Ecological Impact Assessment
Proposed Re-Zoning
Ohinewai Structure Plan

Sleepyhead Estate, 231 Tahuna Road & 52-58 Lumsden Road

Prepared for Ambury Properties Limited

29 November 2019

ECOLOGY
NEW ZEALAND

Document Sign-off

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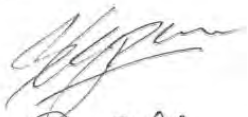
	Simon Chapman Principal Ecologist	
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1. INTRODUCTION

1.1 This report[1], prepared by Ecology New Zealand Limited ('ENZL') for Ambury Properties Ltd ('the client'), presents an Ecological Impact Assessment ('EcIA') for the proposed Structure Plan and Re-Zoning that will enable the redevelopment of Sleepyhead Estate at 231 Tahuna Road and 52-58 Lumsden Rd, Ōhinewai ('the site').

1.2 Sleepyhead Estate is a mixed-use masterplanned community proposed to be located on the site, located adjacent to State Highway 1 (Waikato Expressway) and the North Island Main Trunk railway (NIMT) at Ohinewai.

1.3 Ambury Properties Limited (APL) are the property holding associate of the New Zealand Comfort Group Limited (NZCG), the manufacturer of Sleepyhead, Sleepmaker, Serta, Tattersfield and Design Mobel Beds along with Dunlop Foams and Sleepyhead flooring underlay. They also produce a wide range of related products including pillows, mattresses, drapes, furniture and other soft furnishings. The manufacturing operations are currently based at several locations in Auckland. Ambury has been investigating options to consolidate all of their manufacturing operations onto one site. It has searched extensively in Auckland and the Waikato for a suitable site.

1.4 APL has found a suitable site on the corner of Lumsden Road and Tahuna Road, Ohinewai, comprising 231 Tahuna Road and 52-58 Lumsden Road. The site is zoned Rural in the operative and proposed Waikato District Plans.

1.5 The proposed NZCG 100,000m² factory will be the major industrial anchor for the project. It will be accommodated in a 63ha industrial hub with rail siding access from the North Island Main Trunk railway. The project will also include 8.7ha of business and commercial development including a service station, local convenience stores and factory outlet shops. 52 hectares of residential land for approximately 900-1100 new houses will also be provided, together with about 55ha of public open space.

1.6 APL has lodged a submission on the proposed Waikato District Plan requesting that the land be rezoned to a mix of industrial, residential and business zones to accommodate the mixed-use community and to enable development. As part of their submission, APL seek to embed a structure plan for Ohinewai within the District Plan. A copy of the proposed Structure Plan is included in this report as Appendix B.

1.7 The structure plan will provide a framework for the development of the wider site, outlining the location of activities, the indicative road network and the general location of the green spaces that will provide for recreation and the management of stormwater. The Structure Plan has been informed by the Illustrative Masterplan that has been prepared for the site (included as Appendix B).

1.8 The Structure Plan and by default, the development that will be enabled as a result of the proposed rezoning has been assessed within this report.

2. PURPOSE AND SCOPE

2.1 This report has been prepared in support of the rezoning request.

2.2 Specifically, this report aims to assess the actual and potential adverse ecological effects associated with the proposed development on the site's ecological values at

[1] This report is subject to the Report Limitations provided in Appendix A.

a level adequate, to inform and support the preparation and the request for the zoning plan change. This report also outlines the ecological enhancement opportunities that the proposed re-zoning enables.

2.3 The scope of this report comprises the following:

- A high-level description of the site's existing terrestrial and aquatic ecological values and of the adjacent receiving environment;
- An assessment of the actual and potential adverse effects on terrestrial and aquatic ecological values; and
- Recommendations to avoid, remedy, mitigate and/or offset adverse ecological effects.

3. SITE LOCATION, DESCRIPTION AND ECOLOGICAL CONTEXT

3.1 The site comprises the landholdings known as 231 Tahuna Road and 52-58 Lumsden Road, Ōhinewai, Waikato and is situated within the Meremere Ecological District of the Waikato Ecological Region. The site location is outlined in Figure 1 below.

3.2 The site consists of a working dairy farm and rural residential properties covering a total of approximately 178ha. Land cover is comprised predominantly of pasture grasses, exotic trees and drainage channels. No watercourses are shown within the site on the Water Classification layer of Waikato Regional Council's WaikatoMaps, online mapping system. Within the wider landscape context, the site lies within a rural area, bordered by agricultural land on all sides, with the North Island Main Trunk railway (NIMT), State Highway 1 and the Waikato River to the west.

3.3 The site contains a small amount of Significant Natural Area (SNA) in the eastern part of the site[2] (Figure 1). This is an extension of the SNA surrounding Lake Rotokawau and the vegetation is characterised as "exotic with wetland, terrestrial, and wetland – freshwater"[3].

3.4 This area is also classed as an Outstanding Natural Feature in the proposed Waikato District Plan (subcategory Wetland and River Margin). A 2017 report classified this area as regionally significant, an assessment based on a set of 11 criteria outlined in the Waikato Regional Policy Statement.

3.5 Waikato Regional Council's Vegetation Biodiversity Map 4 (Land Cover layer) shows the majority of the assessment site as High-Producing Exotic Grassland, with a small pocket of Exotic Forest and a small area of Herbaceous Freshwater Vegetation which forms part of the SNA. The Biodiversity Vegetation layer further classifies the SNA vegetation as Exotic Hardwoods.

3.6 The receiving environment immediately downstream of the site consists of Lake Rotokawau and Lake Waikare with connectivity to Whangamorino wetland. Lake Rotokawau is a poor quality, hyper-eutrophic peat lake of c. 22ha in size with a depth of 1.2m. Lake Rotokawau is a degraded lake significantly impacted by flood management and agricultural activities. While the lake is only moderately large and shallow it has one of the most extensive (i.e. c. 230ha) and diverse areas of wetland vegetation surrounding a lake in the Lower Waikato Basin. Lake Rotokawau is

[2] Van der Zwan, W. and Kessels, G. (2017) Significant Natural Areas of the Waikato District: Terrestrial and Wetland Ecosystems. Waikato Regional Council Technical Report 2017/36
[3] Waikato District Council, Proposed District Plan.

considered to have very good connectivity to the surrounding landscape with historical connection to Lake Waikare still in existence and managed connectivity with Lake Ohinewai. The water levels in Lake Rotokawau are linked to Lake Waikare which has tightly controlled water levels[4].

3.7 Lake Waikare is a large, poor quality, hypertrophic, riverine lake covering c. 3442 ha with a depth of 1.8 m. Lake Waikare is a degraded lake which has been significantly impacted by flood management and agricultural activities. The lake fish population is dominated by exotic species with only a moderate diversity of native fish remaining. Lake Waikare is no longer connected to the Waikato River via the Onetea Stream or during flood conditions. Fish passage has been constructed to allow access between the lake and the internationally significant Whangamarino Wetland[5].

3.8 Whangamarino Wetland is one of the largest swamp and raised peat dome wetland complexes in New Zealand. The wetland encompasses an area of c. 6,912 ha. A significant proportion of this (5,690 ha) has been recognised as a wetland of international importance under the Ramsar Convention. Whangamarino contains large areas of peat bog and is an important habitat for a high diversity of indigenous plants and fauna. Specifically, the largest known breeding population in New Zealand of the threatened Australasian bittern (*Botaurus poiciloptilus*) inhabits the wetland. Whangamarino is considered a stronghold for the 'at risk' black mudfish (*Neochanna diversus*) and is the only known location for the tiny and nationally critical swamp helmet orchid (*Corybas carsei*)[6].

[4,5] Van der Zwan, W. and Kessels, G. (2017) Significant Natural Areas of the Waikato District: Terrestrial and Wetland Ecosystems. Waikato Regional Council Technical Report 2017/36

[6] Kathryn Duggan, Lucy Roberts, Mary Beech, Hugh Robertson, Matthew Brady, Michael Lake, Kerry Jones, Kevin Hutchinson, Shannon Patterson, 2013, Arawai Kākāriki Wetland Restoration Programme, Whangamarino Outcomes Report 2007-2011, Research and Development Group, Department of Conservation, Box 10420, Wellington.

Drainage Channel B /
Balemi Drain

Drainage Channel A /
Tahuna Drain

Legend

- Site Boundary
- Development Footprint
- Open Space Areas
- Significant Natural Area
- Drainage Canals
- Copper Skink
- Potential Bat Roosting Trees

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N

0 100 200 300 400 500 m

1:8500@ A3

Projection: NZGD 2000/ NZTM 2000

Sources: Map data ©2019 Google, NZ Property Titles sourced from LINZ Crown Copyright Reserved;SNA Layer from Waikatomaps; Building footprint and open space layers based on Sleephead Estate Structure Plan prepared by Adapt Studio Ltd., dated 10 July 2019, Rev C, Drawing no 1805_012

Sleepyhead Estates

Figure 1: Ecological Assessment- Proposed Plan Change

Date: 03 December 2019 | Revision : 3

Plan prepared for Ambury Properties Ltd.
by Ecology New Zealand Limited
Author: SAE

4. PROPOSED RE-ZONING & STRUCTURE PLAN

4.1 The proposed re-zoning of the site is being sought via submissions to the proposed Waikato District Plan that seek to embed appropriate Industrial, Business and Residential zonings across the site. The development will also be guided by a Structure Plan that outlines development area, roading network and open space areas.

4.2 The Structure Plan represents a comprehensive development proposal for the site that comprises:

- A 100,000m^2 Sleepyhead factory, located within a wider industrial zoned area of 63ha;
- Approximately 900-1,100 new homes, within a residential zoned area of 52ha;
- 8.7 hectares of business zoned land comprising factory outlet shops, a service centre, local community shops; and
- 55 hectares of open space comprising, stormwater management infrastructure such as swales, wetlands, recreation reserves and community facilities.

4.3 The Structure Plan has been guided by an illustrative Masterplan that provides an indicative outline of the proposed development. A copy of the Masterplan is included in Appendix B.

4.4 The development of Sleepyhead Estate will be completed over a number of years with multiple stages. Development can be expected to be undertaken in a manner consistent with 'green fields' development that enables a transition from rural land use to urban development.

4.5 For Sleepyhead Estate, this is expected to include the following works:

- Removal of exotic trees and pasture vegetation;
- Substantial earthworks and geotechnical remediation works;
- Realigning of existing farm drains within the site;
- Provision of stormwater infrastructure, including swales and wetlands located within centralised open space areas and discharge location likely to be located adjacent to Lake Rotokawau; and
- Road construction.

4.6 This report assesses the effects of the proposed development at a concept level so as to inform the Structure Plan and Re-Zoning. Recommendations will be made as required at this stage of the planning process. Detailed assessment of effects reporting will be undertaken at the subdivision and development phases.

5. METHODOLOGY

Overview

5.1 A detailed assessment of the ecological values across the entire 178 ha site was not undertaken due to concerns by the landowner over disturbance to the working dairy operation. Consequently, the assessment included the combination of a previously completed ecological opportunities and constraints site walk-over and a detailed assessment of the north-western portion of the site only, as part of a Resource Consent application (Stage 1 earthworks area).

5.2 Assessment focused on describing the nature, extent and quality of the following aspects within the project area:

- Watercourse and wetland areas;
- Indigenous and exotic vegetation; and
- Terrestrial, avifauna and aquatic fauna species including lizards, birds, bats and fish.

5.3 ENZL ecologists carried out an opportunities and constraints site assessment of the 178ha site on 1st and 2nd of July 2019. Both aquatic and terrestrial ecological values were noted. Aquatic and terrestrial habitat features were identified, and their associated structure, composition and ecological quality were noted. See Appendix C for ENZL's Ops and Cons Ecological Assessment report.

5.4 In addition, ENZL ecologists undertook a detailed Ecological Impact Assessment (EIA) for Stage 1 of the development in support of a Resource Consent application to undertake earthworks on approximately 7.65 hectares in the north-western corner of the site. See Appendix D for ENZL's Stage 1 Ecological Impact Assessment report.

5.5 In support of the Resource Consent application for Stage 1, ENZL ecologists also undertook a black mudfish (*Neochanna diversus*) survey within the two farm drains expected to be impacted by Stage 1, between 21 and 23 of August, 2019. See Appendix E for ENZL's Supplementary Ecological Assessment for Black Mudfish report.

5.6 This information was used, in conjunction with a review of the illustrated masterplan, to determine the actual and potential impacts on aquatic and terrestrial ecological values across the site, in order to inform and support the preparation and the request for the zoning plan change.

6. TERRESTRIAL

6.1 Prior to commencement of any site assessment, a desktop investigation was undertaken, querying relevant databases for information relating to the site's ecological characteristics. Initial opportunities and constraints site investigations included visual assessments of terrestrial vegetation and the documentation of fauna communities.

6.2 Follow up detailed assessment within the Stage 1 area specifically, included vegetation classification, habitat assessments for bats, lizards and birds, a five-minute bird count, and targeted manual habitat searches for native lizards in suitable habitats. Automatic bat detectors were not used because the fieldwork was undertaken out of season for moderate to high levels of bat activity. On that basis, on-site trees were risk-rated as potential bat roosting habitat on a conservative basis, following the NZTA risk guidelines[7] which have become established as industry best practice.

7. AQUATIC

Watercourse Assessment

7.1 A preliminary desktop survey was completed to note any mapped watercourses within proximity to the site and any connectivity between the site, Lake Rotokawau and the greater Whangamarino Wetland complex to the north (a Ramsar Site). A site

[7] Smith, D., Borkin, K., Jones, C., Lindberg, A., Davies, F., & Eccles, G. (2017). Effects of land transport activities on New Zealand's endemic bat populations: reviews of ecological and regulatory literature (No. 623).

assessment was carried out to assess the ecological values of any watercourses and wetlands on site.

7.2 Aquatic fauna surveys were considered outside the scope of the opportunities and constraints assessment; however, a search of the New Zealand Freshwater Fish Database (NZFFD) was completed to obtain reference data of fish species previously found in the catchment.

7.3 Within the Stage 1 area all watercourses were walked, photographed and their physical parameters assessed based on a modified version of Auckland Council's Watercourse Assessment Methodology[8]. Channel definition and classification was undertaken in accordance with the Waikato Regional Plan definitions

Fish

7.4 In general, the watercourses on site were not suited to electric fishing (due to vegetative overgrowth, shallow water depth and high nutrient input), and were too shallow for the deployment of fyke nets at the time of assessment. The lack of open water also made spotlighting unsuitable. Consequently, gee minnow traps were deployed where suitable to sample for fish potentially utilising the site. Traps were baited and left in place for approximately 22 hours.

7.5 A targeted mudfish survey was undertaken on 19 July 2019 within the north-west portion of the site identified as Stage 1. The methods utilised to undertake the mudfish survey on-site were based on the 2009 Methodology to Survey and Monitor New Zealand Mudfish Species[9] ('the guidelines'), as well as recommendations from Bruno David of Waikato Regional Council.

8. ASSESSMENT OF EFFECTS METHODOLOGY

8.1 Guidelines for undertaking Ecological Impact Assessments (EcIA) have been published by the Environment Institute of Australia and New Zealand (EIANZ 2018). The guidelines outline a standardised process to assess ecological values using criteria for the following matters: 'representativeness', 'rarity/distinctiveness', 'diversity and pattern', and 'ecological context.' Based on the designated values for each matter, overall ecological value for the site can be calculated using the attributes matrix in Appendix 10 of the EIANZ Guidelines (2018). Chapter 6 of the EIANZ Guidelines (2018) provide proposed criteria for describing the magnitude of effects associated with proposed activities. Table 1 below summarises the EIANZ criteria for describing the magnitude of effects.

8.2 The level of effect can then be determined through combining the value of the ecological feature/attribute with the score or rating for the magnitude of effect to create criteria for describing the level of effects (Table 2). The cells in italics in Table 2 represent a 'significant' effect in accordance with the Resource Management Act (RMA). Cells with low or very low levels of effect represent a low risk to ecological values rather than low ecological values *per se*. A 'moderate' level of effect requires careful

[8]Lowe, M., Ingley, R and Young, D (2016). Watercourse assessment methodology: infrastructure and ecology version 2.0. Prepared by Morphum Environmental for Auckland Council. Auckland Council technical report, TR2016/002
[9] Ling, N., O'Brien, L.K., Miller, R., Lake, M. 2009. *Methodology to survey and monitor New Zealand mudfish species*. CBER Contract Report 104. Department of Conservation and University of Waikato, Hamilton. 60pp

assessment and analysis of the individual case. These effects could be mitigated through avoidance, design, or appropriate mitigation actions (EIANZ 2018).

