources and expertise, and on the ability of the particular taxonomic groups to provide useful comparative information on distribution. Juvenile stages are often difficult to identify to lower levels using morphology and we made no attempt to utilise very small taxa, such as mites (Acari), springtails (Collembola) and booklice (Psocoptera), as these are difficult and time-consuming to identify and there is insufficient background knowledge of these groups in New Zealand.

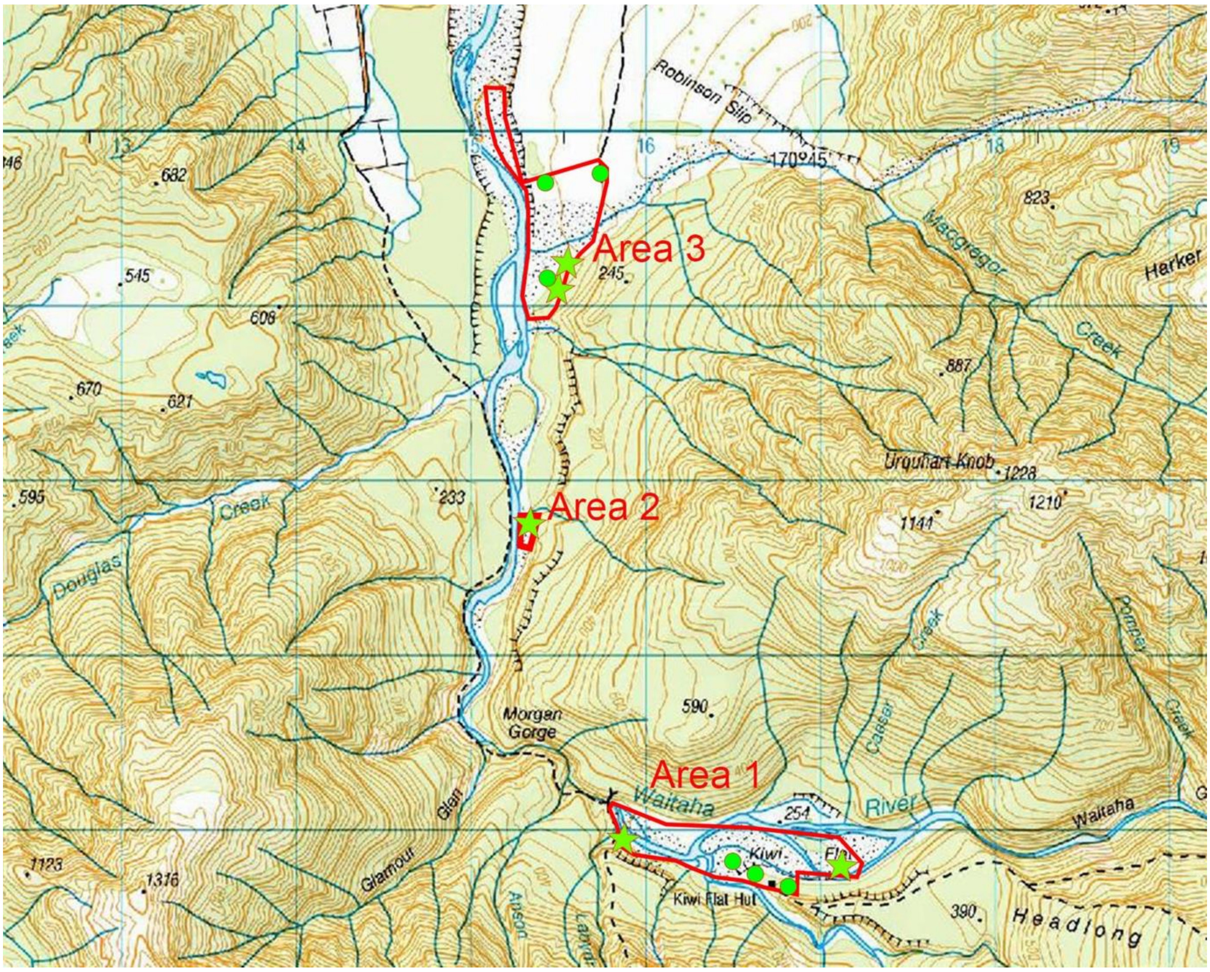

Figure 2: The three main areas of activity for terrestrial invertebrate surveys shown outlined in red (the areas are numbered to align with the table of invertebrates identified in **Appendix A**). Green stars show the specific locations of Malaise traps, while green circles mark positions of UV light traps. A fourth riparian area was surveyed immediately upstream of the highway bridge (manual collecting techniques only).

2.16 We also reviewed recent eDNA data gathered from the Waitaha River (refer to EOS Ecology, 2025 Waitaha Hydro Scheme: Assessment of environmental effects – Freshwater Ecology (**Freshwater Ecology Report**)), which includes some additional information on terrestrial invertebrate species found in the Waitaha catchment.

Terrestrial Invertebrate Values Identified

2.17 The full results of the field survey, including which of the invertebrate survey areas the species were identified from is provided in **Appendix A**.

2.18 None of the terrestrial invertebrates identified from the survey are known to have a threat status under DOC's threat classification system (Townsend et al, 2008). In general, the invertebrate fauna surveyed is typical of wet, western South Island locations, and strongly related to the vegetation types present.

2.19 The invertebrate communities present have a high degree of natural integrity with relatively few adventive species present.

2.20 As expected, the terrestrial invertebrate communities found along the riparian margins of the Waitaha River, including Kiwi Flat and the open margins downstream from Morgan Gorge contain a range of species that specialise in such open and dynamic habitats, including three species of Therevidae and three species of tiger beetles (Coleoptera: Carabidae). Other riverine specialists include the large water spider (*Dolomedes aquaticus*). Apart from the Therevidae, the other riverine specialists found are all known to have wide distributions.

