



APPENDIX C

Ecological Report

Ōhaupō Plan Change

Ecological Effects Assessment

Report prepared for

Honey Comb Developments LP

Prepared by

RMA Ecology Ltd

Report number and date

2454

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BETTER ECOLOGICAL OUTCOMES

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1.0 Introduction

1.1 Background

Honey Comb Developments LP is proposing a Private Plan Change (PPC) application for a block of land located in the Southern end of Ōhaupō (Waipā District), south of Ryburn Road, and west of Ōhaupō Road (SH3), hereafter 'the site' (Figure 1).

The purpose of the PPC is to rezone 21.505 ha of land at 4336 Ohaupo Road, RD4 (Ohaupo 3883; LOT 2 DP 606747) from Rural Zone to Large Lot Residential. The land is bound by Ryburn Road to the north, State Highway 3 to the east, farmland to the south and the North Island Main Trunk Railway Line to the west. A number of residential properties are north of the site as well as a small number of businesses that make up the Ōhaupō Township.

The Site is approximately 17 km from Hamilton and 10 km from Te Awamutu.

To achieve its purpose (as described above), this PPC proposes to make changes to the following sections of the WDP:

- Planning Maps (refer to Figure 2)
- Landscape and Overlays (Section 25)



Figure 1. The proposed Plan Change site boundary (red outline).

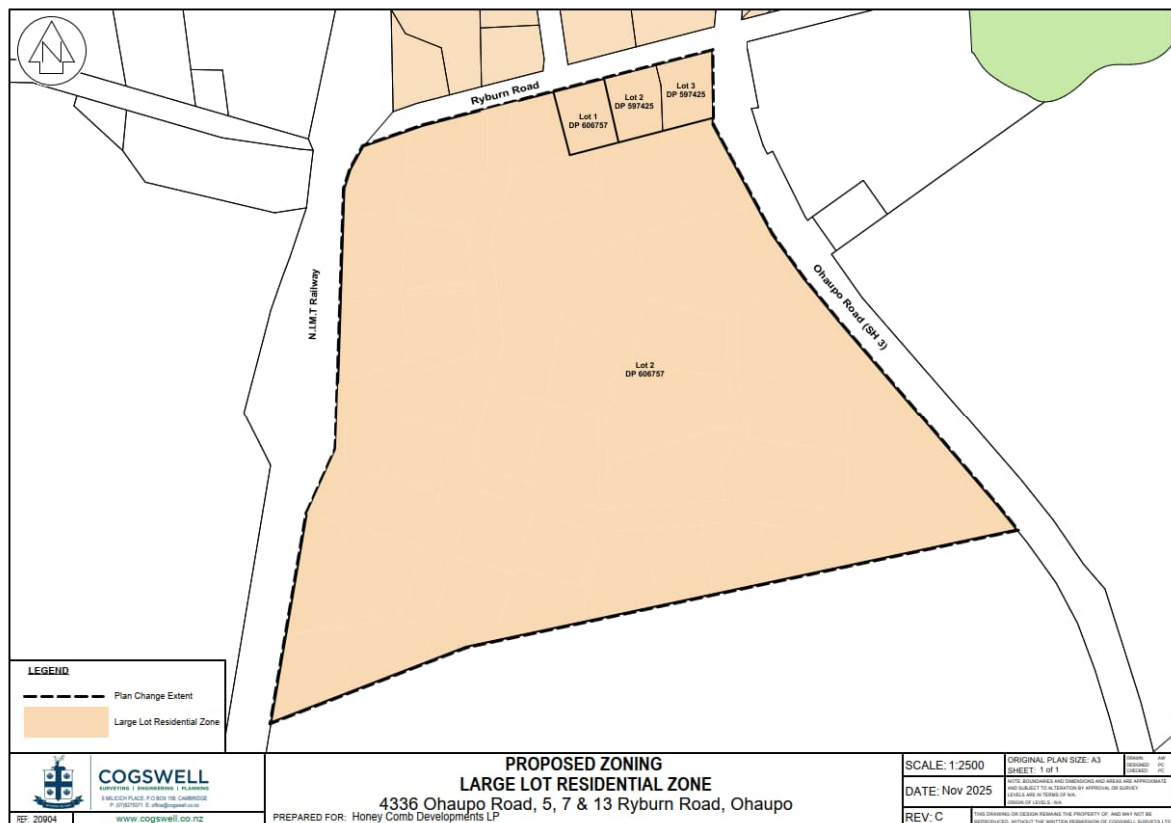


Figure 2. Proposed PC Zoning.

1.2 Purpose and scope

Honey Comb Developments LP has engaged RMA Ecology Ltd to undertake an assessment of the aquatic and terrestrial ecology values at the site¹. This is to support the Structure Plan required by Waipā District Council, and the PPC.

The purpose of this report is to classify and map areas of important ecological values – ecosystems or species that may have relevance to the Structure Plan design process (for example, which may have a notable effect on infrastructure or Lot layout, or which may introduce risk to the planning process, or substantial cost by way of offsetting). Ecological values assessed include wetlands, streams, native wildlife (fish, birds, lizards, and bats), native vegetation, and significant natural areas (SNAs).

Current land use is rural and dominated by pastoral farming activities. Access to all parts of the site was undertaken as part of the assessment process. Our assessment included a desk-top review as well as site-based survey to obtain an accurate assessment of ecological values across the site.

We have prepared this report using a combination of desktop-based assessment and field-based survey. The approach included assessment of both aquatic and terrestrial values and provides the following:

- A description of the vegetation types that exist at the site and their ecological significance (meeting the significance criteria within the Waikato Regional Policy Statement);

¹ Offer of service dated 11 November 2024

- A classification and description of the streams at the site based on the definitions within the Waikato Regional Plan;
- A delineation and classification of wetlands at the site based on the definitions within the Resource Management Act 1991 and the National Policy Statement – Freshwater Management; and
- An assessment of the likelihood of native wildlife (birds, bats, lizards, fish) being present at the site.

This report contains the following:

- An overview of the methods used to identify, classify, and assess ecological features, the ecological values, and the ecological significance of those features; and
- A quantitative and qualitative summary of ecological features, values, and significance, and how these features may function as constraints and opportunities for the Structure Plan process.

The next phase of ecology reporting (not reported here) would normally include the following, once resource consent applications are being prepared to enable subdivision and land use development:

- An assessment of the type and magnitude of potential effects associated with the development, construction, and operational activities, including potential habitat loss and degradation, and direct mortality or injury of indigenous fauna; and
- Recommendations to address adverse effects.

2.0 Methods

Desktop and field assessments were used to identify and classify ecological features and determine their ecological value and significance.

Following this, an ecological management lens was applied based on standard practice which includes recommended setbacks from streams, wetlands, and native vegetation as protection and/or restoration buffers. Additional restoration opportunities representing best practice underpinned by ecological theory are also presented.

2.1 Desktop assessment

A desktop assessment of the site and surrounding area was undertaken to provide insight into the recent history of the site and to identify potential or mapped ecological features by reviewing:

- Historic and present-day aerial images;
- Waipā District Council and Waikato Regional Council GIS;
- New Zealand Freshwater Fish Database;
- National Amphibian and Reptile Database System (Herpetofauna);
- Bird Atlas of New Zealand;
- Department of Conservation (DOC) bat database; and
- iNaturalist records.

The National Policy Statement – Indigenous Biodiversity (NPS-IB) and Waikato Regional Policy Statement Criteria for determining significance of indigenous biodiversity were applied.

Individual species were recorded and their conservation status checked against the national threatened species classification list for plants².

For wildlife species assessed as potentially being present, their conservation status was checked against the national threatened species classification lists for fish³, birds⁴, bats⁵, and reptiles⁶.

² de Lange, Peter J., Jeremy R. Rolfe, John W. Barkla, Shannel P. Courtney, Paul D. Champion, Leon R. Perrie, Sarah M. Beadel, Kerry A. Ford, Ilse Breitwieser, Ines Schönberger, Rowan Hindmarsh-Walls, Peter B. Heenan and Kate Ladley (2017). Conservation status of New Zealand indigenous vascular plants. New Zealand Threat Classification Series 22. 82p.

³ Dunn, N.R., Allibone, R.M., Closs, G.P., Crow, S.K., David, B.O., Goodman, J.M., Griffiths, M., Jack, D.C., Ling, N., Waters, J.M., Rolfe, J.R. (2018) Conservation status of New Zealand freshwater fishes, 2017. New Zealand Threat Classification Series 24. Department of Conservation, Wellington. 11 p

⁴ Robertson, Hugh A., Karen A. Baird, Graeme P. Elliott, Rodney A. Hitchmough, Nikki J. McArthur, Troy Makan, Colin M. Miskelly, Colin. J. O'Donnell, Paul M. Sagar, R. Paul Scofield, Graeme A. Taylor and Pascale Michel (2021). Conservation status of birds in Aotearoa New Zealand. New Zealand Threat Classification Series 36. Department of Conservation, Wellington. 43p.

⁵ O'Donnell, C. F. J., K.M. Borkin, J.E. Christie, B. Lloyd, S. Parsons and R.A. Hitchmough (2017). Conservation status of New Zealand bats New Zealand Threat Classification Series 21. 4p.

⁶ Hitchmough, Rod, Ben Barr, Carey Knox, Marieke Lettink, Joanne M. Monks, Geoff B. Patterson, James T. Reardon, Dylan van Winkel, Jeremy Rolfe and Pascale Michel (2021). Conservation status of New Zealand reptiles. New Zealand Threat Classification Series 35. Department of Conservation, Wellington. 15p.

2.2 Field assessment

Site investigations were undertaken from 27 – 31 January 2025. The weather was fine and sunny during site visits, with no recent rainfall.

2.2.1 Wetlands

The site was assessed for wetlands based on the definition in the Waikato Regional Plan⁷ and the Resource Management Act 1991⁸ (RMA). The site was also assessed for 'natural inland wetlands' based on the definition within the National Policy Statement for Freshwater Management 2020 (NPS-FM)⁹ (last amended January 2024).

The updated NPS-FM technical support documents regarding wetland classification and delineation require that a step-wise assessment is undertaken. That assessment includes application of the exclusion criteria based on pasture grassland, assessment of threatened species habitat use, and then application of three separate vegetation tests (Rapid Test, Dominance Test, and Prevalence Index). Wetland soils and hydrology information can be applied if the results of vegetation community and exotic pasture grass exclusion are inconclusive. Key for identification of natural inland wetlands at this site are whether any wet areas have developed in or around a deliberately constructed water body, or are dominated by pasture grasses.

We understand that the National Environmental Standards for Freshwater 2020 (NES-F) and NPS-FM require Councils to ensure that the loss of values and extent of 'natural inland wetlands' is avoided in most instances (excluding some activities, including urban development). The NPS-FM/ NES-F also restricts activities within a 10 m buffer around 'natural inland wetlands', and places controls on the level of potential adverse effects (from, for example, discharge of water or diversion of water) within 100 m from a 'natural inland wetland'.