Table 1: Criteria for describing the magnitude of effects (EIANZ 2018).

Magnitude	Description
Very high/severe	Total loss of, or very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature
Moderate/medium	Loss or alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature
Low/minor	A minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature

Table 2: Criteria for describing the level of effects (EIANZ 2018).

Ecological Value Magnitude	Very High	High	Moderate	Low
Very High	*Very High*	*Very High*	*High*	*Moderate*
High	*Very High*	*Very High*	*Moderate*	Low
Moderate	*Very High*	*High*	Low	Very Low
Low	*Moderate*	Low	Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low
Positive	Net gain	Net gain	Net gain	Net gain

9. ECOLOGICAL VALUES ASSESSMENT

Vegetation

9.1 Overall, the vegetation across the site was of low ecological quality with little diversity. Vegetation cover was dominated by pasture grass with few scattered exotic trees, and hedgerows (Figure 2). Mature exotic trees on-site consisted of tortured willow (*Salix matsudana*), sweet chestnut (*Castanea sativa*), London plane (*Platanus x acerifolia*), macrocarpa (*Cupressus macrocarpa*) and liquidambar (*Liquidambar styraciflua*); with hedgerows comprised primarily of Japanese cedar (*Cryptomeria japonica*), poplar (*Populus* sp.) and pine (*Pinus* sp.) of various sizes.

9.2 Vegetation communities associated with lower lying areas and those adjacent to drainage channels were characterised by juncus (*Juncus* sp.), carex (*Carex geminata*), willow weed (*Persicaria maculosa*) and patches of ferns (*Blechnum novae-zelandiae* and *Paesia scaberula*)(Figure 3).

Figure 2: Representative vegetation community dominating the site.

Figure 3: Representative vegetation community associated with drainage channels

10. TERRESTRIAL FAUNA

Avifauna

10.1 Due to the dominant vegetation community characterising the site (pasture grass), avifauna habitat consisted primarily of foraging habitat for common native and exotic avian species that have adapted to open agricultural landscape areas. Five-minute bird counts were conducted across the site and indicated high densities of welcome swallow (*Hirundo neoxena*) and kingfisher (*Todiramphus sanctus*).

10.2 Other birds seen and/or heard on-site included skylark (*Alauda arvensis*), spur-winged plover (*Vanellus miles*), magpie (*Gymnorhina tibicen*), white-faced heron (*Egretta novaehollandiae*), fantail (*Rhipidura fuliginosa*), house sparrow (*Passer domesticus*), Australasian harrier (*Circus approximans*), black swan (*Cygnus atratus*), paradise shelduck (*Tadora variegata*), common myna (*Acridotheres tristis*), yellowhammer (*Emberiza citronella*) and Eastern rosella (*Platycercus eximius*). Limited arboreal nesting habitat was noted with scattered, suitable exotic trees on-site.

10.3 Table 3 below summarises additional native avifauna species previously recorded near Lake Waikare, c. 1.5km north-east of the greater site. The At-Risk and Threatened

species such as shags and terns are unlikely to be utilising the subject site for foraging or breeding but are more likely to use it as a transit flyway.

10.4 The limited habitat values noted on site suggested the overall ecological value for avifauna was low.

Table 3: Additional native avifauna noted at Lake Waikare within the past five years (ebird.org).

Common Name	Latin Name	Threat status
Caspian Tern	*Hydroprogne caspia*	Threatened-Nationally Vulnerable
Little Black Shag	*Phalacrocorax sulcirostris*	At Risk - Naturally Uncommon
Royal Spoonbill	*Platalea regia*	At Risk - Naturally Uncommon
Black Shag	*Phalacrocorax carbo novaehollandiae*	At Risk - Naturally Uncommon
Pied Shag	*Phalacrocorax varius varius*	At Risk - Recovering
Cattle Egret	*Ardea ibis*	Non-resident Native - Migrant
Little Pied Cormorant	*Phalacrocorax melanoleucos melanoleucos*	Non-resident Native - Vagrant
Pied stilt	*Himantopus himantopus leucocephalus*	Not Threatened
Grey teal	*Anas gracilis*	Not Threatened
Australasian Shoveler	*Anas rhynchotis*	Not Threatened
Mallard x Grey Duck Hybrid	*Anas superciliosa x platyrhynchus*	Not Threatened

Herpetofauna

10.5 Some suitable habitat for ground-dwelling lizards was identified on site, specifically within leaf litter, clumped vegetation and rank grass along the drainage channels, decomposing logs and inorganic farm debris, such as corrugated iron sheets, provided suitable cover objects.

10.6 Three indigenous lizard species are known to occur in the general area. While copper skink (*Oligosoma aeneum*) are the most common, Forest gecko (*Mokopirirakau granulatus*) have been captured as part of the Huntly section of the Waikato Expressway as well as the Auckland green gecko (*Naultinus elegans*). Two other gecko species, common gecko (*Woodworthia maculatus*) and pacific gecko (*Dactylocnemis pacificus*) are widespread in the North Island and are also present in this ecological district[10]. Other species which may occur are ornate skink (*Oligosoma ornatum*) and possibly striped skink (*Oligosoma striatum*) and speckled skink (*Oligosoma infrapunctatum*). Native frogs (*Leiopelma* spp.) have not been reported.

10.7 Targeted manual searches across the site confirmed the presence of both copper skink and non- indigenous plague skinks (*Lamprophelis delicata*). Habitat for arboreal lizard species was not observed onsite.

[10] Van der Zwan, W. and Kessels, G. (2017) Significant Natural Areas of the Waikato District: Terrestrial and Wetland Ecosystems. Waikato Regional Council Technical Report 2017/36

Figure 4: Inorganic debris, commonly used by native skinks.

Figure 5: Log pile onsite, checked for native skinks.

Chiropterofauna

10.8 Potential bat roosting habitat was noted within several trees across the site. These trees met the criteria to be considered potential bat roosting trees, i.e., they were sufficiently large (>15cm DBH) and had suitable cavities and/or other features required to provide long-tailed bat (*Chalinolobus tuberculatus*, Threatened – Nationally Critical) roosts.

10.9 The nearest and most recent records from the Department of Conservation bat distribution database are from 2009 and confirm long-tailed bat presence at Hakarimata Scenic Reserve, approximately 20km south of the site[11].

10.10 Additional assessments from the Waikato Expressway project indicated that bats were detected approximately 7.5km from the site[12],[13]. A 2018 unpublished assessment by Wildland Consultants refers to the confirmation of long-tailed bats approximately 5km south of the site at Lake Kimihia[14]; however, a summary of monitoring between 2014 and 2017 at Lake Kimihia as part of the Huntly expressway long-tailed bat monitoring programme specified only a single bat pass was noted during vegetation removal protocol implementation, indicating that this area has very low bat activity[15].

10.11 With bat activity levels also confirmed as low within 8km of the site, the actual likelihood of bats being present on-site at any particular time is substantially reduced. However, with their confirmed presence in the wider area, albeit at low activity levels, and the presence of linear hedgerows, low lying wet areas, drainage canals and lakes which are features known to be used by long-tailed bats in other areas for transportation and foraging, suggests that the site may provide some habitat value for long-tailed bats.

[11] DOC national bat database – Long-tailed bat recorded by Andrea Dekrout (2009)
[12] Opus International Consultants Ltd (2017), *Huntly Section Long-tailed bat Monitoring 2016-17*., Prepared for NZ Transport Agency, Reference number 1-HTYV0.71
[13] Tonkin & Taylor Ltd (2014), Waikato Expressway Huntly Section Bat Survey, Prepared for NZ Transport Agency, T&T Ref: 61446.2013
[14] Wildlands Consultants Ltd. (2018), Ecological Assessment of the Proposed Lakeside Development Subdivision at 65 and 94 Scott Road, Te Kauwhata.
[15] Opus International Consultants Ltd (2017), *Huntly Section Long-tailed bat Monitoring 2016-17*., Prepared for NZ Transport Agency, Reference number 1-HTYV0.71

Figure 6: Cavity within deciduous exotic tree on the north eastern boundary.

Figure 7: Sweet chestnut tree that meets potential bat roost criteria.

Figure 8: Dead trees within hedgerow, which provide roosting cavities for long-tailed bats.

Figure 9: A potential roosting cavity for long-tailed bats.

11. FRESHWATER ECOLOGY

11.1 A desktop analysis revealed no mapped watercourses or water bodies within the site according to the Waikato Regional Council's (WRC) online mapping data, but did suggest the presence of two large artificial drainage channels.

11.2 In the wider context, the site is situated between the Waikato River approximately 1km to the west, Lake Ōhinewai to the south and Lakes Rotokawau and Waikare to the east.

11.3 WRC maps suggested there is no direct connectivity between the subject site and the Waikato River. WRC maps indicate Lake Ohinewai and the subject site are connected to the greater Whangamarino Wetland complex via both Lake Rotokawau and Lake Waikare.

11.4 The two large drainage channels mapped within the site form part of large surface water management scheme (including quantity, quality and flood management) managed by WRC as part of the Lower Waikato-Waipa Flood Control Scheme (LWWFFCS) and the Franklin-Waikato Drainage Scheme (Waikare drainage area, West subdivision).

11.5 The wider catchment is also described in the Lake Waikare and Whangamarino Wetland Catchment Management Plan (WWCMP). The WWCMP sets out priorities and actions for the management of the wider catchment, with a particular focus on conservation, enhancement and restoration of the river, land and wetland environment.

11.6 The ecological opportunities and constraints assessment confirmed the presence of the two large artificial drainage channels, one in the southeastern part of the site (Channel A – Figure 10) also known as the Tahuna Drain, and one along the north-eastern boundary (Channel B – Figure 11) also known as the Balemi Drain.

11.7 Channel A was approximately 5-6m wide and contained a substantial amount of water suggesting a shallow water table at the eastern end of the site. This large channel traversed the site from south to north connecting Lake Ōhinewai to Lake Rotokawau and forming a part of the greater Whangamarino Wetland complex, including Lake Waikare.

11.8 Channel B was approximately 3-4m wide and contained a substantial amount of water at the time of assessment, again suggesting a high-water table. It was not clear whether this channel was inside or outside the boundary of the site or whether it was connected to Lake Rotokawau as suggested by WRC's online mapping data.

11.9 Much of the site was covered by a large network of small, unmapped, interconnected, channels (Figure 12) classified as artificial drains. These channels were likely created historically to convert the land to productive pasture, for dry stock farming. These small unmapped channels varied in size, with the smallest containing no water and being completely vegetated with terrestrial vegetation (Figure 13).

11.10 The morphology of these channels showed little variation with no natural meander, near vertical banks in areas and limited evidence of sustained fluvial activity. Instream habitat structure was limited to vegetation, with no variation in substrate and no woody debris or undercut banks. Riparian margin vegetation was dominated by rank and grazed pasture grasses with patchy Juncus and small areas containing both kiokio (*Parablechnum novae-zelandiae*) and ring fern (*Paesia scaberula*). Channel shading varied from nil to very high (being nil in the unfenced, grazed areas and very high where the channel was completely overgrown with grass).

11.11 Connectivity between the small channel network and the larger Channel A and Channel B was not considered permanent. The confluence between the main, central channel draining the small channel network and Channel A was controlled by a pump bypass and a small overflow culvert. The confluence between a secondary channel and Channel B in the north-eastern corner of the site provided only intermittent connectivity, except for species adept at climbing (e.g. eels). A c. 50cm elevational difference between the invert of the secondary channel and the top of water level in Channel B at the time of assessment indicated that most aquatic fauna would only have access to the network of smaller channels during periods of high flow.

11.12 Water quality appeared poor overall with organic oils (assessed by noting the fracturing nature when disturbed) and sediment bubbling present across many of the channels. The lack of water flow and abundant vegetative growth over many of the channels suggested it is likely that dissolved oxygen levels were poor.

11.13 The surrounding topography suggests it is unlikely that there were any historic, natural watercourses on this site. It is more likely that this area was representative of a riverine wetland complex subject to periodic flooding from the Waikato River. Consequently, the artificial channels are best defined as artificial watercourses (farm drainage canals) based on Waikato Regional Plan definitions.

11.14 The ecological value of Channel A and B was considered moderate, due to the expected permanent water flow, and connectivity to the wider catchment. The ecological value of the farm drain network was considered low, due to the surrounding land use, intermittent nature of the water flow, artificial nature of the drains, poor water quality, lack of habitat features, and the absence of permanent connectivity to the wider catchment.

Figure 10: Channel A running north-east through eastern portion of the site, connecting Lake Ohinewai and Lake Rotokawau

Figure 11: Channel B running north and east connecting the site and Lake Rotokawau

Figure 12: Small, unmapped drain within south-west portion of the site looking north

Figure 13: Small, unmapped drain within north-west portion of the site (Stage 1) looking west

12. FISH

12.1 A search of the NZFFD for the Lake Waikare catchment showed records extending back to 1978, indicating 16 species of fish or aquatic invertebrate, including both exotic and native species have been recorded in the catchment (Table 4). Entries over the last ten years showed 53 records of exotic fish (including four different species) and 49 records of native fish (including five different species). The more recent fish records included two records of black mudfish (*Neochanna diversus*; At-Risk – Declining) and one of giant kōkopu (*Galaxias argenteus*; At Risk – Declining). No records of notable aquatic invertebrates were recorded.

12.2 The perennial nature of the water flow in Channels A and B and their permanent connectivity to the downstream catchment suggests these channels could sustain a number of indigenous fish species throughout the year.

12.3 The poor-quality habitat in the smaller channel network covering much of site, suggests it is unlikely that anything other than highly tolerant species (e.g., shortfin eels, black mudfish and gambusia) would persist in these channels. Black mudfish have been

recorded in the vicinity of the subject site (within 2km) and are known to occur in marginal habitats, including habitats that dry out periodically.

12.4 Fish presence was sampled in the north-west portion of the site (Stage 1) using Gee minnow traps where suitable water depths and conditions existed at the time of assessment. A total of 2, baited Gee traps were deployed in two drains overnight in July, 2019. No fish were captured. NZFFD records indicate trapping in the local catchment area has previously yielded shortfin eels (*Anguilla australis*), and numerous exotic species including common carp/koi carp (*Cyprinus carpio*), catfish (*Ameiurus nebulosus*) and mosquitofish (*Gambusia affinis*) and as such these species and others cannot be ruled out from being present within the farm drains.

12.5 A targeted mudfish survey was also carried out across Stage 1, as per the methodology outlined in Section 7.5. A total of 20, unbaited Gee traps were deployed in two drains for two successive nights in August 2019. No mudfish were captured; however, a total of 22 shortfin eels were captured - it is acknowledged that some of these may have been recaptures; however, the highest number caught in one day was 13 so shortfin eels do appear to have more than a sporadic distribution within the drains (See Appendix E for ENZL's Supplementary Ecological Assessment - Black Mud Fish Survey) .

Table 4: Fish and aquatic invertebrate species in the Lake Waikare catchment (from NZFFD 1978-2016)

Common Name	Latin Name	Threat status
Longfin eel	*Anguilla dieffenbachii*	At risk - Declining
Giant kōkopu	*Galaxias argentus*	At risk - Declining
Redfin bully	*Gobiomorphus huttoni*	At risk - Declining
Black mudfish	*Neochanna diversus*	At risk - Declining
Shortfin eel	*Anguilla australis*	Not Threatened
īnanga	*Galaxias maculatus*	Not Threatened
Crans bully	*Gobiomorphus basalis*	Not Threatened
Common bully	*Gobiomorphus cotidianus*	Not Threatened
Kōura	*Paranephrops planifrons*	Not Threatened
Freshwater shrimp	*Paratya curvirostris*	Not Threatened
Smelt	*Retropinna retropinna*	Not Threatened
Catfish	*Ameiurus nebulosus*	Introduced and Naturalised
Goldfish	*Carassius auratus*	Introduced and Naturalised
Koi carp	*Cyprinus carpio*	Introduced and Naturalised
Gambusia	*Gambusia affinis*	Introduced and Naturalised

13. SITE VALUES ASSESSMENT

13.1 The table below outlines the ecological values of the site assigned to the four matters prescribed in the EIANZ guidelines (2018). The overall values assess the matters at an ecosystem/vegetation type, fauna habitat and species level.