2.21 Specialist preparation and analysis of the Therevidae specimens indicate that all three are undescribed species in the large genus *Anabarhynchus*. One of these was only collected in the Kiwi Flat area (six specimens), another found on the boulder fields of Robinson slip/Macgregor Creek (one specimen), and the third was found both on sand banks at Kiwi Flat and just upstream of the State Highway bridge (one at each location).

2.22 While interesting that all three of the Therevidae species collected from the Waitaha River were undescribed species, it is not altogether surprising because there has been very little collecting of this family from Westland river systems generally, and we are still finding undescribed species from areas that have received much greater collecting effort, such as the Canterbury braided rivers.

2.23 The Therevidae tend to exploit highly specialised habitat types (e.g. Holston 2005) and several New Zealand species are currently known from single catchments or very restricted localities (Harris, 2006; Lyneborg, 1992) and as such, some of these species are listed as either "At Risk – Naturally Uncommon" or "Data Deficient" within the New Zealand Threat Classification System. It is possible that some, or all three of the Waitaha species are restricted to just a few river margins of Westland, but a lack of comparative surveys in adjacent catchments means we are indeed data deficient and cannot make assertions about the distribution of these species. They could also be quite widespread along the river margins on the western side of the southern alps.

2.24 Three species of tiger beetles were also collected from the riparian areas. *Neocicindela garnerae* was collected from the Kiwi Flat area and is found in open habitats throughout the South Island. *Zecicindela helmsi halli* was collected from both the Macgregor Creek area and upstream of the highway bridge. Records indicate that the *halli* subspecies of *Z. helmsi* is primarily a riparian specialist of West Coast rivers (Larochelle & Larivière, 2013). *Actenonyx bembidioides* is likely to be present over much of the length of the Waitaha riparian zone and is a common and widespread species of river margins.

2.25 Another Carabid ground beetle encountered was the large *Mecodema metallicum*, but this was found dead on the sand banks at Kiwi Flat and likely to have been a recent flood victim from the surrounding area. This species is common in forests on the West Coast of the South Island.

2.26 A total of 88 lepidopteran taxa were identified from the Waitaha survey. The moth fauna collected was typical of the West Coast region with most larval feeding guilds represented and none thought to have a particularly restricted distribution. A fern-feeding geometrid moth, *Paradetis porphyrias*, was of interest because it is taxonomically isolated and not often collected, although thought to be widespread in high-rainfall forested areas, such as the West Coast. A North Island understory leafroller, *Epalxiphora axenana* (Tortricidae) was an interesting find from the Macgregor Creek area. It is thought to have been transported to the South Island, probably on leafy horticultural stock and garden shrubs. It was discovered in the Taramakau Valley in the mid-1980s, and later confirmed in Golden Bay, and West Coast localities from Karamea to Westport. The Waitaha Valley record is the most southerly to date and extends its known range even further.

2.27 The Lepidoptera collected from Kiwi Flat included a range of species that are specifically associated with toe toe (*Austroderia* spp.) and native broom (*Carmichaelia odorata*), which are dominant plant species on the riparian zones in this area. This includes two *Dipaustica* species, *Tmetolophota arotis* (Noctuidae), *Anisoplaca ptyoptera* (Gelechiidae), and *Pseudocoremia melinata* (Geometridae). Two psyllid bug species, *Psylla carmichaeliae* and *Trioza subvexa* are also associated with the native brooms. Butterflies in the area include the glade copper (*Lycaena feredayi* complex) and boulder copper (*L. boldenarum*), both of which breed on *Muehlenbeckia* species.

2.28 No tree weta (*Hemideina* sp.) were detected during the surveys, and a discussion with the farmer that runs the adjacent dairy farm, indicates a very low abundance of weta, as he could not remember ever seeing one in firewood or elsewhere on that property. However, the Waitaha is within the known range of the Wellington tree weta (*H. crassidens)*, so it is quite probable that more dedicated searching of the forest environments would have found them. The West Coast bush weta (*H. broughi*) is not thought to occur as far south as the Waitaha. The eDNA survey also detected the presence of a cave weta species, *Talitropsis sedilloti*, which is a common forest species found throughout much of New Zealand.

2.29 Bush giant dragonflies (*Uropetela carovei*) were seen on forest margins of the Macgregor Creek area. The larvae live in holes in wet soils on shaded banks, rather than in bodies of water as other dragonflies do. Dozens of huhu beetles (*Prionoplus reticularis*) were collected in light traps at Kiwi Flat, and a large sheetweb spider (*Cambridgea* sp.) observed on a broom plant in the same area. While these are not unexpected finds, the prevalence of large-bodied native invertebrates is further indicative of the natural integrity of this area.

2.30 Another indicator of natural integrity are low numbers of adventive species, and notable by their absence in a February survey were European common wasps, *Vespula vulgaris.* These invasive social insects are major pests in many areas of the South Island, but the lack of honeydew beech forest in the Waitaha area would not be favourable for supporting large populations of wasps. Some other common introduced species (e.g. bumblebees) were also in relatively low abundance.

Significance of Values Assessment

2.31 I have reviewed the relevant plans and policy documents that provide guidelines to assessing values of significance for terrestrial invertebrate fauna. These documents are the National Policy Statement for Indigenous Biodiversity (**NPS-IB**), the Regional Policy Statement (**RPS**), the Westland District Plan (**WDP**), the proposed Te Tai o Poutini Plan (**TTPP**) and the West Coast Conservation Management Strategy 2010-2020 (**CMS**).

2.32 My interpretation of these documents in respect to environmental consents of the Scheme largely follows that provided in the **Terrestrial Fauna Report** for other indigenous fauna. The RPS, WDP, TTPP and CMS present various criteria and policy statements for determining the significance of habitat for terrestrial fauna. Although there are a variety of approaches and language used amongst the documents, the assessment criteria can be organised into a framework of eight components. This framework is provided in **Appendix B** and was the framework used in assessing the significance of terrestrial invertebrate values both currently and as a potential result of the Scheme.

