



# Ecological Monitoring and Management Plan

## Mahinerangi Wind Farm Stage 2

**Tararua Wind Power Limited**

Prepared by:

**SLR Consulting New Zealand**

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## Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	24 October 2025	Steve Rate with input from Boffa Miskell (MPCP, AviMP) and Tony Payne (LMP)	Hamish Dean Keren Bennett	

## Basis of Report

This report has been prepared by SLR on the instructions of our Client, in accordance with the agreed scope of work. It is intended to support the Client's application under the Fast Track Approvals Act 2024 and may be relied upon by the Expert Panel and relevant administering agencies for the purposes of assessing the application. While SLR has exercised due care in preparing this report, it does not accept liability for any use of the report beyond its intended purpose. Where information has been supplied by the Client or obtained from external sources, it has been assumed to be accurate unless otherwise stated.



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## 1.0 Introduction

Tararua Wind Power Limited (“TWP”), a fully owned subsidiary of Mercury NZ Limited, is progressing Stage 2 of the Mahinerangi Wind Farm which is to be known as “Puke Kapo Hau” (“the Project”, “Puke Kapo Hau” or “MWF Stage 2”).

The MWF is located on the eastern foothills of the Lammermoor Range, situated approximately 5 km north of Lake Mahinerangi and approximately 50 km west of Dunedin.

This document applies to Stage 2 and the earlier Ecological Monitoring and Management Plan remains relevant to Stage 1 (Appendix 2 in Kingett Mitchell Ltd 2006) and summarises protocols for managing potential adverse effects of construction and operation of Stage 2 of the wind farm on ecological values.

## 2.0 Objective

The Purpose of this Ecological Monitoring and Management Plan is to set out the practices and procedures to be adopted to ensure that all resource consent conditions relating to ecological monitoring and management are complied with. The Ecological Monitoring and Management Plan provides a framework for the individual management plans listed including but not limited to:

- Woody Weed Management Plan
- *Carex tenuiculmis* and *Epilobium chionanthum* Management Plan
- Rehabilitation Management Plan
- Water Quality Management Plan
- Native Fish Recovery Management Plan
- Wetland Monitoring and Management Plan
- Wetland and Aquatic Compensation Plan
- Avifauna Management Plan
- Lizard Management Plan
- Mammalian Pest Control Plan.

## 3.0 Woody Weed Management

The Woody Weed Management Plan (WWMP; SLR 2025a) will guide management of woody weeds during the development of Stage 2 of the wind farm and within the Wetland and Aquatic Compensation Sites (SLR 2025b). The WWMP is an update of the Mahinerangi Wind Farm Woody Weed Control Plan prepared for Stage 1 of the consented wind farm (Golder Associates 2010a).

Construction activity may result in the introduction and spread of weeds within the wind farm site. The primary threat for woody weed spread within the site comes from gorse and broom



due to the proximity of infestations to works sites, seeds persisting in the soil, and earthworks moving this soil to other sites. Existing and novel weed species could be introduced to the site on vehicles, other equipment, and in aggregate used for construction. Introduction and spread of weeds could adversely affect ecological values and increase weed control costs for farmers and wind farm managers.

The following protocols for management of weeds aim to reduce potential adverse effects of windfarm construction and operation on existing ecological values and reduce long term weed management costs:

- Vehicle use – Restricting vehicles to works sites, inspection and cleaning of vehicles entering the site, and sourcing of weed free aggregates for all construction, operational and maintenance related requirements.
- Site rehabilitation – To help prevent the establishment of weeds, all disturbed sites within the Stage 2 area should be sown with pasture grass/clover species as soon as earthworks are completed.
- Weed monitoring and control within the Stage 2 area:
  - Prior to construction, survey and control all woody weeds and pest plants listed in the Otago Pest Management Plan (OPMP; Otago Regional Council 2019) at and within 20 m of construction works.
  - Register the areas where weeds were controlled and ensure the surface soils at weed control sites are buried as deeply as possible under other soil to prevent germination of seeds in the soil e.g. deep within Surplus Fill Disposal (SFD) sites.
  - During construction, undertake weed monitoring and control every six months.
  - Post construction, undertake weed monitoring and control annually.
- Weed monitoring and control within the Wetland and Aquatic Compensation Sites:
  - Prior to any other compensation or rehabilitation works being undertaken, survey, record the locations of, and control all woody weeds and pest plants listed in the OPMP.
  - Following the baseline survey and control, undertake woody weed monitoring and control annually.
- Maintain all woody weed species and OPMP pest plants at effective zero density within 20 m of earthworks and in the Wetland and Aquatic Compensation Sites.

