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Orewa 4 Private Plan Change: Ecological Impact Assessment

July 2025

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Cover Illustration: The Ara Hills site, located on State Highway 1, Upper Orewa (photo taken in October 2018).

CONTENTS

1. INTRODUCTION

Bioresearches was engaged by AV Jennings to undertake an ecological impact assessment (EcIA) for a Private Plan Change (PPC) application for Ara Hills ('the site'; Lot 3 DP 327701 and Lot 1 DP 310813; Figure 1). The site encompasses 84.5 ha of land, situated to the west of the State Highway 1 (SH1), in Upper Orewa, and is currently recognised as a Future Urban Zone under the Auckland Unitary Plan Operative in Part (AUP (OP)). The proposal seeks to rezone the site to several residential, business, and open space zones, which will facilitate the development of a new residential community. As part of the PPC application, precinct provisions for the site, as the new 'Orewa 4 Precinct', have also been proposed.

AV Jennings holds resource consent from Auckland Council[1], granted in 2017, to undertake developmental works on site for the purpose of establishing 575 lots. However, since consent award, AV Jennings has undertaken a review of the original development plan and now seeks to expand the residential community to include up to 900 homes, a neighbourhood centre and private open spaces. The aforementioned PPC application and Orewa Precinct 4 provisions have been prepared to enable this new scheme.

This report details the ecological impact assessment that was undertaken by Bioresearches to determine the ecological features within the site and the significance of those features. The assessment also draws on the findings of ecological reporting undertaken to support the 2017 consent application (Boffa Miskell Limited, 2015). The extent of works authorised under the site's existing resource consent (e.g., earthworks, vegetation removal, etc. – some of which is ongoing) has been considered to represent a baseline environment, against which the impact of the proposed PPC and precinct provisions can be assessed. Within this assessment, Bioresearches considers the impact of the proposed rezoning on the ecological value of remaining terrestrial or freshwater features, including provisions which are designed to avoid, minimise, or remediate the adverse effects that could arise.

[1] Consent numbers BUN20441333, SUB60035991, LUC60010513, DIS60048302, DIS60048335, LUS60048380 & WAT60051016.

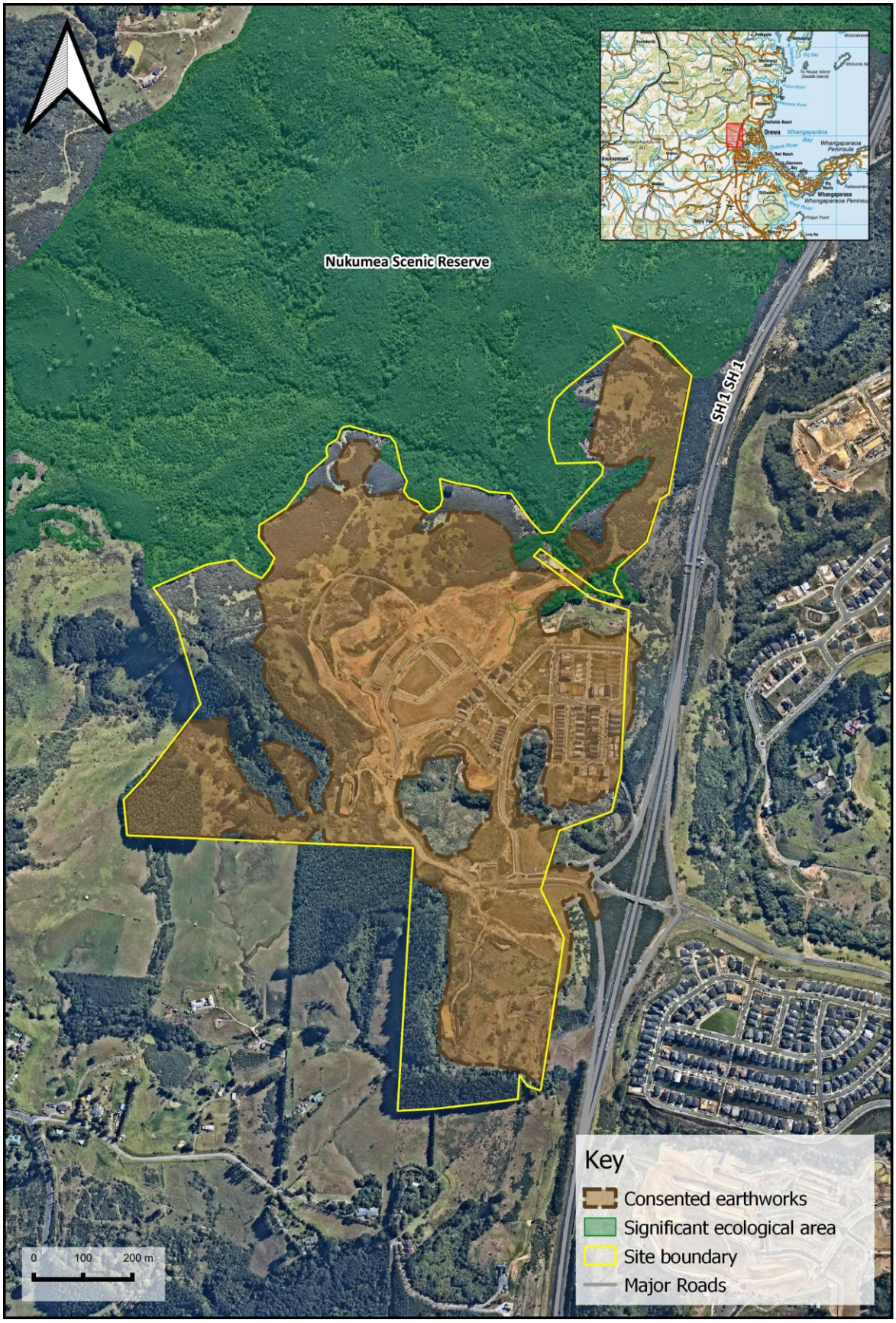

Figure 1. The Ara Hills site, proposed to comprise the Orewa 4 Precinct, with approximate site boundaries shown in yellow.

2. METHODS

2.1 Overview

Site assessments were undertaken by experienced ecologists on several occasions between 2017 and 2022, the latest of which being 7 September 2022, to assess the ecological values within the site. Prior to field surveys, a review of recent aerial images was undertaken to gain an understanding of the topography of the site. Assessments of freshwater habitats, vegetation and potential fauna habitats were noted during the site visit and photographs of the site were taken. These notes and photographs were used to assess the ecological values of the terrestrial and freshwater ecosystems. A desktop analysis of relevant databases was also undertaken.

2.2 Terrestrial Ecology

The vegetation and terrestrial fauna values within the site were assessed during site walkovers. The botanical value of both exotic and native vegetation was recorded, and the quality and extent of vegetation present on site was considered. Additionally, a desktop review of terrestrial characteristics was undertaken. Fauna habitats were assessed qualitatively, in conjunction with database reviews (e.g. Department of Conservation's Amphibian and Reptile Distribution Scheme (ARDS), Bioweb, eBird, iNaturalist) and considered indigenous lizards, birds, and bats. Quantitative lizard and bird surveys were undertaken on site using the methods described below.

2.2.1 Herpetofauna Survey

Desktop investigations involved a review of the Department of Conservation's ARDS database (accessed February 2022), as well as an analysis of aerial and topographic imagery to plan survey design and spatial coverage.

A lizard survey was completed by an experienced herpetologist (Wildlife Authority 37604-FAU) between 26 January and 10 March 2017 (Bioresearches, 2017). An onsite habitat assessment guided the survey effort, including placement of survey equipment. Areas that were considered to support the highest quality lizard habitat were surveyed using Artificial Retreats (ARs) to target ground-based (terrestrial) lizards and nocturnal visual encounter surveys (VES) to target tree-dwelling (arboreal) species. In addition to the 2017 survey, searches for lizards were completed on site on 18 – 23 October 2019 and 8 - 9 October 2022, in accordance with a lizard management plan (LMP) prepared for the site (Bioresearches, 2018 & 2022). The results of these searches have been included in this assessment.