The methodology applied for the identification of wetlands at this site was as follows:

- Visual assessment as to whether the potential wetland area could support a threatened species;
- Visual assessment as to whether the potential wetland and surrounding area is clearly dominated by pasture grass species (the Rapid Pasture Test);

⁷ Wetland: Includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.

⁸ RMA – a wetland is defined as a 'permanently or intermittently wet areas, shallow water, and land-water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions'.

natural inland wetland means a wetland (as defined in the Act) that is not:

- (a) in the coastal marine area; or
- (b) a deliberately constructed wetland, other than a wetland constructed to offset impacts on, or to restore, an existing or former natural inland wetland; or
- (c) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body; or
- (d) a geothermal wetland; or
- (e) a wetland that:
 - (i) is within an area of pasture used for grazing; and
 - (ii) has vegetation cover comprising more than 50% exotic pasture species (as identified in the *National List of Exotic Pasture Species* using the *Pasture Exclusion Assessment Methodology* (see clause 1.8)); unless
 - (iii) the wetland is a location of a habitat of a threatened species identified under clause 3.8 of this National Policy Statement, in which case the exclusion in (e) does not apply

⁹

- Visual assessment of areas where the vegetation composition includes species that are scored as wetland obligate, facultative wetland, or facultative (e.g., rushes, wet pasture or 'wetland-type' vegetation) as assessed by Clarkson *et al.*¹⁰ (following the Pasture Exclusion Test, and Wetland Delineation Protocols as laid out in the Pasture Exclusion Assessment Methodology¹¹);
- Where these compositions exist, an assessment of vegetation, soils, and hydrology is required according to the Pasture Exclusion Assessment Methodology:
 - Vegetation is assessed through plant identification and percentage cover estimates (as per the method described by Clarkson¹²) of 2 m x 2 m plot areas within each potential wetland area;
 - Soils are assessed by applying the criteria outlined in Fraser (2018)¹³ for identifying hydric (wetland) soils – which involves excavation and examination for gleyed, mottled, peaty, or wet soils; and
 - Hydrology is assessed by applying the criteria outlined in the Ministry for the Environment tool¹⁴;

An area can be classified as a wetland based on the definition within the Waikato Regional Plan and the RMA, but not be classified as a 'natural inland wetland' under the NPS-FM because the definition of the latter includes some exclusions:

“Natural inland wetland means a wetland (as defined in the [Resource Management] Act) that is not:

- (a) in the coastal marine area; or*
- (b) a deliberately constructed wetland, other than a wetland constructed to offset impacts on, or to restore, an existing or former natural inland wetland; or*
- (c) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body; or*
- (d) a geothermal wetland; or*
- (e) a wetland that:*
 - (i) is within an area of pasture used for grazing; and*
 - (ii) has vegetation cover comprising more than 50% exotic pasture species (as identified in the National List of Exotic Pasture Species using the Pasture Exclusion Assessment Methodology (see clause 1.8)); unless*
 - (iii) the wetland is a location of a habitat of a threatened species identified under clause 3.8 of this National Policy Statement, in which case the exclusion in (e) does not apply”*

¹⁰ Clarkson B. R., Fitzgerald N. B., Champion P. D., Forester L., Rance B. D. (2021). New Zealand wetland plant indicator status ratings 2021: Data associated with Manaaki Whenua - Landcare Research contract report LC3975 for Hawke's Bay Regional Council.

¹¹ Ministry for the Environment. 2022. Pasture exclusion assessment methodology. Wellington: Ministry for the Environment.

¹² Clarkson, B. (2013). A vegetation tool for wetland delineation in New Zealand. Report prepared for Meridian Energy Limited by Landcare Research.

¹³ Fraser S., Singleton P., Clarkson B. (2018). Hydric soils – field identification guide. Envirolink Tools Contract C09X1702. Manaaki Whenua – Landcare Research Contract Report LC3233 for Tasman District Council.

¹⁴ Ministry for the Environment. (2021). Wetland delineation hydrology tool for Aotearoa New Zealand. Wellington: Ministry for the Environment.

The boundaries of potential wetland areas are delineated by carrying out assessments of the various vegetation communities and through professional judgement.

2.2.2 Watercourses

Watercourses were mapped and classified onsite according to the definitions within the Waikato Regional Plan:

“River: A continually or intermittently flowing body of fresh water, and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal).

Perennial stream: A stream that flows all year round assuming average annual rainfall.

Ephemeral streams: Streams that flow continuously for at least three months between March and September but do not flow all year.

Modified watercourse: An artificial or modified channel that may or may not be on the original watercourse alignment and which has a natural channel at its headwaters.

Artificial watercourse: A watercourse that contains no natural portions from its confluence with a river or stream to its headwaters and includes irrigation canals, water supply races, canals for the supply of water for electricity power generation and farm drainage canals.

Farm drainage canal: An artificial watercourse on a farm that contains no natural portions from its confluence with a river or stream to its headwaters, and includes a farm drain or a farm canal.”

2.2.3 Native vegetation

Indigenous vegetation was mapped and described in terms of its composition and values.

All vegetation at the site was assessed for significance based on the Waikato Regional Policy Statement criteria for determining significance of indigenous vegetation and habitats of indigenous wildlife.

The NPS-IB became active on 4 August 2023. It seeks to achieve an objective of maintaining indigenous biodiversity so that there is, at the least, no overall reduction nationally. Seventeen policies are required to be implemented to achieve this objective. The identification of Significant Natural Areas (SNA) is central to the technical implementation of the NPS-IB, as is an assessment of whether impacts on indigenous biodiversity (if outside of mapped SNAs) is deemed ‘significant’.

2.2.4 Wildlife

A wildlife survey was conducted during the site visits. The survey involved general visual observations of potential habitat and wildlife.

For lizards, potential habitat was assessed and debris (e.g., logs, corrugated iron, rubble) were inspected. A more comprehensive survey using active capture methods (pitfall traps, ACOs and

gees minnow traps) was not undertaken as the extremely modified and poor-quality habitat for lizards did not warrant such effort.

For fish, survey methods included the use of six (6) baited fyke nets and 20 baited Gee's minnow traps set over four (4) nights at a range of locations that sampled the diversity of the habitats (that is, ponds, drains and streams where sufficient water allowed) within the surveyed area (Figure 3). The full diversity of habitats within the visited area were sampled (ponds, drains and streams), with a particular focus on the survey of potential black mudfish (*Neochanna diversus*) habitat.

Black mudfish have a threat status of At Risk–Declining and are known to inhabit farm drains, pond edges and wetlands in parts of the Waikato. Their presence is also known in the Ōhaupō peat lakes catchment. Fine mesh (3 mm) Gee's minnow traps were used at available mudfish habitat, such as areas of shallow water likely to dry out in summer, within close proximity of tree roots and other established riparian vegetation.



Figure 3. Location of Gee's minnows, fyke nets and eDNA sampling points across the site area for the survey of native fish.



Plate 1 Gee's minnow trap set in a farm drainage canal where water has pooled to sample for mudfish.

Mudfish habitat was comprehensively surveyed where available, including 26 separate fish traps over four nights of sampling effort.

We also conducted comprehensive eDNA sampling at the southernmost end of the permanent stream on site to detect any fish species that may have been missed by manual trapping and mudfish that may have been missed due to aestivation.

All birds seen or heard during the field visits were recorded. No call playback was used to target more elusive wetland birds due to the lack of wetland habitat within the site, and because potential wetland areas were so small that they could be comprehensively surveyed visually and by binoculars.

The site was assessed for bat habitat. A bat survey was not undertaken during the site visit.

3.0 Results

3.1 Ecological context

The site consists largely of exotic pastoral grass paddocks with a few farm sheds and three dwellings developed at the northeastern corner of the parcel. There is one stream that traverses the western boundary of the site and four ponds within the central portion of the site. The site contains a small number of scattered individual exotic trees and hedgerows. The most substantial land use on the site is agricultural cropping of maize.

Apart from the three dwellings at the north-eastern corner of the land parcel, the land is predominantly used for livestock grazing and cropping.

The c. 21.5 hectare site is within the Hamilton Ecological District¹⁵. This ecological district is characterised by low-altitude inland basins, alluvial plains, Holocene peatlands, and minor lakes. Geologically, it consists of quaternary sediments, including pumiceous sand, silt, gravel and peat from the ancestral Waikato River.

Wildlife in the Hamilton Ecological District includes a number of rare and threatened species. There are seven (7) species of native lizards, including copper skink (*Oligosoma aenum*), ornate skink (*Oligosoma ornatum*), striped skink (*Oligosoma striatum*), crenulate skink (*Oligosoma robinsoni*), Pacific gecko (*Dactylocnemis pacificus*), elegant gecko (*Naultinus elegans*), and forest gecko (*Mokopirirakau granulatus*). The District also supports the long-tailed bat (*Chalinolobus tuberculatus*). There are also seven (7) species of native freshwater fish recorded from the District, including the rare black mudfish.

The site is typical of the Hamilton Ecological District rural environment in that original vegetation has been cleared, watercourses have been modified, most wetlands have been drained, and pasture is the dominant vegetation cover, with scattered individual exotic trees and hedgerows, and with riparian plantings. The site is mostly surrounded by rural and semi-rural land, except to the North where the site borders existing Large Lot Residential Zones of the Ōhaupō township.

A historic river terrace is the dominant topographical feature of the site. The terrace scarp runs approximately north-south through the centre of the site and has a westerly aspect. The site is classed as lowland, with an altitudinal range of 35-45 m above sea level. It lies 40 km inland from the sea. The site is within the greater peat lake catchment area around the Ōhaupō township.

3.2 Terrestrial ecology

3.2.1 Vegetation

The existing vegetation can be categorised into three communities:

1. Exotic pasture: Exotic grassland, as managed for pastoral agriculture, is one of the most common vegetation communities within the site and is dominated cocksfoot (*Dactylis*

¹⁵ Ecological Districts and Regions are a framework developed to manage indigenous biodiversity in New Zealand and to communicate spatial extent of ecologically distinct and representative areas. Classification is based upon ecosystem types and species features where the topographical, geological, climate, soil and biological features including the broad cultural pattern produce a landscape and range of biological communities. A description of the framework can be found in the publication: McEwen, 1987. Ecological regions and districts of New Zealand. Third edition. Produced for the Department of Conservation, Wellington by the New Zealand Biological Resources Centre (publication 5).

glomerata), sweet vernal, (*Anthoxanthum odoratum*), Yorkshire fog (*Holcus lanatus*), brown top (*Agrostis capillaris*), paspalum (*Paspalum dilatatum*), and white clover (*Trifolium repens*) (Plate 2). In damper areas, Mercer grass (*Paspalum distichum*), creeping bent (*Agrostis stolonifera*), buttercup (*Ranunculus repens*), lotus (*Lotus pedunculatus*), and soft rush (*Juncus effusus*) become prevalent (Plate 3).