## 4.0 *Carex tenuiculmis* and *Epilobium chionanthum* Management

The *Carex tenuiculmis* and *Epilobium chionanthum* Management Plan (C&EMP; SLR 2025c) will guide management of these species during the development of Stage 2 of the wind farm. The C&EMP is an update of the plan prepared for Stage 1 of the wind farm (Golder Associates 2010b).



These species may be directly affected through loss of wetland habitats, or indirectly through changes to wetland hydrology. Indirect effects are unlikely due to retention of waterways and runoff, minimising the length of new flow paths, directing all flows that would have originally flowed into a gully into the same gully, locating and contouring fill disposal sites to conserve catchment areas, and including appropriate armouring of drains and areas downstream of culvert outlets to help reduce the effects of any increased flow velocity (SLR 2025b).

The following protocols aim to reduce potential adverse effects of windfarm construction and operation on *Carex tenuiculmis*:

- Pre-works survey at and adjacent to the two sites where physical disturbance of wetlands will occur.
- Translocation of any directly affected *Carex tenuiculmis* plants to a protected area ('Scrappy Pines' QEII Covenant or the Wetland Compensation Site).
- Post-work survey of any *Carex tenuiculmis* individuals adjacent to the two sites where physical disturbance of wetlands will occur.
- If any surveyed plants are dead or in poor condition, propagation of double the number of affected plants and planting them within a protected area.
- Monitoring of transplanted and planted individuals for condition and survival for a minimum of two years.

For *Epilobium chionanthum*:

- Pre-works survey for, and protection of, any existing populations within the Wetland Compensation Site.
- If a population is not present in the Wetland Compensation Site, then management to follow that for *Carex tenuiculmis*.

## 5.0 Rehabilitation Management Plan

The Rehabilitation Management Plan (RMP; SLR 2025d) will guide rehabilitation of snow tussock grassland during the development of Stage 2 of the wind farm. Snow tussock rehabilitation will take place within the Wetland and Aquatic Compensation Sites (SLR 2025a) as these sites will be permanently fenced to exclude stock and legally protected, which will prevent damage from grazing and potential future clearance that could occur if rehabilitation sites were located in the Stage 2 area.

Rehabilitation of snow tussock grassland will be achieved by carefully removing tussocks from any areas where earthworks extend into snow tussock grassland and planting them 1.5 m apart (centre-to-centre) in areas of exotic grassland on gully walls within the Wetland and Aquatic Compensation Sites, after which they will be monitored for condition and survival. Snow tussocks may be carefully trimmed or divided before planting, but should be a minimum of 10 cm diameter where the leaves/sheathes meet the ground.

Storage of removed snow tussocks should be avoided if at all possible. However, if tussocks cannot be taken directly to a rehabilitation site, they can be stored for up to three months.



Storage areas will need to be stock proof, snow tussocks will require watering to prevent desiccation, and the health of plants will need to be monitored.

Snow tussock rehabilitation sites are to be monitored annually by measuring the survival of snow tussocks in 25 m<sup>2</sup> quadrats. The number of plots will be proportional to the area of each rehabilitation area. All sites will be walked through to determine the presence of woody weeds and vegetation/tussock condition. Monitoring may result in the need for additional management which could include, but not be restricted to, replacement of snow tussocks which have died, woody weed control, and application of fertiliser.

Monitoring and management will continue until a minimum of 1.6 ha is planted, and snow tussocks have a 90% survival rate two years after planting. The survival rate is to be determined using the percentage of live plants. Pest plant and animal control targets are outlined in the Woody Weed Management Plan (SLR 2025b) and Mammalian Pest Control Plan (Boffa Miskell 2025).