2.33 The NPS-IB is not relevant to the Scheme as it specifically exempts projects for renewable energy generation under subclause 1.3(3): *"Nothing in this National Policy Statement applies to the development, operation, maintenance or upgrade of renewable electricity generation assets and activities and electricity transmission network assets and activities. For the avoidance of doubt, renewable electricity generation assets and activities, and electricity transmission network assets and activities, are not "specified infrastructure" for the purposes of this National Policy Statement*." However, the NPS-IB sets out criteria for identifying significant indigenous vegetation or significant habitats of indigenous fauna in much the same way as in the RPS and WD, therefore the NPS-IB has been included in my significance assessments by default.

2.34 For the purpose of assessing the significance of terrestrial invertebrate values the "existing environment" includes the downstream riparian habitat that could potentially be affected by the Scheme, not just the physical footprint.

2.35 My assessment is that the terrestrial invertebrate values of the existing environment are significant on the basis of habitat, representativeness, distinctive communities, diversity, connectivity, and context. This is mostly due to riparian river habitats and the specialist invertebrate communities they contain being intrinsically uncommon, as they exist only as narrow ribbons in the landscape.

2.36 A detailed analysis of the significance of the terrestrial invertebrate communities using the framework of the relevant Regional and District policies is provided in **Table 1**.

Table 1: Assessment of significance of terrestrial invertebrate values within the framework of criteria provided in Appendix B.

ASSESSMENT CRITERIA	SIGNIFICANCE	REASONING
HABITAT	Significant	The existing environment includes largely unmodified natural habitat for indigenous terrestrial invertebrates, including riparian river margins that are intrinsically rare in the environment as they occur only as narrow ribbons on the landscape and contain invertebrate species that are specifically adapted to live in them.
REPRESENTATIVENESS	Significant	The terrestrial invertebrate communities of the Waitaha have a high ecological integrity with relatively few adventive species and are representative of the ecological region and district.
THREATENED SPECIES	Possible Significance	No terrestrial invertebrates of known conservation threat status have been identified from the footprint, but 3 undescribed species of *Anabarhynchus* (Diptera: Therevidae) were collected from riparian margins of the Waitaha. This genus is known to include species with limited distribution that are naturally uncommon and breed in very discreet habitat types (such as the sand deposits and loose substrates deposited on the margins of rivers).
DISTINCTIVE SPECIES	Low significance	The area is not known to be at the limits of distribution for any terrestrial invertebrates, except possibly the moth *Epalxiphora axenana*, although its distribution in the South Island may be human mediated. The large areas of contiguous natural vegetation in the Wilberg ED indicate the forest terrestrial invertebrate communities will be well-distributed in the region. The distribution of the *Anabarhynchus* species discussed above is unknown and may also be found in neighbouring catchments or western South Island rivers generally.
DISTINCTIVE COMMUNITIES	Significant	The riparian river habitats and the specialist invertebrate communities within them are intrinsically restricted in the environment, existing as narrow ribbons on the landscape.
DIVERSITY	Significant	The riparian river habitats and the specialist invertebrate communities within them are intrinsically uncommon in the environment and therefore an important component of biological diversity in the district, region and nationally.
CONNECTIVITY	Significant	The vegetated parts of the footprint are part of a large and contiguous area of indigenous vegetation with a high degree of natural integrity, while the riparian margins of the Waitaha are part of a network of river habitats in the district and region and is also a perfect example of a “mountains to sea” sequence of ecosystems.
CONTEXT	Significant	The Waitaha River has largely undisturbed examples of riparian river habitats for indigenous terrestrial invertebrates that are intrinsically restricted in the environment and form part of a network of these ribbon habitats in the District and Region.

3. ENVIRONMENTAL EFFECTS ASSESSMENT

3.1 There will be some destruction of natural invertebrate habitat (see **Project Description** and the **Vegetation Report**) as a direct result of road, transmission and facility construction. This will inevitably result in the death of some invertebrates living in those areas, especially the slow-moving ones. However, the impact of this habitat loss on invertebrate values as a whole is mitigated by the extensive areas of contiguous habitat that is adjacent to the Scheme's footprint, meaning it is very unlikely that any terrestrial invertebrate species or assemblages occurring within the footprint will be threatened by the Scheme's construction.

3.2 The actual effect of habitat clearance will extend beyond the area of clearance due to edge effects. This is especially likely where taller forest is abruptly exposed to an open edge. This will cause an increase of daily fluctuations in climatic variables such as wind speed, temperature and humidity in the exposed forest, with the extent of the fluctuation depending in part on the degree of exposure to climate of the new edge (Norton, 2002).

3.3 There have been few studies in New Zealand on the effects of edges on forest invertebrates and those that have been undertaken have usually considered functional groups, rather than individual species. Nonetheless, even within these large groupings, impacts such as a reduced number of species have been detected up to 40 meters into the forest from the edge (Norton, 2002). In a major study where individual beetle species were considered, Ewers and Didham (2008) found evidence for edge effects as much as 1km into forest fragments. Forest litter species, e.g. indigenous microsnails, can be particularly vulnerable to the desiccating effects of edges (Simcock et al. 2022)

3.4 Clearing of vegetation within the project footprint is also likely to increase the quantity of dead wood lying on the edges of adjacent habitats. This will lead to an increase in invertebrate species specialising in the use of dead wood in the short to medium term. This effect occurs naturally in indigenous forests after such events as major windfalls and the invertebrate community will ultimately adjust back to a more normal makeup as the available resource is used up.

3.5 There will also be disturbance to some of the riparian river habitats, principally through initial backwater effects at Kiwi Flat, but also construction activities near the Power Station and for access roads. River systems are naturally dynamic and subject to significant changes, and the riparian invertebrates that live in those dynamic systems are generally well adapted to cope with disruption. Therefore, it is unlikely that the riparian invertebrate communities present alongside the Waitaha River will suffer any long-term effects from the construction phase of the Scheme.