2. Maize plantation: c. 8.3 hectares of the site has been tilled and transformed into maize (Plate 4; Figure 4). No other vegetation is dominant within this area.
3. Exotic trees and scrub: Ungrazed areas have developed into exotic weedy species including blackberry (*Rubus fruticosus*), Chinese privet (*Ligustrum sinense*) and greater bindweed (*Calystegia silvatica*) (Plate 5). Mature liquidambar (*Liquidambar styraciflua*), London plane (*Platanus × hispanica*), black wattle (*Acacia mearnsii*) and macrocarpa (*Hesperocyparis macrocarpa*) are dispersed as individual trees around pasture paddocks.

A list of plant species recorded on the site is presented in Appendix A.

There are no Significant Natural Areas (SNA) listed at the site under the Operative Waipā District Plan. The nearest SNA is 200 m from site along the edges of the neighbouring Rotomanuka peat lake.

No threatened plant species were detected at the site.



Plate 2. Typical vegetation over most of the site area: dry exotic pasture with wetted pasture and maize plantation behind.



Plate 3. Wetted pasture, common along ditches, drains and depressions. This is frequently cultivated for cropping before lying fallow for several years.



Plate 4. Maize plantation.



Plate 5. Dense mixed exotic hedgerow following a farm drain towards the western end of the site. Species include blackberry, Chinese privet, and greater bindweed.



Figure 4. Vegetation cover within the site, including maize plantation (pink polygons) and exotic scrub and trees (red polygons). All remaining vegetation outside of these polygons is exotic pasture.

3.2.2 Birds

During our site visit we recorded eight (8) native and 15 exotic bird species typical of rural Waikato at the site (Table 1). Two weweia, New Zealand dabchick (*Poliocephalus rufopectus*; Threatened – Nationally Increasing) were observed in the larger ponds within the site. Riparian habitat availability for breeding for dabchick at these ponds is absent, and they are likely permanent residents of the eight larger neighbouring peat lakes within a 5 km radius of the site where they have been detected from other studies.¹⁶ Their presence on the ponds at the site indicates that local dabchick may use these ponds for occasional feeding or resting – as is noted elsewhere where dabchick also use a network of ponds and wetlands to forage, rest and breed.

None of the other bird species at the site are Threatened or At Risk.

Our desktop assessment found that six species of rare and threatened birds inhabit the nearby areas (outside of the site). Spotless crane (*Porzana tabuensis*; At Risk – Declining), marsh crane (*Porzana pusilla*; At Risk – Declining), fernbird (*Megalurus punctatus*; At Risk - Declining), banded rail (*Gallirallus philippensis*; At risk – Declining), grey teal (*Anas gracilis*; Not Threatened) and white heron (*Ardea modesta*; Threatened – Nationally Critical) are also known to inhabit the neighbouring peat lakes (within 0.5-5 km of the site).

None of these species were observed at the site itself during our site visits, and there are no records of their occurrence at the site. The loss of original vegetation at or near the site, and the lack of comprehensive pest animal control across the site suggests that the rare or threatened species as above are unlikely to inhabit the site. Although cranes and bittern are known to range widely between areas of suitable habitat, presence of a resident population is highly unlikely, due to the complete lack of preferred habitat (tall reed or rush cover).

Table 1. List of bird species detected during the field survey.

Species	Common name	Conservation status
<i>Anas platyrhynchos</i>	Mallard	Introduced and naturalised
<i>Callipepla californica</i>	California quail	Introduced and naturalised
<i>Carduelis carduelis</i>	European goldfinch	Introduced and naturalised
<i>Chloris chloris</i>	European greenfinch	Introduced and naturalised
<i>Circus approximans</i>	Kahu, harrier hawk	Native - Not Threatened
<i>Gerygone igata</i>	Grey warbler	Native - Not Threatened
<i>Gymnorhina tibicen</i>	Australian magpie	Introduced and naturalised
<i>Hirundo neoxena</i>	Welcome swallow	Native - Not Threatened
<i>Passer domesticus</i>	House sparrow	Introduced and naturalised
<i>Poliocephalus rufopectus</i>	Weweia, New Zealand dabchick	Native - Nationally increasing
<i>Porphyrio melanotus</i>	Pūkeko	Native - Not Threatened
<i>Streptopelia chinensis</i>	Spotted dove	Introduced and naturalised
<i>Todiramphus sanctus</i>	Kotare, sacred kingfisher	Native - Not Threatened
<i>Zosterops lateralis</i>	Silvereye	Native - Not Threatened

¹⁶ From <https://webstatic.niwa.co.nz/library/WaipāDistrictPeatLakesandwetlands.pdf>

Species	Common name	Conservation status
<i>Acridotheres tristis</i>	Common myna	Introduced and naturalised
<i>Emberiza citrinella</i>	Yellowhammer	Introduced and naturalised
<i>Rhipidura fuliginosa</i>	Piwakawaka, fantail	Native - Not Threatened
<i>Turdus merula</i>	Blackbird	Introduced and naturalised
<i>Turdus philomelos</i>	Song thrush	Introduced and naturalised
<i>Alauda arvensis</i>	Eurasian skylark	Introduced and naturalised
<i>Platycercus eximius</i>	Eastern rosella	Introduced and naturalised
<i>Sturnus vulgaris</i>	Common starling	Introduced and naturalised
<i>Phasianus colchicus</i>	Common pheasant	Introduced and naturalised

3.2.3 Bats

Long-tailed bats/pekapeka (*Chalinolobus tuberculatus*; Threatened – Nationally Critical) are common in and around Cambridge. There are 10 records of long-tailed bats within 5 km of the site, according to the Waikato Regional Council maps website and in the Department of Conservation National Bat Database.

One record is noted within 200 m of the eastern boundary of the site during an acoustic survey in 2021 within the Lake Rotomanuka Wildlife Reserve. A further two locations are 2.5 km to the northeast within mixed mature trees along a permanent stream and had 28 records over a span of 22 days from 10 May 2021 to 31 May 2021 during an acoustic survey. In total there are 35 separate bat records within 5 km of the site including potential overlap from sampling over a given time period in the same location (Figure 5).

Potential bat habitat exists on the site in the form of large exotic trees (macrocarpa and one London plane) up to 20 m high (Plates 6a-c), several of these have deep cavities and crevices that could be used by bats for roosting (Plates 7a-b; Table 2). The location of these trees on site is shown in Figure 6.

Table 2. Record of Bat Habitat Risk Assessment on site.

Date	Location	Species	Risk assessment (feature) ¹⁷
30 January 2025	Ōhaupō - Waikato	2 x lone macrocarpa (Plates 6a-b)	High Risk (crevice, tree top not visible, broken branches, multiple features; Plates 7a-b)
30 January 2025	Ōhaupō - Waikato	5 x grouped macrocarpa (Plate 6c)	High Risk (crevice, tree top not visible, broken branches, multiple features; Plates 7a-b)
30 January 2025	Ōhaupō - Waikato	London plane	High risk (tree top not visible)

¹⁷ Trees are to be assessed as 'High Risk' (contains features suitable for bats) or 'Low Risk' (does not contain suitable features for bats).

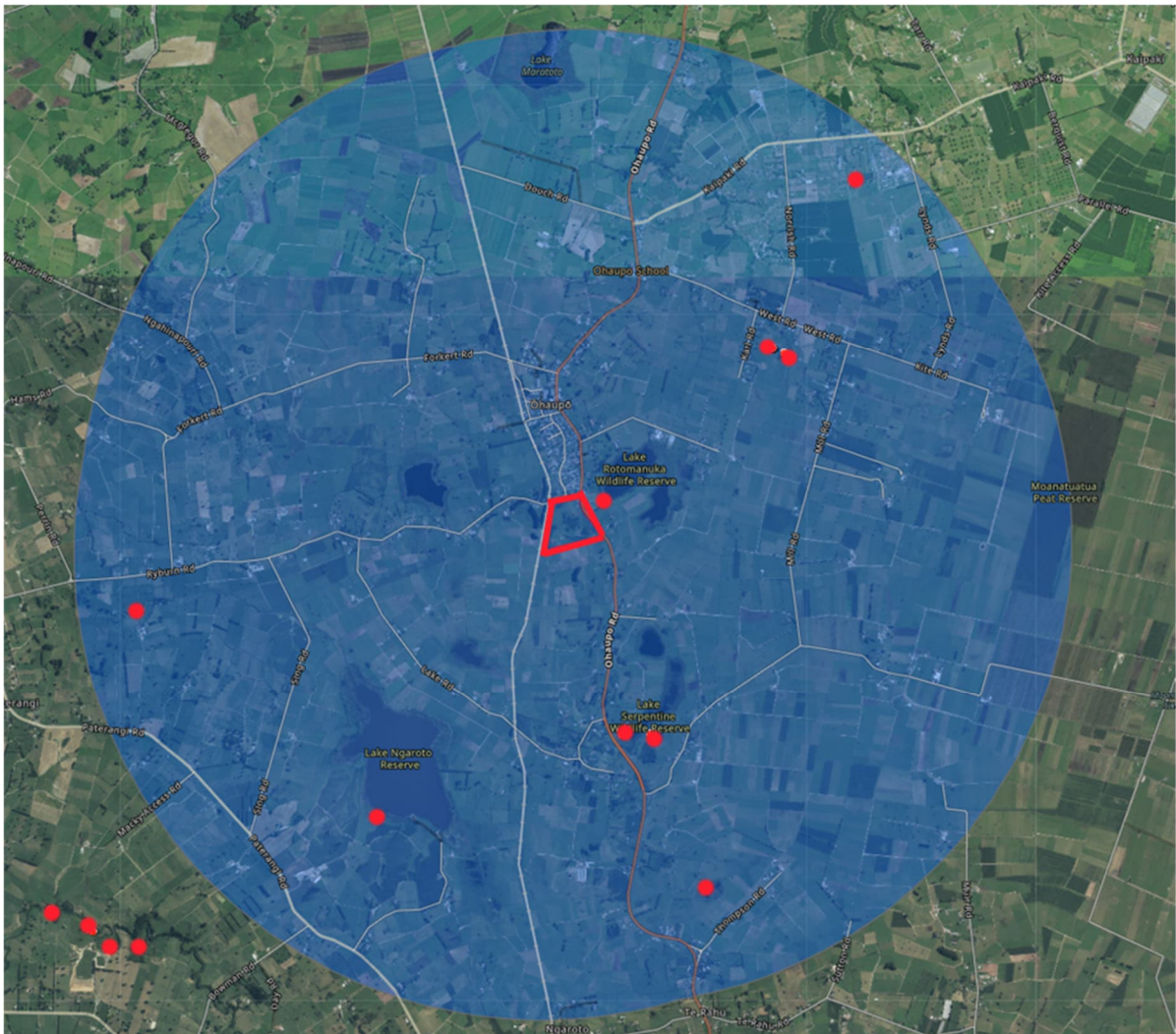


Figure 5. Long-tailed bat observations from the DOC National Bat Database (red dots) within 5 km of the site (red polygon and blue 5 km buffer).