Terrestrial Assessment

Table 5: EIANZ assessment of terrestrial ecological values

Ecological Matter	Ecological Feature		
	Ecosystems/vegetation types	Fauna Habitat	Species
Representativeness	Low-predominantly pasture grass, working dairy farm, grazed throughout the year.	Low-limited habitat provided for birds, bats, and lizards.	Low-low diversity of flora and fauna across the site.
Rarity/distinctiveness	Low-no rare or distinctive ecosystems or vegetation types onsite.	Moderate- The majority of trees onsite were potential bat roosting sites, which represents distinctiveness.	Very High-Should a tree contain a communal roost of bats.
Diversity and Pattern	Low- diversity of ecosystem/vegetation types was low due to current land use.	Low-Diversity of habitat was minimal since predominantly pasture grass, with scattered exotic trees.	Low- Vegetation dominated by pasture grass, few exotic trees and shrubs. Indigenous fauna diversity low due to lack of habitat and current disturbance regime
Ecological Context	Low-The site is part of a wider landscape area dominated by working farm paddocks.	Moderate- The wider landscape (i.e. 8km radius) is relatively depauperate of roosting features, therefore their potential presence on site is notable.	Moderate- May be an important site for long-tailed bat roosting.
Overall Value	Low	Moderate	Moderate

13.2 The presence of potentially suitable bat roost trees and foraging areas suggests Long-tailed bats may be present across the site. Consequently, the overall ecological value of the terrestrial features on site are considered moderate, based on a conservative approach.

Aquatic Assessment

Table 6: EIANZ assessment of freshwater ecological values

Ecological Matter	Value	Summary
Representativeness	Low	Artificial watercourses with no discernible headwaters. Shallow flow depths and not characteristic of any New Zealand stream or aquatic habitat type.
Rarity/distinctiveness	Moderate	Unlikely to support threatened or at-risk species, however, there is a possibility of black mudfish presence (At-Risk, Declining). No distinctive ecological features.
Diversity and Pattern	Low	Little diversity, unlikely to support a complex community of aquatic fauna.
Ecological Context	Low	Poor quality riparian vegetation, highly modified local environment, not contributing to ecological corridors.

13.3 Overall, the ecological value of the freshwater features would generally be considered low, however, given the uncertainty around the presence of black mudfish across the remainder of the site, a conservative approach would class the ecological value as moderate.

14. ASSESSMENT OF ECOLOGICAL EFFECTS

14.1 Based on the findings in Section 13, the permanent removal of vegetation, bulk earthworks, construction of stormwater infrastructure, roads and the infilling and realignment of a number of drains across the site shall result in both actual, and potential adverse effects as described below.

Actual Effects

- Permanent loss and fragmentation of habitat for threatened fauna;
- Direct and permanent loss of vegetation and permeable surface cover; and
- Permanent loss of aquatic habitat.

Potential Effects

- Potential injury/death of native fauna, particularly native birds and bats inhabiting the exotic trees on-site and native fish species within the drains and downstream;
- Sedimentation of aquatic ecosystems if earthworks activities not effectively managed;
- Introduction of contaminants to the adjacent environment if stormwater runoff not effectively managed;
- Dust pollution on adjacent SNA vegetation if earthworks not effectively managed; and
- Increased noise and lighting during construction and operational phases;
- Introduction of pets and exotic garden species associated with residential development.

14.2 In addition to the adverse effects, it is important to consider the actual and potential positive effects attributable to the proposed rezoning and structure plan. Currently the site is dominated by intensive land use as a working dairy farm. The environmental consequences of dairying are increasingly understood. The following positive effects are considered attributable to the retirement of the farm and specific design features of the structure plan.

Positive Effects

- Reduction in nutrient contamination (e.g. nitrogen and phosphorus) of surface and groundwater;
- Reduction in nutrient loading of Lake Rotokawau, Lake Waikare and ultimately the Whangamarino wetland;
- Decrease in soil erosion and damage to soil structure;
- The change in land use to an industrial, commercial and residential zone will result in an altered stormwater runoff regime. The proposed stormwater management system for the development incorporates a toolbox approach including a 'treatment train' philosophy which aims to ensure stormwater discharged from the site achieves appropriate water quality standards, is consistent with the statutory framework and meets stakeholder's expectations.
- The stormwater management options outlined in the Woods Stormwater management plan (SMP), include the following[16]:
- a combination of at source treatment devices;
- conveyance along open, vegetated swales and
- discharge to naturalised wetland features prior to leaving the site and entering the receiving environment.
- These wetland features will provide not only stormwater treatment and attenuation functions, but also restore the functional capacity of wetlands adjacent to the site;
- Increase the availability of wetland habitat for wetland dependent indigenous flora and fauna.
- The proposed structure provides for a significant re-allocation of approximately 55ha of land to be managed as open space, comprising of a mix of functional stormwater management areas, recreational opportunities, and wetland park. This will create an ecological buffer adjacent to the SNA surrounding Lake Rotokawau and has the unique potential of reversing current degradation and potentially expanding the conservation estate through negotiated agreements or partnerships with the Department of Conservation (DOC) and/ or other stakeholders.

15. MAGNITUDE OF UNMITIGATED EFFECTS ON TERRESTRIAL VALUES

15.1 The magnitude of unmitigated effects on the terrestrial ecological features considered in Section 13 have been assessed at a wider landscape scale in the sections below.

[16] Preliminary concepts only. Stormwater management to be confirmed at the appropriate development stage.

Ecosystems/Vegetation Type

15.2 The proposed development will result in the permanent loss of predominantly pasture grass and scattered exotic trees. Removal of this vegetation type will result in temporary displacement of some fauna species.

15.3 Clearance of vegetation and associated earthworks may result in elevated dust deposition on the adjacent SNA vegetation. Dust may affect photosynthesis and respiration of plants, which in turn may result in growth inhibition. This can have a disproportionate effect on indigenous vegetation growth allowing pest plant species to establish and out compete indigenous species.

15.4 The magnitude of unmitigated effect on ecosystem and vegetation types is conservatively considered to be Moderate.

Fauna Habitat

15.5 The onsite habitat is primarily comprised of exotic pasture of very low ecological value, although it does have potential value as foraging habitat for native birds (e.g., species that prefer open areas such as paradise shelduck) and bats. The proposed development will remove some of this habitat, decreasing the area for foraging and roosting sites. However, given that the site is surrounded by farm paddocks that provide similar habitat, and noting that bat presence or utilisation of the site remains unknown, the magnitude of unmitigated effect on terrestrial fauna habitat is assessed conservatively as Moderate.

Species

15.6 Injury or death to native fauna during the removal of vegetation is a possibility. This can be attributed to the potential of terrestrial fauna to be present within the works footprint during construction activities. Therefore, due to long-tailed bats being listed as 'Threatened-Nationally Critical', the potential death of a colony due to the felling of one of the roost trees would be critical for the population. Fauna management will be required to mitigate this potential impact. The potential for an increased amount of noise and artificial light during the construction and operational phases is also a possibility. This can impact bat foraging and commuting behaviour and should be taken into account in designing mitigation strategies. Given the potential effects on long-tailed bats, the unmitigated magnitude of effect on terrestrial fauna species is considered to be High.

16. MAGNITUDE OF UNMITIGATED EFFECTS ON AQUATIC VALUES

Freshwater Functionality

16.1 Infilling of artificial farm drains will result in the permanent loss of low-quality aquatic habitat.

16.2 Where drain realignment is to occur, the duration of effect of this loss can be considered temporary given the proposed re-creation of aquatic habitat within new drain alignments. It is accepted that the establishment of this habitat will take time (e.g for aquatic plants and macroinvertebrates to recolonise) but in the mid-long term, it is considered there will be no net loss of aquatic habitat within re-aligned drains.

16.3 Given the poor-quality habitat available in these drains, their intermittent connectivity to the wider catchment, their lack of natural habitat features, and the temporary nature of some of the habitat loss, the magnitude of effect associated with drain infilling and re-alignment is considered Low.

Species

16.4 Injury or death of native fish species is possible during infilling and realignment of the drains. The species considered most likely to be present in these drains is shortfin eel (Not Threatened) so the loss of a small number of this species would have little effect on either the local or regional populations. However, while unlikely, it is possible that Black mudfish may be present in some of these drains. Owing to being an at-risk species, the loss of even a small number of Black mudfish may have an adverse effect on the population. On that basis, the magnitude of the unmitigated effect on fish is conservatively assessed as Moderate.

17. LEVEL OF UNMITIGATED EFFECTS

17.1 Table 7 and Table 8 below summarise the overall level of effects, pre-mitigation, using EIANZ's (2018) guidelines. Ecological values are taken from Section 13 and magnitude of effects from Sections 15 and 16.

Table 7: Level of effect, pre-mitigation, for each terrestrial ecological feature.

Ecological Feature	*Ecological Value*	*Magnitude of effect*	*Level of effect*
Vegetation/Ecosystem	Low	Moderate	Low
Fauna Habitat	Moderate	Moderate	Moderate
Species	Moderate	High	Moderate

Table 8: Level of effect, pre-mitigation, for freshwater ecological features.

Ecological Feature	*Ecological Value*	*Magnitude of effect*	*Level of effect*
Freshwater Functionality	Moderate	Low	Low
Species	Moderate	Moderate	Moderate

18. MANAGEMENT OF ECOLOGICAL EFFECTS

18.1 The section below outlines the recommended management of the unmitigated ecological effects identified in the sections above as a result of the proposed development.

18.2 The majority of the mitigation measures can be addressed at future development phases via resource consent processes. However, where necessary, mitigation at a broad Structure Plan level is identified.

Bat Management

18.3 The majority of the trees on-site meet the requirements to be considered potential roosting habitat for long-tailed bat (Threatened, Nationally Critical). Though the likelihood of occurrence of this species on site is low, it cannot be completely ruled out and impacts may be of a high magnitude if a roost tree is felled containing multiple bats.

18.4 Injury or death of bats during the removal of vegetation is possible and should be managed through the development and implementation of a Bat Management Plan (BMP) at the relevant development phase. This BMP should be prepared by a suitably qualified and experienced bat ecologist and should cover avoidance and industry-best practice vegetation removal protocols. This plan should be submitted to Waikato Regional Council for approval prior to the commencement of works.

18.5 It is suggested that works across the site be undertaken where impacts on high risk trees can be avoided. However, where potential bat roost trees must be removed, industry-best practice vegetation removal protocols should be implemented by a suitably qualified and experienced bat ecologist to mitigate potential adverse effects.

Bird Management

18.6 Although the potential magnitude of impact on native birds has been assessed as low, native birds are protected under the Wildlife Act 1953. It is therefore, considered appropriate that during the development phases, implementation of vegetation removal protocols be undertaken.

Fish Management

18.7 Despite the artificial, highly degraded, poor quality aquatic habitat within the drains and the expected low level of effect, it is recommended that mitigation for the permanent loss of drain habitat be provided for within the development site. Considering the extensive open space, stormwater infrastructure and enhancement planting proposed over the development, it is considered that this can be readily provided over the course of the development.

18.8 Risk of injury or death of native fish during drainage channel infilling was considered to have a moderate level of effect, and therefore should be mitigated. The risk to native fish species can be managed through the development and implementation of a Native Freshwater Fish Management Plan (FMP) at the appropriate development phase. FMP's should be prepared by a suitably qualified and experienced ecologist and should cover suitable fish salvage methods tailored for the site. It should include consideration of potential species within the on-site drainage channels and appropriate methodologies for the salvage, temporary storage and relocation of any fish caught into suitable habitat within the same catchment.

Erosion & Sediment Control and Dust Management

18.9 To mitigate the risk of sediment entering adjacent drains and contaminating the downstream catchment (e.g. Lake Rotokawau and Lake Waikare), erosion and sediment control plans should be prepared in accordance with Waikato Regional Council's Erosion and Sediment Control Guidelines (Report: TR 2009/02, updated 2014).

Such plans are industry best practice and can be addressed at the appropriate development stage.

18.10 Dust management will need to be implemented across the site in order to manage the potential for adverse dust effects as a result of earthworks. As with erosion and sediment control measures, dust management can be addressed at the appropriate development stage.

Stormwater Management

18.11 To address the potential increase of stormwater runoff and potential contaminants as a result of urbanisation of the site, appropriate stormwater management is required for the development. Stormwater management for the overall development is covered by the Stormwater Management Plan (SMP) prepared by Woods.

18.12 The SMP outlines appropriate measures to be employed across the site to adequately address the management of on-site stormwater quality and quantity in line with statutory requirements and best practice. The specific measures to be implemented will be developed at the appropriate development stage.

19. RESIDUAL EFFECTS ASSESSMENT

19.1 Following the implementation of the above mitigation recommendations in Section 18 of this report, a residual effects assessment is provided to determine the overall level of mitigated effects. Based on the summaries presented below in Tables 9 and 10, the level of effects for all ecological features identified are reduced to low if the recommended ecological management is implemented effectively.

19.2 The ecological features requiring mitigation have been addressed to ensure that adverse impacts will be avoided and/or mitigated. This is particularly important to address levels of uncertainty regarding the presence of critically, threatened native bats and At Risk fish.

19.3 In addition, the proposed contribution to the quantity and quality of functioning riverine wetland habitat within the Meremere ecological district is seen as positively addressing any unforeseen residual impacts associated with the development.

Table 9: Level of mitigated effects for each terrestrial ecological feature.

Ecological Feature	*Ecological Value*	*Magnitude of effect*	*Level of effect*
Vegetation/Ecosystem	Low	Low	Very Low
Fauna Habitat	Moderate	Moderate	Low
Species	Moderate	High	Low

Table 10: Level of mitigated effects for overall freshwater values.

Ecological Feature	*Ecological Value*	*Magnitude of effect*	*Level of effect*
Freshwater Functionality	Moderate	Low	Low
Species	Moderate	Moderate	Low

19.4 Based on the above summary, no residual effects are predicted to remain post-mitigation. On that basis, additional compensatory and/or off-setting measures are considered unnecessary.

20. CONCLUSION

20.1 This report provides an ecological impact assessment for the proposed re-zoning to enable the development at 231 Tahuna Road and 52-58 Lumsden Rd, Ōhinewai.

20.2 The possible but unlikely presence of At Risk and Threatened native fauna species on-site increased the assessed ecological value and the magnitude of unmitigated potential effects for the proposed development. However, the presence of those species is currently uncertain and there are no other high value ecological features that will be adversely impacted within the site.

20.3 Though the risk of actual significant adverse ecological effects is considered low, appropriate mitigation has been proposed to avoid and mitigate those possible effects. The recommended ecological management measures will decrease the risk of adverse impacts on any potential high value features. Consequently, the overall level of ecological impact for the project is considered to be low.

20.4 There are extensive positive outcomes provided by the retiring of the existing dairy farm and extensive provision of open space and restored wetland habitat. Consequently, it is expected that no off-setting or compensatory measures will be required.

21. FURTHER WORK TO SUPPORT DEVELOPMENT STAGES

21.1 This assessment of effects was undertaken at a high level to facilitate decisions on the proposed re-zoning only. This assessment has utilised a number of assumptions with regard to Threatened and At Risk species presence and utilisation of the site. Consequently, it is recognised that additional ecological assessment will be required to support future development proposals and resource consent applications associated with subsequent development of the site. Additional work will be undertaken to better understand the specific ecological values of the site in relation to the actual and potential effects associated with the proposed development. Specifically, additional work to support future resource consent is to include:

- Acoustic monitoring of potential bat roost trees to determine level and type of behavioural bat use within the site;
- Detailed assessment and mapping of the farm drainage network to better understand the extent of farm drainage area to be impacted and the quality of habitat present;
- Detailed survey of farm drains to better determine the presence or absence of Threatened or At Risk fish species such as Black mudfish, Giant kōkopu, Redfin Bully and Longfin eels;
- Detailed survey of macroinvertebrates and the calculation of a Macroinvertebrate Community Index (MCI) to better understand the quality of aquatic habitat on site; and
- Detailed survey of suitable lizard habitat to better determine the presence or absence of indigenous lizard species and the extent of utilisation within the site.