3.6 More critical for riparian communities would be if the operation of the Scheme created long-term changes to flood events and prevented deposition of sands and sediments within the riparian zone that species such as the *Anabarhynchus* spp. depend on. However, the design of the Scheme will have a minimal effect on the dynamics of flood events, and the sediment report confirms there will be no significant changes to the sediment flows during those events, allowing for normal deposition of silt, sands and fine gravels to occur (refer Hicks, M. 2025, Waitaha Hydro Scheme: Assessment of environmental effects - Sediment (**Sediment Report**)). Flood events are also important for maintaining the character of riparian habitats by preventing excessive vegetation growth from stabilising the loose sandy substrates.

3.7 The lichen encrusted boulder fields near the mouth of Macgregor Creek (created by the massive 1903 Robinson Slip) represent a different riparian habitat that is being utilised by a range of indigenous invertebrates that inhabit open areas. The construction of the access road across this area will affect a narrow band of this habitat, but there are extensive areas of this boulder field on either side of the proposed road route and there are already vehicle tracks crossing this area. The characteristic invertebrates of this boulder field habitat (grasshoppers, stiletto flies, wolf spider etc) were highly mobile species and it is unlikely that an improved road through that area will create a significant barrier to their movement.

3.8 One of the primary threats to invertebrate communities in riparian river habitats is colonisation by weed species, which has the effect of binding the loose sandy substrates that these specialist invertebrate species are adapted to. This threat exists with or without the Scheme, and during field investigations we noted an extensive area of Canada thistle (*Cirsium arvense*) growing on riparian sand banks near the confluence of Whirling Waters and Waitaha River.

3.9 There will be an increased risk of new weeds and invasive invertebrates (e.g. ants, molluscs and millipedes) establishing in natural habitat because of vehicles and equipment being brought into the area for project construction and ongoing maintenance. The risk of invasive invertebrate species being established on site is also increased if plants are grown in nurseries with no biosecurity steps in place, as invasive species can have life stages hiding inside the pots.

3.10 As discussed in the **Terrestrial Fauna Report**, human activity and roadways can also lead to increased activity from pest mammals, and many of these pests are also predators of large-bodied indigenous invertebrates. Rats, mice and hedgehogs are particularly problematic for invertebrates.

3.11 Artificial lighting during hours of darkness can be an issue for insects attracted to light, causing significant behavioral changes, preventing reproduction of species with short-lived adult flight periods, and death. This effect is especially strong when artificial light sources are emitting light in the blue to ultraviolet spectrum. The **Project Description** confirms there will be no lighting installed on the Power Station access road and transmission corridor. The only artificial (non-UV) lighting will be at the Power Station and at the Headworks. These will normally be turned off and only switched on in the unlikely event that someone needs to attend the site for maintenance purposes after dark to address a problem. The lighting will be designed to maximise the downward light output ratio and avoid any upward light/light scatter. The lighting will likely (at most) be turned on for only a brief period (an hour or so) maybe two or three times per year. Where practicable lighting will be colour rated to 3000k or lower to avoid the emission of blue light.

3.12 It is considered that the level of effect of the Scheme on terrestrial invertebrates without any mitigation ranges from less than minor to minor. With mitigation and time, effects on terrestrial invertebrates can be held to less than minor.

3.13 Importantly, it is considered that even without mitigation the Scheme will not change the significance of the terrestrial invertebrate values of the Waitaha because:

(a) the Scheme has a small footprint in the context of the surrounding contiguous habitat, and

(b) The Scheme still allows for the stochastic high flood events downstream of the Scheme that are critical to maintaining and creating the open, sandy and silty patches of habitat that are important to riparian specialists such as stiletto flies and tiger beetles.

3.14 The potential effects of the Scheme on terrestrial invertebrates is tabulated in **Table 2** below.

4. ADVERSE EFFECTS MANAGEMENT RECOMMENDED

4.1 A key mitigation for the Scheme is to keep the footprint of habitat disturbance as small as possible, and this does appear to have been a key factor in the design of the project, with a ca. 6.8 ha of indigenous vegetation disturbed during the construction phase, reducing to ca. 4.5 ha in the operational phase.

4.2 Part of reducing the overall effect of the Scheme on terrestrial invertebrates is to manage edge effects where taller indigenous forest vegetation has been cleared. The use of some dense plantings of site-appropriate species to create an armoured edge with adjacent forest habitat helps to reduce air movement through the exposed edge. Edge planting, where appropriate, is recommended to encourage natural revegetation of edges to occur more quickly.

4.3 Reducing the use of artificial lights at night to a minimum is already proposed in the Project Description and is an important mitigation for effects on insects. Where some lighting is required, the use of lights that do not emit wavelengths in the blue – UV spectrum will be very beneficial in further reducing the effect of lights on insects and is already proposed in the Project Description.

4.4 Some good biosecurity practices will assist in retaining invertebrate communities of high natural integrity. Some of these have been discussed in the vegetation report in respect to weed control (**Vegetation Report**), and in the T**errestrial Fauna Report** in respect to pest mammal species and these will benefit terrestrial invertebrate communities. Reducing the risks of invasive invertebrates getting established around the Project Site should also be considered. Some practical biosecurity steps include:

- Making sure machinery and materials that have been stored outside and transported to the Project Site are clean of weed seeds and checked for potential invasive invertebrates such as ant and wasp nests.
- Minimise human food waste storage on site that can attract pests including rodents and wasps.
- Any nursery-raised plants being transported to site for rehabilitation should be pre-treated with insecticide and removed from planter pots before transporting to the rehabilitation site.

4.5 Further detail of the proposed management for the Scheme's adverse effects is provided in **Table 2** below.

Table 2: Environmental effects on terrestrial invertebrate values associated with each phase of the Scheme (construction and operational), the suggested approaches to manage these effects, and effects after management measures have been applied.