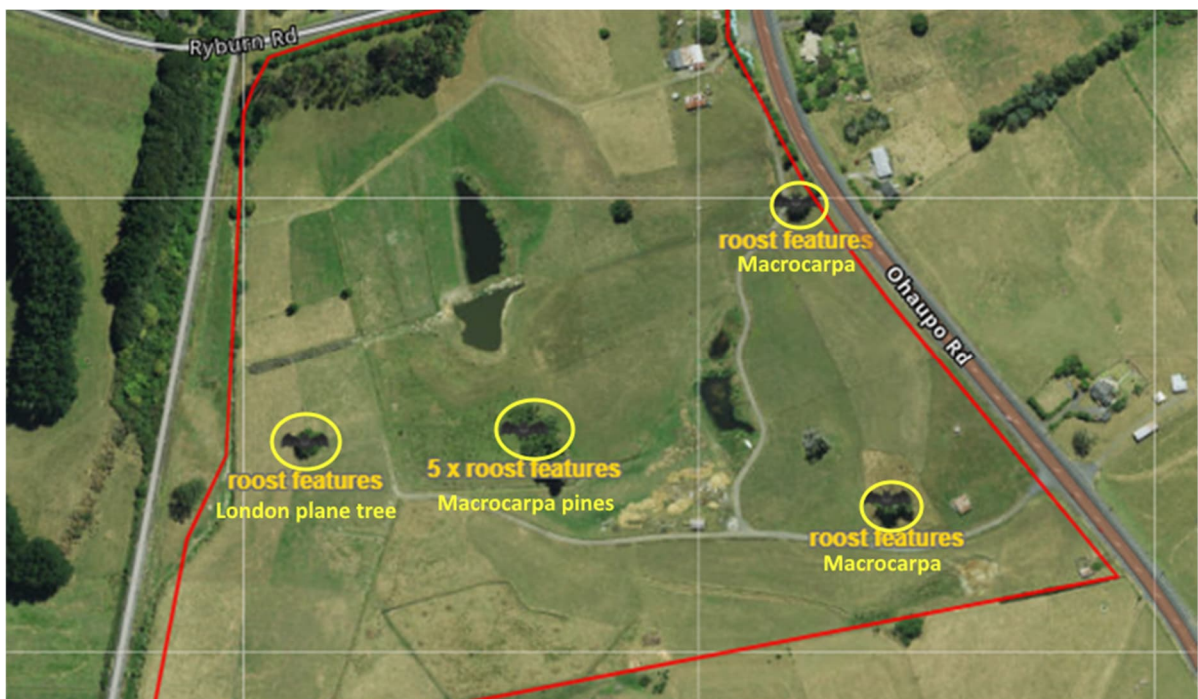


Figure 6. Sites providing potential long-tailed bat roost habitat. Note, the western-most tree is the London plane. All other trees shown on this image on the site have been felled and no longer exist.



Figure 7. Historic site image in 1966 – sourced from retolens.nz showing the presence of the existing potential bat habitat on site.

Of the eight extant potential bat trees on site, all of these are at least 50 years old.

It is unlikely that any of the remaining trees can support colonies, based on the context and location of the trees. They may, however, provide temporary roosts for bats on occasion, such as during extreme weather events.

Given that there are bat records within the last 10 years within 25 km of the site, and that there are several trees on the site that meet the classification as ‘high risk’ potential bat roost trees (under the Department of Conservation’s (DOC) bat management protocols), it is standard practice to:

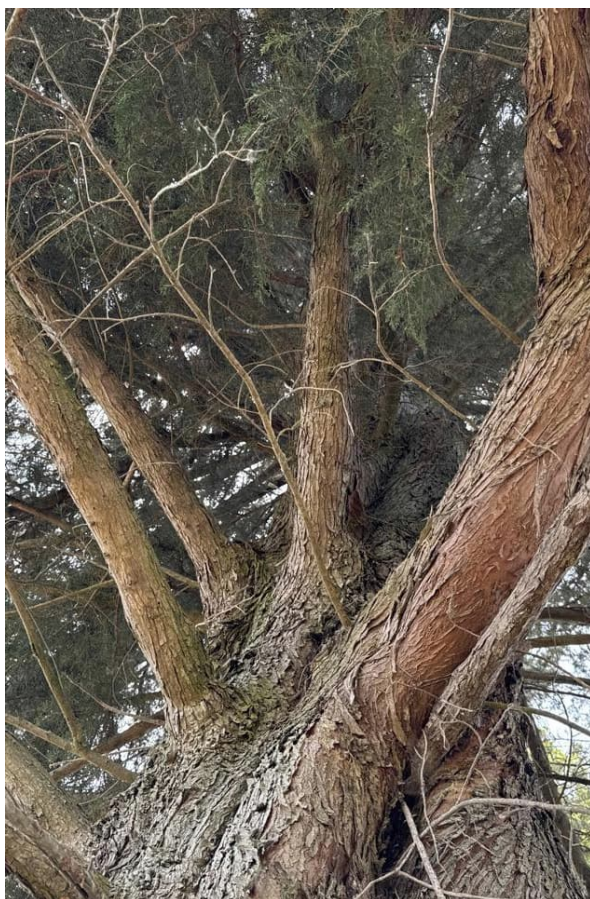
- Undertake an Automatic Bat Monitor (ABM) survey and/or a visual assessment of the ‘High Risk’ trees prior to tree felling;
- The felling and climbing of trees to inspect trees for potential bat roosts should be restricted to the winter months; and,
- If following a survey of the trees for bat roosts and activity, no bats are detected by the second morning of the survey, tree felling can occur; this must happen on the same day.¹⁸

A decision flow chart for tree removal in bat areas is described in the DOC protocols for minimising the risk of felling occupied bat roosts and is provided in Appendix D.

¹⁸ Protocols for minimising the risk of felling occupied bat roosts. Version 4: October 2024.



Plates 6a (top left), 6b (top right) and 6c (bottom). Mature macrocarpa across the site. These contain potential bat roost features.



Plates 7a and 7b. Examples of macrocarpa with small cavities providing potential long-tailed bat roosts.

3.2.4 Lizards

Seven native lizard species and one exotic lizard species are known to be present in the Waipa area (Table 3). Most of these species are unlikely to be present at the site due to the lack of suitable habitat, and isolation from other areas of habitat. The native copper skink (*Oligosoma aeneum*) and the exotic plague skink (*Lampropholis delicata*) are the most likely to be present.

Table 3. Lizard species which are known in the wider area surrounding the site, conservation status, preferred habitat, nearest observation from the DOC herpetofauna database, and likelihood of presence at the site.

Species	Common name	Conservation status	Preferred habitat	Nearest observation	Presence likelihood
<i>Dactylocnemis pacificus</i>	Pacific gecko	Not Threatened	Arboreal/ terrestrial including forest, scrub, clay banks, rock, dense ground cover.	16 km	Nil
<i>Lampropholis delicata</i>	Plague skink	Introduced	Wide range of habitats including gardens and rough pasture. Typically found in low dense vegetation and leaf litter.	12 km	Confirmed
<i>Mokopirirakau granulatus</i>	Forest gecko	At Risk - Declining	Arboreal species which live in forest and scrub.	19 km	Nil
<i>Naultinus elegans</i>	Elegant gecko	At Risk - Declining	Strongly arboreal often inhabiting pioneer scrubland and regenerating forest.	6 km	Nil

<i>Oligosoma aeneum</i>	Copper skink	At Risk - Declining	Grasslands, shrubland and forest. Also found in urban areas, most commonly in thick rank grass, compost heaps, or under rocks, logs, and other debris.	2.4 km	Low
<i>Oligosoma ornatum</i>	Ornate skink	At Risk - Declining	Forested areas and shrubland; found amongst leaf litter, in dense low foliage, thick rank grass and under rocks or logs.	37 km	Very low
<i>Oligosoma robinsoni</i>	Crenulate skink	At Risk - Declining	Range of habitats from dune systems and boulder beaches on the coast, to open forest, scrub or pasture at inland sites.	11 km	Nil
<i>Oligosoma striatum</i>	Striped skink	At Risk - Declining	Range of habitat types, but primarily arboreal in habit, occupying mature forest canopies. Strong preference for damp habitats. May persist in or under rotting logs and dense vegetation (such as pampas shelter belts) in pasture where mature forest has recently been cleared.	58 km	Nil

A lizard survey was undertaken during the site visit using basking search and manual cover search techniques. Several lizards were detected but were not able to be identified – but were most probably plague skinks based on their size, colour and behaviour. Plague skink (*Lampropholis delicata*) were confirmed across other parts of the site (Figure 8), and after discovering eggs beneath some dry topsoil where lizards were sighted (Plate 7).

There are two (2) copper skink observations within 5 km of the site from the DOC herpetofauna database (Figure 9). Observation one (2.4 km from the site) is from 2020, in dense riparian vegetation within the Lake Serpentine Wildlife Reserve. The other observation (4.7 km from the site) is from 2003 in a mature and sparse hedgerow on the outskirts Te Rahu.

Potential native lizard habitat on site was recorded in the form of rank grass and weeds, exotic hedgerows, logs, stumps, and scattered debris. Most of the site is grazed pasture and maize plantation, which provides no suitable habitat for native lizards. The history of the site suggest native lizards are unlikely to be present, but we cannot discount the possibility that a sparse population of copper skinks persists at the site. The site has been highly modified in recent decades (draining, deforestation and farmed) and remains isolated from other surrounding potential native lizard habitat.



Plate 8. Exotic plague skink (*Lampropholis delicata*) eggs beneath loose topsoil.



Figure 8. Lizard detections across the site (circled in orange) and the location of the plague skink eggs (circled in blue).

