

# Proposed Waiinu Energy Park

Summary of Ecological Investigations for Fast Track Referral

Prepared for Meridian Energy Limited



27 March 2026





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## Document Quality Assurance

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Cover photograph: Typical vegetation at the Waiinu Site with exotic forestry, improved and rough pasture and exotic shrublands. © BML, 2025

# Executive Summary

## The Site

The proposed Waiinu Energy Park site is situated halfway between the Patea River and the Whanganui River, south and east of the settlement of Waitōtara in South Taranaki. It is approximately 4,300 ha in <sup>1</sup> located on the South Taranaki bight<sup>(1)</sup> (Map – Appendix 1). Henceforth referred to as “the Site”. Most of the Site is in pastoral land use (predominantly on the flat sand country) with some areas of arable cropping, and plantation pine predominantly on older stable rolling dunes.

## The Project

The Proposed Waiinu Energy Park Development (henceforth “the Project”) is for a combined wind and solar farm and associated ancillary infrastructure located throughout the Site, constructed over four stages. Stages 1 – 2 will include the construction of 56 wind turbines (producing an estimated 7.0MW each and a total of 392MW), electrical infrastructure and civil works, including foundations and supporting infrastructure. Turbines will be up to 250 m in height with approximately 50 m blade tip clearance from the ground. Stages 3 – 4 will see the installation of solar arrays and supporting infrastructure, including a DC-connected BESS. Full details of the Project are provided in the Referral Application.

## Overview

The coastal fringe of this Site is a recognised biodiversity hotspot in the South Taranaki bight with some habitats identified as significant (RMA Section 6(c)). There is active, modified and stable dune habitat, dune swale wetlands, dune lakes, an important river estuary, rare plants, threatened habitats and terrestrial fauna. The Project will avoid direct effects on these values.

Three zones of coastal environment have been determined by Councils along this coastline; the Coastal Protection Area (Coastal Environment), Outstanding Features and Landscapes (ONFL), and Outstanding Natural Character (ONC). No turbines fall within any of these three zones. Of these the ONC best defines the extent of indigenous habitats along the coastline.

Matching the diversity of habitats, there is also a high diversity of mobile coastal, migrant, wetland, and sea birds occupying different habitats within the Site. Some habitats within the Site have also been identified as significant (RMA Section 6(c)) and some of these are protected as reserves or covenants, as well as being recognised in regional and district plans. These include lakes, ponds and wetlands with indigenous vegetation communities which provide habitat for a range of waterbirds and cryptic wetland species.

In addition, this study has identified the presence of long-tailed bats in certain habitats within the site.

Gathering sufficient information on mobile avifauna and bat species to be able to determine risk to them from this development has been a large focus of these investigations, particularly for those species that are classified as rare or threatened.

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<sup>1</sup> A bight is a long, gradual bend or recess in the shoreline that forms a large, open bay.

## Terrestrial & wetland / freshwater habitats

Two ecological districts overlap the Site. The sand country falls within the Foxton Ecological District (31.02) and the inland terraces fall within the Manawatu Plains Ecological District (31.01) (McEwen, 1987a).

Within the Site, most of the Project is situated either in improved or rough pasture, and seasonal cropland - habitats which typically have low biodiversity values. Plantation pine currently occupies 15% of the Site and this has some habitat value for bats. Other vegetation and habitat includes small, isolated areas of indigenous scrub or hardwood forest in gullies, and riparian, lake and stream habitat.

Wetland habitat ranges from small exotic grassland marsh wetlands to larger indigenous swamps and submerged, emergent and riparian wetlands on lake margins.

The Waitōtara River is the largest waterbody traversing for 8 km through the Site. The smaller Waiau Stream flows for 3 km through the western part of the Site and connects Tapuarau Lagoon wetland, and the Waitōtara River mouth with Lake Waiau.

In-stream habitat is degraded due to accumulation of fine sediments from surrounding land uses which reduce habitat heterogeneity, and a lack of indigenous riparian vegetation. Using records from a similar nearby system (Whenuakura River) as a proxy habitat, the Waitōtara is likely to have poor water quality and fair to poor stream health (determined by diversity & abundance of macroinvertebrates). Fish species include at risk – declining species, inanga and longfin eel.

Avoiding, and buffering key habitat corridors, including all lakes, wetlands, the Waitōtara River, Waiau Stream, riparian margins, and coastal dunes has been a continual focus of project shaping.

## Lizards

Potential lizard species include Kupe skink (Nationally Critical), goldstripe gecko (Declining), barking gecko (Declining) and northern grass skink (Not Threatened). During surveys, northern grass skinks were located at three locations south of the Waitōtara River. No Kupe skinks were located, but they have previously been recorded along the southern coast of the Site and may occupy fringe rank grass habitat at other locations. Based on the habitats present, the gecko species are considered unlikely to be present on Site.

## Avifauna

A year of field work using a range of methods has identified 63 bird species of which 30 are native, and 22 of those natives have a conservation status. Some of these observations were of only 1 or a few birds. Other species were abundant and widespread.

Overall, it has been concluded that there are four discrete groups of birds occupying preferred habitats within the Site. There are some generalist species which move between these habitats, but many other species are largely limited in their distribution to these habitats and corridors. They are:

- Species of the coastal waters, beech, estuary, and coastal dunes,
- Species of the inland rivers, streams, lakes and wetlands,
- Species of dry pasture and pine, and
- Species of dairy pasture.

Within these habitats several species with a conservation status of at risk or threatened have been observed. Of the species identified, the one with the highest conservation status is the Australasian bittern (matuku-hūrepo) which occupies several lakes and wetlands. This species has a conservation status of Nationally Critical.

These habitats have been mapped, and these maps are supporting design of the windfarm layout to establish buffers which will avoid habitats and minimise interactions between key avifauna and wind and solar infrastructure.

Early in project design, a significant coastal buffer was established, providing a setback of at least 1.6 km from the coast to the nearest turbine along the beaches, dunes, swamps and estuaries of high value. All turbines in Clusters B, C, and D meet or exceed this setback. At the very corner of the site, turbine Cluster A approaches to within 380 m of the crest of the high coastal scarp.

Significant buffers for inland habitats were then also established. These both protect indigenous river, lake, wetland and riparian habitats, and create safe corridors for mobile wildlife as they move along and between these habitats. To create these buffers the extent of key habitats were mapped, and a 200m buffer was then applied. This creates a corridor varying in width between 450m (e.g. minimally vegetated streams) and 1.2km wide (e.g. parts of the Waitōtara River). 55 of the 56 proposed turbines have been placed to avoid the mapped habitat corridors by 200 m, with one turbine (D17), constrained by a pivot irrigator, achieving a 160m set back from the habitat corridor. Setting the habitat corridor buffer at 200m has avoided almost all risk to freshwater and coastal birds using these corridors. While one of the turbines falls within the 200 m nominal setback, there remains a conservative buffer to avoid adverse risk.

Once buffers had been established, the project footprint was constrained to avoid them. Through this process, project design is expected to ensure there are no significant ecological effects. An effects assessment will be completed to determine if there are residual effects, their scale and location, and to determine whether and the extent to which mitigation is required.

This future analysis will look at each of these species to determine relative risk to that species, and whether any identified risk needs to be, and if so how it will be, managed with suitable conditions.

Any additional birds, identified as taonga species identified in the Cultural Effects Assessment (CEA), will also require assessment.

## Bats

The long-tailed bat (pekapeka tou-roa) has also been recorded in lake, riverine and pine forest habitats within the Site. This species has a conservation status of Nationally Critical.

Variable levels of bat activity were recorded across the Site. Bats were seen year-round with no clear seasonal pattern. They were most often recorded near streams, gullies and the margins of pine forest.

Additional analysis of bat data will consider the distribution of bats across the Site, potential commuting routes, the use of setbacks, and other management tools to avoid or minimise potential effects on bats.

## Summary

Vegetation and habitats of significance (representing high values and a variety of bird species) include vegetation and habitats of significance within coastal environment, the Waitōtara River and the string of inland lakes running along the northern boundary of the Project. The project avoids these features and provides a buffer between them and wind and solar infrastructure. It also avoids the wildlife corridor that links these key habitats including a buffer from them of 200 m (with only one exception, where the buffer is 160m).

Productive dairy pasture, which also provides avifauna habitat, will also be avoided. Looking at the remaining pastoral vegetation where turbines will be located, effects of the Project are assessed to be relatively benign on habitats and species.

Therefore, the focus of this report is upon highly mobile species, birds and bats, which can traverse the Site from the natural areas around the Site. That will also be the focus of ongoing investigation and analysis, and the Ecological Impact Assessment to be submitted with the Substantive Application.

Based on this initial analysis it is concluded that the project will not cause significant adverse effects. If more than minor effects are identified at a species level, these can be addressed by appropriate conditions. Where residual effects are identified following mitigation, methods are available to offset those effects.

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# 1 The Project & Site

## 1.1 Introduction & Disclaimer

This document has been prepared to provide the Ministry for the Environment (MfE), the Expert Panel, and Minister an overview of the current ecological data collected by Boffa Miskell to inform the Referral Application for the proposed Waiinu Renewable Energy Park project. It is important to note that the data presented herein remains under analysis and will be subject to further refinement as the Project progresses.

Boffa Miskell is actively engaged in a project shaping process, and at this stage:

- Data of the Site's ecology has been collected to identify the key habitats and species present within the Project Site. This information is being actively used to assist the shaping of the project design with the goal of avoiding significant vegetation and important habitats of significant species. It provides sufficient information to support the conclusions set out in this report.
- Ecological surveys and analysis are continuing to further support a comprehensive ecological effects assessment, further refine the Project layout and determine if residual effects will occur that would require offsetting. See Section 4.
- Comprehensive analysis and interpretation of the ecological data will be undertaken once a final project layout has been confirmed.

## 1.2 The Site

The Site lies on the South Taranaki bight halfway between the Patea River and the Whanganui River. The full site is 4,300 ha in area (Map 1). An additional 5 km transmission corridor connects the Site to the grid connection point.

The Site has been shaped by its coastal location, with the underlying geology that of coastal cliffs formed by uplifted marine terraces, backed by dunelands formed by windblown sand. Towards the coast, many of these dune landforms have been modified by the overlying agricultural land use, as well as by areas of pine plantation situated in the central and eastern parts of the Site.