Environmental effects	Assessment of effects	Recommended effects management	Residual effects post mitigation
CONSTRUCTION EFFECTS			
Habitat destruction	Less than minor		Less than minor. The proposed footprint is relatively small in relation to the surrounding habitat available to terrestrial invertebrates.
Edge effects	Minor	Allow for rehabilitation of indigenous vegetation along the margins of cleared forest areas as fast as practicable, predominately through natural re-generation, with supplementary planting of appropriate species to be undertaken where practical to enhance the speed of revegetation.	Less than minor with time. Edge effects will reduce over years as denser vegetation growth occurs on edges to create an armoured front that helps reduce the extent of environmental effects into adjacent taller habitat.
Habitat fragmentation	Less than minor		Less than minor. The least mobile species with specialised habitat requirements (e.g. native litter micro-snails) will find roads a barrier to movement, but there remains extensive contiguous habit for such species and creating armoured edges to reduce edge effects will minimise the impact on populations of these species.
Death of individuals	Less than minor		Less than minor. The proposed clearance is restricted to the minimum required and the area of habitat affected will be relatively small in relation to the surrounding habitat available to terrestrial invertebrates. Although it is inevitable that invertebrate

			individuals will perish as a result of construction, the impact at the population level will be negligible due to the large areas of contiguous habitat available to them.
Lighting effects	Less than minor		Less than minor. The Project Description outlines the measures to reduce the impact of lighting such as not installing lights on the access road and minimising light sources that emit shorter wavelengths (blue-ultraviolet). This will greatly reduce the impact on insects.
Invasive species	Minor	Keep food waste on site to a minimum as this may attracts pest species (e.g. rodents and wasps) that are also predators of native invertebrates.	Less than minor. Proposed biosecurity precautions will reduce the risk of new invasive species establishing on site. The area is already prone to some invasive weeds, and including on-site weed control may also have a beneficial effect, as stabilisation of loose sandy substrates by weeds is an existing threat to riparian invertebrate habitats.

OPERATIONAL EFFECTS			
Permanent habitat loss from infrastructure	Less than minor		Less than minor. Given the relatively small size of the proposed Scheme footprint in comparison to the extent of contiguous terrestrial invertebrate habitat in the area, the long-term effect is negligible.
Change to sediment flow for riparian river habitats	Less than minor	.	Less than minor. The Sediment Report predicts no significant effects to the downstream flow of sediments, especially during flood events, which is important for the ongoing viability of riparian river habitats for invertebrates.
Lighting effects	Less than minor		Less than minor. The Project Description already discusses steps to reduce the impact lighting, such as not installing lights on the access road and minimising light sources that emit shorter wavelengths (blue-ultraviolet). This will greatly reduce the impact on insects.
Habitat fragmentation	Less than minor		Less than minor. The least mobile species with specialised habitat requirements (e.g. native litter micro-snails) will continue to find roads a barrier to movement, but there remains extensive contiguous habit for such species and creating armoured edges to reduce edge effects will minimise the impact on populations of these species.

Invasive species	Less than minor (positive and negative)	Keep food waste to a minimum and maintain weed control operations in the area, particularly within the riparian margins.	Less than minor. The risk of invasive species incursion onto the site will be reduced post-construction, with fewer vehicles and materials being brought onto site. Ongoing weed control, particularly in riparian river habitat is potentially a beneficial effect.

5. CONCLUSIONS

5.1 The terrestrial invertebrate found in the Waitaha Valley are largely typical of the region and have high natural integrity with relatively few adventive species. The riparian margins of the Waitaha River contain communities of terrestrial invertebrates that are adapted to these highly dynamic habitats, which are created and maintained by deposition of sand and silt during flood events. Such habitats are intrinsically uncommon as they occur only as narrow ribbons on the landscape.

5.2 No terrestrial invertebrate species of known conservation threat were identified in the area, but three undescribed species of *Anabarhynchus* (Diptera: Therevidae) were collected from the riparian habitats of the Waitaha, and this large genus has a tendency for restricted distribution patterns. However, a lack of historic collecting of this group in the region means we simply do not know if they are limited to a few catchments or are more widespread on West Coast river systems.

5.3 The terrestrial invertebrate values of the area are significant under the criteria of the RPS, WDP, TTPP and CMS policy documents, largely because of the intrinsically uncommon riparian margin communities, but also because the invertebrate habitats generally score highly for representativeness and connectivity. The Scheme will not change the significance of terrestrial invertebrate values in the area.

5.4 The main effects of the Scheme on terrestrial invertebrates will be habitat loss, edge effects into adjacent indigenous forest habitat, habitat fragmentation through creation of the access roads, potential effects of lights at night on insect communities, and increased vulnerability to invasive species. However, most of these effects will be less than minor due to:

(a) the relatively small size of the footprint - especially in the context of the large amount of contiguous habitat available to terrestrial invertebrate communities in the area;

(b) where forest clearance is required, all areas not required for the ongoing operation or maintenance of the Scheme will be rehabilitated;

(c) ensuring there are no significant effects to the downstream flow of sediments, especially during flood events, which is important for the ongoing viability of riparian river habitats for invertebrates;

(d) avoiding the use of lighting on the Power Station access road and transmission corridor, minimising the use of lighting at night during elsewhere during construction and operations as far as practicable and choosing light sources that minimise blue-UV wavelengths;

(e) undertaking basic biosecurity precautions to reduce the risk of invasive weeds and pests establishing and/or proliferating in the area.

Mitigation of potential minor effects of the Scheme on terrestrial invertebrates is achievable through:

(f) rehabilitation of cleared vegetation predominately through natural re-generation, and supplementary planting where practical of appropriate species to create an armoured edge to the adjacent forest habitat to reduce the extent of edge effects; and

(g) keeping food waste on site to a minimum as this may attracts pest species (e.g. rodents and wasps) that are also predators of native invertebrates to reduce the risk of new invasive species establishing on site.