2.2.1.1 Artificial lizard retreats

ARs were installed within bush fragments where suitable ground cover was present. A total of 44 ARs were installed in clusters of four (stations) on 26 January and inspected for lizard occupancy three times during fine and settled weather from 16 February.

2.2.1.2 Nocturnal visual encounter searches

VES was undertaken after dusk during calm and settled weather. VES is a standard method for detecting geckos, particularly forest gecko (*Mokopirirakau granulatus*), pacific gecko (*Dactylocnemis pacificus*), and elegant gecko (*Naultinus elegans*). VES was conducted along vegetation edges using powerful focused headlamps (*Fenix HP 30*) aided by Nikon Monarch™ 8 x 42 binoculars to search for geckos on the ground and in vegetation above the ground (tree trunks, branches and foliage). A total of 12 person search hours was achieved over two nights in February.

Where any lizards were encountered, an encounter rate was calculated as *n / (h x s)*, where:

n = number of geckos encountered;

h = number of hours spent searching; and

s = number of surveyors searching.

2.2.2 Bat Survey

A bat survey was undertaken by Bioresearches between 26 January and 7 March 2017 (Bioresearches, 2017). Four Automatic Bat Monitoring boxes (ABMs) were used on site to record ultrasounds created by a bat's echolocation calls, in accordance with methodology set out in Sedgeley *et. al.* (2012). ABMs consist of ultrasound sensors, a sound-activated recording device, a timer to switch the system on each night, and a rain detector to switch the system off in rain. Ultrasound sensors recorded up to 50 m and at 40 kHz, the frequency at which long- bats are best detected. Each ABM was set up to record for a minimum period of 20 nights.

2.2.3 Avifauna Survey

The results of an avifauna survey, completed by Boffa Miskell Limited (BML) in 2013, are included in this report. Avifauna species communities were assessed by undertaking five-minute bird counts (Dawson & Bull, 1975). This method involves observing at fixed points for five minutes and recording how many birds are seen and heard. Four five-minute bird counts were conducted in different parts of the site on 2 September 2013 (Boffa Miskell Limited, 2015).

2.3 Freshwater Ecology

During the site assessment, the presence and extent of streams and wetlands within the site were noted and the quality of any freshwater habitat was visually assessed. Watercourses were classified as per the AUP (OP) definitions to determine the ephemeral, intermittent or permanent status of these watercourses.

The Ministry for the Environment's (MfE) latest guidance (MfE, 2020) and wetland delineation protocols (MfE, 2021), including vegetation assessments, hydric soils and wetland hydrology, were utilised, where appropriate, to determine areas defined as a *'natural inland wetland'* under the National Policy Statement for Freshwater Management 2020 (NPS-FM). Wetland assessments included identifying native and exotic vegetation, examining the structural tiers within wetland areas, and assessing the quality and abundance of aquatic habitats. Signs of wetland degradation such as pugging and grazing from stock access, structures such as culverts impeding hydrological function, and weed infestation were also noted.

Freshwater habitat was assessed, noting ecological aspects such as channel modification, hydrological heterogeneity, riparian vegetation extent, substrate type and any fish or macroinvertebrate habitat observed. Riparian and catchment information was also reviewed and the NIWA New Zealand Freshwater Fish Database (NZFFD) was examined for fish species potentially present within the site. As part of fish relocation works required for development of the eastern region of the site, the species of fish observed on site were recorded. The methods used to capture these species are detailed below.

2.3.1 Fish Survey

Native fish relocation was undertaken by Bioresearches over a three-day period (19 – 21 November, 2018) within the main reach and a tributary of the Middle Stream (refer Section 3.3). The relocation works were completed in accordance with a Fish Capture and Relocation Plan FCRP (Bioresearches, 2018 & 2022), and involved the installation of exclusion barriers at the lower and upper extents of the stream. Two initial electric fishing runs were undertaken between the two exclusion barriers.

Following the electric fishing run, where possible, fyke nets and gee-minnow traps were set within the mainstream and tributary. The nets and traps were left overnight, then checked and removed the following morning, and captured fish were released downstream. This process was repeated a second time, with all traps and nets reset and left overnight. All traps and nets were checked and removed the following day. A final electric fishing run was undertaken.

The results of electric fishing surveys completed by BML in 2013 are also included within this report (Boffa Miskell Limited, 2015).

2.3.2 Macroinvertebrate Survey

Macroinvertebrate surveys completed by BML in 2013 have been included in an assessment of the site's ecological values (Boffa Miskell Limited, 2015). The survey was undertaken in accordance with the methodology set out in Stark *et. al.* (2001).

2.4 Ecological Impact Assessment

The overarching approach of this analysis and reporting is to ascertain the existing ecological values on the site and determine the impact of the proposed PPC and resulting residential development on those values.

The ecological value of the site, relating to species, communities and systems, were determined as per the EIANZ Ecological Impact Assessment guidelines (EcIAG) for use in New Zealand (Roper-Lindsay, Fuller, Hooson, Sanders, & Ussher, 2018). This report also identifies statutory guidelines and regulation with respect to ecology (such as watercourses, wetlands, high value vegetation and habitats) where relevant to the proposed development. Using this framework, the EcIAG describes a simple ranking system to assign value to species (Table 1) as well as other matters of ecological importance such as species assemblages and levels of organisation (Table 2). The overall ecological value is then determined on a scale from '*Negligible*' to '*Very High*' (Table 3).

Criteria for describing the magnitude of effects are given in Chapter 6 of the EcIAG (Table 4). 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 a criterion for describing level of effects (Table 5). The cells in italics in Table 5 represent a 'significant' effect under the EcIAG. 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. For moderate levels of effects or above, measures need to be introduced to avoid through design, or appropriate mitigation needs to be addressed (Roper-Lindsay *et al.* 2018).

Table 1. Factors to be considered in assigning value to species (Roper-Lindsay *et al.* 2018).

Determining factors	Value
Nationally threatened species, found in the ZOI[2] either permanently or seasonally	Very High
Species listed as 'At-Risk' – declining, found in the ZOI, either permanently or seasonally	High
Species listed as any other category of 'At-Risk' found in the ZOI either permanently or seasonally	Moderate
Locally (ED) uncommon or distinctive species	Moderate
Nationally and locally common indigenous species	Low
Exotic species, including pests, species having recreational value	Negligible

Table 2: Attributes to be considered when assigning ecological value or importance to a site or area of vegetation / habitat / community (as per Table 4 of Roper-Lindsay *et al.* 2018).

Matters	Attributes to be considered
Representativeness	*Criteria for representative vegetation and aquatic habitats:* • Typical structure and composition • Indigenous species dominate • Expected species and tiers are present • Thresholds may need to be lowered where all examples of a type are strongly modified. *Criteria for representative species and species habitats:* • Species assemblages that are typical of the habitat • Indigenous species that occur in most of the guilds expected for the habitat type
Rarity/distinctiveness	*Criteria for rare/distinctive vegetation and habitats:* • Naturally uncommon or induced scarcity • Amount of habitat or vegetation remaining • Distinctive ecological features

[2] ZOI (Zone of Influence) in Roper-Lindsay *et al.* (2018) defines the Zone of Influence as "*the areas/resources that may be affected by the biophysical changes caused by the proposed project and associated activities.*"

	• National Priority for Protection *Criteria for rare/distinctive species or species assemblages:* • Habitat supporting nationally threatened or At-Risk species, or locally uncommon species • Regional or national distribution limits of species or communities • Unusual species or assemblages • Endemism
Diversity and Pattern	• Level of natural diversity, abundance and distribution • Biodiversity reflecting underlying diversity • Biogeographical considerations- pattern, complexity • Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation
Ecological context	• Site history and local environment conditions which have influenced the development of habitats and communities • The essential characteristics that determine an ecosystems integrity, form, functioning and resilience (from 'intrinsic value' as defined in Resource Management Act 1991 (RMA)) • Size, shape and buffering • Condition and sensitivity to change • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material • Species role in ecosystem functioning - high level, key species identification, habitat as proxy

Table 3. Assigning value to areas (Roper-Lindsay *et al.* 2018)

Value	Determining Factors
Very High	Area rates 'High' for at least three of the assessment matters of Representativeness, Rarity/distinctiveness, Diversity and Pattern, and Ecological Context. Likely to be nationally important and recognised as such.
High	Area rates 'High' for two of the assessment matters, and 'Moderate' and 'Low' for the remainder OR area rates 'High' for one of the assessment matters and 'Moderate' for the remainder. Likely to be regionally significant and recognised as such.