APPENDIX A

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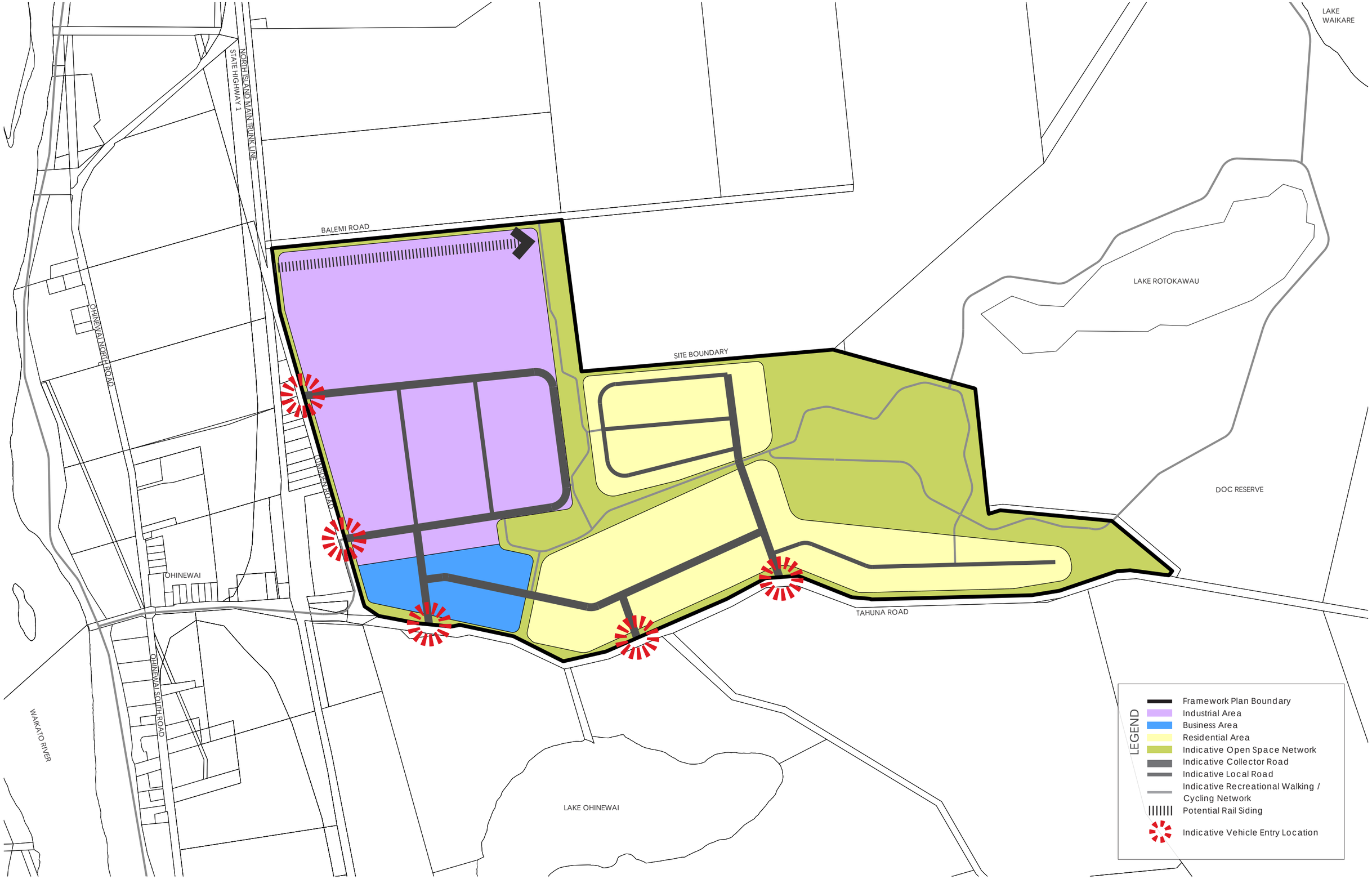
ix) Where lengths or other measurements have not been provided by a surveyor, ENZL has used basic GIS mapping and measurement systems to estimate these numbers. These should not be taken as surveyor-level accuracy for the purposes of decision making.

APPENDIX B

Illustrated Masterplan - Sleepyhead Estate (Ōhinewai Development)

Sleepyhead Estate – Structure Plan

File Ref: 1805_012_Framework_Plan.indd



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SLEEPYHEAD ESTATE

Structure Plan

Date: 29 November 2019 | Revision E

Drawing Number: 1805_012

Plan prepared by Adapt Studio Ltd

File Ref: 1805_018_Illustrative_Masterplan.indd

TO AUCKLAND CBD (60MINS), PAPAKURA (40MINS)

SITE BOUNDARY
MAIN ROAD
LOCAL ROAD
COMMERCIAL BUILDING
ATTACHED HOME
FREESTANDING HOME
COMMUNITY ACTIVITY NODE
COMMUNITY BUILDING
WETLAND PLANTING
RESTORATION PLANTING
PRODUCTIVE PLANTING
SHARED PATH

BALEMI ROAD
RAIL SIDING
STATE HIGHWAY 1
RAILWAY LINE
LUMSDEN ROAD
CENTRAL PARK
TAHUNA ROAD
SPORTS FIELDS
WETLAND PARK
MARKET GARDEN
LAKE ROTOKAWAU
DOC RESERVE
LAKE OHINEWAI
TO HAMILTON (35MINS)

1. REALIGNED LUMSDEN / BALEMI ROADS SO SIDING CROSSES AT 90 DEGREES
2. CARGO / FREIGHT STORAGE AREA
3. PRIMARY INDUSTRIAL TENANT WITH DIRECT ACCESS TO RAIL SIDING, OFFICE AND CAR PARKING
4. ACCESS TO RAIL SIDING AND FACTORY SITE
5. LIFESTYLE LOTS TO REMAIN
6. MAIN LIGHT INDUSTRIAL AREA
7. SHARED PATH CONNECTION TO EXISTING OHINEWAI PRIMARY SCHOOL AND WAIKATO RIVER
8. SERVICE CENTRE WITH TRUCK STOP AND CONVENIENCE RETAIL
9. EMERGENCY SERVICE BUILDINGS AND BUS DEPOT
10. FACTORY OUTLET STORES
11. POTENTIAL FUTURE ROAD ACCESS IF ADJOINING FARM IS DEVELOPED
12. COMMUNITY FACILITY / HALL / COMMUNITY HUB
13. COMMUNITY CORNER SHOP
14. SPORTS FIELDS
15. MARKET GARDEN AND PROCESSING AREA / CAFE
16. SHARED PATH CONNECTIONS INTO DOC RESERVE
17. ORCHARD / BEE HIVES AND PROCESSING AREA
18. FULL THREE WAY INTERSECTION. DESIGN TBC
19. LEFT IN / LEFT OUT INTERSECTION. DESIGN TBC
20. REINSTATEMENT OF HISTORIC TRAIN STATION AND POSSIBLE SERVICE TO AUCKLAND / HAMILTON
21. UTILITIES AREA
22. POTENTIAL TRANSFORMER STATION LOCATION
23. OPPORTUNITY FOR MANA WHENUA GATEWAY POU OR ARTWORK

Sleepyhead
ADAPT STUDIO
gaze commercial Smart Property Solutions

N
0 250m
1:7,500 @ A3

OHINEWAI STRUCTURE PLAN

Illustrative Masterplan

Date: 22 November 2019 | Revision K

Drawing Number: 1805_018

Plan prepared by Adapt Studio Ltd for Gaze Property Solutions

APPENDIX C

ENZL Ecological Opportunities and Constraints Assessment, **Ōhinewai Development, 231 Tāhuna Rd and 52 Lumsden Rd**

Ecological Opportunities and Constraints Assessment

Ōhinewai Development, 231 Tāhuna Rd and 52 Lumsden Rd

Prepared for Ambury Properties Ltd.
25 June 2019

Report Number 1708247.1-001.V2

ECOLOGY NEW ZEALAND

Document Sign Off

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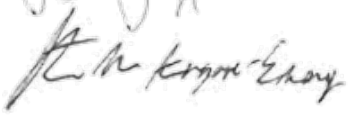
	Stephanie Angove-Emery Ecologist	
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INTRODUCTION

This report[1], prepared by Ecology New Zealand Limited ('ENZL') for Ambury Properties Ltd ('the client'), presents an Ecological Opportunities and Constraints Assessment for the proposed development at 231 Tāhuna Rd and 52 Lumsden Rd, Ōhinewai ('the site'). Specifically, this report provides a preliminary level assessment of the site's ecological features, context and value. The findings of this report are intended to be used in the decision-making process in relation to the feasibility and design of the development.

1.1. Site Location, Description and Ecological Context

The site is located at the corner of Tāhuna Rd and Lumsden Rd, Ōhinewai, Waikato (LOT 1 DPS 29288, LOT 2 DPS 29288 and LOT 3 DP 474347) and is situated within the Meremere Ecological District of the Waikato Ecological Region. The site consists of a working dairy farm covering approximately 178ha. Land cover is comprised predominantly of mature pasture grasses, exotic trees, hedgerow plantings, as well as pockets of wetland-adapted vegetation. No watercourses are shown within the site on Waikato Regional Council's WaikatoMaps, online mapping system on the Water Classification layer; however, two drainage channels are shown draining from the site into the wetland area around Lake Rotokawau on the Drainage layer. Within the wider landscape context, the site lies within a rural area, bordered by agricultural land on all sides, with State Highway 1 and the Waikato River to the west.

The site contains a small amount of Significant Natural Area (SNA) as classified by Waikato Regional Council in the eastern part of the site (Figure 1). This is an extension of the SNA surrounding Lake Rotokawau and the vegetation is characterised as" exotic with wetland, terrestrial, and wetland – freshwater"[2]. This area is also classed as an Outstanding Natural Feature in the proposed district plan (subcategory Wetland and River Margin). A 2017 report classified this area as regionally significant[3], an assessment based on a set of 11 criteria outlined in the Waikato Regional Policy Statement.

Waikato Regional Council's Vegetation Biodiversity Map[4] (Land Cover layer) shows the majority of the assessment site as High-Producing Exotic Grassland, with a small pocket of Exotic Forest and a small area of Herbaceous Freshwater Vegetation which forms part of the SNA. The Biodiversity Vegetation layer further classifies the SNA vegetation as Exotic Hardwoods.

[1] This report is subject to the Report Limitations provided in Appendix A.
[2] Waikato District Council, Proposed District Plan.
[3] Van der Zwan, W. and Kessels, G. (2017) *Significant Natural Areas of the Waikato District: Terrestrial and Wetland Ecosystems*. Waikato Regional Council Technical Report 2017/36
[4] Waikato Regional Council. WaikatoMaps. Retrieved from: https://waikatomaps.waikatoregion.govt.nz/Viewer/?map=49a72640c5474484b156d453144044a3

Figure 1: Indicative site map

1.2. Proposed Activity

The project proposes to develop the site into a combination of industrial park and medium to high density housing, including the creation of a wetland park and open space recreation area (Appendix C - Adapt Studio Ltd Illustrative Master Plan, 05 June 2019, Revision H). This will require the clearance of various exotic trees and pasture grasses, as well as the infilling of numerous farm drains across the site. The following assessment is based on communications with the client's project team and preliminary site designs (Appendix C – Illustrative Master Plan, 05 June 2019, Revision H).

2. METHODOLOGY

Two ENZL ecologists carried out a site assessment on Thursday 30th May 2019. Both aquatic and terrestrial ecological values were assessed in order to evaluate the potential ecological opportunities and constraints associated with the proposed activities. Aquatic and terrestrial features were identified, and their associated structure, composition and quality were documented.

2.1. Terrestrial

Prior to commencement of the site assessment, a desktop investigation was undertaken, querying relevant databases for information relating to the site's ecological characteristics. Onsite investigations included walk-over assessments of terrestrial vegetation and fauna communities. Specifically, the assessment included vegetation classification, habitat assessments, avian surveys, and manual habitat searches for native lizards in suitable habitats.

2.2. Aquatic

A preliminary desktop survey was completed to note any mapped watercourses within proximity to the site and any connectivity between the site, Lake Rotokawau and the greater Whangamarino Wetland complex to the north (a Ramsar Site). A site assessment was carried out to assess the ecological values of any watercourses and wetlands on site.

Aquatic fauna surveys were considered outside the scope of this opportunities and constraints assessment; however, a search of the New Zealand Freshwater Fish Database (NZFFD) was completed to obtain reference data of fish species previously found in the catchment.

3. ECOLOGICAL VALUES ASSESSMENT

3.1. Vegetation

Overall, the vegetation within the proposed assessment area was dominated by pasture grass with scattered exotic trees (Figure 2). Vegetation communities associated with lower lying areas and those adjacent to drainage channels were characterised by juncus (*Juncus* sp)(Figure 3Figure 4 below). Many drainage channels were lined with hedgerows of poplar (*Populus* sp.) and pine (*Pinus* sp.) of various sizes as well (Figure 5 Hedgerow of pines. Of note was a large, veteran macrocarpa (*Cupressus macrocarpa*) located in the western portion of the site, near Lumsden Road (see section 3.2).

Figure 2 Scattered exotic trees across the site.

Figure 3 Concentrated area of rushes in grazed paddock.

Figure 4 Rushes lining drainage channel.

Figure 5 Hedgerow of pines.

3.2. Terrestrial Fauna

The quality of native bird habitat on site was considered poor. Habitat availability was limited due to the low number of trees, present on site. The birds observed onsite included mainly welcome swallows (*Hirundo neoxena*) and skylarks (*Alauda arvensis*).

Suitable habitat for ground-dwelling lizards was identified on site, specifically within leaf litter, clumping vegetation along the drainage channels and decomposing logs (Figure 6). Targeted manual searches across the proposed works footprint confirmed the presence of copper skink (*Oligosoma aeneum*) (Figure 7). Habitat for arboreal lizard species was not observed onsite.

Figure 6 Lizard habitat onsite.

Figure 7 Copper skink found onsite.

Potential bat roosting habitat was present within several large exotic trees (e.g poplar, London plane, macrocarpa and pine). The large, veteran macrocarpa located just east of Lumsden Road within the south-western portion of the site (Figure 9) was sufficiently large (> 80cm DBH) and had suitable cavities to host long-tailed bat (*Chalinolobus tuberculatus*, Threatened – Nationally Critical) roosts. Furthermore, the hedgerows of large exotic trees (Figure 8) provided a linear edge along drainage channels which long-tailed bats tend to utilise as pathways for commuting and foraging activities. The nearest and most recent records from the Department of Conservation bat distribution data are from 2009 and confirm long-tailed bat presence at Hakarimata Scenic Reserve, approximately 20km south of the site[5]; however, a survey undertaken at Lake Waikare (approximately 3km from the site) in 2014 did not detect the presence of bats[6].

Further studies conducted as part of the construction of the Waikato Expressway[7][8], detected bats at 48 out of a total of 69 bat detectors deployed along the proposed expressway alignment during surveys conducted between 2014 and 2017. Bats were detected along the southern section of the alignment from c. 7.5km to 14.5km from the site at Ohinewai. Long-tailed bats are known to travel substantial distances from a roost when foraging. - A distance of 10km is considered to be within the potential foraging range of long-tailed bats[9] Consequently, foraging bats could be flying to this site from forested areas to the south and east. Long-tailed bats are known to forage in remnants of indigenous podocarp-hardwood forests and over wetlands, beneath exotic Salix woodlands lining braided riverbeds, and flowing channels within the river courses, and occasionally over farmland[10]. The Waikato River,

[5] DOC national bat database – Long-tailed bat recorded by Andrea Decrout (2009)
[6] DOC national bat database – Long-tailed bat recorded by Brian Lloyd (2014)
[7] Opus International Consultants Ltd (2017), *Huntly Section Long-tailed bat Monitoring 2016-17.*, Prepared for NZ Transport Agency, Reference number 1-HTYV0.71
[8] Tonkin & Taylor Ltd (2014), Waikato Expressway Huntly Section Bat Survey, Prepared for NZ Transport Agency, T&T Ref: 61446.2013
[9] C. F. J. O'Donnell (2001) Advances in New Zealand mammalogy 1990–2000: Long-tailed bat, Journal of the Royal Society of New Zealand, 31:1, 43-57, DOI: 10.1080/03014223.2001.9517638
[10] Griffiths, R. 1996: Aspects of the ecology of a long-tailed bat, Chalinolobus luberculatus (Gray, 1843), population in a highly fragmented habitat. Unpublished MSc thesis, Lincoln University, Lincoln, New Zealand.

onsite drainage channels and multiple surrounding lakes and wetlands suggest the Ohinewai site may be situated in proximity to potential foraging areas for long-tailed bats.

Figure 8: Poplar hedgerow along drainage channel at the northern edge of the site

Figure 9 Large macrocarpa providing potential bat roosting habitat.

3.3. Watercourse Assessment

Desktop analysis revealed no mapped watercourses or water bodies within the site but did suggest the presence of two drainage channels[11]. In the wider context, the site is between the Waikato River to the west, Lake Ōhinewai to the south and Lakes Rotokawau and Waikare to the east. Waikato Regional Council maps suggested that Lake Ōhinewai is connected to the greater Whangamarino Wetland complex via the other two lakes but has no connectivity to the Waikato River approximately 1km to the west.