## 6.0 Water Quality Monitoring

The Water Quality Monitoring Plan (WQMP) outlines requirements of a water quality monitoring programme to demonstrate the effectiveness of site-specific erosion, stormwater and sediment control measures during culvert installation on the Lee Stream tributary.

Monitoring will be undertaken in the stream upstream and downstream of the culvert immediately prior to instream works commencing (to establish baseline conditions), during the culvert installation works, and following completion of the installation works.

Sampling will involve on-site assessments of visual clarity (black disk) and turbidity (using a field meter) and the collection of water quality samples (in laboratory-provided containers) to be analysed for suspended solids.

Photographs of each sampling site, to indicate water and weather conditions at the time of sampling, will be taken on each occasion, from a similar position to allow comparisons over time. Rainfall in the 24 hours prior to the sampling event will be recorded, based on data from the closest monitored rainfall gauge.

The monitoring will ensure sediment and construction controls are effective. Should monitoring results indicate increased instream sediment that can be attributed to the instream works, an immediate review and amendments to the sediment control mechanisms will be initiated (in conjunction with appropriate site staff and management).

## 7.0 Native Fish Recovery

The Native Fish Recovery Plan (NFRP; SLR 2025f) contains a toolbox of native fish salvage procedures that will be implemented to manage and protect native freshwater fish against adverse effects resulting from the Lee Stream tributary culvert works.

The proposed culvert construction works require localised stream channel dewatering, which triggers the requirement for salvage to avoid adverse effects on the resident fish.



Installation of the culvert will be undertaken during dry/low flow periods, proposed to be undertaken between January and March and to last approximately 7 days.

Works during September to November (inclusive) may only occur with prior approval from the consent authority if it can be demonstrated the works will avoid the disturbance of Eldon's galaxias spawning habitat.

To the extent practicable, screened pump intake pipes should be positioned mid-channel, as small native fish are more likely to be utilising areas adjacent to stream banks.

Fish salvage works will generally include the following:

- At the outset of the salvage works, and prior to any instream works commencing, the Project Contractor(s) and Project Ecologist will meet to identify and delineate the upstream and downstream extent of instream works, and to discuss how the Plan will be implemented during instream works.
- A permeable, fine mesh barrier (3-5 mm) will be constructed immediately upstream and downstream of the site to prevent recolonisation of the stream works reach following fish relocation. The fish barriers will be permeable to allow water flow but fitted to prevent fish movement to the greatest extent possible. The fish barriers will extend from bank to bank and be secured to the stream bed.
- Methods utilised will be at the discretion of the Project Ecologist and are likely to require a combination of trapping (baited gee-minnow and/or fyke nets), hand netting and electric fishing. The optimal technique to be used in each habitat will be dependent on-site conditions at the time of fish removal.
- All nets, traps and other equipment used during the fish relocation exercise will be clean and dry at the outset of works to avoid the potential spread of unwanted organisms and diseases.
- Prior to instream works commencing, fish traps will be deployed in suitable locations and will remain in place overnight before being cleared of fish the following morning. Traps will be deployed for a minimum of two consecutive nights.
- Where practicable, trapping and hand netting will be utilised in preference to electric fishing.
- Following the completion of the trapping exercises, impermeable bunds will be installed surrounding the works reach and the isolated reach will be dewatered. The project ecologist will be onsite during dewatering, to capture any remaining fish observed within the works reach.
- Where 'mucking out' of surface stream sediments is proposed, sediment slops will be spread in a thin layer on nearby banks and will be visually assessed by the project ecologist for remnant fish.

Fish relocation works will generally include the following:

- After capture, indigenous fish shall be transferred to the release site in a lidded container filled with clean stream water.
- Fish will be held for the minimum time possible, and holding containers kept in a shaded location.