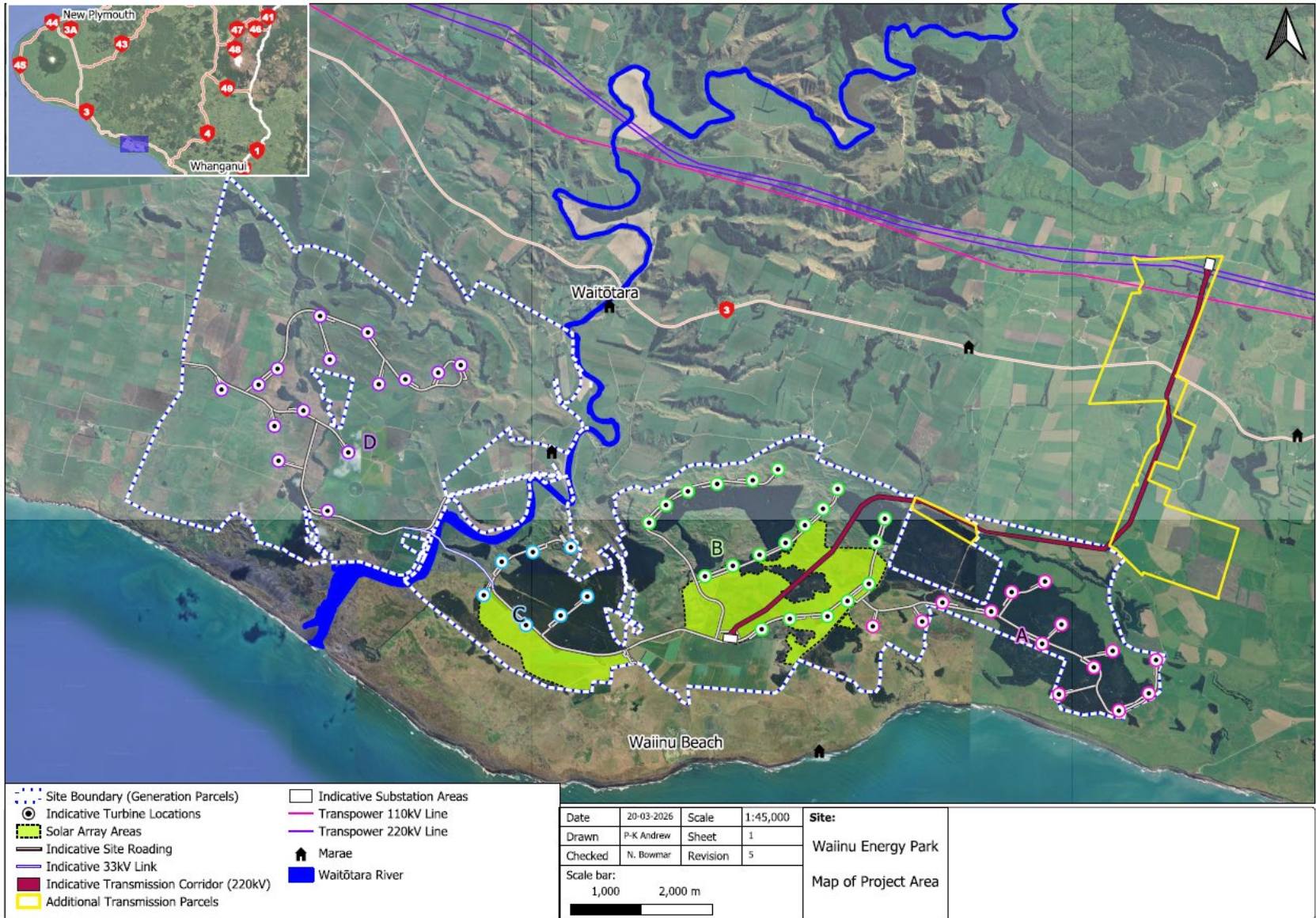
Inland from the coastline, the dune landforms become higher and more uneven. The sand country stops at a high escarpment which leads to terrace land of sandstone and limestone. The Waitōtara River cuts through the dunes and higher terraces with wide floodplains to either side. This geology is described in Section 2.3.

Most of the Site is in pastoral land use (predominantly on the flat sand country) with some areas of arable cropping, or in plantation pine (predominantly on older stable rolling dunes). The settlement of Waitōtara lies just outside the Site boundary to the northwest and has been established on the alluvial terraces adjoining the Waitōtara River. The settlement at Waiinu Beach is located just beyond the southern Site boundary, with access to rugged cliffs, exposed sandy beaches and dunes along the coastal edge. Further details of the Site, including a map of the Site and relevant features, is provided in the Referral Application.

### 1.3 The Project

The Waiinu Energy Park (henceforth “the Project”) is a proposed large-scale renewable energy development integrating wind power, solar photovoltaic (PV) generation, and battery energy storage system (BESS), within a single coordinated project footprint. The proposal is for up to 56 modern wind turbines, each up to 250 m in height, arranged in four clusters. Approximately 510,000 solar modules on fixed-tilt mounting structures will be installed with a maximum height of 3.1 m above ground level.

Once operational, the energy park is expected to produce up to 1,760 GWh of renewable electricity annually. This output is equivalent to the electricity consumption of around 253,000 households, representing over 10% of private dwellings in New Zealand. The project has been designed as a long-term, multi-technology energy hub to support national climate and energy security goals.



Map 1: Site Map

## 2 Summary of Ecosystems with Existing Established High Value

### 2.1 Significant and Protected Natural Areas

While the Site partly falls into the Manawatū-Whanganui Region, almost all identified areas containing significant biodiversity fall within the Taranaki Region. They are detailed within the Proposed Coastal Plan (Taranaki Regional Council, 2021a) and maps showing their locations and extents are linked to the councils Map Viewer.<sup>2</sup>

The Waitōtara River, Estuary, and associated coastline of dunes, wetlands and lagoons are a biodiversity hotspot for the Taranaki Region, and a wide range of categorisations, classifications, identification codes, names and mapped extents describe them. However, many described areas either entirely or largely overlap each other.

Here, we acknowledge the high values of eight broad areas that occur within or near the Site which have been identified for their biodiversity values, These are:

- **Oceanic / Offshore**
- **The “Waitōtara Conservation Area”**
- **Lake Okoia**
- **Waitōtara Lagoon**
- **Unnamed (QEII) Wetland / Inland Lakes**
- **Lake Waikato**
- **Lake Marahau**
- **Lake Waiau**

Highlighted in orange in table 1 are four micro-sites (within three of these areas) which carry formal legal protection, from DOC and QEII. While many of these identified habitats sit just outside the project boundary, their proximity is ecologically critical. Most of the recorded lakes and lagoons are located within or partially within the site. Furthermore, because mobile species are drawn to these high-value habitats, adjacent to the site, they are highly likely to interact with the project site itself.

#### The Waitōtara River

In addition to the Waitōtara estuarine habitat associated with The “Waitōtara Conservation Area”, which is recognised as having ‘Outstanding Natural Features’ for its geo-preservation sites (South Taranaki District Council, 2021), the Waitōtara River in general is recognised in the Regional Fresh Water Plan for Taranaki as a river with high cultural, spiritual, and historical associations, and high recreational & fishery values (Taranaki Regional Council, 2021b). It is also recognised as a significant waterbody in the South Taranaki District Council plan (2015), meeting four of five criteria for significance. It has a large catchment extending 55 km to the north where it is located within the western edge of the Whanganui River National Park.

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<sup>2</sup> <https://maps.trc.govt.nz/LocalMapsViewer/>

See Map 1 for the locations of significant natural areas (SNA). Photographs are provided of each of the SNAs (Photos 1 to 9 below).

Table 1: Conservation Area designation and associated key ecological & landscape values within the project site and beyond. Protection status also provided with orange denoting legal protection.

Designation	Authority (code if applicable)	Protection Type	Stated key ecological (& landscape) values
<b>Oceanic / Offshore</b> – zone that extends from the beach (MHWS) out to sea. Outside the Project Site. Direct effects to this habitat will be avoided.			
Marine Mammal Sanctuary	DOC	Statutory (Marine)	Marine mammal protection; seabird foraging context
Seabird Important Bird Area (IBA)	Forest & Bird (2016 IBA)	Non-statutory	Seabird feeding, migration
Coastal Management Area – Open Coast	TRC	Regional Plan	Coastal processes, management overlay
<b>Waitōtara Conservation Area</b> - biodiversity hotspot for this section of the south Taranaki Bight. Outside the Project Site. Direct effects to this habitat will be avoided.			
Tapuarau Lagoon Conservation Area	DOC	Statutory (Reserve)	Wetlands, coastal habitats, avifauna.  Identified as a Regionally Significant Wetlands in the Regional Freshwater Plan  A significant dune wetland complex, adjacent to the Project Site, with the presence of threatened or at-risk flora and fauna. This large wetland complex provides habitat for many waterbirds, waders, divers and dabblers. Known for the presence of spotless crane and Australasian bittern.
Coastal Bird Feeding Area	TRC (CBF19)	Regional Plan	Seabird feeding sites.
Coastal Management Area - Outstanding Natural Character	TRC (ONC8 Waitōtara)	Regional Plan	High natural character (coast/dunes) dune hollows & relic foredunes, limestone and sedimentary rock outcrops amongst foredune. riverine, lacustrine, and palustrine wetland systems. Spinifex ( <i>Spinifex sericeus</i> ) and the At Risk (Declining) pīngao ( <i>Ficinia spiralis</i> ), Threatened (Nationally Critical) erect herb <i>Sebaea (Sebaea ovata)</i> . Occasionally visited by the Threatened (Nationally Critical) kotuku or white heron ( <i>Ardea modesta</i> ).
Coastal Management Area - Outstanding	TRC (ONFL9 Waitōtara)	Regional Plan	Outstanding dune/landform values. Strong wild and scenic association. River mouth, low promontory of shell-limestone outcrops and a very dynamic dune system. Prominent remains

Designation	Authority (code if applicable)	Protection Type	Stated key ecological (& landscape) values
Natural Features & Landscapes			of a tōtara forest that has been drowned and preserved by rising sea-levels. The largest relatively unmodified dune systems in the Taranaki region. Two distinct vegetation types associated with the dunes and outcrops. Seabird feeding, breeding and resting area.
KNE – Nukumaru Recreation Reserve	TRC (KNE-ID 158)	Regional Plan	Representative habitats
KNE – Tapuarau (Hawken's) Lagoon	TRC (KNE-ID 23)	Regional Plan	Wetland habitats
QEII - Hawken's Swamp	QEII (5-07-648)	Voluntary QEII NT covenant	Protected wetland
SNA - Hawken's Swamp	STDC (SNA 33)	District Plan	Swamp wetland
Scheduled Wetland	TRC (0910-0)	Regional Plan	Waitōtara & Hawken's Lagoon
Waitōtara River Estuarine Habitat	TRC	Regional Plan	Estuarine ecosystems
Kai Iwi Cliffs (RAP 39) / Nukumaru Beach (RAP 40)	PNA (Ravine, 1992)	Non-statutory	Coastal cliffs/dunes; representative ecosystems
<b>Lake Okoia</b> – This lake and associated wetlands are connected to the Waitōtara River via the Waiiau Stream. Several waterfowl have been recorded at this location. This lake lies within the Project Site. Direct effects to this habitat will be avoided. Identified as a Regionally Significant Wetland in the Regional Freshwater Plan			
KNE	TRC (KNE-ID 38)	Regional Plan	Waterfowl; hydrologic connectivity
Scheduled Wetland	TRC (0973-0)	Regional Plan	Wetland protection
<b>Waitōtara Lagoon</b> - This lagoon oxbow lake lies west of the Waitōtara River. It is dominated by a Raupō reedland and is known for the presence of spotless crane and Australasian bittern. This oxbow lies within the Project Site. Direct effects to this habitat will be avoided.			
KNE	TRC (KNE-ID 149)	Regional Plan	Oxbow wetland
Scheduled Wetland	TRC (1005-0)	Regional Plan	Wetland protection
SNA	STDC (SNA 32)	District Plan	Spotless crane, Australasian bittern