The site assessment confirmed the presence of two drainage channels, one in the south-eastern part of the site (Channel A) and one in the central northern area (Channel B). The remainder of the site had a large network of interconnected drainage channels which were likely created historically to convert the land from wetland to arable land.

The drainage channels varied in size, with the smallest containing no water and being completely vegetated. The largest channel was Channel A at approximately 5-6m wide (Figure 11). This large channel dissected the site from south to north and contained a substantial amount of water suggesting a shallow water table at the eastern end of the site. This channel connects Lake Ōhinewai to Lake Rotokawau and forms a part of the greater Whangamarino Wetland complex, including Lake Waikare. No other drainage channels were observed.

In addition to the drainage channels, an artificial pond was identified on aerial imagery to the east of the farm buildings towards the south-western corner of 231 Tāhuna Rd. However, this feature could not be confirmed during the on-site assessment due to access constraints.

Whilst all watercourses onsite were classified as artificial and degraded within an intensive farming environment, they provide potential habitat for native fauna such as eels. Given the

[11] Waikato Regional Council Local Maps – "Drainage" map. https://waikatomaps.waikatoregion.govt.nz/Viewer/?map=15b6ef59ffba4d9b9128c70da260bef3

volume of water in these channels and their connectivity to important habitat both upstream and downstream, they should be considered when assessing the impacts of the proposed development.

3.3.1. Wetland Areas

The Resource Management Act 1991 (RMA) and Waikato Regional Plan define a wetland as 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. The vegetation communities noted on site, coupled with the network of large drainage channels and proximity of the wetland around Lake Rotokawau suggests that much of the assessment site may have been a wetland ecosystem historically. Juncus (spp) was widespread across the site (predominantly the eastern half of the site), at variable densities associated with the site's soil moisture gradient. A circumscribed area of dense juncus growth was noted in the topographical depression located in the south-western corner of the site (Figure 13). This feature was described as a modified and degraded wetland providing poor quality habitat for wetland species.

Given the soil moisture regime it would be expected that if all grazing pressures were ceased, wetland-adapted vegetation would gradually colonise the low-lying areas of this site.

3.3.2. Wider Catchment

The drainage channels on site discharge into Lake Rotokawau to the east. Lake Rotokawau is a peat lake draining into Lake Waikare, with a large area of peat bog and good quality, semi-mineralised wetland with moderate to high botanical values occupying the fringe of the lake. Fauna potentially utilising the lake include Australasian Bittern (*Botaurus poiciloptilus* - Nationally Critical), North Island Fernbird (*Bowdleria punctata vealeae* – At Risk), Spotless Crake (*Porzana tabuensis tabuensis* – At Risk) and Black Mudfish (*Neochanna diversus* – At Risk/Declining)[12][13][14]. This is a degraded lowland lake which is connected to Lake Ohinewai to the south-west and Lake Waikare to the east. Lake Rotokawau is at the bottom of an intensively farmed catchment of around 1804ha[15]. During water quality assessments in 2008[16], Lake Rotokawau was classified as hypertrophic, meaning it has poor water quality due to a high nutrient load. It is buffered to some degree by the protected wetland vegetation surrounding it on three sides. The lake is a target of freshwater restoration efforts as part of the Lake Waikare and Whangamarino Wetland Catchment Management Plan. Lake Rotokawau was assessed

[12] Waikato Regional Plan, Water Module, S.3.7.7 Table of Wetlands in the Waikato Region, WRP online, https://www.waikatoregion.govt.nz/Council/Policy-and-plans/Rules-and-regulation/Regional-Plan/Waikato-Regional-Plan/3-Water-Module/37-Wetlands/377-Table-of-Wetlands-in-the-Waikato-Region-for-Rule-3746/
[13] Robertson, Hugh A et al. May 2017, *Conservation status of New Zealand Birds 2016,* New Zealand Department of Conservation, New Zealand Threat Classification Series, Wellington, New Zealand.
[14] Dunn, Nicholas R. et al. August 2018, *Conservation Status of New Zealand Freshwater Fishes, 2017*, New Zealand Department of Conservation, New Zealand Threat Classification Series, Wellington, New Zealand.
[15] Leanne Lawrence & Graeme Ridley. (2018). *Lake Waikare and Whangamarino Wetland Catchment Management Plan. Part One: Catchment Background*. Prepared for Waikato Regional Council.
[16] Duggan, I.C. (2008). *Zooplankton composition and a water quality assessment of seventeen Waikato lakes using rotifer community composition.* Centre for Biodiversity and Ecology Research, The University of Waikato.

as part of a Waikato-wide lake assessment programme and was ranked 22nd out of 96 lakes in terms of biodiversity management priority[17].

3.3.3. Fish

A search of the NZFFD for the Lake Waikare catchment had records extending back to 1978 showing 16 species of fish or invertebrate, including both exotic and native species. Records from the last ten years showed 53 records of exotic fish (including four different species) and 49 records of native fish (including five species). The more recent fish records included two records of black mudfish (*Neochanna diversus*; At-Risk – Declining) and one of giant kōkopu (*Galaxias argenteus*; At Risk – Declining). No records of invertebrates were noted.

Whilst onsite, two large exotic fish were seen at the Tāhuna Road end of the large channel and were likely either koi carp (*Cyprinus carpio*) or goldfish (*Carassius auratus*). Given the habitat type, it is expected that at the very least, shortfin eels (*Anguilla australis*) would be present in the drainage channels onsite.

Table 1: Fish and aquatic invertebrate species in the Lake Waikare catchment (from NZFFD 1978-2016)

Common Name	Latin Name	Threat status
Banded kokopu	*Galaxias fasciatus*	Not Threatened
Black mudfish	*Neochanna diversus*	At Risk - Declining
Catfish	*Ameiurus nebulosus*	Introduced and Naturalised
Common bully	*Gobiomorphus cotidianus*	Not Threatened
Crans bully	*Gobiomorphus basalis*	Not Threatened
Freshwater shrimp	*Paratya curvirostris*	Not Threatened
Giant kōkopu	*Galaxias argentus*	At risk - Declining
Gambusia	*Gambusia affinis*	Introduced and Naturalised
Goldfish	*Carassius auratus*	Introduced and Naturalised
īnanga	*Galaxias maculatus*	Not Threatened
Koi carp	*Cyprinus carpio*	Introduced and Naturalised
Kōura	*Paranephrops planifrons*	Not Threatened
Longfin eel	*Anguilla dieffenbachii*	At risk - Declining
Redfin bully	*Gobiomorphus huttoni*	At risk - Declining
Shortfin eel	*Anguilla australis*	Not Threatened
Smelt	*Retropinna retropinna*	Not Threatened

[17] Wildlands Consultants. (2011). *Significant Natural Areas of the Waikato Region – Lake Ecosystems.* Waikato Regional Council Technical Report 2011/05

Figure 10: Marked drainage channel on site boundary to the north of the site

Figure 11: Large canal connecting Lakes Ōhinewai & Rotokawau

Figure 12: Scattered grazed juncus with grazing dairy cows in background

Figure 13: Wetland area within south-western portion of site

4. OPPORTUNITIES & CONSTRAINTS

4.1. Opportunities

The site provides opportunities for enhancement and restoration of ecological features as outlined below:

- Restoration of historic wetland ecosystems onsite (especially the area identified as 'Wetland Park' on the Illustrative Masterplan on the eastern half of the site); thereby, expanding the current valuable habitat in the adjacent protected area (Significant Natural Area) around Lake Rotokawau. This could include (but not be limited to), restoration of hydrological regime through the infilling of drainage channels, pest plant and animal control, and revegetation with appropriate native species;
    - Restoration of this area may provide suitable offset opportunities to assist in mitigating any potential or actual effects associated with development on remaining portions of the property;
- Enhancement of native lizard habitat within the open space recreation area and wetland park area as indicated on the preliminary, illustrative master plan, 05 June 2019, Revision H. This would include planting low-growing plants and other species that are preferred by ground-dwelling skinks; and
- Map the entire site using high-definition drone imagery. This would allow accurate mapping of ecological features including vegetation community coverage, drainage channel alignment and wetland areas. This would allow for accurate quantification of impacts and a comparison with future imagery to assess the success of any restoration efforts.

4.2. Constraints

The site provides ecological constraints to development as outlined below. Recommendations to avoid or minimise impacts are also made.

- Drainage channel to be retained – The large channel dissecting the site provides a valuable aquatic corridor that links Lake Ōhinewai to Lake Rotokawau. As such it is recommended that this be retained;
- Further survey of the drainage channels on site – It is recommended that all drainage channels be mapped in order to quantify any habitat to be lost or restored. If any channels are to be reclaimed/infilled, then fish surveys will need to be completed to determine what species are present and how best to salvage them prior to infilling;
- Wetland areas within the development footprint - there is an area of degraded wetland in the south-west of the site. Reclamation/earthwork of this area may result in a requirement for mitigation to offset the loss of this ecosystem type;
- Further assessment for bat habitat - Large exotic trees within the identified areas may have potential to act as bat roosting sites. Given the level of existing information available on bat presence in the general area, acoustic surveys are not likely required at this time; however, further acoustic surveys and detailed visual assessment, as part of standard, best practice vegetation removal protocols will be required to determine the significance of these trees to bats, prior to any removal; and
- Further assessment of lizard habitat – Given that a native copper skink was found on site, further surveys should be carried out to determine the density of native lizards within

the vicinity of the works footprint. Should further assessments confirm their presence across the site, then appropriate mitigation measures would be required to mitigate potential impacts on these species.

- Best practice timing windows for the sampling of terrestrial and aquatic fauna may have an effect on consent and construction scheduling (e.g. mudfish sampling Sept - Nov; Lizard sampling Dec - Mar etc). In addition, timing windows associated with life cycle periods of highest risk (i.e. nesting, breeding, roosting etc) are to be factored in to earthworks scheduling.

5. SUMMARY

This report provides an assessment of the ecological opportunities and constraints associated with the proposed development at 231 Tāhuna Rd and 52 Lumsden Rd, Ōhinewai. Overall, the ecological features of the site are of poor to moderate quality. The most substantial constraint for the proposed development is associated with the potential impacts on the large channel connecting Lake Ōhinewai to Lake Rotokawau and the greater Whangamarino Wetland complex north east of the site. This aquatic ecosystem forms an important hydrological and ecological corridor sustaining a unique habitat feature on the landscape.

It is recommended that the wetland park area identified in the Illustrative Master plan be retained as shown. Restoration of this wetland area provides a unique opportunity for expanding the valuable wetland habitat within the adjacent Significant Natural Area and indirectly contributing to the nationally and internationally significant Whangamarino Wetland complex (A Ramsar Site). In addition, restoration of this area may provide adequate opportunities for mitigating or offsetting the potential and actual effects of development.

In support of the Resource Consent application process and any proposed plan changes, it is recommended an Ecological Impact Assessment and associated Ecological Management Plan be developed for the site subsequent to the preparation of a confirmed scheme plan for the project.

APPENDIX A

Report Limitations

This Report/Document has been provided by Ecology New Zealand Limited (ENZL) subject to the following limitations:

i) This Report/Document has been prepared for the particular purpose outlined in ENZL's proposal and no responsibility is accepted for the use of this Report/Document, in whole or in part, in other contexts or for any other purpose.

ii) The scope and the period of ENZL's services are as described in ENZL's proposal and are subject to restrictions and limitations. ENZL did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Report/Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by ENZL in regard to it.

iii) Conditions may exist which were undetectable given the limited nature of the enquiry ENZL was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Report/Document. Accordingly, if information in addition to that contained in this report is sought, additional studies and actions may be required.

iv) The passage of time affects the information and assessment provided in this Report/Document. ENZL's opinions are based upon information that existed at the time of the production of the Report/Document. The Services provided allowed ENZL to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

v) Any assessments, designs and advice made in this Report/Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Report/Document.

vi) Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by ENZL for incomplete or inaccurate data supplied by others.

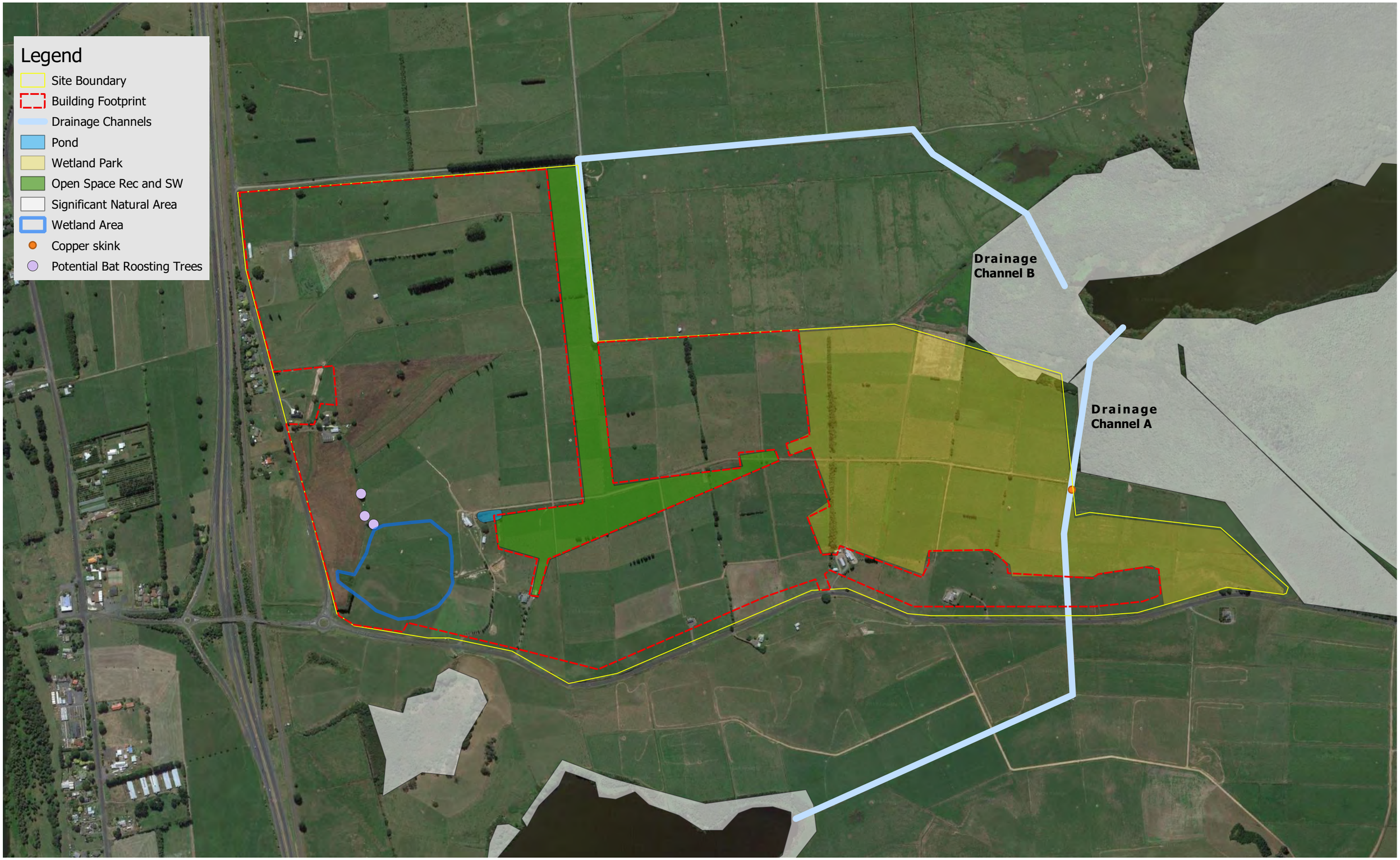
vii) The Client acknowledges that ENZL may have retained sub-consultants affiliated with ENZL to provide Services for the benefit of ENZL. ENZL will be fully responsible to the Client for the Services and work done by all of its sub-consultants and subcontractors. The Client agrees that it will only assert claims against and seek to recover losses, damages or other liabilities from ENZL and not ENZL's affiliated companies. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any legal recourse, and waives any expense, loss, claim, demand, or cause of action, against ENZL's affiliated companies, and their employees, officers and directors.

viii) This Report/Document is provided for sole use by the Client and is confidential to it. No responsibility whatsoever for the contents of this Report/Document will be accepted to any person other than the Client. Any use which a third party makes of this Report/Document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. ENZL accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Report/Document.

ix) Where lengths or other measurements have not been provided by a surveyor, ENZL has used basic GIS mapping and measurement systems to estimate these numbers. These should not be taken as surveyor-level accuracy for the purposes of decision making.