- The density of the fish within the holding container will be monitored and kept to an appropriate level (e.g., less than 15 fish per container) to ensure that low dissolved oxygen within the container does not lead to mortality. Portable, battery powered aerators will be available for use in the holding containers, if required.
- Fish shall be handled as little as possible and shall not be handled with dry hands.
- If any individuals show signs of stress (loss of righting response, gaping, gulping air) the water shall be changed to provide more oxygen and/or portable aerators or bubblers used to maintain oxygen levels.
- All fish recovered will be identified, measured and counted prior to release.
- Based on estimates of local fish population sizes, calculated using the Hayne (1949) regression method or Zippen (1958) removal algorithm, a minimum of 80% removal is to be achieved for each species identified.
- Fish will preferentially be released upstream of the works reach, into suitable habitat (e.g., flowing sections with water depths greater than 4 cm, pool areas) within the same stream system. The preferred release site is in the lower reaches of the true right branch of the stream upstream of the existing culvert as identified within the NFRP. Upon release, fish shall be distributed over, at minimum, a similar length of stream as they were caught.

## 8.0 Wetland Monitoring and Management

The Wetland Monitoring and Management Plan (WMMP; SLR 2025e) describes the monitoring and management of wetlands within 100 m of proposed earthworks within the Mahinerangi Wind Farm Site and the associated Transmission Line Corridor.

Photopoints will be used to monitor wetlands. The photopoints cover wetlands most at risk i.e. within 30 m of a Surplus Fill Disposal (SFD) site and earthworks sites.

Photopoints will be established where there is a good view of the area of wetland that is likely to be affected by any works in the vicinity. Care will be taken to ensure that the photopoint does not become inaccessible during or following works.

Photographs will be taken at each photopoint prior to works commencing (baseline) and then on a three-monthly basis for the duration of the construction works. A photopoint monitoring sheet will be completed for each site. Following completion of the construction activities authorised under the resource consent, one more scheduled three-monthly monitoring event will be undertaken. If the monitoring indicates that no further monitoring is required (i.e., no changes to wetlands are observed), monitoring will be complete.

If any major adverse effects (e.g., clearly visible sedimentation, infilling, or scouring) are observed during monitoring or at any other time, the project manager will be notified immediately so that remedial actions are not delayed.

A report will be prepared following each three-monthly monitoring event which summarises the findings of the monitoring and any changes and/or adverse effects that may have occurred since the previous monitoring event. Any non-compliance with the consent conditions will be assessed. Reports containing illustrative photographs will be provided to



Clutha District Council. All photopoint photographs will be supplied in digital format, with file names containing the photopoint number and monitoring date.

## 9.0 Wetland and Aquatic Compensation

The Wetland and Aquatic Compensation Plan (WACP; SLR 2025f) describes the requirements of compensation works to achieve a net positive gain in wetland and aquatic values within the MWF Stage 2 and includes fencing of the Wetland and Aquatic Compensation Sites to exclude stock and ongoing woody weed control (SLR 2025g) to ensure the gains in ecological value persist.

At the Wetland Compensation Site, a 4.6 ha gully containing an estimated 1.3 ha of wetland habitat will be fenced from stock and protected as compensation for loss of wetlands at two sites that cannot be avoided (SLR 2025g). Within the Wetland Compensation Site, rehabilitation of snow tussock grassland will be undertaken on gully walls as required by the existing consent and the Rehabilitation Management Plan (SLR 2025c) (see Section 4.0 above). While this is not considered part of the WACP, as it is not additive, it will improve ecological values by buffering the wetland from surrounding land uses. New planting will be undertaken in line with WACP (SLR 2025f) in the wetland and on gully walls to enhance biodiversity. A minimum of 550 plants will be planted.

At the Aquatic Compensation Site, a minimum of 50 m of stream length will be fenced as compensation for adverse effects on aquatic values at the culvert construction site on the Lee Stream tributary (SLR 2025g). At this site, snow tussocks will be planted along the margins of the stream channel to enhance fish habitat by shading the waterway.

Pest plant and animal control targets for the Wetland and Aquatic Compensation Sites are outlined in the Woody Weed Management Plan (SLR 2025b) and Mammalian Pest Animal Plan (Boffa Miskell 2025b).