Designation	Authority (code if applicable)	Protection Type	Stated key ecological (& landscape) values
<b>Unnamed (QEII) Wetland / Inland Lakes</b> – a series of six small lakes and associated wetlands along a small unnamed stream. Protected in part by a QEII covenant and also listed as an SNA. This wetland system lies within the Project Site. Direct effects to this habitat will be avoided.			
QEII Covenant	QEII (5-07-536)	Voluntary QEII National Trust covenant	Recognised natural values (data limited)
<b>Lake Waikato</b> - A freshwater lake and associated wetlands with modified margins which is Identified as a Regionally Significant Wetlands in the Regional Freshwater Plan, after being a Recommended Area for Protection (RAP) (Ravine, 1995) . It is known for the presence of bittern, white heron, and dabchick, species likely to move between wetlands sites locally. This lake lies adjacent to the Project Site but does not enter it. Direct effects to this habitat will be avoided.			
KNE	TRC (ID 44)	Regional Plan	Wetland/lake habitats
Scheduled Wetland	TRC (0985-0)	Regional Plan	Wetland protection
Lake Waikato Island (RAP 42)	PNA (Ravine, 1992)	Non-statutory	Representative/island habitat
SNA - Lake Waikato	STDC (SNA 31)	District Plan	Bittern, white heron, dabchick; TRC encumbrance
<b>Lake Marahau</b> – A large lake with habitat that would support several waterfowl and cryptic birds. The northern end of this lake lies within the Project Site. Direct effects to this habitat will be avoided.			
			Bittern, Australian coot, little black shag.
<b>Lake Waiau</b> - A large lake with habitat that would support several waterfowl and cryptic birds.			
		Regional Freshwater Plan	Identified as a Regionally Significant Wetlands

In addition to these high value ecological areas, the Substantive Assessment will cover potential naturally uncommon ecosystems, including seepages, dune slacks, lake margins, lagoons, estuarine margins, ephemeral wetlands and damp sand plains within the general area.



- Scheduled Wetlands TRC FWP 2001
- QEII National Trust Covenant Boundaries
- Marine Protected Area
- Marine Reserve
- West Coast North Island Marine Mammal Sanctuary
- Department Of Conservation Land
- Key Native Ecosystems
- Important Bird Area (IBA) for Seabirds
- Outstanding value
- Estuary modified
- Estuary unmodified
- Open coast
- Port

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This plan has been prepared by Boffa Miskell Limited on the instructions of our Client, in accordance with the agreed terms of work. It is intended to assist an application under the Resource Management Act 1991. It may be relied upon by the Expert Panel and relevant administering agencies for the purposes of assessing the application. While Boffa Miskell Limited has exercised due care in preparing this plan, it does not accept liability for any use of the plan 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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1:45,000 @ A3  
**DRAFT**  
Date Sources: Tairānaki Regional Council LINZ, Google Imagery  
Projection: NZGD 2000 New Zealand Transverse Mercator

- Wind Turbine Location (20250812)
- Watercourse
- Site Boundary

**WAIINU ENERGY PARK - WETLANDS & TERRESTRIAL HABITATS**  
**Protected Natural Areas**  
Date: 27 February 2026 | Revision: 0  
Project Manager: s 9(2)(a) | Drawn: JMW | Checked: AKU

### 3 Project Shaping

A fundamental component of ecological involvement in this project has been project shaping: that is, the identification of significant vegetation and habitats, and the development of the project design to avoid or minimise potential effects on vegetation, streams, and habitats of fauna.

Specifically for this project, project shaping has sought to:

- Avoid significant vegetation and wetlands.
- Avoid the coastline, estuary, dunelands and associated wetlands.
- Avoid the Waitōtara River.
- Minimise effects on Waiau Stream (where three crossings are proposed).
- Avoid habitats (indigenous or exotic) which support significant fauna, especially inland lake habitats and connecting streams.
- Consider options for management, monitoring and offsetting where avoidance is not possible.

To date project shaping has occurred over three phases of design.

- Firstly, a scoping report was provided to Meridian together with preliminary constraints maps in early 2023. These were based on a preliminary site visit and a desktop review of all available data on the Sites ecology. The Scoping Report was provided to Meridian and led to discussions on vegetation and habitats to avoid.
- The process was repeated in early 2025 with the completion of most of the field work. The field work confirmed the locations and extent of vegetation and habitat value and the results were discussed at several workshops in relation to the turbine layout, solar field layout, the transmission corridor alignment, and the locations of connective roading infrastructure.
- In mid-2025, additional field work was completed to delineate and verify wetlands across the Site. There was also additional analysis of bat and avifauna data which confirmed the importance of the habitat corridors connecting wetlands and waterways and these habitat corridors were mapped within the Site. A new turbine and solar design iteration responded immediately to these results. 55 of the 56 proposed turbines have been placed within the site to avoid the mapped habitat corridors by 200 m, with one turbine (D17) that will achieve a 160m set back from the habitat corridor. Importantly, the setbacks are from the habitat corridor to the blade tip, not to the tower. This ensures that the setback distance will remain fixed, irrespective of the size of wind turbine and blade length chosen. With these setbacks in place significant adverse effects are not anticipated.

With the establishment of these habitat corridors, the focus of the ecological assessment is now on further detailed analysis of data for these mobile fauna species (birds and bats), to identify and address any residual effects. Assessing potential effects on these groups has begun.

Assessing any potential effects on wetlands and lizard habitat will be completed as part of the substantive design Ecological Impact Assessment.

## 4 Ecological investigations undertaken to date

Ecological investigations have been carried out at the Site between 2023 and 2026. These investigations have included: vegetation, wetlands, freshwater (rivers), lizards, bats and bird surveys. There has been a particular focus on gathering seasonal avifauna data (including movements and flight heights) through human observers and bioacoustics recorder at various locations. Preliminary reports for this Site have been prepared for all the above ecological components and key findings from these reports are detailed below.

### 4.1 Vegetation

Desktop surveys used a range of information including the Manaaki Whenua Land Cover Database, to define potential plant communities present within the Site.

Verification of habitat types was determined and refined through site investigations, with areas of uncertainty and areas of each presumed vegetation types prioritised. We then described each vegetation community. Some less accessible areas were categorised using google earth aerials, together with the data obtained from similar communities visited on Site.

The resulting mapping supported our assessment of ecological value. It also provided the fauna assessments with sizes and distributions of each potential habitat. Calcareous features and wetlands are examples of habitats that were searched for rare plants, such as sand coprosma (*Coprosma acerosa*), and a range of wetland species known to be in the area from previous investigations.

### 4.2 Wetlands

Preliminary GIS mapping (elevation and historical/current wetlands) guided initial field investigations. Detailed study of aerial images informed additional field work to delineate wetlands and inform turbine location design around higher value wetlands, such as indigenous swamp wetlands.

Final wetland investigations and assessments will determine type, area, and condition of wetlands to be removed. We anticipate that only low value marsh wetlands, dominated by exotic species, will be affected by the development.

Within the substantive application, wetland assessments will be undertaken for all wetlands that will be lost and all potential restoration wetlands. We will use the following wetland 'Condition Aspects':

- Ecosystem health
- Indigenous biodiversity
- Hydrological functioning

The substantive assessment will score specific attributes under these conditions aspects to produce a wetland condition aspect score, and overall wetland score.

In identifying and mapping wetlands, the definitions of "wetland" from the Resource Management Act 1991 have been applied as well as the definition of "natural inland wetlands" in the National Policy Statement for Freshwater Management (**NPS-FM**) (**Ministry for the Environment, 2023**). Wetland extent was assessed using MfE's 2022 delineation protocols derived from the Clarkson

Method, including rapid, dominance, and prevalence tests (Ministry for the Environment, 2022). The plant indicator status is used (Table 1) to inform dominance and prevalence tests.

Table 1: Plant indicator status against predicted presence in wetland habitat

Plant Indicator Status	Predicted Presence in Wetland Habitat
OBL: Obligate wetland	Rarely in uplands (drylands)
FACW: Facultative Wetland	Usually in wetlands, occ. in uplands
FAC: Facultative	Commonly occurs in wetlands and uplands
FACU: Facultative Upland	Occasionally in wetlands but usually in uplands
UPL: Obligate Upland	Rarely in wetlands, almost always in uplands

Wetlands were classified and mapped using the ‘rapid survey method’ and ‘vegetation plot method’ (Ministry for the Environment, 2022).

The Rapid Survey Method is a rapid visual assessment of (indigenous and exotic) species cover within an area. If those species classed as OBL or FACW wetland indicator species have dominant percentage cover then the area qualifies as potential ‘natural inland wetland’.

For areas requiring more detailed investigation, all plant species within 2m x 2m plots were identified and their percent cover estimated (based on above-ground live biomass) to allow for the testing of ‘Dominance’ and ‘Prevalence’ indices in accordance with the Plot Sampling Method in (Clarkson, 2013) and MfE (2022). If species were on the pasture exclusion list, the final step was to confirm that the potential wetland area was actively grazed, and no rare plants were present.

### 4.3 Freshwater

Freshwater surveys will be carried out once a final layout has been completed. It is expected that effects on freshwater bodies will occur from three crossings of the Waiau Stream (for connector roads to specific turbine locations).

### 4.4 Birds

A year-long baseline survey aimed to assess avian presence, abundance, and behaviour at the Site to inform species-specific collision risk with turbines.

Survey locations were selected based on proposed turbine sites, and habitat features likely to influence bird movements, such as saddles, forest patches, and waterbodies.

Surveys were conducted monthly over four-day visits using a combination of:

- 20-minute point count (PC) surveys
- 5-minute bird counts (5MBCs)
- Incidental roaming surveys
- Cryptic wetland bird surveys
- Migratory bird surveys
- Beach surveys

Point counts and 5MBCs were carried out at each of the point count locations shown in Figure 1 below. The 20-minute fixed-point counts were the primary method for obtaining relevant data of species risk. These fixed-point counts were within a 180° arc extending up to 200m. Each location was surveyed four times per month. Observers recorded only indigenous species, noting number;

species; flight height (including RSA relevance); behaviour; and breeding activity. Flight paths of native birds were mapped in ArcGIS.

Each fixed count was followed by a 5-minute stand-down period, during which weather data were recorded. Immediately after, a 5MBC was completed, recording both native and exotic species following Dawson & Bull (1975) methodology to determine relative species abundance.

Incidental roaming observations were recorded anytime the bird survey team or ecologist was on Site. Incidental bird sightings between point counts were also recorded to supplement the data, though not used in statistical analysis.

Static bio acoustic recorders were used to detect cryptic bird species at wetlands shown also in the map below. Cryptic birds were targeted using dawn/dusk surveys and the deployment of acoustic recording devices during the breeding season in spring. Migratory birds were surveyed during the peak migration season using acoustic recorders and ground-based searches by two ornithologists surveying suitable habitats within the Site.

A summary of the survey effort is provided below.