Moderate	Area rates 'High' for one of the assessment matters, 'Moderate' or 'Low' for the remainder OR area rates as 'Moderate' for at least two of the assessment matters and 'Low' or 'Very Low' for the remainder. Likely to be important at the level of the Ecological District.
Low	Area rates 'Low' or 'Very Low' for majority of assessment matters, and 'Moderate' for one. Limited ecological value other than as local habitat for tolerant native species.
Negligible	Area rates 'Very Low' for three assessment matters and 'Moderate', 'Low' or 'Very Low' for the remainder.

Table 4. Criteria for describing the magnitude of effects (Roper-Lindsay *et al.* 2018)

Magnitude	Description
Very High	Total loss of, or a 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 of 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	Loss or alteration to one or more 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 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 and patterns; AND/OR Having 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 5. Criteria for describing the level of effects (Roper-Lindsay *et al.* 2018). Where text is italicised, it indicates 'significant effects' where mitigation is required.

Magnitude of Effect	Ecological Value				
	Very High	High	Moderate	Low	Negligible
Very High	*Very High*	*Very High*	*High*	*Moderate*	Low
High	*Very High*	*Very High*	*Moderate*	Low	Very Low
Moderate	*High*	*High*	*Moderate*	Low	Very Low
Low	*Moderate*	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low
Positive	Net Gain	Net Gain	Net Gain	Net Gain	Net Gain

3. BASELINE ENVIRONMENT

3.1 Overview

The proposed Orewa 4 Precinct is located within the Rodney Ecological District of the North Island. Approximately 64 ha of the PPC area has been authorised for development (Figure 1). The remaining areas on site contain managed pasture, watercourses, wetlands and regions of native-exotic vegetation, as shown in Figures 2 through 5. The ecological value of these areas is discussed in Sections 3.2 through 3.4 below.

3.2 Terrestrial Ecology

3.2.1 Vegetation

The areas on site which are excluded from the consented earthworks extent consist of largely undulating pastureland with patches of exotic treelands and regenerating native forest. Gorse also forms dense buffers around most of the regenerating forest patches, especially those within the gullies on site. A map showing the key ecological features and vegetation types is included as Figure 2.

A detailed description of the terrestrial vegetation within the site is presented in Boffa Miskell Limited (2015). A native plant species from the BML report has been reproduced in Appendix I. No nationally recognised 'Threatened' or 'At-Risk' plant species[3] have been observed within the site. Natural regeneration of native species has been historically suppressed through stock trampling and browsing, which has reduced the quality of the existing vegetation.

Regenerating indigenous vegetation patches are primarily located within the gullies on site, associated with the riparian margins. The diversity of the regenerating native scrub area is relatively low, consisting of common native species, none of any great stature. However, due to the riparian nature of the native vegetation within the site, it was considered to have moderate ecological value, due to the shading, organic matter input and buffer functions it provides to the watercourses.

Although the native vegetation patches have no connectivity to native vegetation in the surrounding landscape, they may provide some value as stepping-stones to the Nukumea Scenic Reserve.

Areas of pasture and exotic vegetation within the site (including gorse and pine) were determined to have low botanical and habitat values.

3.2.1.1 Significant Ecological Areas

Adjacent to the site's northern border is the Nukumea Scenic Reserve, owned by Department of Conservation. The Nukumea Scenic Reserve is subject to a Significant Ecological Area (SEA) overlay (SEA_T_6652) and has been assigned a Biodiversity Focus Area (BFA) by Auckland Council. This SEA extends into parts of the Ara Hills site where the West Hoe stream and its associated tributaries are within the site boundaries (Figure 2 and Figure 5). The SEA is a significant corridor of habitat which forms a component of the NorthWest Wildlink[4]. It is considered to be of a high ecological value.

[3] As assessed by the Department of Conservation; de Lange et al., 2017. Conservation status of New Zealand indigenous vascular plants.
[4] https://www.northwestwildlink.org.nz/

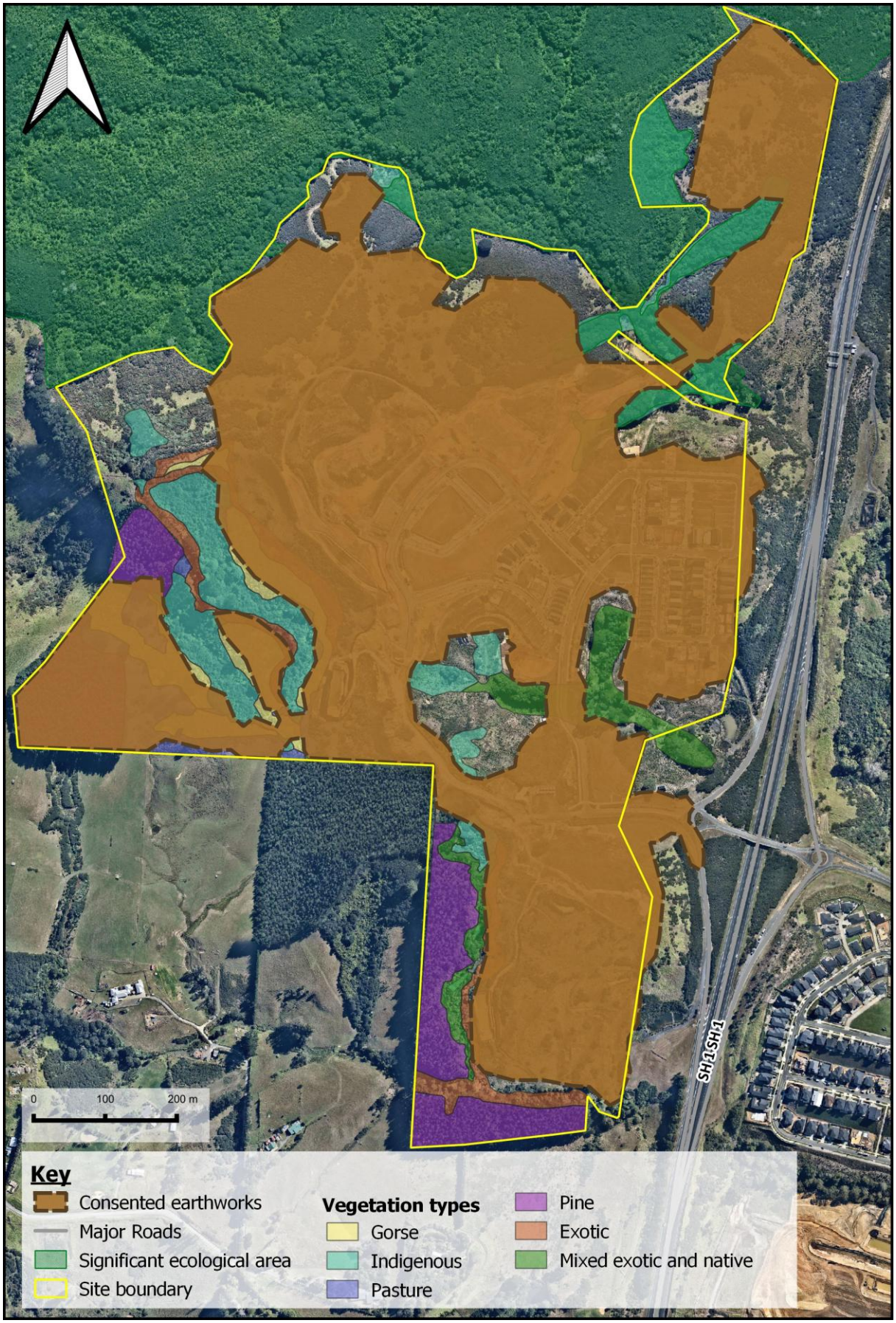

Figure 2. Key ecological features present within PPC area, excluding consented earthwork regions.