## 10.0 Avifauna Monitoring & Management

The Avifauna Management Plan (AviMP BML 2025a) covers management, monitoring and reporting of construction effects for two species, the New Zealand falcon and South Island pied oystercatcher, and subsequent monitoring of potential operational effects on the New Zealand falcon.

### South Island Pied Oystercatcher

This species is known to nest within the Project Site and often does so in pasture and on exposed ground including recently earthworked areas. This plan seeks to avoid the main risks to this species from the development of MWF Stage 2. They are disturbance leading to adult desertion of the nest, destruction of nests, and potential vehicle collisions with juveniles.

Pied oystercatcher prospect and set up breeding territories before or during the early stages of the earthworks season (August and early September) and this is the key period to



implement proactive management measures to deter pied oystercatcher breeding within the Windfarm Development Area. This plan includes the following measures:

*Discourage Nesting:*

- Proactive Management Measures to discourage the prospecting and setting up of breeding territories during the early stages of the earthworks season in August and September through to the end of nesting in November. This can involve:
  - Driving regularly through the areas to be earthworked in the coming season
  - Walking dogs on leash during daylight hours
  - Allowing rank grass to grow creating a less attractive nesting environment.
- These methods have been used successfully for other ground nesting species.

*If nests are established:*

- Survey, identify and establish an appropriate buffer designed for the following situations.
  - Nests adjacent to existing roads
  - Nests adjacent to the Windfarm Development Area
  - Nests within the Windfarm Development Area

*When Chicks Become independent:*

- Juveniles leave the nest within days of hatching and roam the site with their parents foraging in wet areas until they can fly. During this period there is a risk of collision which requires good site management.
- The plan requires training of drivers and additional care while driving during this period.

*Ongoing nest protection:*

- Pest control was required by Conditions of Consent for falcon, and has been carried out within the Stage 1 of the windfarm since commissioning in 2011. This control will be expanded to the wider windfarm as detailed in the Mammalian Pest Control Plan (MPCP, BML 2025b).
- This pest control will directly benefit pied oystercatcher by reducing nest predation.

*Reporting:*

- At the end of each breeding season a plan will be prepared summarising the success of the programme and recommending any improvements for the following breeding season.

## **New Zealand Falcon**

During construction protection of falcon nest sites will be required to prevent disturbance leading to nest desertion by the adult.



During operation, monitoring and management will be required for 2 years post construction to consider potential displacement from habitat, or collisions with turbines during wind farm operation.

## Construction

### Nest Protection:

- Surveys will be carried out from the start of the breeding season to identify breeding pairs and locate nest sites.
- Any nest site located within 500m of the Development Area will be located and an appropriate nest buffer will be established to prevent disturbance.
- The size of nest buffer will take into account terrain, visibility, the type of activity likely to be carried out within 500m of the nest (light vehicle, heavy construction), and the degree to which the birds are already habituated to existing farm operations. The size of the nest buffer will be no less than 200m and potentially up to 500m from the nest site to the area of activity.
- The nest will be monitored and when the chicks have fledged, the nest buffer can be removed.

## Operation

Operational monitoring will commence with the commissioning of the wind farm and continue for two years. It will consist of the following

### Breeding Success Monitoring:

- Condition 27 requires comprehensive falcon monitoring to identify any nests within 3 km of the wind farm site, determine breeding success, record any bird strike and record incidental observations for two years after MWF becomes operational.
- The nest surveys stated during operation will continue after construction for two years. This plan summarises the survey methods and the required data collection for nest, chick, and adult bird monitoring.

### Banding and GPS tagging:

- Banding and GPS tracking of falcon will be carried out focusing on adult birds, and capturing juveniles if the opportunity presents itself.
- This tracking will be used to monitor activity within the windfarm, any avoidance behaviours or displacement from habitat.
- GPS tracking will also allow any mortalities to be located for collection and necropsy to determine cause of death.

### Ongoing protection and offsetting:

- The ongoing protection of falcon is addressed by Consent Condition 28 which requires control of key pest species. Pest control has been carried out within the Stage 1 of the windfarm since commissioning in 2011. It will be expanded to the wider windfarm as detailed in the Mammalian Pest Control Plan (MPCP, BML 2025b).