5.5 The Scheme is predicted to have a negligible impact on downstream flood dynamics, and so the natural maintenance and creation of important riparian micro-habitats for terrestrial invertebrates will not be affected.

5.6 Simply considering the relatively small footprint of the Scheme within the surrounding environment, and the fact it will have no significant impacts on downstream flood dynamics, results in the effects of the Scheme on terrestrial invertebrate values being minor at worst without mitigation. The addition of some other basic mitigations to reduce the risk of other potential impacts would result in the overall effects reducing to **less than minor**.

6. APPENDIX A: INVERTEBRATE SURVEY RESULTS

Table 3: List of terrestrial invertebrates identified from the Waitaha River surveys.

Area codes (see **Figure 2** map): 1. Kiwi Flat,
2. Power Station area
3. Macgregor Creek/Robinson Slip
4. Waitaha Bridge

			Areas			
Order	**Family**	**Genus + Species**	**1**	**2**	**3**	**4**
Araneae	Lycosidae	*Anoteropsis* sp.			✓	✓
	Pisauridae	*Dolomedes aquaticus*			✓	
		Dolomedes minor	✓		✓	
	Desidae	*Cambridgea* sp.	✓			
	Tetragnathidae	Indet.	✓		✓	
	Thomisidae	*Diaea* sp.	✓		✓	
		Sidymella sp.			✓	
Coleoptera	Carabidae	*Actenonyx bembidioides*	✓		✓	
		Mecodema metallicum	✓			
		Neocicindela garnerae	✓			
		Zecicindela helmsi halli			✓	✓
	Cerambycidae	*Prionoplus reticularis*	✓			
	Scarabeidae	*Pyronota* sp.	✓			
		Odontria sp.	✓		✓	
		Sericospilus sp.				✓
	Oedemeridae	?*Baculipalpus mollis*	✓			
		Parisopalpus thoracicus	✓			
		?*Thelyphassa nemoralis*			✓	
	Anthribidae	*Phymatus cucullatus*	✓			
Diplopoda	Sphaerotheriidae	*Procyliosoma delacyi* ssp.*striolatum*	✓		✓	
Diptera	Agromyzidae	*Cerodontha angustipennis*	✓			
	Anisopodidae	*Sylvicola notatus*	✓		✓	
	Polleniidae	*Pollenia* sp.		✓		
	Cecidomyidae	Indet.		✓		
	Chironomidae	Indet.	✓	✓	✓	
	Dolichopodidae	Indet.	✓	✓		
	Empididae	Indet.	✓	✓	✓	
	Keroplatidae	*Macrocera antennatis*	✓		✓	
		Pyrtaula cf. *agricolae*		✓		
		Pyrtaula punctifusa		✓		
		Rypatula brevis		✓		
	Limoniidae	*Amphineurus* sp.	✓		✓	

			Areas			
Order	**Family**	**Genus + Species**	**1**	**2**	**3**	**4**
		Austrolimnophila argus		✓	✓	
		Dicranomyia (Zelandoglochina) huttoni			✓	
		Dicranomyia sp.	✓			
		Discobola dohrni			✓	
		Gynoplistia sp.	✓		✓	
		Molophilus pulcherrimus			✓	
		Molophilus sp.	✓	✓	✓	
		Paralimnophila skusei	✓			
		Rhabdomastix sp.			✓	
	Muscidae	Indet.	✓		✓	
	Mycetophilidae	*Allocotocera crassipalpis*			✓	
		Aneura nitida			✓	
		Brevicornu sp.		✓	✓	
		Exechia cf. *biseta*	✓			
		Manota sp.			✓	
		Mycetophila colorata		✓	✓	
		Mycetophila crassitarsis		✓		
		Mycetophila fagi		✓	✓	
		Mycetophila filicornis		✓		
		Mycetophila furtiva		✓		
		Mycetophila nitens grp.			✓	
		Mycetophila phyllura			✓	
		Mycetophila subspinigera		✓		
		Mycetophila sp.	✓			
		Platurocypta sp. 1		✓	✓	
		Tetragoneura sp.	✓	✓	✓	
		Zygomyia sp.		✓	✓	
	Phoridae	Indet.		✓	✓	
	Psychodidae	Indet.			✓	
	Sciaridae	Indet.	✓	✓	✓	
	Simuliidae	*Austrosimulium* sp.	✓	✓	✓	✓
	Syrphidae	*Melanostoma fasciatum*	✓	✓	✓	
	Tachinidae	*Pales* sp.	✓			
		Procissio valida			✓	
		Protohystricia cf. *gourlayi*			✓	
	Tanyderidae	*Mischoderus forcipatus*	✓			
	Tephritidae	*Austrotephritis plebeia*		✓		
	Therevidae	*Anabarhynchus* nov. sp. 1	✓			
		Anabarhynchus nov. sp. 2	✓			✓

			Areas			
Order	**Family**	**Genus + Species**	**1**	**2**	**3**	**4**
		Anabarhynchus nov. sp. 3			✓	
	Tipulidae	*Aurotipula* sp.	✓			
		Leptotarsus sp.	✓		✓	
Hemiptera	Psyllidae	*Psylla carmichaeliae*	✓			
	Triozidae	*Trioza subvexa*	✓			
Hymenoptera	Apidae	*Bombus terrestris*			✓	
	Braconidae	*Aleiodes*		✓		
		Aphidiinae sp.			✓	
		Ascogaster elongata		✓		
		Aspilota		✓	✓	
		Blacinae sp. 1	✓			
		Blacinae sp. 2			✓	
		Doryctinae sp.			✓	
		Glyptaplanteles sp. 1	✓	✓	✓	
		Glyptaplanteles sp. 2	✓			
		Helconinae sp.			✓	
		Hormiinae sp. 1		✓		
		Hormiinae sp. 2			✓	
	Colletidae	*Leioproctus* sp.	✓			
	Crabronidae	*Tachysphex nigerrimus*			✓	
	Diapriidae	*Spilomicrus* sp.	✓			
	Figitidae	*Anacharis zealandica*			✓	
		Kleidotoma			✓	
	Formicidae	*Chelaner antarcticus* complex	✓		✓	✓
		Prolasius advena	✓		✓	
	Gasteruptiidae	*Pseudofoenus*	✓			
	Halictidae	*Lasioglossum maunga*	✓	✓	✓	
	Ichneumonidae	*Aclosmation*			✓	
		Aucklandella sp.1		✓		
		Aucklandella sp.2		✓		
		Aucklandella sp.3		✓		
		Aucklandella sp.4			✓	
		Aucklandella sp.5		✓		
		Aucklandella sp.6	✓			
		Campoletis			✓	
		Campoplex sp.1		✓	✓	
		Campoplex sp.2		✓		
		Cryptinae genus C?		✓		
		Diadegma			✓	