APPENDIX B

Map of ecological features onsite.



ECOLOGY NEW ZEALAND

N

0 25 50 75 100 m

1:8,500 @ A3

Projection: NZGD 2000/ NZTM 2000
Sources: Base map sourced from Google 2019; NZ Property Titles sourced from LINZ Crown Copyright Reserved; Drain channels overlay sourced from Waikato Regional Council waikatomaps; Building footprint, wetland park, and opens pace recreation/stormwater areas sourced from Gaze Commercial 'Illustrative master plan Rev C Drawing no.1805_18'

Ohinewai Project

Project Map

Date: 24 June 2019| Revision : 3

Plan prepared for Ambury Properties Ltd by Ecology New Zealand Limited
Author: stephanie.angove-emery@ecologynz.nz

APPENDIX C

Illustrative Master Plan, 05 June 2019 | Revision H

ADAPT STUDIO

gaze commercial
Smart Property Solutions

N

0 250m

1:7,500 @ A3

WORK IN PROGRESS
FOR DISCUSSION PURPOSES ONLY

OHINEWAI STRUCTURE PLAN

Illustrative Masterplan

Date: 05 June 2019 | Revision H

Drawing Number: 1805_018

Plan prepared by Adapt Studio Ltd for Gaze Property Solutions

APPENDIX D

ENZL Ecological Impact Assessment for Stage 1a – Ōhinewai Development, 82 Lumsden Road

Ecological Impact Assessment

Ōhinewai Development, 82 Lumsden Road

Prepared for Ambury Properties Ltd
19 July 2019

Report Number 1708247.1-001.V2

ECOLOGY NEW ZEALAND

Document Sign-off

Author(s):	Jasmine Dungey Ecologist
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Review:	Connor Whiteley Senior Ecologist
Principal approval for release:	Simon Chapman Principal

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1. INTRODUCTION

1.1. Purpose and Scope

This report[1], prepared by Ecology New Zealand Limited ('ENZL') for Ambury Properties Ltd ('the client'), presents an Ecological Impact Assessment ('EcIA') for Stage 1 of the proposed development at 82 Lumsden Rd, Ōhinewai ('the site'). Specifically, this report aims to assess the actual and potential adverse ecological effects associated with the proposed development on the site's ecological values.

The scope of this report comprises the following:

- A description of the terrestrial and aquatic ecological values;
- An assessment of effects on terrestrial and aquatic ecological values; and
- Recommendations to avoid, remedy, mitigate and/or offset adverse ecological effects.

1.2. Site Location, Description and Ecological Context

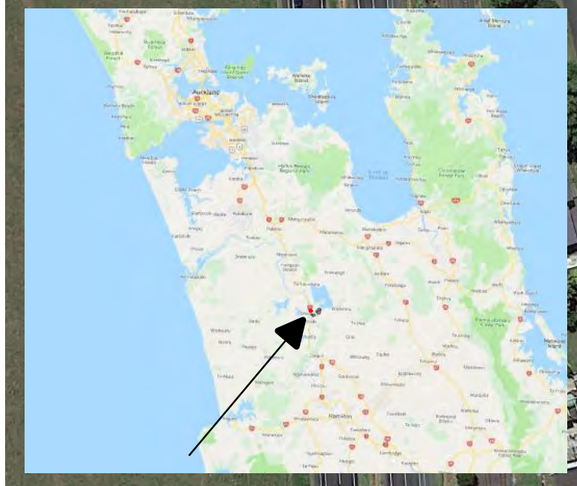
The site is located at 82 Lumsden Road, Ōhinewai, Waikato (Title no: SA6A/776) and is situated within the Meremere Ecological District of the Waikato Ecological Region. The site is outlined in Figure 1 overleaf. The area of proposed works is 9ha within part of larger working dairy farm of 166ha. Land cover is comprised predominantly of pasture grasses, exotic trees and two drainage channels. No watercourses are shown within the site on Waikato Regional Council's WaikatoMaps, online mapping system on the Water Classification layer. Within the wider landscape context, the site lies within a rural area, bordered by agricultural land on all sides, with State Highway 1 and the Waikato River to the west.

The site contains no Significant Natural Areas (SNA) as classified by Waikato Regional Council, with the nearest areas of SNA being just over a kilometre to the south, surrounding Lake Ōhinewai, and at Lake Rotokawau approximately 1.5km to the east. Waikato Regional Council's Vegetation Biodiversity Map[2] (Land Cover layer) shows the entirety of the assessment site as 'High-Producing Exotic Grassland'.

[1] This report is subject to the Report Limitations provided in Appendix A.
[2] Waikato Regional Council. WaikatoMaps. Retrieved from: https://waikatomaps.waikatoregion.govt.nz/Viewer/?map=49a72640c5474484b156d453144044a3

Legend

Earthworks Footprint



ECOLOGY NEW ZEALAND

N

0 25 50 75 100 m

1:1,500 @ A3

Projection: NZGD 2000/ NZTM 2000

Sources: Base map sourced from Google 2019; NZ Property Titles sourced from LINZ Crown Copyright Reserved; Earthworks footprint sourced from Woods 'Ohinewai Factory Stage 1A Earthworks existing contours plan'DWG No:P19-138-01-100-EW

Ohinewai Project

Stage 1 Context Map

Date: 17 July 2019| Revision : 1

Plan prepared for Ambury Properties Ltd by Ecology New Zealand Limited
Author: stephanie.angove-emery@ecologynz.nz

1.3. Proposed Activity

The project proposes to develop the site with bulk earthworks and geotechnical remediation and is expected to commence in the coming earthworks season 2019/2020. This will require the removal of two exotic trees, as well as realigning a small part of two farm drains within the works footprint. The following assessment is based on communications with the client's project team and earthworks plans (Appendix B).

2. METHODOLOGY

ENZL ecologists carried out a site assessment on 1st, 2nd and 15th July 2019. Both aquatic and terrestrial ecological values were assessed. An earthworks plan, provided by Woods Consultants, dated 17/07/2019, was used as a reference for the proposed development and to define the extent of the site (Appendix B). Aquatic and terrestrial features were identified, and their associated structure, composition and ecological quality were assessed.

2.1. Terrestrial

Prior to commencement of the site assessment, a desktop investigation was undertaken, querying relevant databases for information relating to the site's ecological characteristics. On site investigations included visual assessments of terrestrial vegetation and the documentation of fauna communities during site investigations. Specifically, the assessment included vegetation classification, habitat assessments for bats, lizards and birds, a five-minute bird count, and targeted manual habitat searches for native lizards in suitable habitats. Automatic bat detectors were not used because the fieldwork was undertaken out of season for moderate to high levels of bat activity. On that basis, trees were risk-rated as potential bat roosting habitat on a conservative basis, following the NZTA risk guidelines[3] which have become established as industry standard practice.

2.2. Aquatic

2.2.1. Watercourse Assessment

All watercourses within the site were walked, photographed and physical parameters assessed based on a modified version of Auckland Council's Watercourse Assessment Methodology[4]. Particular emphasis was placed on shading, channel morphology, habitat features and anthropogenic alteration. Channel definition and classification was undertaken in line with the Waikato Regional Plan.

2.2.2. Fish

The watercourses on site were not suited to electric fishing (due to vegetative overgrowth, shallow water depth and high nutrient input), and were too shallow for the deployment of fyke nets. The lack of open water also made spotlighting unsuitable. Two gee minnow traps were able to be set within the Southern Drain (see Section 3.3), approximately 10m apart. These were baited with cat biscuits and left in place for approximately 22 hours. A targeted mudfish

[3] Smith, D., Borkin, K., Jones, C., Lindberg, A., Davies, F., & Eccles, G. (2017). *Effects of land transport activities on New Zealand's endemic bat populations: reviews of ecological and regulatory literature* (No. 623).
[4] Lowe, M., Ingley, R and Young, D (2016). Watercourse assessment methodology: infrastructure and ecology version 2.0. Prepared by Morphum Environmental for Auckland Council. Auckland Council technical report, TR2016/002

survey was not undertaken as the assessment took place outside the recommended survey period[5].

2.3. Assessment of Effects Methodology

Guidelines for undertaking Ecological Impact Assessments (EcIA) have been published by the Environment Institute of Australia and New Zealand (EIANZ 2018). The guidelines outline criteria to assess ecological values using criteria for the the following matters: 'representativeness', 'rarity/distinctiveness', 'diversity and pattern', and 'ecological context.' Based on the designated values for each matter, an overall value for the site can be calculated using the attributes matrix in Appendix 10 of the EIANZ (2018). Chapter 6 of the EIANZ (2018) provides proposed criteria for describing the magnitude of effects (Table 1).

The level of effect can then be determined through combining the value of the ecological feature/attribute with the score or rating for magnitude of effect to create criteria for describing level of effects (Table 2). The cells in italics in Table 2 represent a 'significant' effect. Cells with low or very low levels of effect represent low risk to ecological values rather than low ecological values *per se*. A 'moderate' level of effect requires careful assessment and analysis of the individual case. These effects could be mitigated through avoidance, design, or appropriate mitigation actions (EIANZ 2018).

Table 1: Criteria for describing the magnitude of effects (EIANZ 2018).

Magnitude	Description
Very high/severe	Total loss of, or very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally change and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature
Moderate/medium	Loss or alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature
Low/minor	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature

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

Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature

Table 2: Criteria for describing the level of effects (EIANZ 2018).

Ecological Value Magnitude	Very High	High	Moderate	Low
Very High	*Very High*	*Very High*	*High*	*Moderate*
High	*Very High*	*Very High*	*Moderate*	Low
Moderate	*Very High*	*High*	Low	Very Low
Low	*Moderate*	Low	Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low
Positive	Net gain	Net gain	Net gain	Net gain

3. ECOLOGICAL VALUES ASSESSMENT

3.1. Vegetation

Overall, the vegetation within the proposed footprint area was of low quality with little diversity. It was dominated by pasture grass with few scattered exotic trees, and part of a hedgerow (Figure 2). Mature exotic trees onsite consisted of tortured willow (*Salix matsudana*), sweet chestnut (*Castanea sativa*), London plane (*Platanus x acerifolia*) and liquidambar (*Liquidambar styraciflua*); the hedgerow comprised of Japanese cedar (*Cryptomeria japonica*). Vegetation communities associated with lower lying areas and those adjacent to drainage channels were characterised by juncus (*Juncus* sp.), carex (*Carex geminata*), willow weed (*Persicaria maculosa*) and patches of ferns (*Blechnum novae-zelandiae* and *Paesia scaberula*)(Figure 3).

Figure 2: Representative photo of the vegetation onsite.

Figure 3: Area of dense growth of rushes in grazed paddock.

3.2. Terrestrial Fauna

3.2.1. Avifauna

The site provided foraging habitat, primarily for common native and exotic avian species that have adapted to open agricultural landscape areas. A five-minute bird count was conducted onsite and indicated high densities of welcome swallow (*Hirundo neoxena*) and kingfisher (*Todiramphus sanctus*). Other birds seen and/or heard onsite included skylark (*Alauda arvensis*), spur-winged plover (*Vanellus miles*), magpie (*Gymnorhina tibicen*), white-faced heron (*Egretta novaehollandiae*), fantail (*Rhipidura fuliginosa*), house sparrow (*Passer domesticus*), Australasian harrier (*Circus approximans*), black swan (*Cygnus atratus*), paradise shelduck (*Tadora variegata*), common myna (*Acridotheres tristis*), yellowhammer (*Emberiza citronella*) and Eastern rosella (*Platycercus eximius*). Limited arboreal nesting habitat was identified within the exotic trees onsite. The table below indicates additional native avifauna species recorded close by at Lake Waikare. The At-Risk and Threatened species such as shags and terns are unlikely to be utilising the site for foraging or breeding, but are more likely to use it as a transit pathway. Given the limited foraging habitat and low amount of nesting habitat, the overall value for avifauna onsite is considered to be low.

Table 3: Additional native avifauna noted at Lake Waikare within the past five years (ebird.org).

Common Name	Latin Name	Threat status
Caspian Tern	*Hydroprogne caspia*	Threatened-Nationally Vulnerable
Little Black Shag	*Phalacrocorax sulcirostris*	At Risk - Naturally Uncommon
Royal Spoonbill	*Platalea regia*	At Risk - Naturally Uncommon
Black Shag	*Phalacrocorax carbo novaehollandiae*	At Risk - Naturally Uncommon
Pied Shag	*Phalacrocorax varius varius*	At Risk - Recovering
Cattle Egret	*Ardea ibis*	Non-resident Native - Migrant
Little Pied Cormorant	*Phalacrocorax melanoleucos melanoleucos*	Non-resident Native - Vagrant
Pied stilt	*Himantopus himantopus leucocephalus*	Not Threatened
Grey teal	*Anas gracilis*	Not Threatened
Australasian Shoveler	*Anas rhynchotis*	Not Threatened

Mallard x Grey Duck Hybrid	*Anas superciliosa x platyrhynchus*	Not Threatened

3.2.2. Herpetofauna

Suitable habitat for ground-dwelling lizards was minimal onsite and mainly comprised of grazed grassland with inorganic farm debris such as corrugated iron sheets next to existing structures (Figure 4). There were minimal amounts of dense or clumped vegetation along the drainage channels, few scattered logs were present (Figure 5). Targeted manual searches across the proposed works footprint did not confirm the presence of native lizards onsite. Several non-native rainbow skinks (*Lamprophelis delicata*) were observed within the habitat. No suitable habitat for arboreal lizard species was observed onsite.

Figure 4: Inorganic debris, commonly used by native skinks.

Figure 5: Log pile onsite, checked for native skinks.

3.2.3. Chiropterofauna

Potential bat roosting habitat was present within the tortured willow (*Salix matsudana*) on the northeast boundary of the site footprint, the sweet chestnut tree (*Castanea sativa*) observed in the southwestern area of the footprint (Figures 6 & 7), the London plane tree (*Platanus x acerifolia*) on the south-eastern boundary of the site and within the Japanese cedar tree (*Cryptomeria japonica*) hedgerow along the eastern boundary (Appendix C).

The indicated trees meet the criteria to be considered potential bat roosting trees, i.e. they were sufficiently large (>15cm DBH) and had suitable cavities and/or other features required to provide long-tailed bat (*Chalinolobus tuberculatus*, Threatened – Nationally Critical) roosts. The foliage of some of the trees within the hedgerow made assessment of the upper portions of the trees unfeasible from the ground. However, given that Japanese cedar tends to have strips of flaking bark, all of the trees within the hedgerow (~29) were assessed as potential bat roosting trees. There were several dead or dying trees which had several visible crevices that provide a higher potential bat roosting habitat (Figures 8 & 9). Table 4 provides a summary of the high-risk potential bat roost trees present onsite. Although many of the Japanese cedar met the high-risk tree criteria, they are considered to be at the lower end of the risk scale – primarily due to the roost feature being minor strips or flakes of bark. Long-tailed bats are known to use linear landscape features, such as the onsite hedgerow as commuting pathways, and are also known to forage in areas of open pasture.

Table 4: Scale and description of high-risk trees.

Risk Level	Parameter	Description	Quantity
High	Multiple visible cavities, and greater than 15cm DBH	Dead/dying Japanese cedar trees within hedgerow	15
		London Plane	1
		Sweet chestnut	1
		Tortured willow	1
Moderate	One cavity seen; greater than 15cm DBH	Japanese cedar within hedgerow	1
Low	Small amounts of flaking bark; upper third of tree not completely visible, but not likely to host cavities; greater than 15cm DBH	Japanese cedar within hedgerow	13

The nearest and most recent records from the Department of Conservation bat distribution database are from 2009 and confirm long-tailed bat presence at Hakarimata Scenic Reserve, approximately 20km south of the site[6]. Additional assessments of the Waikato Expressway project indicated that bats were detected approximately 7.5km from the site[7,8]. A 2018 unpublished assessment by Wildlands Consultants refers to the confirmation of long-tailed bats approximately 5km south of the site at Lake Kimihia[9], however a summary of monitoring between 2014 and 2017 at Lake Kimihia as part of the Huntly expressway long-tailed bat monitoring programme has specified only a single bat pass was noted during vegetation removal protocol implementation, indicating that this area has very low bat activity[10]. With bat activity levels confirmed as very low within 8km of the site, this means the actual likelihood of bats being present on site at any particular time is substantially reduced. However, with their confirmed presence in the wider area, albeit at low activity levels, and the presence of linear hedgerows for foraging and roosting, this suggests that the site may be of some habitat value for long-tailed bats. This value would only be confirmed in the instance where potential roosting habitat is confirmed to be utilized, even if occurrence of roosting on site is infrequent.