- The primary purpose of this pest control is to offset any effects of the development of this wind farm on this species.

Reporting:

- At the end of each breeding season a report will be prepared summarising the following information:
  - Incidental observations (Location, time and date, activity, age, sex, leg band.)
  - Nest sites (Location, habitat, clutch size, adult bird identity (colour bands).)
  - Hatching success (Number of chicks present, sex and age.)
  - Leg bands and radio transmitter attachment (Band colour combination, bird morphometrics.)
  - Adult bird habitat use (Location fixes for adult males every ten minutes for three days a month for three months.)
  - Any falcon mortalities.

## 11.0 Mammalian Pest Control

The Mammalian Pest Control Plan (MPCP, BML 2025b) was prepared in accordance with Consent Condition 28 and expands mammalian pest control from the Stage 1 area to include Stage 2 of the wind farm. The primary purpose of this pest control is to ensure the densities of predators are at low levels. That will result in:

- The protection of ground nesting indigenous bird species, specifically New Zealand falcon (eastern), and the South Island pied oystercatcher.

A reduction in predator threat to lizards and skinks, helping vulnerable individuals survive and supports safer basking and foraging opportunities in exposed areas. In summary, mammalian pest control will be carried out as follows:

- Target species have been identified and include key predators (mustelids and feral cats) as well as the prey of these predators (rabbits and hares).
- Pest control will involve:
  - Trapping protocols using industry recognised DOC series and Timm's traps.
  - Shooting protocols for rabbits and hares.
  - Responsive bait station use, to manage any population increases.
  - Trap servicing and carcass removal.
- Protocols for monitoring trapping and shooting success are detailed within the MPCP as well as triggers for action if control is not meeting the success targets.
- Data management and reporting requirements are detailed within the MPCP.



## 12.0 Lizard Management Plan

The Lizard Management Plan (LMP, Blueprint Ecology Ltd 2025) covers management, monitoring and reporting of construction effects for all known and potential native lizard species within the Mahinerangi Wind Farm Site and the associated Transmission Line Corridor.

Two native species of lizards have been identified within the Mahinerangi Wind Farm Site - tussock skink (*Oligosoma chionochoescens*) and McCann's skink (*Oligosoma maccanni*). There is c. 35 ha of suitable habitat for these species within the construction footprint, predominantly rough pasture and snow tussock grassland. Approximately 12.6 ha is of moderate to high-quality and these areas are the primary focus for lizard management, which includes:

- Installing lizard-proof fencing along the interfaces of development and of suitable lizard habitat, where relevant.
- Capturing lizards prior to vegetation clearance with a minimum of 600 Artificial Cover Objects (ACOs), and checking these devices a minimum of five times (3,000 checks).
- Salvaging lizards from rock outcrops.
- Relocating lizards to the 59.2 ha "Scrappy Pines Block" QEII covenant release site.
- Undertaking intensive rodent control over 4 ha of the release site for two months prior to lizards being released and for three years after the final year of lizards being released.
- Undertaking a post-release monitoring programme to measure translocation success. The programme involves using 50 ACOs in a 10 x 10 m grid with one pre-release monitoring prior to lizards being salvaged and once annual monitoring check for three years post-lizard salvage.



## 13.0 References

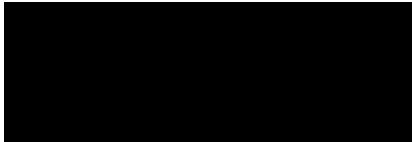
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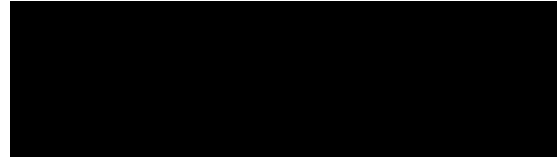
## 14.0 Closure