*Table 2. Summary of survey effort undertaken to investigate avifauna at the proposed Waiinu Renewable Energy Park.*

Survey type	Survey effort
PC surveys	Four days per month for 12 months (48 months)
5MBC	Four days per month for 12 months (48 months)
Incidental/roaming	Any time an ecologist was on Site.
Cryptic wetland bird surveys	Fourteen static loggers set to record from dawn to dusk. <ul style="list-style-type: none"> <li>- (26 September – 30 October 2023)</li> </ul> Two in-person dawn/dusk surveys in spring <ul style="list-style-type: none"> <li>- (30-31 October 2024, 16-18 October 2024)</li> </ul>
Migratory bird surveys	Ten days of on-Site surveys with one team of two <ul style="list-style-type: none"> <li>- (6-10, 20-24 January 2025)</li> </ul> Static logger deployment <ul style="list-style-type: none"> <li>- (16 January – 7 February 2025)</li> </ul>
Beach surveys	Two beach surveys, walking along the coast from Waiinu township: <ul style="list-style-type: none"> <li>- 7-14 February</li> <li>- 18-20 March</li> </ul>

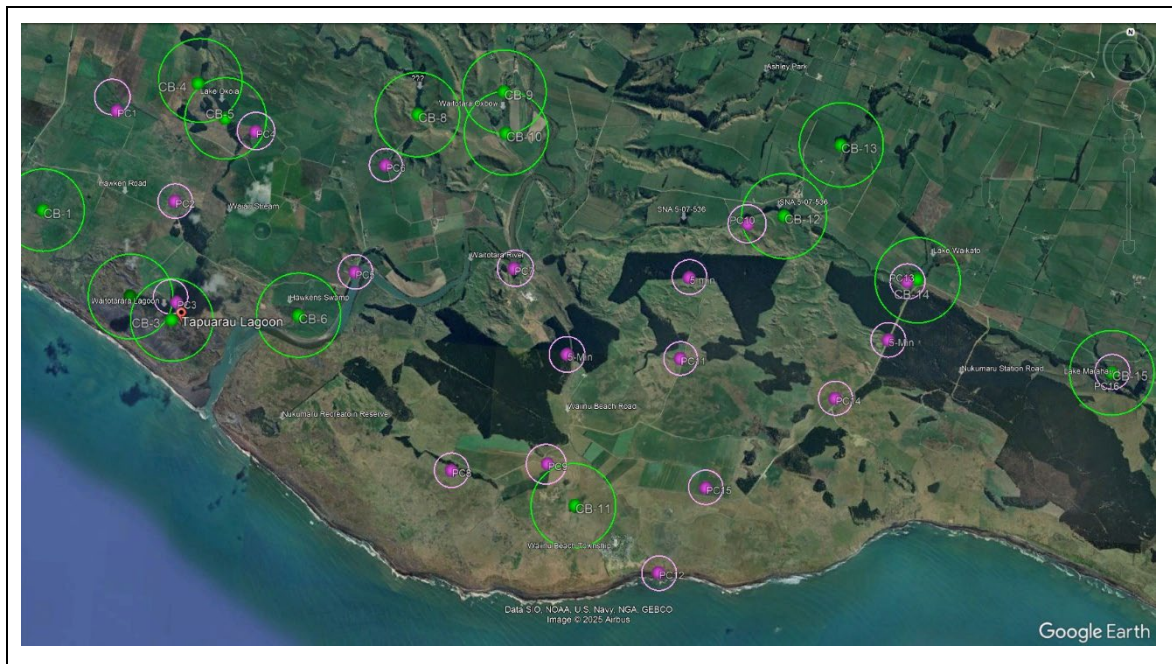


Figure 1: Locations of five-minute bird counts (5MBC) (Pink = Point Count Sites C; Green = location of cryptic bird loggers)

## 4.5 Bats

A total of 23 static loggers (full-spectrum Song Meter Mini Bat detectors (Wildlife Acoustics)) were deployed across the Site to assess bat presence and activity levels within the Project Site. A map of the static logger locations is provided below. The deployment locations were based on how preferable habitat was for bats.

Each logger was left in situ for approximately one month per deployment period, continuously recording from approximately sunset to sunrise. Detectors recorded echolocation calls nightly from 30 minutes before sunset to 30 minutes after sunrise, using a 256 kHz sample rate in trigger mode (3-second trigger window, 12-second max recording).

The dates of deployments were:

- 7 November – 2 December 2023
- 17 January – 12 February 2024
- 21 March – 10 April 2024
- 6 June – 26 June 2024

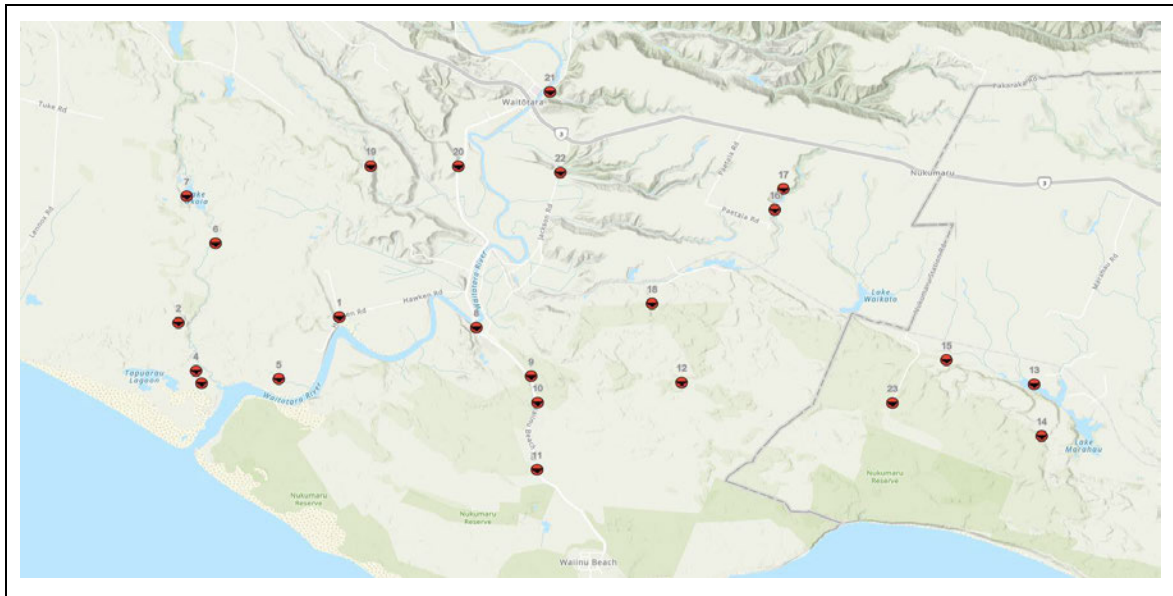


Figure 2: Stotis Bat loggers

Each bat pass—defined as a series of calls separated by at least 3 seconds of silence—was logged via spectrogram. The minimum trigger frequency was set to 16 kHz to detect both long-tailed and short-tailed bats, though only long-tailed bats were expected to be recorded on Site.

Call data was analysed in ‘Kaleidoscope Pro’. Activity levels were assessed using average passes per night, with the understanding that each pass may not represent a unique individual. Survey sites were resampled each interval and included key habitat features: vegetation edges, linear features (e.g., gullies, shelterbelts), and open pasture at varying distances from cover.

## 4.6 Lizards

Lizard surveys were carried out between the 26th of March and the 19th of April 2024.

A combination of three survey techniques were utilized to investigate the herpetofauna at the Project Site. This included the use of pit fall traps, CritterPics, and manual searches. A map of the surveyed areas (Figure 3) is provided below.

- Pitfall trapping: 60 pitfall traps were installed across the Site, at twelve locations in groups of five.
- CritterPics: twelve baited CritterPics were installed throughout the Site; these typically were placed at the same locations as the pitfalls.
- Manual searches: approximately seven person-hours of manual searches and sensitive habitat dismantling was carried out around the Site. Searches included the lifting of beach driftwood and other debris, the dismantling of rockpiles (or overturning of large rocks), and the overturning of woody debris near forest / pine margins.



Figure 3: Lizard survey locations

## 4.7 Assessment of Significance

An assessment of ecological significance will be undertaken within the substantive application.

For the eastern area of the Site, ecological significance will be assessed against the Horizons One Plan criteria set out in the “RPS-ECO Ecosystems, the Indigenous Biodiversity” section (Page 2-101), and Schedule 6 habitats listed as ‘rare’ or ‘threatened’.

Indigenous habitats not listed as rare or threatened in Schedule 6 will be assessed using the following RPS-ECO-P3 criteria for determination of Rare, Threatened and At-Risk habitats (Page 3-158).

For the western area of the Site, ecological significance will be assessed against specific policies within the Taranaki Regional Council Regional Policy Statement (2010). BIO Policy 4, Chapter 9 uses specific criteria for identifying habitats as significant. WET Policy 1 and 2, Chapter 6.4 provides guidance for wetland protection. Policy POL 5A.3.1. of the Taranaki Regional Freshwater Plan specifically addresses wetland.

## 4.8 Summary

Table 3 provides a summary of the Ecological Investigations undertaken at the Site to date.

Table 3 Summary of Ecological Investigations undertaken at the Site

Survey	Survey Type	Date/Duration	Description
Preliminary Site Visit	Site Walkover and observation	2023, 1 day	This preliminary visit determined the range of investigations required and the methods to be used.
Vegetation	Verification, images, description	March (1.5 days). July 2025 (1 day, transmission line), March 2026 (1 day, whole site).	The entire Site was mapped to understand the extent and general composition of all plant communities.
Wetlands	Verification, delineation, description, assessments: <ul style="list-style-type: none"> <li>– vegetation plots</li> <li>– soil plots</li> </ul>	March (2 days), December 2024 (2 days), July 2025 (3.5 days), March 2026 (2 days).	In March 2024, the entire Site was mapped to gain an informed overview of wetlands on Site. Some areas required further investigation. In December 2024, the focus moved to the west of the Site to inform the location of proposed solar arrays. In July 2025, the classification and verification of potential wetlands across the Site was completed to inform turbine and solar array project design. In March, 2026 wetlands within the works footprint were assessed to inform mitigation.
Birds	Baseline Bird utilisation studies.	1 August 2023 to 30 June 2024. 2 x 2 teams, 5 days / month	Point Count and 5MBC
	Incidental observations	Between December 23 and July 24	Roaming searches
	Cryptic Bird Surveys <ul style="list-style-type: none"> <li>– Observers</li> <li>– 14 Acoustic Recording Devices (ARDs)</li> </ul>	Year 1: 14 x ARD deployed at wetland and lake habitat, 26 September and 30 October 2023 (1,200 hrs). Observers on Site 2 dawn and dusk periods, with playback  Year 2: 14 x ARD deployed repeated Sept-October 2024 (1,200 hrs). Observers on Site 2 dawn and dusk at start and finish	Focused on lakes with breeding habitat for bittern including: Tapuarau Lagoon, Lake Okoia, Hawkin’s swamp, Waitōtara River, Lake Waikato, and Lake Marahau Also, Waiau Stream, and several large stock ponds
	Migration Surveys <ul style="list-style-type: none"> <li>– Point Count surveys.</li> <li>– Incidental observations.</li> </ul>		Observations from Baseline bird utilisation studies were combined with beach walks.