3.2.2 Fauna

3.2.2.1 Herptofauna

New Zealand has two major groups of terrestrial reptiles: lizards (Order Squamata) and tuatara (Order Rhynchocephalia). Tuatara are not present on mainland New Zealand outside of wildlife sanctuaries, and therefore were not considered in Bioresearches' assessment. Desktop analysis identified seven species of native lizards to be potentially present within the site, of which six of these are classified as 'At-Risk' by the Department of Conservation (**Error! Reference source not found.**). Strictly coastal species, such as the shore skink (*Oligosoma smithi*), and an introduced species, the rainbow skink (*Lampropholis delicata*)[5], were not considered in this report.

Table 6. Threat classification of potentially present native lizards that are found in the Auckland Region.

Common name	Species name	Threat Category	Threat Status
Copper skink	*Oligosoma aeneum*	Not Threatened	-
Ornate skink	*Oligosoma ornatum*	At Risk	Declining
Moko skink	*Oligosoma moco*	At Risk	Relict
Striped skink	*Oligosoma striatum*	At Risk	Declining
Forest gecko	*Mokopirirakau granulatus*	At Risk	Declining
Pacific gecko	*Dactylocnemis pacificus*	At Risk	Relict
Elegant gecko	*Naultinus elegans*	At Risk	Declining

Previously, no records within the Department of Conservation's ARDS database occurred within the Ara Hills, however forest gecko, elegant gecko and copper skink have been recorded from within 5 km of the site (DOC BIOWEB Herpetofauna database; accessed February 2023).

Most of the vegetation within the site was of a generally poor quality for native lizards. Almost all areas of scrub or pine were subject to cattle grazing, including SEA areas, which has resulted in severe degradation to any potential skink habitat. Native skinks, particularly copper and ornate skinks, require a thick vegetation mat that retains a high moisture content, such as dense leaf litter. Rank grass may provide a surrogate habitat in modified environments, though such habitat was not observed within the site.

Arboreal lizards, particularly geckos, are less reliant on ground cover, though the forest floor fosters an important invertebrate food resource and most species will use the forest floor (at least intermittently) and therefore can persist in scrub vegetation accessed by cattle.

A lizard survey was undertaken by Bioresearches in 2017 at the locations shown in Figure 3, in accordance with the methodology set out in Section 2.2.1[6]. One copper skink and one ornate skink was recorded from the small (c. 0.6 ha) forest fragment at the northern end of the site. However, this area is located within the consented earthworks area, with its development approved under the existing 2017 consent.

[5] Classified as an 'Unwanted Organism' by the Ministry of Primary Industries (MPI) under the Biosecurity Act 1993

[6] The lizard searches completed in 2018 and 2022, in accordance with the site's LMP, found no indigenous lizards (Bioresearches, 2022).

Two ‘fingers’ of indigenous vegetation on the western side of the site provide habitat for arboreal lizards (Figure 3). One forest gecko (‘At-Risk’) was recorded from VES within this vegetation. Three other forest geckos and one pacific gecko were recorded within Nukumea Scenic Reserve, near the Ara Hills site boundary.

Other areas of vegetation within the site, including all areas of pine, were considered to provide low quality habitat for lizards and it is unlikely that significant populations of native lizards occur within these areas.

Herpetofauna habitat on site outside of the approved earthworks extent was limited to the mixed indigenous vegetation on the western side of the site, and this vegetation was considered to be of high ecological value when considering its value as habitat for ‘At-Risk’ herpetofauna.

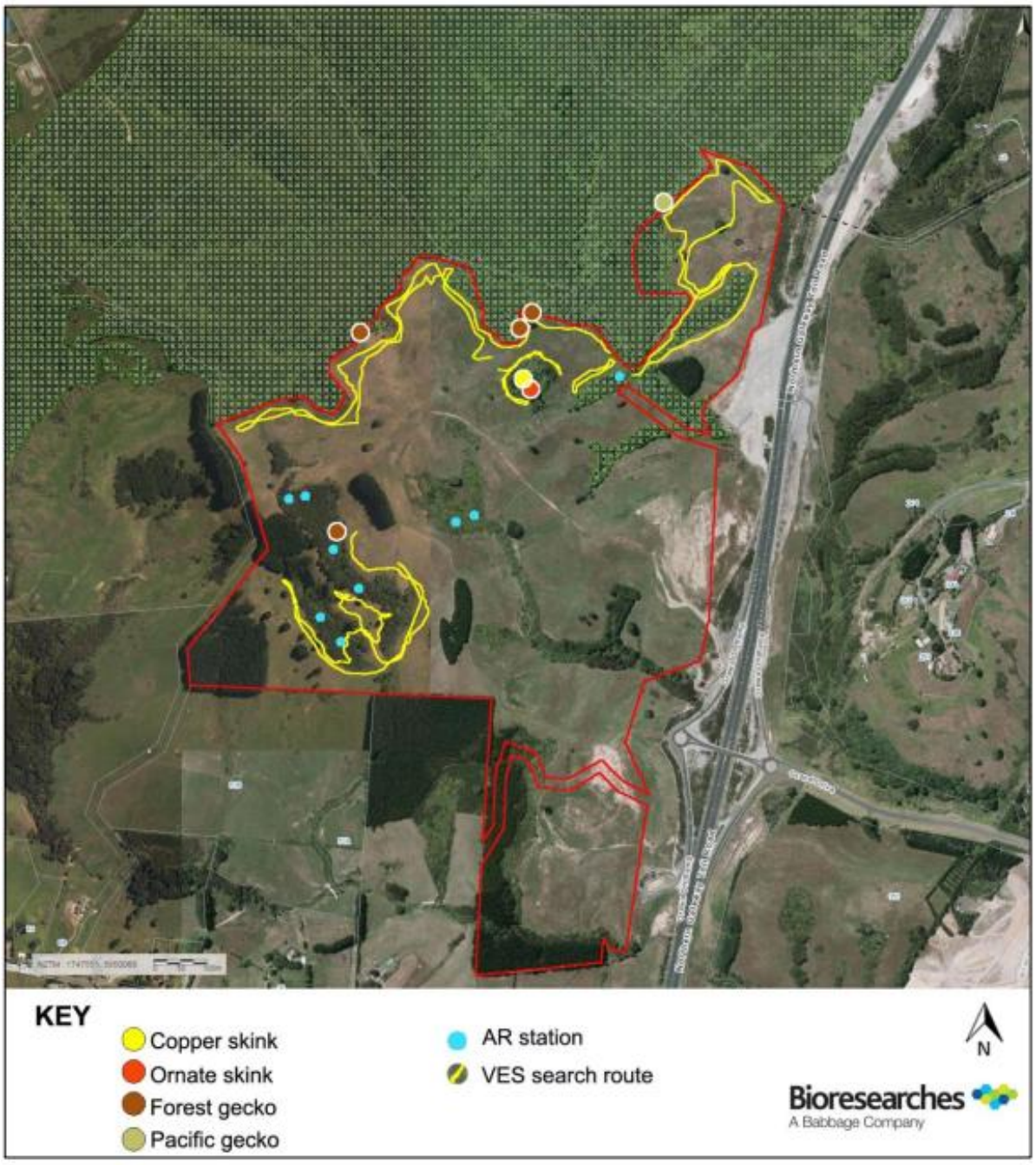

Figure 3. Lizard survey equipment, search areas and observations within the Ara Hills site (boundaries shown by red outline).

3.2.2.2 Frogs

Potential habitat areas within the site were considered to be of low value for Hochstetter's frogs (*Leiopelma hochstetteri*), as the streams were highly channelised and/or had no wetted boulder habitat. Accordingly, no formal survey for frogs were undertaken.

3.2.2.3 Invertebrates

Most native invertebrates are not legally protected under the Wildlife Act 1953. Protected invertebrates are listed in Schedule 7 of the Act, and include a small number of large or threatened species, including the kauri snail (*Paryphanta busbyii*) and wētāpunga (*Deinacrida heteracantha*). Both of these species occur in the Auckland Region, although the wētāpunga is restricted to offshore islands.