			Areas			
Order	**Family**	**Genus + Species**	**1**	**2**	**3**	**4**
		Helictes			✓	
		Lissonota		✓	✓	
		Mesochorus	✓	✓	✓	
		Netelia ephippiata	✓		✓	
	Pompilidae	*Priocnemis (Trichocurgus) conformis*		✓		
		P. monachus		✓		
		P. carbonarius female	✓			
		P. ordishi male		✓	✓	
		P. crawi? male		✓		
		Sphictostethus fugax		✓		
	Proctotrupidae	sp			✓	
	Sparasionidae	*Archaeoteleia novaezealandiae*			✓	
	Trichogrammatidae	sp			✓	
	Chalcidoidea	sp.1			✓	
		sp.2			✓	
		sp.3	✓			
		sp.4		✓		
		sp.5		✓		
		sp.6	✓			
		sp.7			✓	
		sp.8			✓	
		sp.9			✓	
Lepidoptera	Noctuidae	*Agrotis ipsilon*			✓	
		Ichneutica moderata	✓		✓	
		Ichneutica virescens	✓		✓	
		Ichneutica epiastra	✓		✓	
		Ichneutica sp. 'reddish'			✓	
		Feredayia graminosa	✓			
		Ichneutica agorastis	✓			
		Ichneutica mutans	✓		✓	
		Ichneutica nullifera	✓			
		Ichneutica oliveri	✓		✓	
		Ichneutica cf *pelanodes*			✓	
		Ichneutica plena			✓	
		Ichneutica rubescens	✓		✓	
		Physetica sequens			✓	
		Meterana cf *ochthistis*	✓			
		Ichneutica arotis	✓			
		Ichneutica atristriga	✓			

			Areas			
Order	**Family**	**Genus + Species**	**1**	**2**	**3**	**4**
		Ichneutica micrastra	✓			
		Ichneutica purdii	✓			
		Ichneutica semivittata	✓			
	Erebidae	*Rhapsa scotosialis*			✓	
		Schrankia costaestrigalis			✓	
	Geometridae	*Asaphodes camelias*			✓	
		Asaphodes sp.	✓			
		Austrocidaria anguligera	✓		✓	
		Austrocidaria callichlora	✓		✓	
		Austrocidaria cedrinodes	✓			
		Chloroclystis filata	✓		✓	
		Chloroclystis inductata	✓			
		Chloroclystis sp.	✓			
		Cleora scriptaria	✓		✓	
		Declana floccosa	✓		✓	
		Declana junctilinea	✓			
		Elvia glaucata	✓			
		Epiphryne undosata	✓		✓	
		Epyaxa rosearia	✓		✓	
		Gellonia dejectaria	✓		✓	
		Gellonia pannularia	✓		✓	
		Helastia cinerearia	✓		✓	
		Helastia corcularia	✓		✓	
		Homodotis megaspilata			✓	
		Hydriomena purpurifera			✓	
		Hydriomena rixata			✓	
		Ischalis fortinata	✓		✓	
		Ischalis nelsonaria			✓	
		Ischalis variabilis			✓	
		Paradetis porphyrias			✓	
		Pasiphila bilineolata	✓			
		Pasiphila dryas	✓			
		Pasiphila melochlora	✓			
		Pseudocoremia melinata	✓			
		Pseudocoremia productata			✓	
		Pseudocoremia rudisata			✓	
		Pseudocoremia suavis	✓		✓	
		Sestra flexata	✓		✓	
		Sestra humeraria			✓	

			Areas			
Order	**Family**	**Genus + Species**	**1**	**2**	**3**	**4**
		Xyridacma alectoraria	✓			
		Unidentified Geometridae spp.	✓			
	Crambidae	*Orocrambus flexuosellus*			✓	
		Orocrambus ramosellus	✓			
		Orocrambus siriellus	✓		✓	
		Orocrambus xanthogrammus	✓		✓	
		Scoparia pura			✓	
		Scopariinae species (>5 species)	✓		✓	
	Pyralidae	*Diplopseustis perieresalis*	✓			
		Patagoniodes farinaria	✓		✓	
	Lycaenidae	*Lycaena boldenarum*			✓	
		Lycaena feredayi complex	✓			
	Tortricidae	*Apoctena conditana*			✓	
		Capua intractana	✓		✓	
		Cryptaspasma querula			✓	
		Ctenopseustis herana	✓		✓	
		Cydia succedana			✓	
		Epalxiphora axenana			✓	
		Leucotenes coprosmae			✓	
		Planotortrix notophaea			✓	
		Pyrgotis plagiatana			✓	
	Elachistidae	*Elachista* sp.			✓	
	Oecophoridae	sp.	✓		✓	
	Oecophoridae s.l.	*Hierodoris illita*			✓	
		Izatha acmonias	✓			
		Izatha huttonii			✓	
	Gelechiidae	*Anisoplaca ptyoptera*	✓			
	?Gelechiidae	sp.			✓	
	Glyphypterigidae	sp.			✓	
	Yponomeutidae	*Kessleria copidota*			✓	
	Gracillariidae	*Caloptilia linearis*			✓	
	Tineidae	*Sagephora phortegella*			✓	
	Hepialidae	*Wiseana copularis*	✓		✓	
		Wiseana umbraculata	✓		✓	
Odonata	Petaluridae	*Uropetela carovei*			✓	
Orthoptera	Acrididae	*Phaulacridium marginale*			✓	