Survey	Survey Type	Date/Duration	Description
	– Beach and Waitōtara Estuary walking surveys	Beach Surveys 7-14 January 2024 an 18-20 March 2024	Waiinu township to Waitōtara River Mouth and estuary, and interdune sand plains
Long-tailed bats	Acoustic Bat Monitors (ABM)	Install 23 ABMs covering four seasons. – 7 Nov – 2 Dec 2023 – 17 Jan – 12 Feb 2024 – 21 Mar – 10 Apr 2024 – 6 Jun – 26 Jun 2024	The focus was on preferred habitat: – Tall treelines and forest margins – Streams and lake edges
Lizards	Manual searches of debris Pit fall traps Trail Cameras (Crittterpics)	Carried out by a team of 2 – Install and monitor pit falls and trail cams, from 26th of March and the 19th of April 2024. – Manual searches along coastline and at inland rock piles in preferred habitats.	The focus was on likely habitat from the coastline and dunes, through rank grasslands and treelines. The survey sought to identify any Kupe skink, goldstripe gecko, or barking gecko known to be locally present.
Freshwater	Yet to be completed. Surveys will be carried out once a roading layout has been confirmed.	Will look at – The crossing type, culvert, bridge – Stream habitat quality of affected reach – Stream fauna – Fish passage	The focus was on sourcing sufficient information to determine if offsetting is required and the scope and scale. Ensure that fish passage will be maintained.

## 5 Summary of Preliminary Findings

Based on our investigations to date, preliminary reports for this Site have been prepared for vegetation, wetlands, lizards, and avifauna. Key findings from these reports are detailed below.

### 5.1 Vegetation

The Site is predominantly vegetated in high producing exotic pasture, less productive exotic pasture, plantation radiata pine and areas of seasonal cropland. Mixed indigenous and exotic shrubland is localised.

A small number of lakes and associated shallow water wetlands are spread across the site. Although rare, a small area of indigenous forest surrounds some lakes and regenerating gullies dotted throughout this exotic dominated landscape, which include indigenous vegetation. Other indigenous habitat is rare in this landscape.

Ninety-four (mostly exotic) plant species were recorded as part of general observations during this survey across eight general vegetation communities.

Small populations of rare plants such as sand coprosma (*Coprosma acerosa*) and *Coprosma kirkii* were found, associated with calcareous substrate. These communities are small and will be avoided.

We found three vascular and one non-vascular rare (At-Risk Declining) plant species. Two of these are planted, with one of those outside its natural range. All the habitats with At-Risk species will be avoided by the development.

### 5.2 Wetlands

Based on wetland data analysis to date, there are 197 potential natural inland wetlands (NIWs) wetlands occupying less than 4% of the total Site area have been mapped. Although some wetlands were discounted, a small number of additional wetlands were also confirmed from the most recent survey. Four wetland types have now been identified on Site (Table 4). These are:

- Shallow water
- Swamp
- Seepage
- Marsh

Table 4 Within the Site, the smallest wetland is an exotic grass marshland at only 25m<sup>2</sup>. Among the largest wetlands is the Waitōtara oxbow swamp at 59,954.64 m<sup>2</sup> (6 ha) and (partly within 100 m of the Site to the south) Tapuarau Lagoon at 143,118.98 m<sup>2</sup> (14.31ha). The smallest lake is Lake Marahau, measured at 1,615 m<sup>2</sup>, and the largest is Lake Waiau 444,512m<sup>2</sup> (44.45 ha). Both these lakes lie partly within 100 m of the Site boundary.

Preliminary analysis of the wetland data shows the following patterns in terms of vegetation types and ecological values:

- Wetlands classified as **shallow water** wetlands are predominantly associated with raupo, floating vegetation, and Carex sedgeland, with high ecological values. Almost 28% of wetlands were classified as shallow water. This figure includes open water, without vegetation cover.

- Wetlands classified as **swamp** are predominantly associated with raupo, and/or Carex sedgeland, and/or other sedgeland, and rushland, and are moderate to high ecological values. Over half (53.2%) of mapped wetlands were classified as swamp wetlands.
- Wetlands classified as **seepage** are predominantly associated with exotic grassland on slopes, with indigenous components (including sheonoptectus, purei and rautahi) plant communities and moderate ecological values. Seepage wetlands are a small component of wetlands on Site (just over 1%).
- Wetlands classified as **marsh** are predominantly associated with exotic grassland plant communities and low ecological values. Juncus rushland also feature. 17.6% of all wetlands were classified as marsh.

Wetland delineation has informed the most recent design iteration, with all indigenous wetlands being avoided as a result.

A small area of low value marsh and ephemeral wetlands will be affected. These can be mitigated through wetland restoration on site. There are plenty of opportunities throughout the site for positive ecological outcomes as part of this process.

Table 4 Areas of Wetland per classification within Waiinu Energy Park.

Wetland Classification	m <sup>2</sup>	ha	%
Swamp	835,600	84	53
Shallow Water	438,900	44	28
Marsh	276,900	28	18
Seepage	20,800	2	1
<b>TOTAL</b>	<b>1,572,200</b>	<b>158</b>	<b>100.0</b>

### 5.3 Freshwater

Project Shaping to date has focused on avoidance of works that will impact on rivers and streams. Three crossings of the Waiiau Stream are proposed, and this requires a freshwater survey to be carried out. Aside from these crossings, all other freshwater systems have been avoided.

The proposed surveys will consider the quality of habitat, survey macro-invertebrates to determine instream value, and will consider fish species to inform design in relation to fish passage.

If an offset for effects is required, for instance the loss of daylight stream length, the survey will provide sufficient information to support the offset analysis. Having viewed these streams there are no issues that do not have straightforward design and offsetting solutions, to ensure less than significant residual effects.

### 5.4 Birds

Before commencing field work a detailed desktop study was carried out looking at published and unpublished reports, papers, and national datasets.

A total of 63 species were observed throughout the bird utilisation baseline surveys (including point counts and incidental observations). Of these 63 species, 30 were native. Out of the native species, 8 were classified as Threatened and 14 were classified as At-Risk under the New Zealand Threat Classification System (NZTCS).

Over the course of these studies there were 10,500 observations of 34,000 birds. 14,900 were of introduced species, typically pastoral species such as starlings, finches, skylarks, magpie, sparrow, rock pigeon and so on. No exotic bird species is considered significant at this Site.

The remaining 18,570 observations were native species. Approximately 90% of observations of native birds were of native species which are not threatened. They include species such as grey warbler, spur-winged plover, fantail, swamp harrier, paradise shelduck, pukeko, silvereye, black swan, black-backed gull, and welcome swallow. The remaining 10% of observations were spread across 22 species with a conservation status of threatened or at-risk.

Overall, it is concluded that there are four discrete groups of birds occupying preferred habitats within the Site. There are some generalist species which move between these habitats, but many other species which are largely limited in their distribution to these habitats and corridors. They are:

- Species of the coastal waters, beach, estuary, and coastal dunes,
- Species of the inland rivers, streams, lakes and wetlands,
- Species of dry pasture and pine, and
- Species of dairy pasture.

Within these habitats several species with a conservation status of at risk or threatened have been observed. Of the species identified, the one with the highest conservation The Australasian bittern (matuku-hūrepo) occupies several of these lakes and wetlands. This species has a conservation status of Nationally Critical.

With these habitats identified and mapped the analysis focused on developing buffers to avoid habitats and minimise interactions between avifauna, and wind and solar infrastructure. A significant coastal buffer has already been confirmed meaning a minimum set back of 1.6 km from the coast to the nearest turbine along the majority of the site. At the very eastern part of the site, the setback reduces to 380 m along the crest of the high coastal scarp. Buffers around rivers, lakes and wetlands have been incorporated into the current design giving confidence that effects on the majority of key avifauna will be avoided or minimised.

Project shaping has identified buffers for rivers, lakes and wetlands. More detailed assessment of all indigenous species has now been completed to determine residual effects, their scale and location, and to determine whether mitigation is required, and which species require specific consideration, monitoring and management.

We have found that the highest abundance of birds, the greatest diversity of birds, and most threatened species are within the established 200m habitat corridors. Setting the habitat corridor buffer at 200m has avoided almost all risk to freshwater and coastal birds that use these corridors.

A further finding of studies to date is the importance of blade tip ground clearance. For many windfarms to date the lower blade tip of turbines is often set at 20m or 30m above ground level. For this project it will be raised to 50m. This means that many birds which may have been at risk from blade strike at lower heights, are now no longer being seen at blade height. This reduces species of concern significantly. For any threatened or at-risk species where there remains potential for collision mortality; collision risk modelling will be carried out to determine the risk probability and to inform the level of mitigation or offsetting that will be required.

Any additional birds, identified as taonga species identified in the Cultural Effects Assessment (CIA), will also require assessment.

Table 5 provides the number of observations of native bird species during ALL survey methods at Waiinu Renewable Energy Park (2024-2025), ordered by the primary habitats, as listed above.

Table 5: Number of observations of native bird species during all survey methods at Waiinu Renewable Energy Park (2024-2025), ordered by primary habitats.

Species	Conservation Status	Coast, Dune, Estuary	Wet Corridors	Pasture & Pine
Welcome swallow	Not Threatened	759	1,410	928
Black-backed gull	Not Threatened	1,032	991	639
Silvereye	Not Threatened	102	828	854
Paradise shelduck	Not Threatened	99	801	329
Harrier	Not Threatened	103	486	413
Spur-winged plover	Not Threatened	53	342	416
Grey warbler	Not Threatened	7	234	356
Heron, white-faced	Not Threatened	34	300	252
Pied Stilt	Not Threatened	102	159	118
Kingfisher	Not Threatened	5	144	130
Pipit	At Risk - Declining	13	4	33
Pied Shag	At Risk - Recovering	18	17	13
Pied oystercatcher	At Risk - Declining	28	13	5
Shining cuckoo	Not Threatened		18	3
Cattle egret	Non-resident native		8	5
NZ Falcon	At Risk - Recovering			4
Black Swan	Not Threatened	946	1,006	10
Pukeko	Not Threatened	85	1,255	43
Little Black Shag	At Risk - Naturally Uncommon	144	341	8
Royal spoonbill	At Risk - Naturally Uncommon	30	315	
NZ Scaup	Not Threatened	195	96	2
NZ Dabchick	Threatened - Nationally increasing	231	4	2
Black Shag	At Risk - Relict	27	194	1
White-fronted tern	At Risk - Declining	178	1	1
Australasian shoveler	Not Threatened	109	9	
Little shag	At Risk - Relict	28	55	1
Coot, Australian	At Risk - Naturally Uncommon	33	14	
White heron	Threatened - Nationally Critical		22	
Variable oystercatcher	At Risk - Recovering	15	2	2
Black-billed gull	At Risk - Declining	15	1	
Bittern	Threatened - Nationally Critical	8	7	
Grey Duck	Threatened - Nationally Vulnerable		9	
Kereru	Not Threatened		8	
Bellbird	Not Threatened	1	4	
Grey teal	Not Threatened		2	
Brown teal	Threatened - Nationally Increasing		1	
Long-tailed cuckoo	Threatened - Nationally Vulnerable		1	
Australasian Gannet	Not Threatened	20		

Species	Conservation Status	Coast, Dune, Estuary	Wet Corridors	Pasture & Pine
Banded Dotterel	At Risk - Declining	19		
Caspian tern	Threatened - Nationally vulnerable	13		
Bar-tailed Godwit	At Risk - Declining	3		
Red billed gull	At Risk - Declining	3		
Spotless crane	At Risk - Declining	2		
Black-fronted tern	Threatened - Nationally Endangered	1		
Royal albatross	Threatened - Nationally vulnerable	1		
<b>Total</b>		<b>4,462</b>	<b>9,102</b>	<b>4,568</b>

## 5.5 Bats

Before commencing field work, the DOC-administered BioWeb database was reviewed for records of both long-tailed and short-tailed bats within a 50 km radius of the Site.