The presence of other invertebrate species that are not listed as protected may also contribute to the identification of valuable habitats. In particular, the rhytid snail (*Amborhytida dunniae*), a medium sized carnivorous land snail is classified as nationally 'At-Risk' (Mahlfeld, Brook, Roscoe, & Hitchmough, 2012), as well as peripatus (velvet worms). Peripatus (Onychophora: Peripatopsidae) are regarded as important from an evolutionary perspective, with characteristics of both worms and arthropods. They are poorly understood, and there is no formal classification of their taxonomy or conservation status, with many species yet to be described. Rhytid snails and peripatus require cool, moist areas of leaf litter in native forest and scrub. They can be found in deep leaf litter and in association with rotten logs and fallen nikau fronds.

No formal survey was undertaken for invertebrates, but incidental searches occurred during the lizard survey (January - March 2017). The presence of 'Threatened' or 'At Risk' invertebrate species was not observed during this search. It should be noted that the forest floor supported only a few logs that could be searched (around and under). This may be a result of historic grazing and clearance. As such, the site is not considered to be important habitat for either the rhytid snail, peripatus or kauri snail and the overall value of the habitats for nationally 'Threatened' or 'At-Risk' invertebrates is considered low.

3.2.2.4 Bats

Long-tailed bats (LTBs; *Chalinolobus tuberculatus*) are classified as 'Nationally Critical' in the North Island (O'Donnell, et al., 2017). This classification is given the qualifier 'Data Poor' which indicates that there is low confidence in the rating due to poor data available on the species populations and distribution (Townsend, et al., 2008). LTBs are known to occur at several sites across the Auckland Region with scattered records through the Rodney District and including 10 km to the north of the site at Puhoi, west at Wainui and south-west at Riverhead Forest. The site is within the flight range of known LTB populations.

A LTB survey within the site was undertaken by Bioresearches during January and March, 2017, using four fixed-location Automatic Bat Monitoring (ABM) detectors (Figure 4). No bats were recorded from the survey, or at nearby survey sites at Waiwera (Bioresearches, 2013). Some of the larger pine trees within the site may support cavities within which bats could potentially roost, although these trees were typically in exposed locations where higher winds and greater thermal gradients would be expected to reduce roost quality. The results indicate that the site was not important habitat to the species at the time of survey, although the PPC area may provide some intermittent habitat for bats.

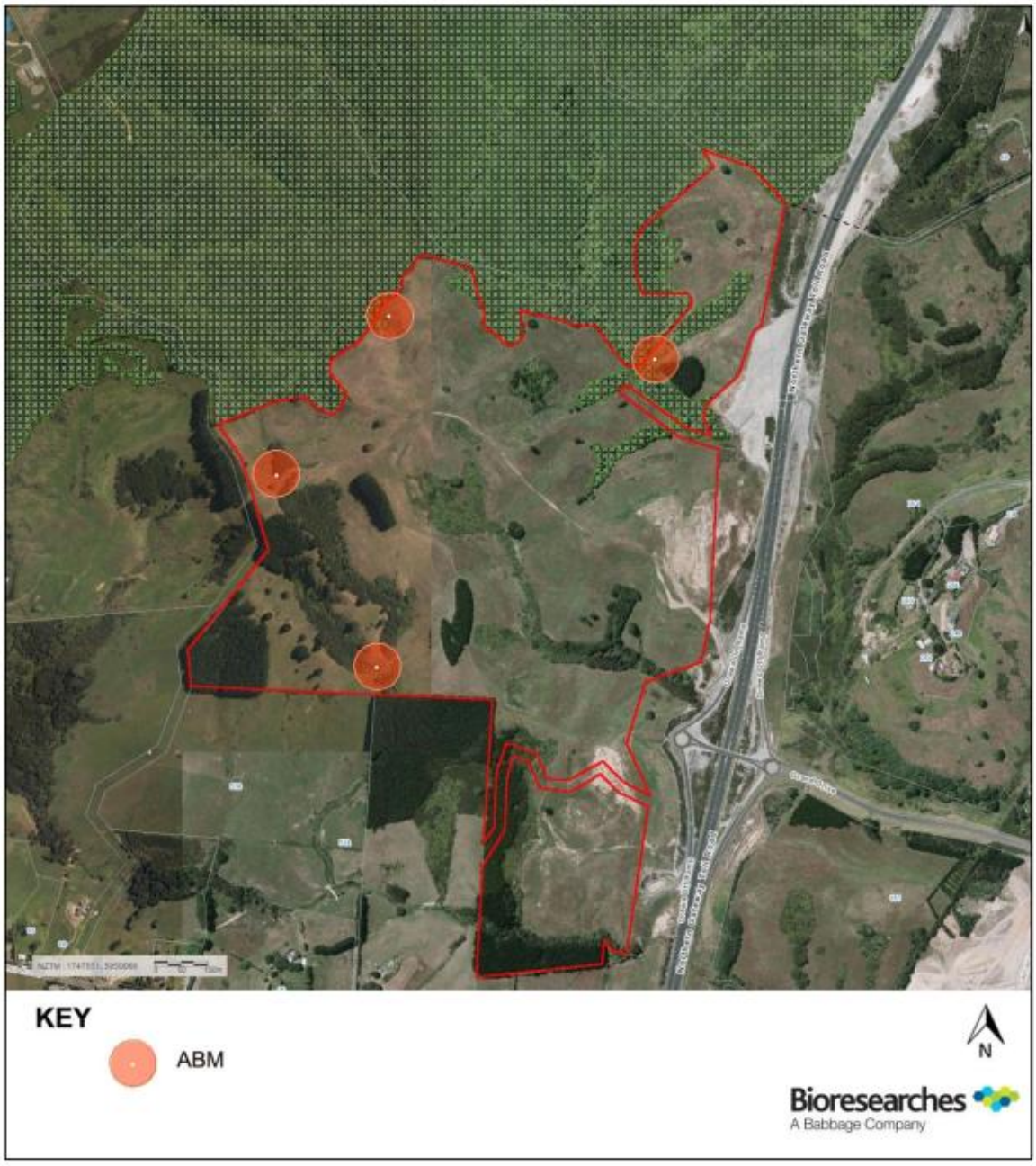

Figure 4. Bat survey equipment and search areas within the Ara Hills site (boundaries shown by red outline).

3.2.2.5 Avifauna

To support consent application for the site in 2017, BML undertook five separate avifauna surveys (Boffa Miskell Limited, 2015). Twelve species of avifauna were recorded, comprising of common native species and exotic birds, including pūkeko (*Porphyrio porphyrio*), tūī (*Prosthemadera novaeseelandiae*), common pheasant (*Phasianus colchicus*) and California quail (*Callipepla californica*). During site visits completed by Bioresearches, opportunistic surveys were also conducted, with no threatened native birds observed or heard.

The patches of forest present are adjacent to the Nukumea Scenic Reserve and form a network of ecological stepping stones. The Nukumea Scenic Reserve is also known to support the 'At Risk' North Island fernbird (*Bowdleria punctata vealeae*). The site offers further opportunity to create additional avifauna habitat adjacent to the Nukumea Scenic Reserve (including fernbird habitat) and/or to restore

avifauna habitat connectivity to the remaining vegetation within the site. Due to the presence of only common indigenous and exotic species recorded, and the largely isolated patches of established vegetation within the site, the existing avifauna habitat was considered to be of low ecological value.

3.3 Freshwater Ecology

Three main catchments are located within the proposed Orewa 4 Precinct area; the Orewa North Stream Catchment, the Middle Stream Catchment, and West Hoe Stream Catchment (Figure 5). The classifications undertaken by Bioresearches largely supported the conclusions drawn by Boffa Miskell (2015).

3.3.1 Streams

The Orewa River North Branch Stream (Orewa North Stream) has a 267 ha catchment area upstream of SH1, and ultimately drains to the Orewa Estuary. Current surrounding land use is predominantly agricultural with some native forest cover (approximately 25%). The total length of the stream is approximately 3.6 km, of which three tributaries extend into the proposed PPC area. The majority of these tributaries met the definition of permanent streams and were noted to be in connection with several natural wetland areas (Figure 5). The presence of native and mixed exotic-native riparian vegetation along the Orewa North tributaries allowed for good quality shading, though this vegetation was subject to edge effects (i.e., gorse present along edges of this vegetation). The streams were predominantly soft-bottomed with run habitat and undercut banks observed. The stream water was noted to be clear. The Orewa North tributaries were determined to have moderate ecological value due to the available aquatic habitat and quality of riparian vegetation which improves shading and filtration functions.