Sincerely,

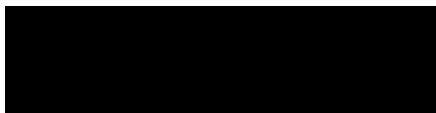
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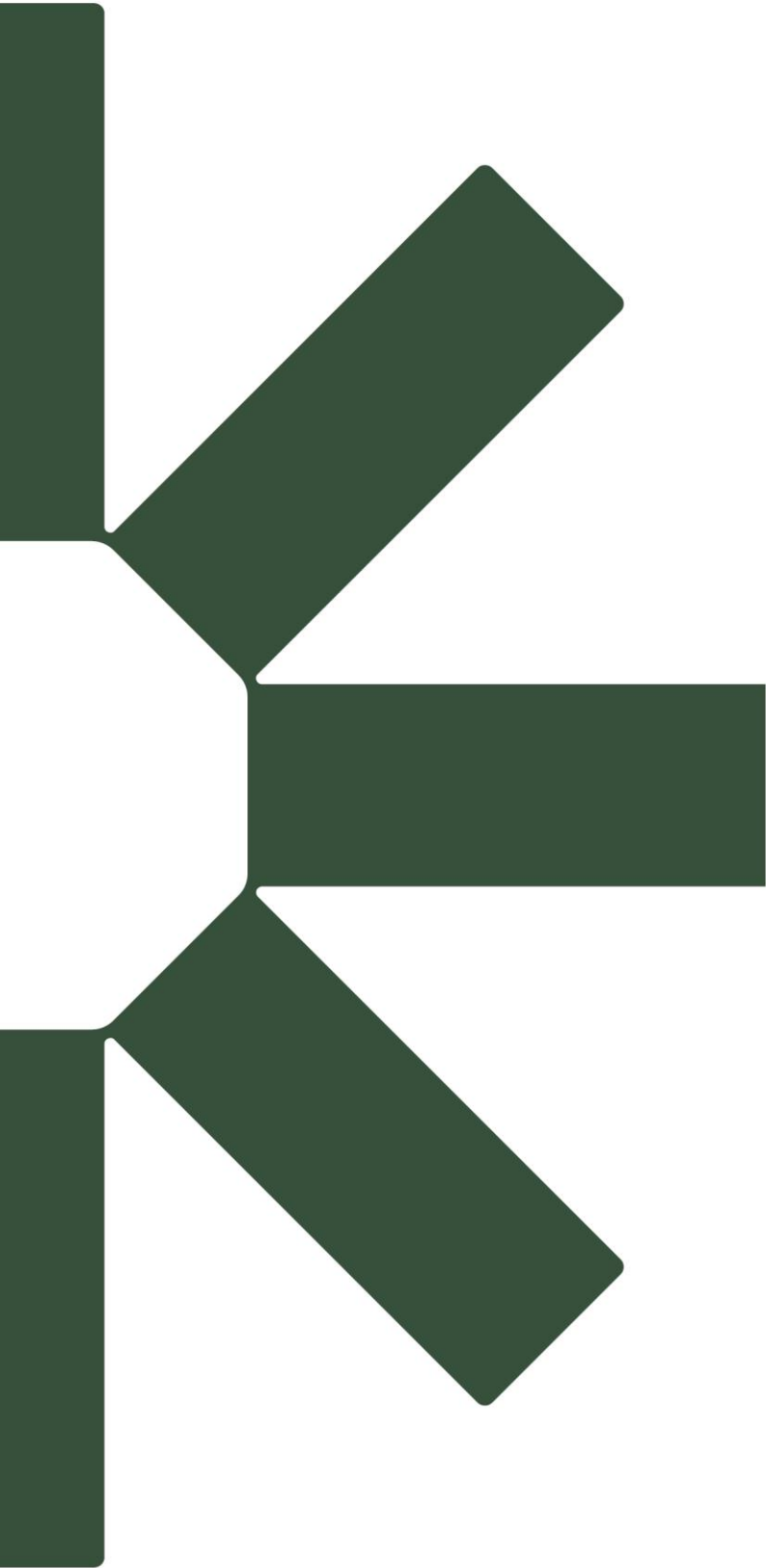
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**Keren Bennett (Reviewer)**  
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Making Sustainability Happen