A large specimen London plane tree was identified during the early stages of the assessment as the potential bat roosting habitat with the highest value (noting that bats may not actually be present). In response, the project proposal was adjusted to avoid removing the tree thereby avoiding the most significant potential adverse ecological effects on bats.

[6] DOC national bat database – Long-tailed bat recorded by Andrea Dekrout (2009)
[7] Opus International Consultants Ltd (2017), *Huntly Section Long-tailed bat Monitoring 2016-17*., Prepared for NZ Transport Agency, Reference number 1-HTYV0.71
[8] Tonkin & Taylor Ltd (2014), Waikato Expressway Huntly Section Bat Survey, Prepared for NZ Transport Agency, T&T Ref: 61446.2013
[9] Wildlands Consultants Ltd. (2018), Ecological Assessment of the Proposed Lakeside Development Subdivision at 65 and 94 Scott Road, Te Kauwhata.
[10] Opus International Consultants Ltd (2017), *Huntly Section Long-tailed bat Monitoring 2016-17*., Prepared for NZ Transport Agency, Reference number 1-HTYV0.71

Figure 6: Cavity within deciduous exotic tree on the north eastern boundary.

Figure 7: Sweet chestnut tree that meets bat roost parameters.

Figure 8: Dead trees within hedgerow, which provide roosting cavities for long-tailed bats.

Figure 9: A potential roosting cavity for long-tailed bats.

3.3. Freshwater Ecology

Two watercourses are present onsite – one in the northern half, and one in the southern half. These are referred to hereafter as 'Northern Drain' and 'Southern Drain' for the purposes of this report (Appendix C). Neither of these was marked on Waikato Regional Council's online mapping system. Both drains appear to be artificially created historically in order to prevent waterlogging of pasture.

Northern Drain

The northern drain enters the site at the edge of Lumsden Rd, passing through a culvert into the site on the western boundary, passing in a north-easterly direction before passing through a second culvert within the site and then continuing on to connect with the roadside drain alongside Balemi Rd. This roadside drain connected with a larger drainage channel at the eastern end of Balemi Rd (outside of the site) before eventually draining into Lake Rotokawau. Much of the roadside channel was dry at the time of assessment (winter) and was perched above the level of the larger drain.

The northern drain was classified as soft-bottomed, and contained sitting water throughout but no flow at the time of assessment. It is likely to be permanently wetted, however assessment during summer would be required to confirm this. There was a poorly defined channel with a more incised bank on the true left bank (TLB) and an indistinct, boggy margin on the true right bank (TRB). Open water was visible at the inlet to both culverts but not at the outlets. *Juncus* spp. were present throughout the channel and extending out on the TRB with the remainder of the riparian margin vegetated by moderately grazed pasture grasses. Rank grass was also present throughout the wetted area and creeping buttercup (*Ranunculus repens*) was present in moderate abundance. The channel downstream of the second culvert had less water, was much more defined and was substantially more overgrown with terrestrial grasses including pasture grasses and carex. Several exotic trees and occasional native plants were present on the TLB alongside this section.

Channel morphology exhibited little variation with a single corner in the middle of the reach on site. Hydrologic heterogeneity was negligible with pools and sitting water present but no runs. "Instream" habitat was limited to vegetation within the wetted area. Shading was considered to be high to very high and was provided by the dense vegetative growth within the channel as well as by bank incision, juncus and the two culverts. There was no anaerobic sediment visible and no sediment bubbling or odour upon sediment disturbance. Leaf litter was present in the reach downstream of the second culvert.

It would appear this channel was artificially created to drain roadside stormwater runoff and excess soil moisture given the flat topography of the land is in this area. Based on the above, the watercourse can be defined as artificial watercourse (farm drainage canal) based on Waikato Regional Plan definitions: "*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.*". On that basis, the intermittent connection with the downstream environment, the overgrowth of vegetation, lack of flow and lack of variation in habitat, the northern drain was considered to have low ecological values.

Southern Drain

The southern drain began outside the site in a slight depression in the middle of a paddock. It commenced as a poorly defined wetted area with severe cattle pugging, organic surface oils, and terrestrial vegetation throughout the channel. Shortly after entering the site, the drain passed through a concrete culvert (around 300mm diameter, not perched) before entering a fenced off area. Within the fenced area, the channel is well defined albeit artificially straight, with overgrowth of grasses and various annual species throughout the channel and riparian margin. The reach was classified as soft-bottomed throughout and was likely permanently sitting water (although assessment in summer would be necessary to confirm this).

This watercourse was connected to Lake Rotokawau via a network of channels that connected to a large watercourse off site, running from the end of Balemi Rd to the lake (the same as for the Northern Drain). It was noted that some of the intermediary watercourses along the way were dry and, as such, connectivity appears to be intermittent.

Shading along the reach varied from nil to very high (being nil in the unfenced, grazed area and very high where the channel was completely overgrown with grass) and was provided mainly by the vegetation within the channel but also a small amount by the banks and by patches of juncus. Channel morphology showed little variation with only one bend along the reach, this being clearly artificial as opposed to a natural meander. Instream habitat was limited to vegetation, with no variation in substrate and no woody debris or undercut banks. Water quality appeared poor with organic oils (assessed by noting the fracturing nature when disturbed) and sediment bubbling present. Combined with the lack of water flow and vegetative overgrowth it is likely that dissolved oxygen levels are poor in this reach.

The riparian margin vegetation was dominated by rank and grazed pasture grasses with patchy juncus and a small area containing both kiokio (*Parablechnum novae-zelandiae*) and ring fern (*Paesia scaberula*).

The surrounding topography makes it unlikely that there was an historic watercourse in this area. It is more likely that this area was wetland in the past as part of the floodplain of the Waikato River, but has been drained for a number of decades for farming purposes. Based on the above, the watercourse can be defined as an artificial watercourse (farm drainage canal) based on Waikato Regional Plan definitions (as defined in the previous section).

Overall considering the surrounding land use, shading, and lack of habitat features, the ecological values of this reach were considered low.

Figure 10: Northern drain looking west

Figure 11: Southern drain looking west

3.4. Fish

Two Gee's minnow traps were set as per the methodology in section 2.2.2 (Appendix C). No fish were seen or caught. Trapping in the local network of watercourses has previously yielded shortfin eels (*Anguilla australis*), and numerous exotic species including common carp/koi carp (*Cyprinus carpio*), catfish (*Ameiurus nebulosus*) and mosquitofish (*Gambusia affinis*) and as such cannot be ruled out from being present within the farm drains.

A search of the NZFFD for the Lake Waikare catchment had records extending back to 1978 showing 16 species of fish or invertebrate, including both exotic and native species. Records from the last ten years showed 53 records of exotic fish (including four different species) and 49 records of native fish (including five species). The more recent fish records included two records of black mudfish (*Neochanna diversus*; At-Risk – Declining) and one of giant kōkopu (*Galaxias argenteus*; At Risk – Declining). No records of notable aquatic invertebrates were noted.

Given the poor-quality habitat on site it is considered unlikely that anything other than highly tolerant species (e.g., shortfin eels and gambusia) would persist in these watercourses. However, black mudfish have been recorded in the vicinity of this site (within 2km) and are known to occur in marginal habitats, including habitats that dry out periodically. As such, despite the reported intermittent nature of the watercourses and the reported presence of a fish passage barrier (a perched culvert) downstream of the site, the presence of black mudfish at the site, while unlikely, cannot be completely ruled out.

Macroinvertebrate sampling was not included in the scope of this assessment due to the notably poor-quality habitat, upstream and downstream environs, and artificial nature of the watercourses.

Table 5: Fish and aquatic invertebrate species in the Lake Waikare catchment (from NZFFD 1978-2016)

Common Name	Latin Name	Threat status
Longfin eel	*Anguilla dieffenbachii*	At risk - Declining
Giant kōkopu	*Galaxias argentus*	At risk - Declining
Redfin bully	*Gobiomorphus huttoni*	At risk - Declining
Black mudfish	*Neochanna diversus*	At risk - Declining
Shortfin eel	*Anguilla australis*	Not Threatened
īnanga	*Galaxias maculatus*	Not Threatened
Crans bully	*Gobiomorphus basalis*	Not Threatened
Common bully	*Gobiomorphus cotidianus*	Not Threatened
Kōura	*Paranephrops planifrons*	Not Threatened
Freshwater shrimp	*Paratya curvirostris*	Not Threatened
Smelt	*Retropinna retropinna*	Not Threatened
Catfish	*Ameiurus nebulosus*	Introduced and Naturalised
Goldfish	*Carassius auratus*	Introduced and Naturalised
Koi carp	*Cyprinus carpio*	Introduced and Naturalised
Gambusia	*Gambusia affinis*	Introduced and Naturalised

3.5. EIANZ Guidelines

The table below outlines the ecological values assigned to the four matters prescribed in the EIANZ guidelines (2018). The overall values assess the matters at a ecosystems/vegetation type, species and fauna habitat level.

3.5.1. Terrestrial Assessment

Table 6: EIANZ assessment of terrestrial ecological values

Ecological Feature Matter	Ecosystems/vegetation types	Fauna Habitat	Species
Representativeness	Low-predominantly pasture grass, grazed throughout the year.	Low-limited habitat provided for birds, bats and lizards.	Low-low diversity of flora and fauna using the site.
Rarity/distinctiveness	Low-no rare or distinctive ecosystems or vegetation types onsite.	Moderate- The majority of trees onsite are potential bat roosting sites, which represents distinctiveness.	Very High-Should a tree contain a communal roost of bats.
Diversity and Pattern	Low- No diversity of ecosystem/vegetation types.	Low-Diversity of habitat is minimal since it is predominantly pasture grass, with scattered exotic trees.	Low-Species diversity was low onsite. Mostly pasture grass, few exotic trees and shrubs.
Ecological Context	Low-The site is part of a wider area comprised of farm paddocks.	Moderate- The wider landscape in an 8km radius is relatively depauperate of roosting features, therefore their presents on site is notable.	Moderate- May be an important site for long-tailed bat roosting.
Overall Value	Low	Moderate	Moderate

3.5.2. Aquatic Assessment

Table 7: EIANZ assessment of freshwater ecological values

Matter	Value	Summary
Representativeness	Low	Artificial watercourses with no discernible headwaters. Shallow flow depths and not characteristic of any New Zealand stream or aquatic habitat type.
Rarity/distinctiveness	Moderate	Unlikely to support threatened or at-risk species, however possibility of black mudfish (At-Risk, Declining). No distinctive ecological features.
Diversity and Pattern	Low	Little diversity, unlikely to support a complex community of aquatic fauna.
Ecological Context	Low	Poor quality riparian vegetation, highly modified local environment, not contributing to ecological corridors.

Overall, when taking into account the matters above, the ecological value of the freshwater features would generally be considered low, however given the uncertainty around the presence of black mudfish, a conservative approach would class the ecological value as moderate.

4. ASSESSMENT OF ECOLOGICAL EFFECTS

Based on the findings in Section 3, the permanent removal of vegetation and the infilling and realignment of two drains within the proposed footprint shall incur both actual and potential effects as described below.

Actual Effects

- Permanent loss and fragmentation of habitat for threatened fauna;
- Direct and permanent loss of vegetation;
- Permanent loss of aquatic habitat.

Potential Effects

- Potential injury/death of native fauna, particularly native birds and bats inhabiting the exotic trees onsite and native fish species within the drains;
- Increased noise and lighting during construction and operational phases;

4.1. Magnitude of effects on terrestrial values

The magnitude of effects on the ecological features considered in Section 3 have been assessed at a landscape scale in the sections below.

4.1.1. Vegetation Removal

The proposed development will result in the permanent loss of 6ha of predominantly pasture grass, and scattered exotic trees. Due to the lack of diversity and minimal native vegetation, the magnitude of effect of vegetation clearance onsite is considered to be Low.

4.1.2. Fauna Habitat

The habitat is primarily comprised of exotic pasture of very low ecological value, although it does have potential value as foraging habitat for native birds (e.g., species that prefer open areas such as paradise shelduck) and bats. The exotic trees proposed for removal provide potential roosting habitat for avifauna and long-tailed bats. A total of 18 trees were assessed as potentially providing bat roosting habitat, and a total of 32 trees that meet the general high-risk parameters. The proposed development will remove some of this habitat, decreasing the area for foraging and roosting sites. However, given that the site is surrounded by farm paddocks that provide similar habitat, and noting that bats may not actually be present on-site, the magnitude of unmitigated effect on terrestrial fauna habitat is assessed conservatively as Moderate.

4.1.3. Species

Injury or death to native fauna during the removal of vegetation is a possibility. This can be attributed to the potential of terrestrial fauna to be present within the works footprint during construction activities. Therefore, due to long-tailed bats being listed as 'Threatened-Nationally Critical', the potential death of a colony due to felling of one of the roost trees would be critical for the population. Fauna management will be required to mitigate this impact. The potential for an increased amount of noise and artificial light during the construction and operational phases is also a possibility. This can impact bat foraging and commuting behaviour of bats. This should be taken into account through mitigation strategies. Given the potential effects listed, the magnitude of effect at a species level is considered to be High.

4.2. Magnitude of effects on aquatic values

4.2.1. Freshwater Functionality

The drain realignment will result in the total loss of 460m (190m in the northern channel and 270m in the southern channel) of artificial drain and low-quality habitat for aquatic fauna. The duration of effect of this loss however, can be considered temporary given the proposed realignment of the drains (and hence recreation of aquatic habitat). It is accepted that the establishment of this habitat will take time (e.g for aquatic plants and macroinvertebrates to recolonise) but in the mid-long term it is considered there will be no net loss of aquatic habitat. Given the poor quality of these drain lengths, their intermittent connectivity to the wider catchment, the temporary nature of the habitat loss and their lack of natural features, the magnitude of effect is considered low.

4.2.2. Species

Injury to or death of native fish species is possible during infilling and realignment of the drains. The species considered most likely to be present in these drains is shortfin eel (Not Threatened) so loss of a small number of this species would have little effect on either the local or regional populations. However, while unlikely, it is possible that black mudfish may be present. Being an at-risk species, the loss of even a small number may have an adverse effect on the population. On that basis, the magnitude of unmitigated effect of the project on fish is conservatively assessed as moderate.

4.3. Level of Unmitigated Effects

Table 8 and Table 9 below summarise the overall level of unmitigated effects using EIANZ's (2018) guidelines. Ecological values are taken from Section 3 and magnitude of effects from Sections 4.1 and 4.2.

Table 8: Level of unmitigated effects summary for each terrestrial ecological feature.

Ecological Feature	*Ecological Value*	*Magnitude of effect*	*Level of effect*
Vegetation/Ecosystem	Low	Low	Very Low
Fauna Habitat	Moderate	Moderate	Moderate
Species	Moderate	High	Moderate

Table 9: Level of unmitigated effects summary for overall freshwater values.

Ecological Feature	*Ecological Value*	*Magnitude of effect*	*Level of effect*
Freshwater Functionality	Moderate	Low	Low
Species	Moderate	Moderate	Moderate

5. MANAGEMENT OF ECOLOGICAL EFFECTS

5.1. Bat Management

The majority of the trees onsite meet the requirements to be considered roosting habitat for a 'Threatened, Nationally Critical' species, the long-tailed bat. Though the likelihood of occurrence of this species on site is low, it cannot be completely ruled out and impacts may be of a high magnitude if a roost tree be felled containing multiple bats. For this reason, injury or death during the removal of vegetation is possible, and industry standard vegetation removal protocols should be followed to mitigate potential adverse effects. It is suggested that works across the site can commence where impacts on these trees can be avoided until such a time that these vegetation removal protocol can be undertaken.

In the instance that bats are found roosting within the subject hedgerow for removal, their significance will be demonstrated. It is recommended that in this instance, this will trigger a hedgerow of no less 32 trees ≥PB18 to be planted along the site boundary to mitigate for the permanent loss of this habitat. Fast-growing exotic trees, such as poplar or oak, should be used given that they grow much faster than natives and are known to be readily used by bats in the Waikato region. As an alternative, 9 roost boxes shall be installed within retained vegetation within 1km of the site. These roost boxes should be permanently installed on trees and will require annual inspection to inform maintenance requirements.

Where possible consideration to lighting should be incorporated into design details. Minimised and downward facing lighting should be use to decrease the effects of artificial light on bats.