The Middle Stream has a 27 ha catchment area upstream of SH1, and the majority of its extent is located within the proposed Orewa 4 Precinct. The catchment is predominantly pastureland, with no significant native vegetation other than regeneration within the riparian zone. A portion of the Middle Stream has been reclaimed as part of works authorised under the 2017 resource consent, with the remaining length of the stream estimated to be 420 m. The riparian yard of both the permanent extent and intermittent tributary of the Middle Stream is comprised of a mixture of exotic and native vegetation, providing moderate-high shading. Aquatic fauna habitat consisted of root mats and woody debris and deep pools. Based on these factors, the ecological value was considered to be moderate.

The West Hoe Stream has a 125 ha catchment area upstream of SH1 and drains into the Orewa Estuary approximately 1.3 km downstream of the site. The upper catchment is mainly located within the Nukumea Scenic Reserve and has approximately 70% native forest cover. The total length of the main stream within the site is approximately 170 m, with four tributaries that drain into the main West Hoe Stream and associated wetlands. The riparian margins of the stream are subject to the SEA overlay, and contain predominantly native species. Hydrological heterogeneity included cascades and deep pools, and woody debris contributed to suitable fish and macroinvertebrate habitat (see Section 3.3.1.2). The ecological value of this stream was considered high.

3.3.1.1 Fish Survey

A review of the NZFFD showed that a number of native freshwater species have been identified within the larger catchment area of the site.

Table 7. Threat classification of potentially present native fish within the wider catchment. Species recorded by BML and/or Bioresearches have been included in bold.

Species	Threat Category	Threat Status
Shortfin eel (*Anguilla australis*)	Not Threatened	-
Longfin eel (*Anguilla dieffenbachii*)	At Risk	Declining
Torrent fish (*Cheimarrichthys fosteri*)	At Risk	Declining
Common bully (*Gobiomorphus cotidianus*)	Not Threatened	-
Giant bully (*Gobiomorphus gobioides*)	At Risk	Naturally Uncommon
Redfin bully (*Gobiomorphus huttoni*)	Not Threatened	-
Banded kōkopu (*Galaxias fasciatus*)	Not Threatened	-
Īnanga (*Galaxias maculatus*)	At Risk	Declining
Kōura* (*Paranephrops planifrons*)	-	-

*Native invertebrate species.

A range of fish species were recorded in the BML survey of the Orewa North Branch Stream, consisting of longfin eel (*Anguilla dieffenbachii*), shortfin eel (*Anguilla australis*) and redfin bully (*Gobiomorphus huttoni*) (Boffa Miskell Limited 2015). Kōura (*Paranephrops planifrons*), kākahi (*Hyridella*) and shrimps (*Paratya*) were also present. This assemblage is generally similar to that in nearby native forest reference sites and indicated a fish habitat of moderate ecological value.

During fish relocation works undertaken by Bioresearches within the Middle Stream, banded kōkopu (*Galaxias fasciatus*), eel (*Anguilla* sp.) and kōura were captured within the main stream and tributary (Bioresearches, 2018 & 2022). Similarly, shortfin eel and banded kōkopu were recorded during the 2013 survey completed by BML.

Fish recorded within West Hoe Stream by BML included banded kōkopu, shortfin eel, redfin bully and kōura. Historical surveys undertaken directly downstream of the site (east of SH1) have also identified giant bully (*Gobiomorphus gobioides*), īnanga (*Galaxias maculatus*) and giant kōkopu (*Galaxias argenteus*), within stream and wetland habitat (Bioresearches, 2008 & 2014). Giant kōkopu are considered an 'At Risk – Declining' species. The fish community observed during the survey and those suspected to be present within the same catchment indicates a high species richness and ecological value.

3.3.1.2 Macroinvertebrate Survey

Macroinvertebrate Community Index (MCI) scores obtained from the survey completed by BML in 2013 indicated that the Orewa North Branch Stream and Middle Stream were of "good" water quality, and the West Hoe Stream was of an "excellent" water quality due to the large proportion of the catchment having a native forest cover (Stark & Maxted, 2007; Boffa Miskell Limited, 2015).

3.3.2 Natural Inland Wetlands

Wetlands are associated with the tributaries of the permanent Orewa River North Branch and West Hoe Streams (Figure 5). The Orewa River North Branch wetlands were vegetated predominantly by sedges (*Carex* spp.) and rushes (*Juncus* spp.), whereas the West Hoe Stream wetlands were dominated by giant umbrella sedge (*Cyperus ustulatus*). Most wetland areas were degraded due to stock access (signs of pugging) and the presence of gorse within the buffer zone.

Due to the dominance of facultative wetland and obligate wetland species throughout the wetlands, along with primary hydrological indicators such as surface water and saturated ground, the wetlands were considered to meet the definition of 'natural inland wetlands' under the NPS-FM, and the NES-F

regulations are applicable. Each wetland extent was defined based on contours of the area and clear changes in vegetation types.

The wetland areas associated with the Orewa River North Branch Stream and West Hoe Stream were determined to be of low-moderate ecological value. Despite having connectivity to permanent streams, their small size, and lack of vegetation diversity reduced the quality of the wetlands overall.

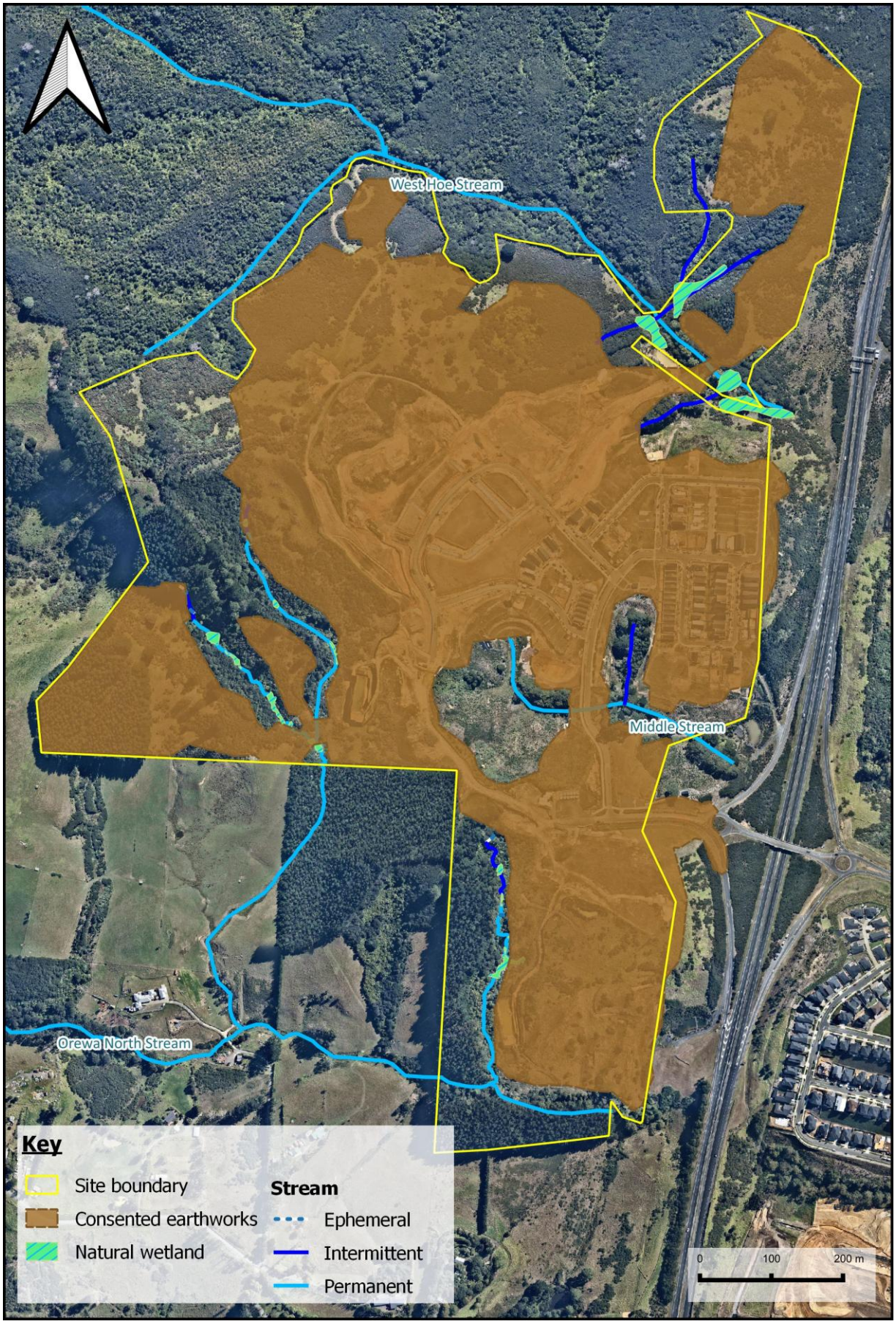

Figure 5. Key freshwater ecological features within the proposed Orewa 4 Precinct area.