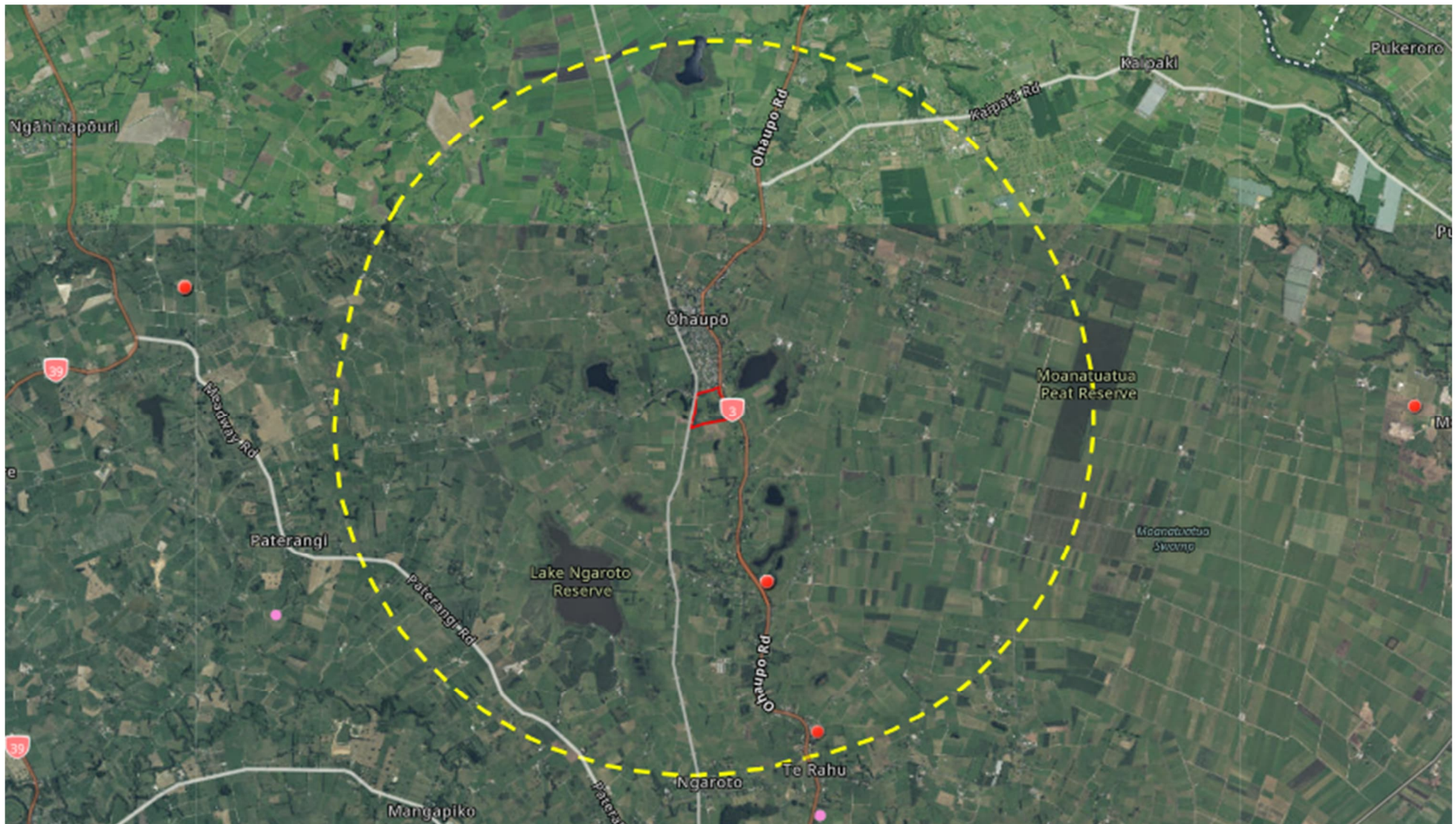


Figure 9. Lizard observations from the DOC herpetofauna database (red and pink dots) within 5 km of the site (yellow dashed polygon). There are two (2) copper skink records within 5 km of the site (red dots).

3.3 Aquatic ecology

3.3.1 Wetlands

One (1) NPS-FM qualifying 'natural inland wetland' is present within the site which is located at the upper end of a farm drainage canal (Figure 10).

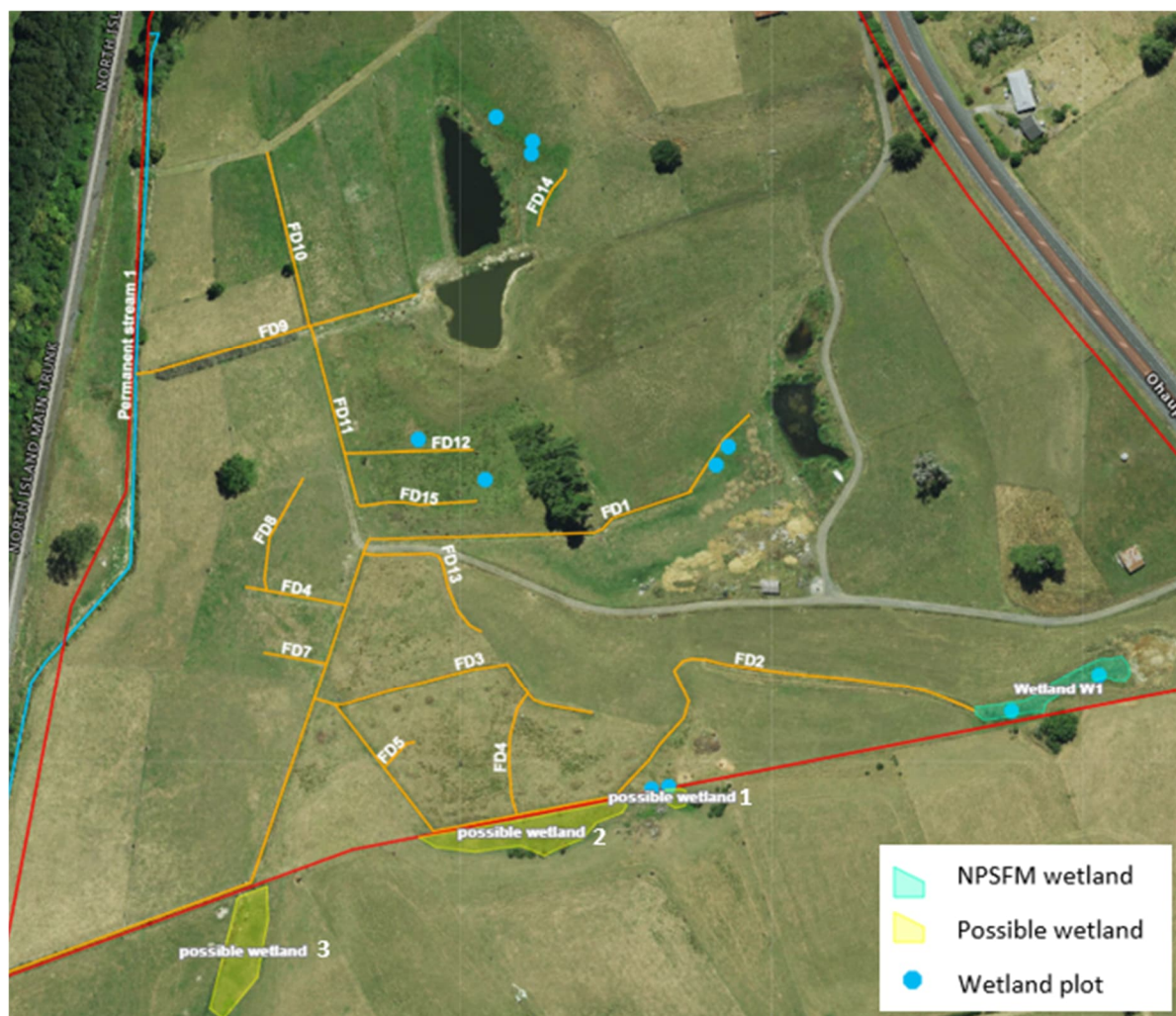


Figure 10. Location of the NPS-FM qualifying wetland within the site and the three possible wetlands on the neighbouring property.

Wetland is W1 dominated by exotic grasses, primarily Mercer grass (*Paspalum distichum*) and some creeping buttercup (*Ranunculus repens*). The wetland is likely to have been included as part of past drainage and agricultural activities and is likely to support crops or pasture on an occasional basis (before reverting back to wetter, wetland exotic species that are seen currently). Despite its use as pasture for grazing, the composition of non-pasture species qualifies this as a natural inland wetland.

A list of plant species and their hydrotype affiliation within wetland plots P6 and P7 within wetland W1 is presented in Appendix B.

Other wet areas that were in maintained pasture areas often had lower water tables and were dominated by exotic herbs and grasses, primarily creeping bent (*Agrostis stolonifera*), Mercer grass (*Paspalum distichum*), creeping buttercup (*Ranunculus repens*), and soft rush (*Juncus effusus*). These wet areas were located within paddocks that have been subject to dairy cattle grazing and

are regularly subjected to regular pasture maintenance, including weed spraying and re-sowing with pasture grasses.

The NPS-IB wetland classification guidance documents rely upon expert judgement as well as on-site measurement. We have not mapped areas of pasture weeds – including Mercer grass and creeping bent – as natural wetlands in grazed pasture paddocks which are subject to ongoing management for farm grazing and pasture sward management, as those areas do not support a natural community of wet-adapted plants and animals, and they are under continual pasture improvement practices.



Plate 9. Wetland W1 looking West over the dominant Mercer grass.



Plate 10. Evidence of soil saturation and cracked soils at the lower end of Wetland W1.



Plate 11. Possible wetland, W2, on neighbouring property. The area is adjacent to a farm drain at the base of a small depression. Dominant species included Mercer grass (FACW), sweet vernal (FACU) and creeping buttercup (FAC).



Plate 12. Possible wetland, W3, on neighbouring property. The area is adjacent to a farm drain. Dominant species include water pepper (*Persicaria hydropiper*; FACW) and Mercer grass (FACW).

Three (3) potential wetlands were also mapped on a neighbouring property on the southern end of the site. A precautionary approach was taken to acknowledge the presence of these neighbouring wetlands under the RMA. As we could not access the neighbouring site, we were unable to gather sufficiently detailed information to assess these areas under the NPS-FM criteria. These areas have a similar species composition to wetland W1 with dominant Mercer grass, creeping buttercup, and occasional soft rush.

3.3.2 Watercourses

There is one (1) permanent stream that flows through the site. The stream is predominantly soft-bottomed and narrow, flowing north to south along the western edge of the site (Figure 11). This watercourse has been modified through channelising and culverting within the last 50+ years and has around 1.6 km of upstream catchment ending north of the Ōhaupō township.

A network of 15 farm drainage canals were mapped at the site. It is unlikely these watercourses flow continuously for at least three months between March and September. At the time of the survey during late January, some drains held pooled water, but none had flow.

3.3.3 Ponds

There are four (4) ponds within the site, two larger (Ponds 1-2) and two smaller (Ponds 3-4) (Figure 11). These ponds have all been artificially constructed and are linked to the farm drainage canal system.