The closest confirmed record of a long-tailed bat is approximately 12 km northeast of the proposed Site boundary. Numerous records are shown within commuting distance of the Site and suitable habitat extends further south towards the Site. Short-tailed bats have been recorded approximately 45 km north in Whanganui National Park.

Monitoring of bats in this area has historically been patchy, and areas of potentially suitable habitat are present that have not been surveyed. It is therefore possible that bats are present within or close to the Site.

Four seasons of monitoring were undertaken in 2023 and 2024, and long tailed bat were recorded at several locations across the Site. In summary:

- Activity occurs year-round, including during the winter, with no clear pattern.
- Activity levels are extremely variable.
- The highest levels of activity occur close to streams, gullies and pine forest, with some nightly averages up to 54 and 112
- Other parts of the Site have low or negligible levels of activity.
- A total of 5,788 bat passes were detected over the course of the four deployments of static loggers. Only long-tailed bats were detected across all deployments. The results of the bat surveys are provided below in Table 6.

Table 6: Number of bat passes from four static logger deployment periods at the proposed Waiinu Renewable Energy Park.

ABM Location	2023		2024				Grand Total	
	Nov	Dec	Jan	Feb	Mar	Apr		Jun
1				2	7			9
2					191		1	192
3							1	1
4							11	11

ABM Location	2023		2024					Grand Total
	Nov	Dec	Jan	Feb	Mar	Apr	Jun	
6					12		20	32
7					20	29		49
8				1	1			2
9	7				1			8
10	4		3		2			9
11				7	3			10
12	5		2		29	3	46	85
13	3		2	6	1	8		20
14					5	24		29
15	5		5	46	54	31		141
16	5				7		8	20
17	74		4	5	8			91
18	244	4	13		94	31	186	572
19	31		8	75	81	1,164	1,183	2,542
20			3	1			1	5
21			1		2			3
22					2			2
23	15	2	2		1,353	3	580	1,955
Grand Total	393	6	43	143	1,873	1,293	2,037	5,788

## 5.6 Lizards

Before commencing field work, BioWeb records were retrieved for a 15 km radius surrounding the Site. In this area, four species of native lizard have been recorded, including two skinks and two geckoes.

Surveys for lizards were carried out using all methodologies available to us. In total, three native lizards were observed during these surveys, all of which were northern grass skinks (Table 7 and Lizard Survey map, Appendix 1).

Table 7: Lizard capture results summary. SVL = snout-vent-length.

Location	Method	Species	SVL
Waiinu Beach East	Manual searches	Northern grass skink	54 mm
Location 06 (western pine block)	Pitfall trapping	Northern grass skink	62 mm
Location 11 (pine block by sand dunes)	Pitfall trapping	Northern grass skink	40 mm

No Kupe skink, goldstripe gecko, or barking gecko were observed along the coast, and the inland pastoral habitats are not preferred.

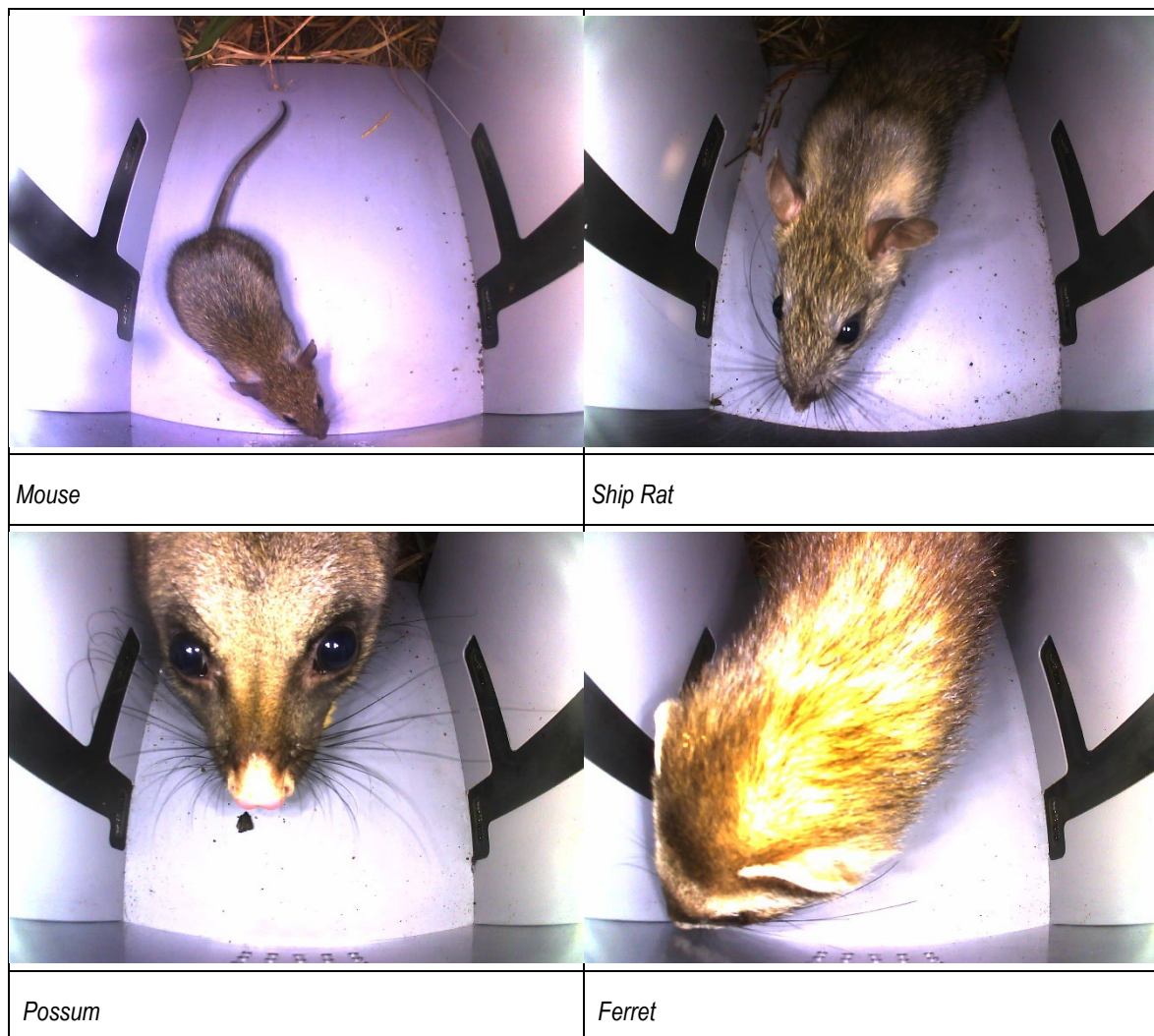
The presence of Kupe skink, goldstripe gecko, or barking gecko along the coastlines and dunelands cannot be ruled out, however it is unlikely they will occupy the areas of improved pasture upon which the Project will be largely located. The capture details are summarised below.

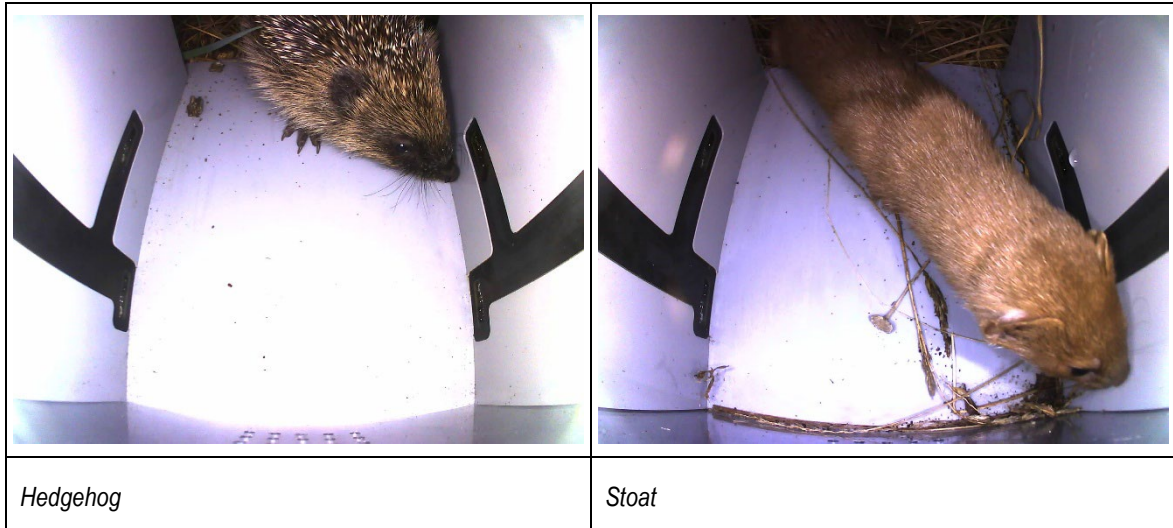
Additional lizard surveys will be recommended for inclusion as a Resource Consent condition, targeting potential habitat within areas of earthworks. Wherever lizards are found, it is considered that standard methods for salvage and relocation to suitable protected and managed habitat, will minimise potential effects to Low or Very Low (or less than minor).

## 5.7 Pest Animals

During the lizard sampling we observed very high levels of predator activity (Figure 4). These predators were seen at almost all lizard observation locations, with mice and rats most common.

This suggests that pest control could be highly effective as a part of an integrated mitigation package to improve lizard, bat, and avifauna habitat if required.





*Figure 4: Predators imaged by Critterpics*

## 6 Remedy and Offsetting

A number of mitigation methods and tools are standard for remedying and offsetting any residual effects of large infrastructure works, including wind farm operation. Utilizing these measures provides a high degree of confidence that all significant effects on ecological values will be avoided, and any residual adverse effects will be minimised, remedied, or offset. The following summarises what mitigation measures may include, to the extent they may be required.

### 6.1 Habitats

#### Terrestrial vegetation & habitats

Almost all terrestrial vegetation (natural and planted) will be avoided by the current design, there may be some residual effects. The design of remedial works and/or the calculation of an appropriate levels of offsetting are well understood, typically based on planting with appropriate species, sometimes partnered with browser management and control. These methods are standard for infrastructure projects. A revegetation plan will be needed to guide this work, if required.

Introduction of weeds is also a risk to native flora and terrestrial habitats. A weed management plan is standard for large infrastructure projects.

Fire is another risk to native flora and terrestrial and wetland habitats. A fire management plan is standard for large infrastructure projects.

#### Wetlands vegetation & habitats

While all indigenous wetlands and almost all exotic or mixed wetland habitat will be avoided by the current design, we anticipate a small number of exotic pastural marsh and ephemeral wetlands to be removed. There may also be some indirect residual effects.

The design of remedial works and/or the calculation of an appropriate levels of offsetting are well understood, typically based on hydrological monitoring and planting with appropriate species. The methods for carrying out this remedial and/or offsetting work is standard for infrastructure projects.