3.4 Summary of Ecological Values

The terrestrial ecological value of the site is predominately linked to the presence of native SEA vegetation contiguous with Nukumea Scenic Reserve, along with isolated patches of native vegetation (largely riparian) within the site. The site provided low value habitat for indigenous avifauna. The majority of the vegetation within the site contained low value herpetofauna, excluding the mixed indigenous 'fingers' of bush on the western side, which was utilised by at-risk species, increasing the ecological value of this area to high based on rarity/distinctiveness (Table 3). However, the overall value of the indigenous vegetation on site was assessed as moderate.

The freshwater values of the site are linked to the presence of moderate-high permanent streams and low-moderate value wetland environments. The values of the site are summarised in Table 1Table 8.

Table 8. Summary of the terrestrial and freshwater ecological values on site.

Ecological Feature	Assigned Ecological Value
Indigenous vegetation	Moderate
Terrestrial Significant Ecological Areas	High
Exotic (incl. pine) vegetation	Low
Indigenous avifauna habitat	Low
Indigenous herpetofauna habitat	Low-high
Permanent/intermittent streams	Moderate-high
Natural inland wetlands	Low-moderate

4. ASSESSMENT OF ECOLOGICAL EFFECTS

4.1 Overview

The proposed PPC and precinct provisions seek to rezone 84.5 ha of land, known as the Ara Hills site (Figure 1), from its current Future Urban zoning to a range of residential, business and open space zonings. The proposed rezoning of the site will facilitate plans to develop residential homes, a neighbourhood centre and a mix of informal recreation and conservation areas, incorporating riparian corridors, wetlands and walkways. A copy of the proposed zoning map and precinct plan is attached as Appendix II. The plan change for Ara Hills has been revised by AV Jennings, in response to the RMA (Enabling Housing Supply and Other Matters) Ammended Act (2021) and the National Policy Statement on Urban Development (NPS_UD). The key changes associated with the PPC and precinct provisions include:

- Ability to achieve up to 900 lots, as opposed to the originally consented 575 lots.
- Additional plans to enhance the ecological, landscape and amenity values of the area.
- New consenting pathways for future earthworks, vegetation removal and reclamation of streams and wetlands. However, it is noted that the authorisation of these activities will remain under the discretion of Auckland Council during the resource consent process.

As discussed in Section 3, the site's ecological values are limited to areas that remain outside of the footprint of earthworks, vegetation removal and stream reclamation authorised under the site's existing resource consent. The impact of the proposed rezoning and associated works (as shown in Appendix II) on this baseline environment is discussed in Sections 4.2 through 4.3 below, and relevant policy documentation is discussed in Section 4.4.

4.2 Terrestrial Ecology

In accordance with B7.2, E15 and Appendix 1 (1.4.2) of the AUP (OP), the proposed Precinct Plan will:

- Protect current significant indigenous terrestrial biodiversity values.
- Protect, restore and enhance currently degraded indigenous terrestrial biodiversity values while providing for appropriate subdivision, use and development.
- Integrate green networks with open space and pedestrian and cycle networks while providing opportunities for environmental restoration and biodiversity.

These objectives will be fulfilled through a number of provisions provided by the proposed Precinct Plan, namely:

- Buffering of the adjacent Nukumea Scenic Reserve through planting of a 10 m or 20 m wide buffer strip along the reserve boundaries, in accordance with Precinct Plan 1 and Precinct Plan 2 (Provision IXXX.6.3.3(1)(c) and IXXX.6.3.3(2)(a)).
- Planting of a minimum of 60% of the net site area of a site within the Nukumea Reserve Protection Overlay as shown on Precinct Plan 1 and Precinct Plan 2 (Provision I553.6.1.4(1)(b)). IXXX.6.2.3(2)).
- Building platforms for sites located in the Nukumea Reserve Protection Overlay shall be located a minimum distance of 20 m away from the reserve boundary (Provision

IXXX.6.2.3(1)) and will not exceed 20% of the net site area or 400m^2, whichever is the lesser (Provision IXXX.6.2.3(4)).

- Protection of native fauna and flora within the Nukumea Scenic Reserve and precinct through:
    - The prohibition of keeping of mustelids, rodents or cats (Provision IXXX.3(6) and Table IXXX.4.1(A1)).
    - The provision of rural post and wire or deer- type fencing to a minimum height of two metres along the reserve boundary (Provision IXXX.6.2.1(1)(b)(ii)).
    - Limiting public access points into the reserve from the precinct (Provision IXXX.3(7)).
- Protection of all land within retained SEA overlays from residential development (AUP:OP Chapter D9)
- Provision of 20 m wide planted strips of land, to serve as ecological connections through to the Nukumea Scenic Reserve, at the general locations shown on Precinct Plan 1 (Provision IXXX.6.3.5(1)).
- All native planting and enhancement areas (including riparian margins) will be:
    - In accordance with Appendix 16 of the AUP (OP).
    - Planted in native eco-sourced vegetation which reflects existing native vegetation in the precinct and surrounding environment, including the Nukumea Scenic Reserve.
    - Subject to weed management and plant maintenance.
    - Protected and maintained in perpetuity by way of a covenant that must be placed on the Certificate of Title.
- Any additional vegetation removal will be assessed against the relevant Auckland-wide provisions through the Resource Consent application process.

The native terrestrial vegetation present on site, outside of the proposed earthworks extent, will not be removed as a result of the proposed PCC. The proposed rezoning of the site will offer the opportunity to create additional herpetofauna and avifauna habitat adjacent to the Nukumea Reserve and to restore connectivity to the remaining vegetation within the site. Planting of open space conservation zones, buffer strips and ecological corridors to the Nukumea Scenic Reserve is proposed, and controls for pest and weed management will protect and encourage the regeneration of existing habitats. This supplementary native vegetation will promote a significant increase in the site's terrestrial ecological values.

Overall, it is considered that the proposal will preserve the baseline ecological values associated with the moderate-high value vegetation and terrestrial habitat on site. The potential adverse impact of the PPC was assessed to be low, with a significant increase in the terrestrial ecological values expected.

4.3 Freshwater Ecology

In accordance with B7.2, E3, Appendix 1 (1.4.2) of the AUP (OP) and the NPS-FM, the proposed Precinct Plan will:

- Enhance degraded freshwater systems.

- Restore maintain and enhance streams and wetlands while providing for appropriate subdivision, use and development (e.g., the removal of a wetland and construction of a stream crossing, in a tributary of the Orewa North Stream located in the western region of the site, was consented under the original PPC application. AV Jennings are now seeking to retain this wetland and enhance the stream environment).
- Minimise loss of freshwater systems.
- Mitigate adverse effects of changes in land use on freshwater.
- Integrate freshwater systems with open space and pedestrian and cycle networks while providing opportunities for environmental restoration and biodiversity.