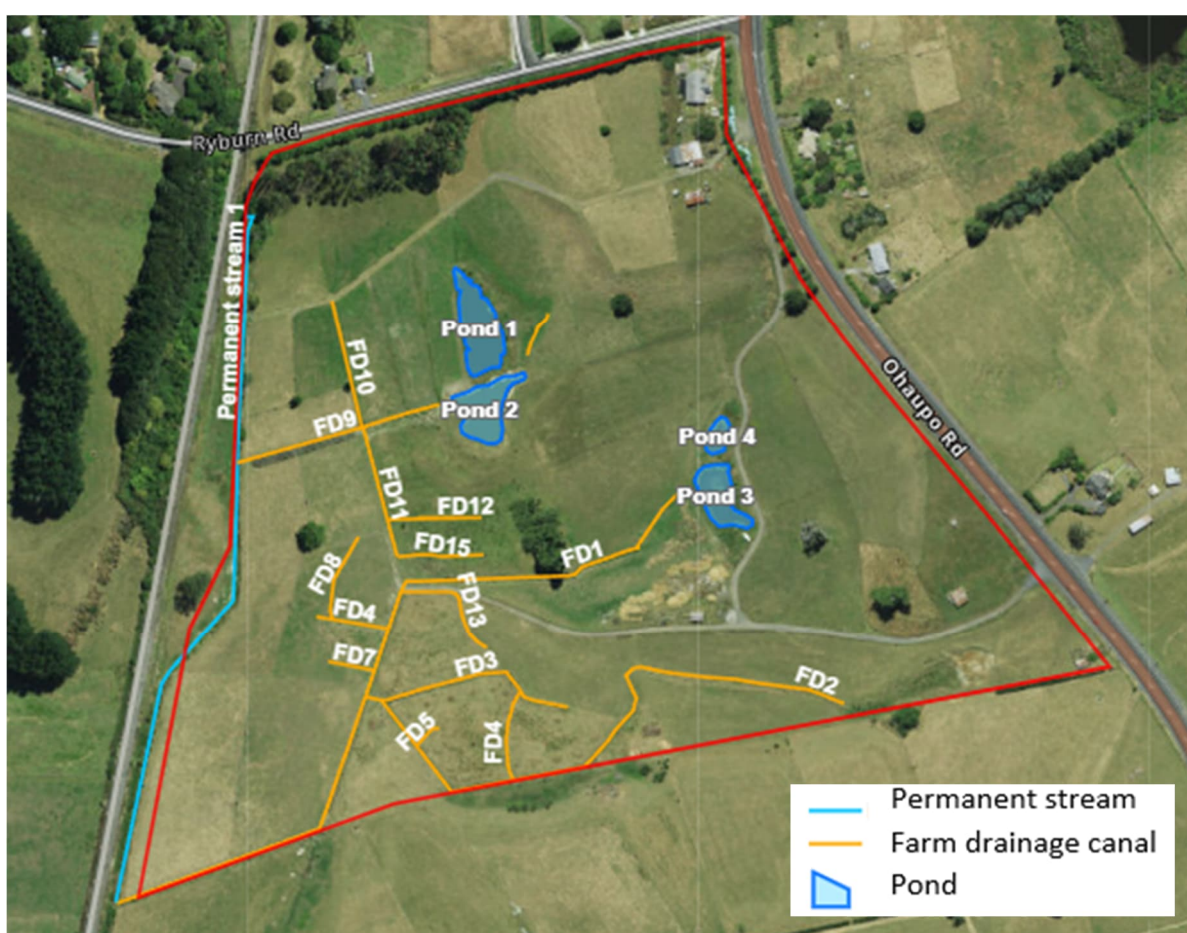


Figure 11. Watercourses and ponds within the site

3.3.4 Fish

The fish survey, which consisted of four (4) nights of trapping using six (6) fyke nets and 20 Gee's minnow traps across the farm drains, ponds, and permanent stream at the site detected two (2) native fish species and one (1) exotic pest fish. The two native fish species were the At Risk longfin eel (*Anguilla dieffenbachia*) and the shortfin eel (*Anguilla australis*, Not Threatened). The sole exotic fish was the pest fish gambusia (*Gambusia affinis*) (Plates 13 a-b).

No black mudfish were detected, despite the large network of 15 farm drainage canals and four farm ponds. Our survey took place at a suboptimal time of the year due to the dryness of the farm drainage canals on site, meaning that if present, mudfish were likely undergoing aestivation (prolonged dormancy during dry periods).

One comprehensive eDNA sample consisting of six replicates was collected from Permanent stream 1 and detected longfin eel, shortfin eel, mosquitofish, and common smelt (*Retropinna retropinna*). If mudfish were undergoing aestivation within the upstream catchment, it is likely that eDNA would have detected their presence, and as such, it is unlikely that mudfish are present within the site.

The presence of eels and large numbers of exotic mosquito fish – as key predators and competitors of mudfish - throughout the drain system means that there is a low likelihood that mudfish are present on this site.

The New Zealand Freshwater Fish Database was reviewed, and the species detected within the wider catchment area (Mangaotama Stream; 220.222 S15) have been listed below in Table 4.

Table 4. List of fish species that have been recorded from the wider catchment (summarised from national database records of surveys at sites outside of the site) and the presence likelihood of these species being within the site.

Scientific name	Common name	Conservation status	Nearest recorded location	Presence likelihood within the site
<i>Anguilla australis</i>	Shortfin eel	Not Threatened	Lake Ngaroto (2km)	Confirmed
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk – Declining	4km	Confirmed
<i>Carassius auratus</i>	Goldfish	Introduced	Lake Ngaroto (2km)	Unlikely
<i>Cyprinus carpio</i>	Koi carp	Introduced	Lake Ngaroto (2km)	Unlikely
<i>Galaxias fasciatus</i>	Banded kokopu	Not Threatened	4km	Likely (permanent stream)
<i>Galaxias maculatus</i>	Inanga	At Risk – Declining	Lake Ngaroto (2km)	Unlikely
<i>Gambusia affinis</i>	Gambusia	Introduced	Lake Ngaroto (2km)	Confirmed
<i>Gobiomorphus basalis</i>	Crans bully	Not Threatened	5.7km	Unlikely
<i>Gobiomorphus cotidianus</i>	Common bully	Not Threatened	Lake Ngaroto (2km)	Likely (permanent stream)
<i>Neochanna diversus</i>	Black mudfish	At Risk – Declining	9km	Unlikely
<i>Paranephrops</i>	Koura	Not Threatened	4km	Likely (permanent stream)
<i>Retropinna retropinna</i>	Common smelt	Not Threatened	Lake Ngaroto (2km)	Confirmed (eDNA)



Plate 13a. Mosquitofish caught in a Gee's minnow trap within farm drainage canal FD1.



Plate 13b. Shortfin eels caught in a fyke net in Pond 1.

3.4 Summary of ecological values

Overall, the ecology values reflect a highly modified landscape. Almost all of the original natural features have been removed or degraded over many decades of farming and land use. The few that remain are common in modified landscapes, or (for wetlands) are exotic-dominated remnants or previous wetlands or have been induced through human modification of the landscape.

This assessment identified the following ecological features:

- Context: The predominant existing land use of the site is pastoral agriculture.
- Vegetation: All original vegetation within the site has been removed, and vegetation present now consists of maize, exotic pasture, and exotic trees and scrub. There are no significant natural areas, no indigenous vegetation communities, and no threatened plant species at the site.
- Birds: Eight (8) native and 15 exotic bird species typical of rural or peri-rural Hamilton were detected within the site. One (dabchick) is Threatened – Nationally Increasing but is known to be common within the Ōhaupō peat lake catchment area and this site does not support habitat suitable for its breeding; its presence on this site is likely to be occasional for foraging and resting.
- Bats: While there are no records for bats at the site, long-tailed bats are recorded in the general area, including one record within 200 m of the site. ‘High-risk’ bat habitat in the form of eight solitary or grouped exotic trees exists at the site. While bats may on occasion use these, it is very unlikely that these trees are used for maternity nest sites or for long-term roost. There are standard protocols developed by DOC for the removal of potential bat roost trees such as this, and we recommend that these are followed if these trees are proposed to be removed.
- Lizards: Lizard habitat quality at the site is poor. There is no habitat for arboreal geckos and low-to-no quality habitat for native skinks. No native lizards were observed during our site visits, and based on the low-quality skink habitat present and high level of disturbance to the site during its normal farm management it is unlikely that native skinks are present at site.
- Wetlands: There is one (1) NPS-FM qualifying natural inland wetland within the site located at the top of one of the farm drainage canals. The wetland is dominated by exotic and weedy grasses and is of low ecological value. Several other similarly small and degraded potential wetlands may exist off the site over the southern boundary.
- Streams: There is around 500 m of permanent stream within the site and 1,900 m of farm drainage canals. The permanent stream is typically degraded from straightening and excavation to increase flood flow capacity and has moderate ecological value.
- Fish: Native longfin eel and shortfin eel were recorded within the surveyed area. Common smelt were detected using eDNA within the permanent stream upstream catchment. No black mudfish were detected.

4.0 Assessment of effects

The existing rules in the District and Regional Plans provide a comprehensive framework that ensures that potential adverse effects on ecology values will be avoided, minimised or mitigated.

This Plan Change application does not propose any site-specific objectives, policies or rules and will instead rely upon the existing suite of controls in the District and Regional Plans to guide environmentally-responsible development on the site.

A concept subdivision layout plan is shown as Figure 12. This was prepared prior to our ecological assessment, and we have been informed by the Applicant that the concept plans will be refined now that ecological values have been recorded in some parts of the site.

For this site, we would expect that a subdivision layout would recognise and allow for the following features of ecological interest:

1. Either avoid removal of the 8 x large potential bat roost trees, or apply the DOC tree clearance protocols to ensure that no bats are injured or otherwise harmed during the removal of these trees. We understand that removal of these trees is a permitted activity under the existing District Plan rules.
2. Works within Wetland 1 and a 10 m wide buffer to wetland 1 should be avoided. This will require the existing concept cul-de-sac turning head and Lot layout to be realigned. The wetland is utterly degraded; however, it could serve as part of a stormwater management system for the site. Buffer planting of the wetland would increase its ecology values, although this wetland will never become a locally or regionally important wetland for wildlife or native vegetation communities because of its very small size, disconnected hydrology through historic farming, and disconnect to other wetland areas.
3. Stream 1 should be conserved on its current path, and a minimum 5 m wide riparian margin planting added to provide shade, shelter and organic inputs into the stream for native fish and instream macroinvertebrates.
4. Of the four ponds, the two largest are proposed to be preserved under the concept subdivision layout. These larger of the ponds are also the areas where dabchick were recorded. Enhancement of these two large ponds with margin planting to provide potential nesting habitat, and buffer planting to provide visual screening from future housing and people use would benefit the ecological values of these ponds.

Assuming the existing rules in the District and Regional Plans are adhered to, and the opportunities for protection, mitigation and restoration outlined in this report are implemented, the residual adverse effects of the proposed Plan Change will be less than minor.