#### Freshwater habitat

There will be three stream crossings requiring culverting. This will likely require both remedial works and offset. Offsets for stream and habitat loss typically involving riparian revegetation. The calculation of appropriate levels of offsetting are covered by guidance. The methods for carrying out remedial and/or offsetting work is standard for infrastructure projects.

Another potential effect is on fish passage. The design of fish friendly culverts is covered by detailed guidelines, and the design requirements are well known.

Finally, the management of sediment discharge will need to be considered. The required technologies to reduce sediment discharge are well documented and will be addressed in detail in a Construction Environment Management Plan and Erosion and Sediment Control Plan (or similar).

## 6.2 Fauna

### Lizards

Potential effects on lizard fauna are typically minimised and mitigated through salvage of individuals within the clearance areas in the Project Envelope. These lizards are transferred to new release sites prepared for them. The methodology for this is well understood and use standard methodologies. There will be a need for a Lizard Management Plan and a Wildlife Authority to enable this work.

### Avifauna

The project has sought to avoid or minimise effects on avifauna through conservative setbacks from valued habitats and corridors. In addition, the lower blade tip clearance of 50m, is much higher than seen historically in NZ wind farms. This increased ground clearance will eliminate risk for the many bird species that rarely fly over 30m in height.

Where there is a residual risk, the scale needs to be calculated, and this may include collision risk modelling and population viability analysis. After 20 years of windfarm monitoring and the design of offsetting, a range of methods have been developed and applied for the mitigation of effects. These often include Pest Control, to reduce predation, particularly of nesting birds, and Habitat Management is also an effective tool. A Pest Management Plan may be required.

Offsetting may occur within the site where breeding occurs, or in another area where the bird is a local visitor, or national migrant. The methods for these types of interventions are well documented and have become standard for effects management, as are the methods for monitoring collision risk once the wind farm is operational.

An Avifauna Management Plan will be needed to detail these methods, and potentially a Wildlife Authority will be needed to enable this work.

### Bats

As for birds, the project has sought to avoid or minimise effects on avifauna through buffering of key habitats and corridors. In addition, bat activity declines with height and the minimum blade tip clearance of 50m from ground level will minimise risk for bats.

Where there is a residual risk the scale needs to be calculated, and this may include collision risk modelling and population viability analysis. Some form of offsetting is likely for bats and may include a range of measures. They may include Pest Control to reduce predation, particularly to breeding colonies.

A Bat Management Plan will be needed to detail these methods, and potentially a Wildlife Authority will be needed to enable this work.

## 7 Management Plans & Wildlife Authorities

The final suite of management plans and wildlife authorities will be determined once the assessments have been completed. However, we expect that the following will be required.

### Vegetation

It is anticipated that two management plans will be prepared in relation to vegetation.

- **Revegetation Plan:** detailing remedial, and voluntary revegetation, designed to achieve a projected net gain in indigenous plant biodiversity as part of the project. To be submitted with the Substantive Application.
- **Weed Management Plan:** which establishes protocols to minimise the risk of weeds being brought to site by vehicles or materials, establishes a monitoring and maintenance regime to identify and remove introduced weeds or weeds that are distributed across the site, and to ensure an effect from potential introduction and spread of weeds are less than significant. To be submitted with the Substantive Application.

### Wetlands

The number of wetlands within 100m of earthworks is still being determined. This will be detailed as part of the Substantive Application. Any wetlands within 100 m will require resource consent conditions to ensure effects on them are avoided.

- The Ecological Effects Assessment will, at the least, map wetlands within 100 m of earthworks. In the event that any wetlands fall within 10m of works a **Wetland Management Plan** will be prepared which details preventative, monitoring and management actions to ensure effects from The Project development are less than significant. This will be submitted with the Substantive Application.

### Birds

- **Avifauna Monitoring and Management Plan:** It is anticipated that pre and post construction monitoring of several species will be required, as is normal for coastal wind farm sites. This will require a monitoring plan which considers avifauna generally and may target several specific species such as Australasian bittern with more detailed monitoring and site management requirements and will describe the delivery of any mitigation or offsetting requirements to ensure the effects of the wind farm on avifauna are less than significant. It will be prepared and submitted with the Substantive Application.
- Where specific species are being monitored, the method may require attaching leg bands for easy identification, and GPS transmitters to track flight activity. A **Wildlife Act Authority** to catch, handle and track bittern is anticipated to enable these works. This will also be submitted with the Substantive Application.

### Bats

- **Bat Monitoring and Management Plan:** It is anticipated that pre and post construction monitoring of long-tailed bats will be required to ensure the anticipated Project effects remain at less than significant. This will also include standard protocols for felling of vegetation. This will be submitted with the Substantive Application.

- The monitoring method may involve attaching tags to bats so that individuals can be tracked to roost sites. For this, a **Wildlife Act Authority** to catch, handle and track bats will be prepared and submitted with the Substantive Application.

### Lizards

- Management of additional Lizard surveying and potential salvage, before construction, and the identification of release sites will require a **Lizard Management Plan** which will be submitted with the Substantive Application. This Management Plan (along with the below Wildlife Act Authority) will ensure effects from the Project on lizards are less than significant.
- Salvage will require trapping, handling, and translocation of lizards to their release sites. A **Wildlife Act Authority** to catch, handle and track lizards will be prepared and submitted with the Substantive Application to enable these works.

### Freshwater

- A Freshwater Management Plan (e.g. detailing fish recovery and fish passage) is required to ensure effects from up to three crossings of Waiau Stream are appropriately managed and less than significant. This Management Plan will be submitted with the Substantive Application.

### Mammalian Pest Control Plan

- It is likely that some forms of mitigation or offsetting will turn to the management of mammalian pests and predators. This will likely apply to lizard salvage and transfer, protection of bat breeding colonies if found, and to some species of ground active birds such as bittern.

### Other

- Fire management plan to manage hot works during dry periods and protect wetlands and riparian vegetation. This is likely to be part of the CEMP.

## 8 Summary and Conclusions

Detailed investigations of the Site have been carried out over two years.

The coastline, Waitōtara River mouth and coastal dunes and dune lakes are considered regionally significant (Taranaki Regional Council, 2021b), and the avifauna studies have confirmed the diversity of coastal, dune and wetland bird species that are present in this area. The Project will avoid this coastal environment and will provide a suitable buffer between the wind turbines and the edge of these habitats, where they merge into pasture.

The Waitōtara River is a corridor for bird movement and has, along its length, several important habitats including the Waitōtara Oxbow. The Project will avoid this river and the associated habitats. There are several Inland lakes, within and on the margins of the Project area. These provide habitat for a diversity of water birds and cryptic wetland species. All will be avoided by the Project. The Australasian bittern is found within these lakes and wetlands, and this species will be a focus for the avifauna assessment.

Project shaping has been based to a large degree on two environmental setbacks designed to avoid or minimise ecological effects. They are:

- A coastal setback to avoid coastal environments of high ecological value and the wildlife that occupy them, and
- A series of inland corridors along all lakes, streams, wetlands and riparian habitats with turbines setbacks of mostly 200 m to avoid these habitats. These corridors also allow movement of highly mobile wildlife when moving between these habitats (See 'Habitat corridor' map in Appendix 1). One turbine (D17) sits within the 200 m buffer, but still achieves a 160m set back from the habitat corridor.

Within the Site, most of the landform is made up of modified and stabilised dunes and pasture. Surveys for lizards found a lack of good habitat and very low numbers of Northern grass skink. The other lizard species found locally were not located by this survey. Bird surveys showed a generic resident population of species adapted to a pastoral landscape.

Indigenous vegetation has been mapped and described. This is very limited in extent, and includes some riparian planting carried out by landowners. All indigenous vegetation will be avoided.

All significant wetlands associated with the inland lakes, and depressions dominated by indigenous communities, have been mapped and described. These will be avoided. Development has worked to avoid other wetland types too. Final effects assessment will determine if wetlands would need to be offset as a result of turbine, solar, and roading footprints. These wetlands are likely to be classified as small, low value exotic marsh wetlands. There are plenty of opportunities within the Site to ensure that offsetting for lost wetlands, if required, will result in an ecological net gain.

Long-tailed bats are present locally and were recorded in the Project Site. The highest levels of activity were close to streams, gullies with perennial streams, and along the margins of pine forests. Ongoing assessments will be looking at options to minimise bat activity at each turbine location.

Overall, the majority of potential indigenous wildlife habitats will be avoided, and the movement of mobile species along identified corridors has led to the establishment of substantial setbacks. This provides confidence that significant or substantial adverse effects will be avoided, and any residual effects can be appropriately minimised, remedied and offset through known and proven methods.

## 9 References

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- Taranaki Regional Council. (2021b). *Regional fresh water plan for Taranaki*. Taranaki Regional Council.