7. APPENDIX B: FRAMEWORK OF ASSESSMENT CRITERIA USED FOR DETERMINING THE SIGNIFICANCE OF TERRESTRIAL INVERTEBRATE VALUES AS DERIVED FROM THE RELEVANT PARTS OF REGIONAL AND DISTRICT POLICY DOCUMENTS

ASSESSMENT CRITERIA	RPS (Policy 7.1 (a), Appendix 1) and TTPP (Policy ECO-P1 (2))	WDP (Policy 4.9C)	CMS (Policies 3.3.3.2 and 3.3.3.5 for management of threatened species)
HABITAT	**Policy 1(a)**: Areas of significant indigenous vegetation and significant habitats of indigenous fauna. **TTPP: ECO-04**: *to maintain the range and diversity of ecosystems and indigenous species found on the West Coast/Te Tai o Poutini*	**Policy 4.9 (b)**: *the protection and enhancement of areas of significant indigenous vegetation and habitats of indigenous fauna, and outstanding natural features in the district will be encouraged*	**Policy 3.3.3.2 (d)**: *maintain populations of indigenous species, habitats and ecosystems with unique or distinctive values.*
REPRESENTATIVENESS	**App. 1(a). Representativeness**: *(a) Indigenous vegetation or habitat of indigenous fauna that is representative, typical or characteristic of the indigenous biological diversity of the relevant ecological district.* *(b) Indigenous vegetation or habitat of indigenous fauna that is a relatively large example of its type within the relevant ecological district.*	**(ii) Representativeness** *The area is one of the best examples of an association of species which is typical of its ecological district.*	**Representativeness, Diversity** **Policy 3.3.3.2 (c)**: *maintain representative examples of the full range of indigenous ecosystems.* **Policy 3.3.3.2 (g)**: *maintain the ecological integrity of indigenous ecosystems consistent with the purposes for which the land is held.*
THREATENED SPECIES	**App. 2(b) Rarity/Distinctiveness** *Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened, at risk, or uncommon, nationally or within the relevant ecological district.*	**(vi) Threat** *The area supports an indigenous species or community of species which is threatened within the ecological district or threatened nationally.*	**Threatened species and habitat** **Policy 3.3.3.2 (e):** *achieve recovery of threatened indigenous species (including their genetic integrity and diversity) and restore their habitats where necessary.*
DISTINCTIVE SPECIES	**App. 2(c) Rarity/Distinctiveness** *The site contains indigenous vegetation or an indigenous species at its distribution limit within the West Coast region or nationally.*	**(iii) Distinctiveness** *The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district.*	**Representativeness and diversity** **Policy 3.3.3.2 (d)**: *maintain populations of indigenous species, habitats and ecosystems with unique or distinctive values.*
DISTINCTIVE COMMUNITIES	**App. 2(d) Rarity/Distinctiveness** *Indigenous vegetation or an association of indigenous species that is distinctive, of restricted occurrence, occurs within an originally rare ecosystem, or has developed as a result of an unusual environmental factor or combinations of factors.*	(iii) **Distinctiveness** *The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district.*	**Representativeness and diversity** **Policy 3.3.3.2 (d)**: *maintain populations of indigenous species, habitats and ecosystems with unique or distinctive values.*

ASSESSMENT CRITERIA	RPS (Policy 7.1 (a), Appendix 1) and TTPP (Policy ECO-P1 (2))	WDP (Policy 4.9C)	CMS (Policies 3.3.3.2 and 3.3.3.5 for management of threatened species)
DIVERSITY	**App. 3 (a) Diversity and Pattern** *Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of indigenous ecosystem or habitat types, indigenous taxa, or has changes in species composition reflecting the existence of diverse biological and physical features or ecological gradients.*	(iii) **Distinctiveness** *The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district.*	**Diversity** **Policy 3.3.3.2 (a):** *prevent the loss of indigenous species and the full range of their habitats and ecosystems.*
CONNECTIVITY	**App. 4 (a) Ecological Context** *Vegetation or habitat of indigenous fauna that provides or contributes to an important ecological linkage or network, or provides an important buffering function.*	**(v) Connectivity** *The area is connected to one or more other significant areas in a way (including through ecological processes) which makes a major contribution to the overall value or natural functioning of those areas.*	**Diversity and viability** **Policy 3.3.3.2 (b)***: Maintain contiguous sequences of indigenous ecosystems (e.g. from mountains to sea).*
CONTEXT	**App. 4 (b) Ecological Context** *Indigenous vegetation or habitat of indigenous fauna that provides important habitat (including refuges from predation, or key habitat for feeding, breeding or resting) for indigenous species, either seasonally or permanently.*	**(ii) Representativeness, (iii) Distinctiveness & (vii) Migratory Species** *The area is one of the best examples of an association of species which is typical of its ecological district.* *The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district.* *An inter-tidal area or area of forest, wetland, lake, estuary or other natural habitat that is important for migratory species or for breeding, feeding or other vulnerable stages of indigenous species.*	**Diversity, Taonga Species and Habitat, Natural landscape character. Threatened species.** **Policy 3.3.3.2 (a)**: *prevent the loss of indigenous species and the full range of their habitats and ecosystems.* **Policy 3.3.3.2 (e)**: *achieve recovery of threatened indigenous species (including their genetic integrity and diversity) and restore their habitats where necessary.* **Policy 3.3.3.2 (f)**: *restore threatened indigenous ecosystems and connections between ecosystems where necessary.* **Policy 3.3.3.5 (3)**: *Work on threatened species should focus on preventing extinction and maintaining genetic diversity.*

8. APPENDIX C: REFERENCES

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