These objectives will be fulfilled through a number of provisions provided by the proposed Precinct Plan, namely:

- Ensuring stormwater is managed and treated in the precinct and watercourses are recharged appropriately. This will be achieved through requiring:
    - Stormwater runoff from all impervious areas to be treated through a treatment train approach which assists in maintain high water quality (Provision IXXX.3(16)).
    - New buildings and additions to new buildings to be constructed from inert materials (Provision IXXX.6.2.2(1)).
- Minimising the number of road crossings within the precinct while providing for appropriate subdivision, use and development.
- All new road crossings/culverts will be assessed against the relevant Auckland-wide provisions through the Resource Consent application process and as such must not prevent the passage of fish.
- Planting the riparian margins of all existing intermittent and permanent streams to a minimum width of 10 m on each bank (excluding road crossings) as shown on the Orewa 4 Precinct: Precinct plan (Provision IXXX.6.3.4(1)).

The reclamation and/or modification of the baseline freshwater habitat on site is not proposed as part of the PPC and precinct provisions. Significant riparian planting is proposed to be undertaken along the Orewa North Branch tributaries, the Middle Stream and the West Hoe Stream. This supplementary riparian vegetation will promote an increase in wildlife habitat, and water quality through the increase of filtration functions and shading.

The main threat to freshwater ecology, as a result of the proposed rezoning from Future Urban to Residential zones (among others), is in relation to the potential increase of impervious surfaces and polluted runoff associated with subsequent development. However, precinct provisions (such as IXXX.3(16) and IXXX.6.2.2(1), which control the quality of new stormwater discharges) have been proposed to mitigate this risk. Furthermore, to align with the NPS-FM and NES-F, future stormwater design will be required to avoid adverse effects on the natural inland wetlands within the site, by minimising erosion through appropriate setbacks (minimum 10 m from natural inland wetlands) achieving net neutrality and avoiding partial/complete drainage.

The proposed rezoning is considered unlikely to have an adverse effect on the site's freshwater features, with the low-moderate value wetlands expected to see an increase in ecological value, and moderate-high stream values expected to be preserved. The additional planting and management of these features will likely result in an overall ecological gain regarding freshwater ecology.

4.4 Relevant Policy Documents

4.4.1 National Policy Statement for Freshwater Management 2020

The NPS-FM provides national direction for decisions regarding water quality and quantity, and integrated management of land, freshwater and coastal environments under the Resource Management Act 1991. The NPS-FM contains national objectives for protecting ecosystems, indigenous species and the values of outstanding water bodies and wetlands.

The main objective of the NPS-FM is to ensure the health and well-being of water bodies and freshwater ecosystems are prioritised. The PPC is in accordance with the objective of the NPS-FM as all freshwater ecosystems have been identified within the site; no wetland/stream reclamation or works are proposed and any potential significant adverse effects identified during future development will be able to be appropriately avoided, minimised, remedied or offset under the effects management hierarchy.

4.4.2 Auckland Unitary Plan

The AUP (OP) sets out several policies and objectives that gives effect to the RMA to promote the sustainable management of natural and physical resources. This section addresses the objectives and policies set out in the AUP pertaining to ecology.

4.4.2.1 B2 – Urban Growth and Form

Consistent with B2, through vegetation protection and enhancement, the PPC will provide ample opportunity to enhance the quality of the natural environment, including those scheduled in the AUP (OP). Additionally, it has been demonstrated above that the adverse environmental effects of the PPC, including potential significant adverse effects on receiving waters, will be avoided/minimised.

Adverse environmental effects of urbanisation in future, including any significant adverse effects on receiving waters that can be appropriately avoided, remedied or mitigated.

4.4.2.2 B7 – Natural Resources

Consistent with B7, areas of significant indigenous biodiversity value and freshwater environments have been identified within the site, and these areas will not be affected by the proposed PPC.

Urbanisation of the site will provide opportunities for all freshwater habitat to be protected from significant adverse effects of subdivision use and development, as well as provide opportunities to maintain indigenous biodiversity through the protection, restoration and enhancement of areas where ecological values are degraded and where development is occurring, namely through revegetation planting adjoining Nukumea Scenic Reserve and existing SEA within the site, along with the planting and protection of riparian margins.

4.4.2.3 E1 – Water Quality and Integrated Management

Consistent with E1, the PPC avoids adverse effects on freshwater systems as no physical works are proposed. Future urbanisation can involve appropriately managing discharges, subdivision and

development that affect freshwater systems to maintain or enhance water quality, flows, stream channels and their margins.

4.4.2.4 E3 – Lakes, Rivers, Streams and Wetlands

Consistent with E3, all potential streams and wetlands have been identified within the site. Additionally, reclamation and adverse effects will be avoided, and future residential development within the site provides opportunities to protect and enhance the freshwater systems.

4.4.2.5 E15 – Vegetation Management and Biodiversity

Consistent with E15, the vegetation and biodiversity values of the site have been identified. The PPC avoids adverse effects on vegetation and biodiversity values within the site and receiving environments.

Urbanisation is expected to provide opportunities to maintain and enhance ecosystem services and indigenous biodiversity values, particularly in sensitive environments, and buffer any areas of existing indigenous vegetation cover, while providing for appropriate subdivision, use and development.

4.4.2.6 Appendix 1 – Structure Plan Guidelines

Consistent with the Structure Plan Guidelines, it has been demonstrated that the PPC provides opportunities and mechanisms to protect and maintain natural resources, particularly those that have been scheduled in the AUP (OP).

5. SUMMARY AND RECOMMENDATIONS

The impact of rezoning from Future Urban to residential, business, and open space zones has been considered in relation to the terrestrial and freshwater values present on site. Key ecological values on site include:

- Permanent and intermittent watercourses within three main catchments, with predominantly native riparian margins, supporting a diverse fish and macroinvertebrate community. These watercourses were of moderate-high ecological value.
- Small and degraded wetland environments, considered to have low-moderate ecological value.
- High value SEA and moderate value indigenous vegetation, found to support native species of herpetofauna and avifauna, namely associated with riparian vegetation along the Orewa North Branch tributaries, or within the northern edge of the site.
- Pine, pasture and gorse-dominant areas of vegetation were considered to have low ecological and botanical value.

It is considered that the proposed PPC is appropriate for maintaining the site's high-quality ecological features and enhancing low value features. The proposed PPC and precinct provisions promote:

- A development that is integrated with its ecologically sensitive surroundings;
- Stormwater management that appropriately treats discharges and recharges watercourses;
- Enhancement of water quality and ecology of the stream network within the precinct through riparian vegetation;
- Ecological connections to the Nukumea Reserve and other bush patches; and
- An increase in biodiversity values.

Overall, it is considered that the outcomes of the proposed precinct plan are consistent with the objectives and policies of the AUP (OP) and are consistent with the anticipated outcomes of the current underlying consents. Future subdivision and development is anticipated to provide opportunities for the appropriate protection and enhancement of indigenous terrestrial and freshwater biodiversity values of the site. It is recognised that the operative AUP (OP) and the NES-F provide a framework that manage any proposed future development at the resource consenting phase to ensure development aligns with the appropriate polices and regulations.

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Appendix I. Native Plant Species List

Scientific Name	Common Name
Myrsine australis	Māpou
Carpodetus serratus	Putaputaweta
Melicytus ramiflorus	Māhoe
Cyathea medullaris	Mamaku
Cyathea dealbata	Ponga
Dicksonia squarrosa	Wheki
Geniostoma ligustrifolium	Hangehange
Coprosma rhamnoides	Twiggy coprosma
Phyllocladus trichomanoides	Tanekaha
Dacrycarpus dacrydioides	Kahikatea
Myrsine australis	Mapou
Ripogonum scandens	Supplejack
Gleichenia dicarpa	Tangle fern
Blechnum novaezelandiae	Kiokio
Phormium tenax	Flax
Cordyline australis	Cabbage tree
Podocarpus totara	Tōtara
Hedycarya arborea	Pigeonwood
Schefflera digitata	Patē
Coprosma grandifolia (C. autumnalis)	Kanono
Knightia excelsa	Rewarewa
Rubus cissoides	Bush lawyer
Oplismenus hirtellus	Basket grass
Kunzea ericoides	Kānuka
Leptospermum scoparium	Mānuka
Rhopalostylis sapida	Nīkau
Carex **spp.**	
Juncus **spp.**	

The native plant species list was obtained from the Boffa Miskell 2015 report.

Appendix II. Proposed Orewa 4 Precinct