Appendix A: Plant species list

Table A1. Plant species recorded within the site and their threat status

Scientific name	Common name	Threat status (de Lange et al., 2018)
<i>Acacia mearnsii</i>	Black wattle	Exotic – Introduced and naturalised
<i>Achillea millefolium</i>	Yarrow	Exotic – Introduced and naturalised
<i>Agrostis capillaris</i>	Browntop	Exotic – Introduced and naturalised
<i>Agrostis stolonifera</i>	Creeping bent	Exotic – Introduced and naturalised
<i>Amaranthus powellii</i>	Powell's amaranth	Exotic – Introduced and naturalised
<i>Anthoxanthum odoratum</i>	Sweet vernal	Exotic – Introduced and naturalised
<i>Berberis glaucocarpa</i>	Barberry	Exotic – Introduced and naturalised
<i>Parablechnum minus</i>	Swamp kiokio	Native – Not threatened
<i>Parablechnum novae-zelandiae</i>	Kiokio	Native – Not threatened
<i>Bromus catharticus</i>	Prairie grass	Exotic – Introduced and naturalised
<i>Calystegia silvatica</i>	Great bindweed	Exotic – Introduced and naturalised
<i>Carex geminata</i>	Cutty grass, Ruatahi	Native – Not threatened
<i>Carex secta</i>	Pūrei	Native – Not threatened
<i>Chamaecytisus prolifer</i>	Tree lucern	Exotic – Introduced and naturalised
<i>Cichorium intybus</i>	Chicory	Exotic – Introduced and naturalised
<i>Cirsium arvense</i>	Creeping thistle	Exotic – Introduced and naturalised
<i>Cirsium vulgare</i>	Bull thistle	Exotic – Introduced and naturalised
<i>Cordyline australis</i>	New Zealand cabbage tree	Native – Not threatened
<i>Cortaderia selloana</i>	Pampas grass	Exotic – Introduced and naturalised
<i>Crataegus monogyna</i>	Common hawthorn	Exotic – Introduced and naturalised
<i>Crepis capillaris</i>	Smooth hawksbeard	Exotic – Introduced and naturalised
<i>Crococsmia x crocosmiiflora</i>	Garden montbretia	Exotic – Introduced and naturalised
<i>Cupressus macrocarpa</i>	Macrocarpa	Exotic – Introduced and naturalised
<i>Cyathea dealbata</i>	Silver fern	Native – Not threatened
<i>Cyathea medullaris</i>	Black tree fern	Native – Not threatened
<i>Cynodon dactylon</i>	Bermuda grass	Exotic – Introduced and naturalised
<i>Dactylis glomerata</i>	Orchard grass	Exotic – Introduced and naturalised
<i>Datura stramonium</i>	Purple thorn-apple	Exotic – Introduced and naturalised
<i>Diplazium australe</i>	Austral lady-fern	Native – Not threatened
<i>Digitaria sanguinalis</i>	Summer grass	Exotic – Introduced and naturalised
<i>Epilobium ciliatum</i>	Willowherb	Exotic – Introduced and naturalised
<i>Erigeron sumatrensis</i>	Tropical horseweed	Exotic – Introduced and naturalised
<i>Eucalyptus globulus</i>	Blue gum	Exotic – Introduced and naturalised
<i>Hedera helix</i>	Common ivy	Exotic – Introduced and naturalised
<i>Holcus lanatus</i>	Yorkshire fog	Exotic – Introduced and naturalised
<i>Helminthotheca echioides</i>	Bristly oxtongue	Exotic – Introduced and naturalised
<i>Hypericum perforatum</i>	Common St. John's-wort	Exotic – Introduced and naturalised
<i>Jacobaea vulgaris</i>	Ragwort	Exotic – Introduced and naturalised
<i>Juncus articulatus</i>	Jointed rush	Exotic – Introduced and naturalised
<i>Juncus effusus</i>	Soft rush	Exotic – Introduced and naturalised
<i>Lactuca serriola</i>	Prickly lettuce	Exotic – Introduced and naturalised
<i>Leontodon saxatilis</i>	Hawkbit	Exotic – Introduced and naturalised
<i>Leycesteria formosa</i>	Himalayan honeysuckle	Exotic – Introduced and naturalised
<i>Ligustrum lucidum</i>	Tree privet	Exotic – Introduced and naturalised
<i>Ligustrum sinense</i>	Chinese privet	Exotic – Introduced and naturalised

<i>Liquidambar styraciflua</i>	American sweetgum	Exotic – Introduced and naturalised
<i>Lolium perenne</i>	Perennial ryegrass	Exotic – Introduced and naturalised
<i>Lotus pedunculatus</i>	Lotus	Exotic – Introduced and naturalised
<i>Lycopus europaeus</i>	European water-horehound	Exotic – Introduced and naturalised
<i>Lythrum hyssopifolia</i>	Hyssop loosestrife	Exotic – Introduced and naturalised
<i>Malva sylvestris</i>	Common mallow	Exotic – Introduced and naturalised
<i>Paspalum dilatatum</i>	Paspalum	Exotic – Introduced and naturalised
<i>Paspalum distichum</i>	Mercer grass	Exotic – Introduced and naturalised
<i>Persicaria hydropiper</i>	Water-pepper	Exotic – Introduced and naturalised
<i>Phormium tenax</i>	New Zealand flax	Native – Not threatened
<i>Phytolacca octandra</i>	Inkweed	Exotic – Introduced and naturalised
<i>Pittosporum eugenioides</i>	Lemonwood, Tarata	Native – Not threatened
<i>Platanus x hispanica</i>	London plane	Exotic – Introduced and naturalised
<i>Plantago lanceolata</i>	Ribwort plantain	Exotic – Introduced and naturalised
<i>Prunella vulgaris</i>	Common selfheal	Exotic – Introduced and naturalised
<i>Quercus robur</i>	English oak	Exotic – Introduced and naturalised
<i>Ranunculus repens</i>	Creeping buttercup	Exotic – Introduced and naturalised
<i>Raphanus raphanistrum</i>	Jointed charlock	Exotic – Introduced and naturalised
<i>Rubus fruticosus</i>	Blackberry	Exotic – Introduced and naturalised
<i>Rumex obtusifolius</i>	Broad-leaved dock	Exotic – Introduced and naturalised
<i>Salix cinerea</i>	Grey willow	Exotic – Introduced and naturalised
<i>Salix x fragilis</i>	Hybrid crack willow	Exotic – Introduced and naturalised
<i>Senecio esleri</i>	Hairy-legs groundsel	Exotic – Introduced and naturalised
<i>Setaria pumila</i>	Yellow foxtail	Exotic – Introduced and naturalised
<i>Solanum nigrum</i>	Black nightshade	Exotic – Introduced and naturalised
<i>Sonchus asper</i>	Prickly sowthistle	Exotic – Introduced and naturalised
<i>Stachys sylvatica</i>	Hedge woundwort	Exotic – Introduced and naturalised
<i>Stellaria media</i>	Common chickweed	Exotic – Introduced and naturalised
<i>Taxodium distichum</i>	Baldcypress	Exotic – Introduced and naturalised
<i>Trifolium repens</i>	White clover	Exotic – Introduced and naturalised
<i>Ulex europaeus</i>	Gorse	Exotic – Introduced and naturalised
<i>Zantedeschia aethiopica</i>	Calla lily	Exotic – Introduced and naturalised

Appendix B: Wetland W1 species composition

Wetland plot points are as below (P1 – P11). See Table below and wetland delineation forms for Plot 6 and Plot 7 data.



Species	Hydrotype (e.g. FAC, FACW, OBL)	Hydrotype score	Plot 6	Plot 7
<i>Holcus lanatus</i>	FAC	3	8%	8%
<i>Lolium perenne</i>	FACU	4		
<i>Lotus pedunculatus</i>	FAC	3	3%	5%
<i>Paspalum distichum</i>	FACW	2	76%	45%
<i>Persicaria hydropiper</i>	FACW	2		
<i>Ranunculus repens</i>	FAC	3	3%	20%
<i>Trifolium repens</i>	FACU	4		
<i>Anthoxanthum odoratum</i>	FACU	4		
<i>Agrostis stolonifera</i>	FACW	2	8%	4%
<i>Juncus articulatus</i>	FACW	2		
<i>Juncus effusus</i>	FACW	2		18%

<i>Lythrum</i>	FACW	2	
<i>hyssopifolia</i>			
<i>Epilobium ciliatum</i>	FAC	3	
<i>Rumex</i>	FAC	3	2%
<i>obtusifolious</i>			
<i>Rubus fruticosus</i>	FAC	3	
<i>Trifolium dubium</i>	UPL	5	
<i>Paspalum</i>	FACU	4	
<i>dilatatum</i>			
<i>Calystegia silvatica</i>	FACU	4	

Appendix C: Wetland W1 Delineation Data Forms (Plots 6 and 7)

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST					
SECTION A – SITE INFORMATION					
Site: Ōhaupō	Region: Waikaito	Sampling point/ID: P4			
Owner/address:	Date: 29 January 2025	Land use: Farming			
Landform: Flat	Local relief: Flat	Land cover: Exotic grassland			
Is the land drained? YES ☒ NO ☐ UNKNOWN ☐	Investigator(s): Douglas Fotheringham	Slope*: 3			
GPS (NZTM): -37.9298039, 175.3083410	Altitude m: 60	Photo Nos:			
Are climatic/hydrologic conditions on the site typical for this time of year? YES ☒ NO ☐ (if NO explain in Remarks)					
Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are 'Normal Circumstances' present? YES ☒ NO ☐					
Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? Explain answers in Remarks if needed					
SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.					
Pasture exclusion? YES ☐ NO ☒	Hydrophytic vegetation present? YES ☒ NO ☐	Hydric soils present? YES ☒ NO ☐	Wetland hydrology present? YES ☒ NO ☐	Is the sampled area within a wetland? YES ☒ NO ☐	
SECTION B – VEGETATION					
Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover	Pasture Exclusion Test: Pasture cover/Total vegetation cover (P/TVC) x100 = 11 %
Tree Stratum (Plot size: _____)					☐ Rapid Pasture Test
1. _____					☐ Pasture Exclusion Test is >50%
2. _____					
3. _____					
4. _____					
Total tree cover (TT) = _____	50%	20%			
Sapling/Shrub Stratum (Plot size: _____)					Dominance Test:
1. _____					No. Dominant Spp. OBL/FACW/FAC (A) 1
2. _____					Tot. Dominant Spp. across strata (B) 1
3. _____					% OBL/FACW/FAC (A/B) 100
4. _____					
5. _____					
Total sapling/shrub cover (TS) = _____	50%	20%			Prevalence Index:
Herb Stratum (Plot size: _____)					Total % cover of: Multiply by:
1. AGR sto	8		FACW		OBL _____ x 1 = _____
2. HOL lan	8		FAC	8	FACW 84 x 2 = 168
3. LOT ped	3		FAC	3	FAC 16 x 3 = 48
4. PAS dis	76	Yes	FACW		FACU _____ x 4 = _____
5. RAN rep	3		FAC		UPL _____ x 5 = _____
6. RUM obt	2		FAC		Total 100 (A) 216 (B)
7. _____					Prevalence Index (B/A) = 2.16
8. _____					Hydrophytic vegetation indicators:
9. _____					☐ Rapid Test
10. _____					☒ Dominance Test is >50%
11. _____					☒ Prevalence Index is ≤3.0 ¹
12. _____					☐ Morphological adaptations ¹ (supporting data in Remarks)
13. _____					☐ Problematic hydrophytic vegetation ¹
14. _____					Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic
15. _____					Hydrophytic vegetation present?
16. _____					YES ☒ NO ☐ UNCERTAIN ☐
17. _____					Remarks:
18. _____					
Total herb cover (TH) = _____	50%	20%			
Total Vegetation Cover (TVC): TT+TS+TH = _____	50%				