5.2. Bird Management

Though the potential magnitude of impacts on native birds are assessed as low, as with bats, they are protected under the Wildlife Act 1953. It is therefore considered appropriate that during the implementation of vegetation removal protocol for bats, trees are inspected by an ecologist for the presence of nesting native birds.

5.3. Fish Management

Given the artificial and highly degraded nature of the drains and the low level of effect, no mitigation is required for the loss of the poor-quality aquatic habitat. This is further supported by the fact that the loss of habitat is only temporary given the proposed realignment of the drains (as outlined in section 4.2.1). Risk of injury to or death of native fish however, gives a potential level of effect of moderate and as such should be mitigated. The risk to native fish species should be managed by the implementation of a fish management plan. This plan should be prepared by a suitably qualified and experienced ecologist and should cover suitable salvage methods tailored for the site. It should include consideration to potential species within the on-site waterways and methodologies for the salvage, temporary storage and relocation of any fish caught into appropriate habitat within the same catchment. It is suggested that works across the site can commence where impacts on these drains can be avoided until such a time that fish management can be undertaken.

5.4. Sediment Management

To mitigate the risk of sediment entering adjacent drains and contaminating the Lake Waikare catchment, a sediment and erosion control plan should be prepared in accordance with Waikato Regional Council's Erosion and Sediment Control guidelines (Report: TR 2009/02, updated 2014). This plan should be submitted to Waikato Regional Council for approval prior to commencement of works.

6. RESIDUAL EFFECTS ASSESSMENT

Following the implementation of the above recommendations in section 5 of this report, a residual effects assessment is provided to determine the overall levels of mitigated effects. Based on the summaries presented below in Tables 10 and 11, the level of effects for all factors considered are reduced to low if the recommended ecological management is implemented. The ecological aspects requiring mitigation have been addressed to ensure that adverse impacts will be avoided and/or mitigated. This is particularly important to address levels of uncertainty regarding the presence of native bats and fish, in addition to the highly mobile and transient nature of bats which may be present in periods outside of survey periods. Triggers for possible bat habitat replacement have been recommended based on the possible future confirmation of bat presence, and will therefore be initiated on a justified basis if required.

Table 10: Level of mitigated effects summary for each terrestrial ecological feature.

Ecological Feature	*Ecological Value*	*Magnitude of effect*	*Level of effect*
Vegetation/Ecosystem	Low	Low	Very Low
Fauna Habitat	Moderate	Moderate	Low
Species	Moderate	High	Low

Table 11: Level of mitigated effects summary for overall freshwater values.

Ecological Feature	*Ecological Value*	*Magnitude of effect*	*Level of effect*
Freshwater Functionality	Moderate	Low	Low
Species	Moderate	Moderate	Low

Based on the above summary, no residual effects are predicted to remain post mitigation. On that basis, additional compensatory and/or off-setting measures are considered unnecessary.

7. CONCLUSION

This report provides an ecological impact assessment for the proposed development at 82 Lumsden Road, Ōhinewai. The possible but unlikely presence of At Risk and Threatened native fauna species on-site increased the assessed ecological value and the magnitude of unmitigated potential effects for the proposed development. However, those species may not be present and there are no other high value ecological features that will be adversely impacted within the site. Though the risk of actual significant adverse ecological impacts is considered low, appropriate mitigation has been proposed to avoid and mitigate those possible effects. The recommended ecological management measures will decrease the risk of adverse impacts on any potential high value features, resulting in an overall assessment of low level of ecological impacts for the project. On that basis, it is predicted that the proposed development will result in no net ecological loss.

APPENDIX A

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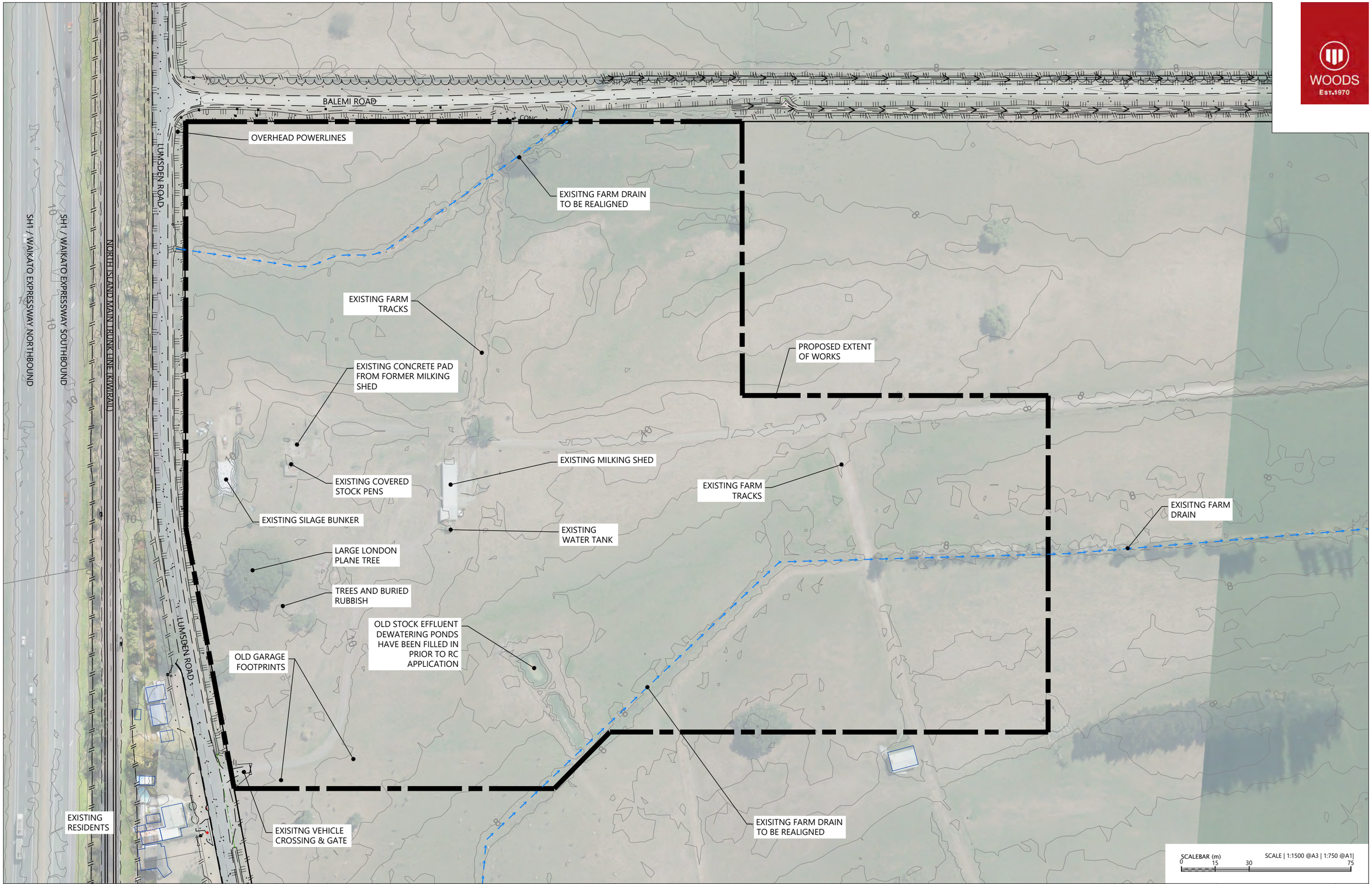
ix) Where lengths or other measurements have not been provided by a surveyor, ENZL has used basic GIS mapping and measurement systems to estimate these numbers. These should not be taken as surveyor-level accuracy for the purposes of decision making.

APPENDIX B

Earthworks Plan



REVISION DETAILS		INT	DATE	SURVEYED	RH
1	ISSUED FOR CONSENT	BP	17/07/2019	DESIGNED	BP
				DRAWN	BP
				CHECKED	BP
				APPROVED	

88 LUMSDEN ROAD
OHINEWAI

WOODS.CO.NZ

the comfort group

OHINEWAI

STAGE 1A EARTHWORKS
EXISTING FEATURES

N

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:1500 @ A3	1
COUNCIL		
DWG NO	P19-138-01A-012-GE	

APPENDIX C

Ecological Features and Survey Effort

ECOLOGY NEW ZEALAND

N

0 25 50 75 100 m

1:1,500 @ A3

Projection: NZGD 2000/ NZTM 2000
Sources: Base map sourced from Google 2019; NZ Property Titles sourced from LINZ Crown Copyright Reserved; Earthworks footprint and drain channels sourced from Woods 'Ohinewai Factory Stage 1A Earthworks existing contours plan'DWG No:P19-138-01-100-EW

Ohinewai Project

Stage 1 Ecological Features and Survey Efforts

Date: 17 July 2019| Revision : 1

Plan prepared for Ambury Properties Ltd by Ecology New Zealand Limited
Author: stephanie.angove-emery@ecologynz.nz

APPENDIX E

ENZL Supplementary Ecological Report: Black Mudfish Survey, **Ōhinewai** Development, 82 Lumsden Road

Supplementary Ecological Report: Black Mudfish Survey

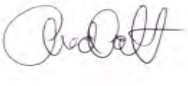
Ōhinewai Development, 82 Lumsden Road

Prepared for Ambury Properties Ltd
30 August 2019

Report Number 1708247.1-003

ECOLOGY NEW ZEALAND

Document Sign Off

Author(s):	Jasmine Dungey Ecologist Ecology New Zealand Limited	
Review:	Connor Whiteley Senior Ecologist Ecology New Zealand Limited	
Sign off:	Chad Croft Principal Ecologist Ecology New Zealand Limited	

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1. INTRODUCTION

This report[1], prepared by Ecology New Zealand Limited (ENZL) for Ambury Properties Ltd, presents supplementary ecological information relating to the development at 82 Lumsden Rd, Ohinewai, as requested by Waikato Regional Council. This report should be read in conjunction with the Ecological Impact Assessment report for Stage 1a by ENZL (dated 19 July 2019).

1.1. Background

An Ecological Impact Assessment was submitted to Waikato Regional Council as part of a resource consent application for development at 82 Lumsden Rd, Ohinewai (the 'site'). Further fish surveys were requested to address concerns around impacts on black mudfish (*Neochanna diversus*) and their habitat, given their recorded presence within 1.5km of the site.

1.2. Purpose and Scope

This report outlines the methodology utilised for the supplementary mudfish surveys, the results of said surveys and a discussion based on these results.

[1] This report is subject to the Report Limitations provided in Appendix A.

ECOLOGY NEW ZEALAND

N

0 20 0 20 40 60 80 m

1:1,300 @ A3

Projection: WGS 84 / Pseudo Mercator

Sources: Map data ©2015 Google, NZ Property Titles sourced from LINZ Crown Copyright Reserved

Ōhinewai Development, 82 Lumsden Road

Figure 1: Trap Locations, Black Mudfish Survey

Date: 28 August 2019 | Revision : 1

Plan prepared for Ambury Properties Ltd by Ecology New Zealand Limited
Author: connor.whiteley@ecologynz.nz | Checked: SCh

2. METHODOLOGY

The methods utilised to undertake the mudfish survey on site were based on the 2009 Methodology to Survey and Monitor New Zealand Mudfish Species [2] ('the guidelines'), as well as recommendations from Bruno David of Waikato Regional Council. Ten coarse-mesh gee minnow traps were set in each of the impact channels (Northern Drain and Southern Drain, see Figure 1) over a distance of approximately 150m in the Northern Drain and approximately 200m in the Southern Drain. Placement of traps was based on habitat suitability and appropriate water depth.

Traps were set unbaited as per the guidelines and were left in place for two nights with checks each day (set 21.8.19, checked 22.8.19, checked and removed 23.8.19). Traps were left set no longer than 24hrs between checks. All traps were set partially submerged as per the guidelines, in order for captured fish to breathe atmospheric air if required (Figure 2). Trap locations were recorded by GPS and all traps were counted prior to setting and after retrieval to ensure no traps were left in place. All fish captured were returned immediately to the same environment.

Figure 2: Gee minnow trap set partially submerged within Southern Drain

3. RESULTS

Survey results are outlined in Table 1 below. No mudfish were seen or captured. The only fish species caught was shortfin eel (*Anguilla australis*), which are commonly found through the Waikato region in this habitat type. The majority of these eels were caught in the southern drain, with only two caught in the northern drain. This may have been due to the fencing of the southern drain prohibiting direct stock access. It was noted that the paddock containing the northern drain had been intensively grazed between the site visit carried out for the EIA in July and this supplemental survey (Figure 3). A single shortfin eel was found dead in a trap within the northern drain during the second check and it was assumed that this was due to a combination of poor habitat conditions, and the additional stress of trapping. The Northern Drain presented signs of excess of organic matter with an organic film and anaerobic odour.

[2] Ling, N., O'Brien, L.K., Miller, R., Lake, M. 2009. *Methodology to survey and monitor New Zealand mudfish species*. CBER Contract Report 104. Department of Conservation and University of Waikato, Hamilton. 60pp

Figure 3: Gee minnow trap set partially submerged within Northern Drain

A total of 20 shortfin eels were captured over two nights of trapping across both drains – it is acknowledged that some of these may be recaptures; however, the highest number caught in one day was 13 so they do appear to have more than a sporadic distribution within the drains. The highest number of eels in any one trap was three and the size range varied from approximately 150mm to 380mm. Larger individuals were observed during trap deployment but were likely restricted from capture due to the trap aperture.

No pest fish species were seen or caught. Of note was the absence of gambusia (*Gambusia affinis*) which is known to be widely distributed downstream within the tributaries to Lake Waikare and are often present in high numbers in farm drain habitats across the Waikato region.

Table 1: Results of mudfish surveys, August 2019. SF = Shortfin eel

		Day One			Day Two		
Northern Drain		Species	Number	Length	Species	Number	Length
	Gee 10	No catch			No catch		
	Gee 9	No catch			SF	1	250mm
	Gee 8	No catch			No catch		
	Gee 7	No catch			No catch		
	Gee 6	No catch			No catch		
	Gee 5	No catch			No catch		
	Gee 4	No catch			No catch		
	Gee 3	No catch			No catch		
	Gee 2	No catch			No catch		
	Gee 1	SF	1	~150mm	No catch		
	Total		1			1	
		Day One			Day Two		
Southern Drain		Species	Number	Length	Species	Number	Length
	Gee 10	No catch			No catch		
	Gee 9	No catch			No catch		
	Gee 8	No catch			No catch		
	Gee 7	No catch			SF	2	150mm, 150mm

	Gee 6	SF	2	200mm, 300mm	SF	3	240mm, 180mm, 170mm
	Gee 5	SF	1	300mm	SF	1	380mm
	Gee 4	No catch			No catch		
	Gee 3	No catch			No catch		
	Gee 2	SF	1	100mm	SF	3	210mm, 180mm, 180mm
	Gee 1	SF	2	150mm, 250mm	SF	1	320mm
	Total		6			12	

4. DISCUSSION

The presence of shortfin eels in these drains is unsurprising given their ubiquitous distribution across a range of degraded habitats in the Waikato region. Eels are well known to be able to access habitats that are unavailable to other species, due to their ability to climb and to traverse overland. These two channels are considered intermittent in nature within the site (the landowner has reported that they dry up each summer) and in addition to this, their downstream connectivity is interrupted by discontinuous wetted areas (as noted by ENZL during site visits 1st and 2nd July 2019). The presence of culverts downstream and the drop from the end of these channels into a larger channel downstream (perpendicular to the end of Balemi Rd), also mean that fish passage to these reaches is poor. It is surmised that this is the reason for the absence of pest fish species that are widely spread through the catchment further downstream.

While mudfish have been found in the presence of short fin eels in the Canterbury region, a correlation between low mudfish population densities and the presence of predatory fish (e.g. short fin eel, gambusia etc) in hydrologically variable systems subject to agricultural disturbance suggests mudfish are vulnerable to local extirpation[3]. In addition, the lack of connectivity to downstream environments for much of the year is likely to prevent colonisation of these areas by non-migratory species such as the black mudfish.

In conclusion, it is considered unlikely that there are mudfish present in either the northern or southern drains on site given the habitat conditions noted. If black mudfish are present, they were below detectable levels during this tailored survey effort.

[3] O'Brien, Leanne, K., 2005., The Conservation Ecology of Canterbury Mudfish (*Neochanna burrowsius*), Thesis submitted for Doctor of Philosophy in Zoology, University of Canterbury, Christchurch, New Zealand.

APPENDIX A

Report Limitations

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