# Appendix 1: Maps

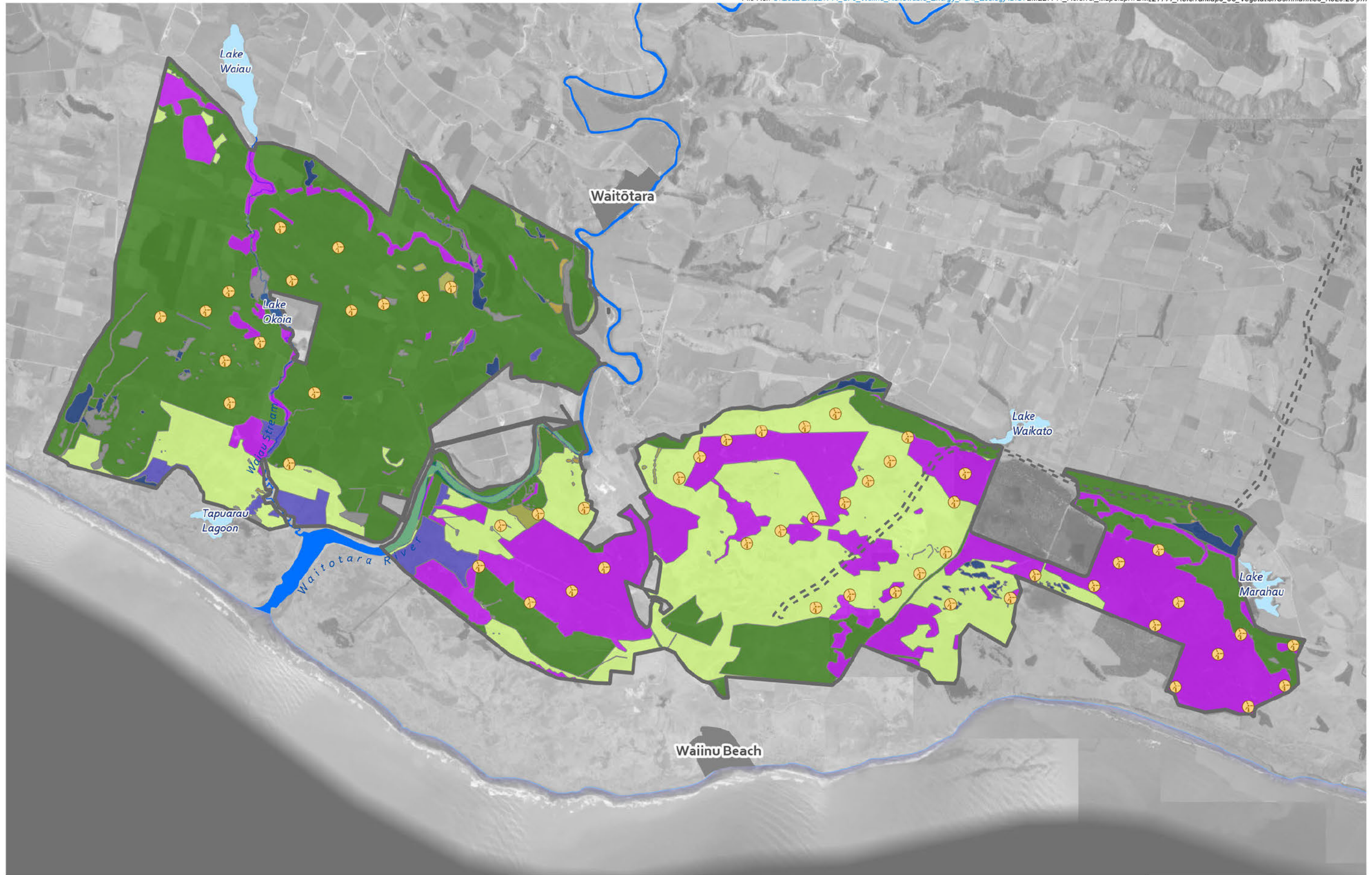
Vegetation

Wetlands

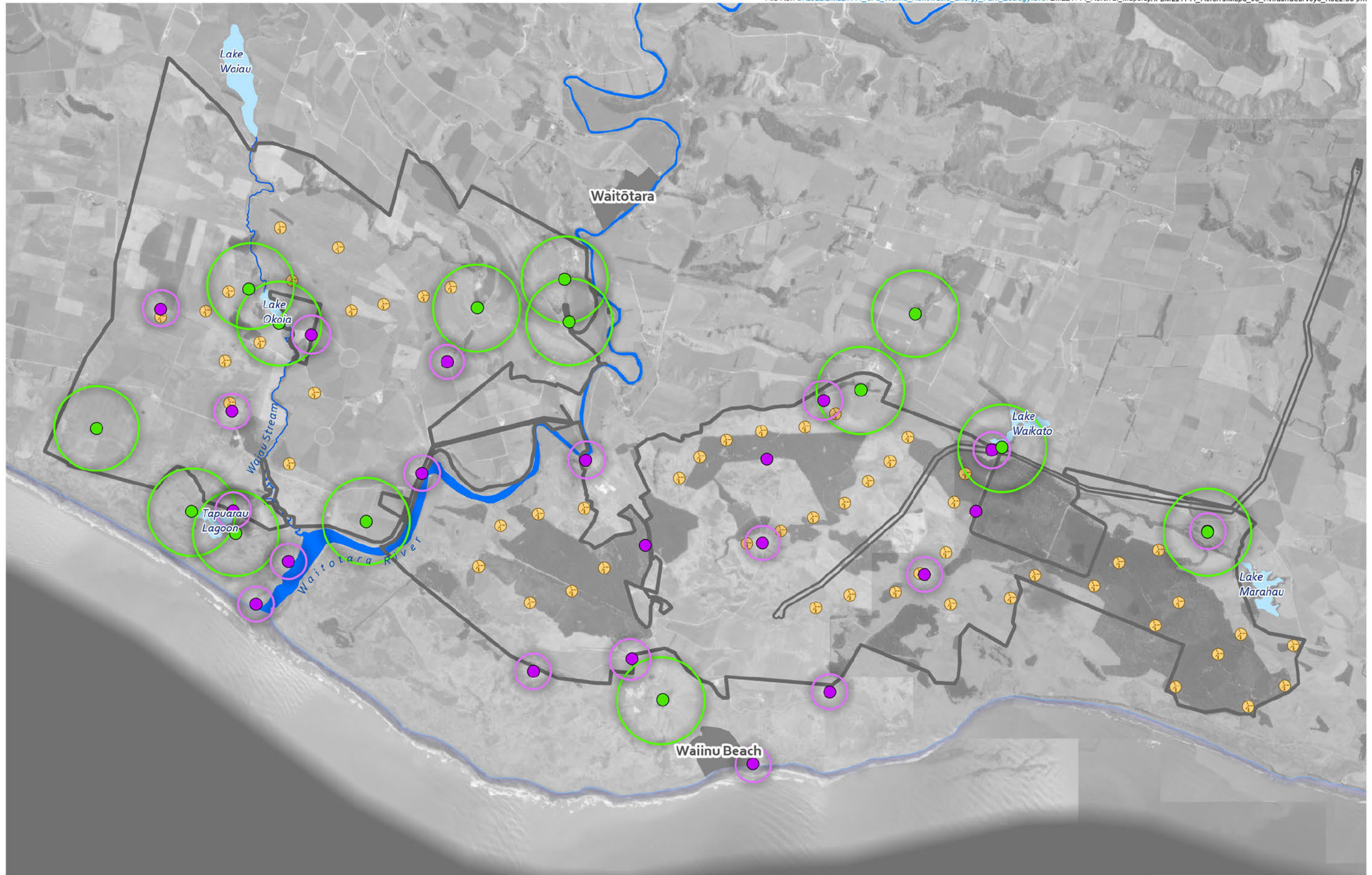
Lizard survey results

Avifauna survey & cryptic bird locations

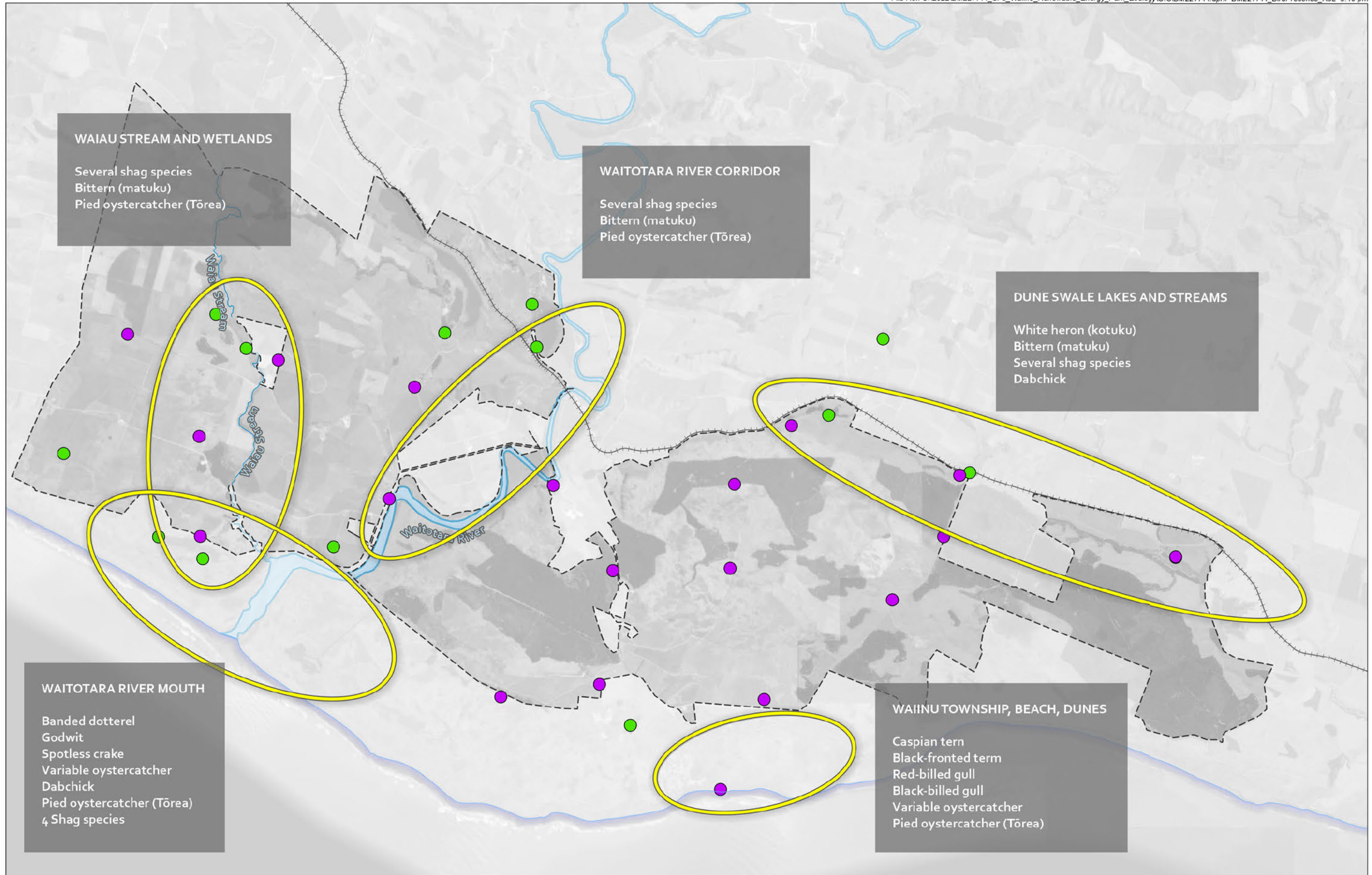
Habitat corridor analysis











## Appendix 2: Images



Photo 1: Waitōtara River mouth, estuary and dunelands.  
Waitōtara Management Area (TRC).  
Unaffected by project.



Photo 2: Coastal dunelands.  
Waitōtara Management Area (TRC).  
Unaffected by project.



Photo 3: Tapuarau Lagoon, dunes and wetlands. Waitōtara Management Area (TRC). Vegetation and habitat unaffected by project. Very high diversity of bird life.



Photo 4: Waitōtara River. Waitōtara Management Area (TRC). Unaffected by project.



Photo 5: Wetlands on the margin of Lake Marahau. Unaffected by project.



Photo 6: Lake Okoia.  
Unaffected by project.



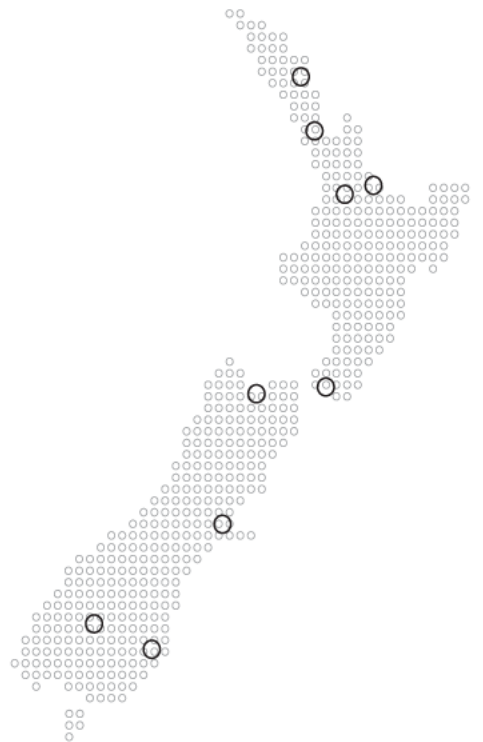
Photo 7: Inland sand  
plains.  
Within the Project Site



Photo 8: Typical pasture and pine, inland of the coastal dunes and escarpment. Within the Project Site.



Photo 9: Typical farmland and plantation pine which makes up most of the Site. Within the Project Site.



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