SECTION C – SOIL AND HYDROLOGY

Profile description: (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (cm)	Matrix colour (moist)	Mottles colour (moist)	Mottles % ¹	Mottles Size ²	Mottle location ³	Material ⁴	Remarks
0 - 10	3/4 10YR	-	-	-	-	Organic	
10 - 30	2/2 10YR	-	-	-	-	Organic	
30 - 50	4/1 10YR	-	-	-	-	Clay	

¹Use % area charts; ²Use size classes; ³Ped face, pore, within ped along roots, within matrix; ⁴Organic (peaty), humic, mineral soil

Hydric soil indicators: Soil drainage (circle) W MW I P VP		Cause of wetness (circle appropriate): Location: Depression Flat Valley Gully Slope Water table: Depth (cm) _____ High GW Perched Seepage Tidal Lithic Pans: Depth (cm) _____ Pan Humus Fe-pan Densi- Duri- Fragi Ortstein Restricting layers: Depth (cm) _____ Slow perm argillic ☐ Pugged
Organic layers: ☒ Organic soil material ☐ Litter ☐ Fibric ☐ Mesic ☐ Humic ☒ Peaty topsoil ☐ Peaty subsoil	Concretions: ☐ Iron concretions ☐ Manganese concretions ☐ Nodular Consistence: ☐ Plastic ☒ Sticky ☐ Fluid	Colours: profile form either: ☐ Gley profile OR ☐ Mottled profile Horizon: ☐ Reductimorphic ☐ Redox mottled ☐ Redox segregations ☐ Perch-gley features
Hydric soils present? YES ☒ NO ☐ UNCERTAIN ☐ NZSC subgroup _____		

Primary hydrology indicators: minimum of 1 required; check all boxes that apply

Soil °C _____

- | | | |
|---|---|--|
| ☐ Surface water (1A) | ☐ Algal mat/crust (2D) | ☐ Aquatic invertebrates (2J) |
| ☐ Groundwater <30 cm (1B) | ☐ Iron deposits (2E) | ☐ Hydrogen sulphide odour (3A) |
| ☒ Soil saturation <30 cm (1C) | ☒ Surface soil cracks (2F) | ☐ Oxidised rhizosphere on roots (3B) |
| ☐ Water marks (2A) | ☒ Inundation on aerial imagery (2G) | ☐ Reduced iron (3C) |
| ☐ Sediment deposits (2B) | ☐ Sparsely vegetated concave surface (2H) | ☐ Reduced iron in tilled soil (3D) |
| ☐ Drift deposits (2C) | ☐ Salt crust (2I) | ☐ High water table stunted/stressed plants (4A) |

Secondary hydrology indicators: minimum of 2 required; check all boxes that apply

- | | | |
|--|--|--|
| ☐ Water-stained leaves (2K) | ☐ Geomorphic position (4B) | FAC-neutral test (4D); refer to Section B: Vegetation
1. No. OBL & FACW dominant species _____ (A)
2. No. FACU & UPL dominant species _____ (B)
3. Total _____ (A+B)
4. FAC-neutral (>50%) _____ (A/A+B)*100 |
| ☐ Drainage patterns (2L) | ☐ Shallow aquitard (4C) | |
| ☐ Dry-season water table (3E) | ☐ FAC-neutral test (4D) | |
| ☐ Saturation in aerial imagery (3F) | ☐ Frost-heave hummocks (4E) | |

Wetland hydrology present? YES ☒ NO ☐

Sketch of site/vegetation types/sampling points:

Remarks:

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: Ōhaupō Region: Waikaito Sampling point/ID: P4
 Owner/address: _____ Date: 29 January 2025 Land use: Farming
 Landform: Flat Local relief: Flat Land cover: Exotic grassland
 Is the land drained? YES ☒ NO ☐ UNKNOWN ☐ Investigator(s): Douglas Fotheringham Slope*: 3
 GPS (NZTM): -37.9298039, 175.3083410 Altitude m: 80 Photo Nos: _____

Are climatic/hydrologic conditions on the site typical for this time of year? YES ☒ NO ☐ (if NO explain in Remarks)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed?

Are 'Normal Circumstances' present? YES ☒ NO ☐

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic?

Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☒ Hydrophytic vegetation present? YES ☒ NO ☐ Is the sampled area within a wetland? YES ☒ NO ☐
 Hydric soils present? YES ☒ NO ☐
 Wetland hydrology present? YES ☒ NO ☐

SECTION B – VEGETATION

Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover	
Tree Stratum (Plot size: _____)					
1. _____	_____	_____	_____	_____	Pasture Exclusion Test: Pasture cover/Total vegetation cover $(P/TVC) \times 100 = \underline{13} \%$ ☐ Rapid Pasture Test ☐ Pasture Exclusion Test is >50%
2. _____	_____	_____	_____	_____	
3. _____	_____	_____	_____	_____	
4. _____	_____	_____	_____	_____	
Total tree cover (TT) = _____ 50% _____ 20%					
Sapling/Shrub Stratum (Plot size: _____)					
1. _____	_____	_____	_____	_____	Dominance Test: No. Dominant Spp. OBL/FACW/FAC (A) <u>2</u> Tot. Dominant Spp. across strata (B) <u>2</u> % OBL/FACW/FAC (A/B) <u>100</u>
2. _____	_____	_____	_____	_____	
3. _____	_____	_____	_____	_____	
4. _____	_____	_____	_____	_____	
5. _____	_____	_____	_____	_____	
Total sapling/shrub cover (TS) = _____ 50% _____ 20%					
Herb Stratum (Plot size: _____)					
1. <u>AGR sto</u>	<u>4</u>	_____	<u>FACW</u>	_____	Prevalence Index: Total % cover of: Multiply by: OBL _____ x 1 = _____ FACW <u>67</u> x 2 = <u>134</u> FAC <u>33</u> x 3 = <u>99</u> FACU _____ x 4 = _____ UPL _____ x 5 = _____ Total <u>100</u> (A) <u>233</u> (B) Prevalence Index (B/A) = <u>2.33</u>
2. <u>HOL lan</u>	<u>8</u>	_____	<u>FAC</u>	<u>8</u>	
3. <u>LOT ped</u>	<u>5</u>	_____	<u>FAC</u>	<u>5</u>	
4. <u>JUN eff</u>	<u>18</u>	_____	<u>FACW</u>	_____	
5. <u>PAS dis</u>	<u>45</u>	<u>Yes</u>	<u>FACW</u>	_____	
6. <u>RAN rep</u>	<u>20</u>	<u>Yes</u>	<u>FAC</u>	_____	
7. _____	_____	_____	_____	_____	
8. _____	_____	_____	_____	_____	
9. _____	_____	_____	_____	_____	
10. _____	_____	_____	_____	_____	
11. _____	_____	_____	_____	_____	
12. _____	_____	_____	_____	_____	
13. _____	_____	_____	_____	_____	
14. _____	_____	_____	_____	_____	
15. _____	_____	_____	_____	_____	
16. _____	_____	_____	_____	_____	
17. _____	_____	_____	_____	_____	
18. _____	_____	_____	_____	_____	
Total herb cover (TH) = _____ 50% _____ 20%					
Total (P) = _____					
Total Vegetation Cover (TVC): TT+TS+TH = _____ 50% _____					

Hydrophytic vegetation indicators:

☐ Rapid Test

☒ Dominance Test is >50%

☒ Prevalence Index is $\leq 3.0^1$

☐ Morphological adaptations¹ (supporting data in Remarks)

☐ Problematic hydrophytic vegetation¹

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present?
 YES ☒ NO ☐ UNCERTAIN ☐

Remarks: _____

SECTION C – SOIL AND HYDROLOGY

Profile description: (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (cm)	Matrix colour (moist)	Mottles colour (moist)	Mottles % ¹	Mottles Size ²	Mottle location ³	Material ⁴	Remarks
0 - 15	4/1 10YR	-	-	-	-	Organic	
15 - 50	4/1 10YR	5/4 10YR	2	1 - 2	In matrix	Clay	

¹Use % area charts; ²Use size classes; ³Ped face, pore, within ped along roots, within matrix; ⁴Organic (peaty), humic, mineral soil

Hydric soil indicators: Soil drainage (circle) W MW I P VP		Cause of wetness (circle appropriate): Location: Depression Flat Valley Gully Slope Water table: Depth (cm) _____ High GW Perched Seepage Tidal Lithic Pans: Depth (cm) _____ Pan Humus Fe-pan Densi- Duri- Fragi Ortstein Restricting layers: Depth (cm) _____ Slow perm argillic ☐ Pugged
Organic layers: ☒ Organic soil material ☐ Litter ☐ Fibric ☐ Mesic ☐ Humic ☒ Peaty topsoil ☐ Peaty subsoil	Concretions: ☒ Iron concretions ☐ Manganese concretions ☐ Nodular Consistence: ☐ Plastic ☒ Sticky ☐ Fluid	Colours: profile form either: ☐ Gley profile OR ☐ Mottled profile Horizon: ☐ Reductimorphic ☐ Redox mottled ☐ Redox segregations ☒ Perch-gley features
Hydric soils present? YES ☒ NO ☐ UNCERTAIN ☐ NZSC subgroup _____		

Primary hydrology indicators: minimum of 1 required; check all boxes that apply

Soil °C _____

- | | | |
|---|---|--|
| ☐ Surface water (1A) | ☐ Algal mat/crust (2D) | ☐ Aquatic invertebrates (2J) |
| ☐ Groundwater <30 cm (1B) | ☒ Iron deposits (2E) | ☐ Hydrogen sulphide odour (3A) |
| ☒ Soil saturation <30 cm (1C) | ☒ Surface soil cracks (2F) | ☐ Oxidised rhizosphere on roots (3B) |
| ☐ Water marks (2A) | ☒ Inundation on aerial imagery (2G) | ☐ Reduced iron (3C) |
| ☐ Sediment deposits (2B) | ☐ Sparsely vegetated concave surface (2H) | ☐ Reduced iron in tilled soil (3D) |
| ☐ Drift deposits (2C) | ☐ Salt crust (2I) | ☐ High water table stunted/stressed plants (4A) |

Secondary hydrology indicators: minimum of 2 required; check all boxes that apply

- | | | |
|--|--|--|
| ☐ Water-stained leaves (2K) | ☐ Geomorphic position (4B) | FAC-neutral test (4D); refer to Section B: Vegetation
1. No. OBL & FACW dominant species _____ (A)
2. No. FACU & UPL dominant species _____ (B)
3. Total _____ (A+B)
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| ☐ Drainage patterns (2L) | ☐ Shallow aquitard (4C) | |
| ☐ Dry-season water table (3E) | ☐ FAC-neutral test (4D) | |
| ☐ Saturation in aerial imagery (3F) | ☐ Frost-heave hummocks (4E) | |

Wetland hydrology present? YES ☒ NO ☐

Sketch of site/vegetation types/sampling points:

Remarks:

Appendix D: Tree removal in bat areas flow chart (DOC tree felling protocols)

