



WILD ECOLOGY

Ecological Assessment Report

Brookvale Green, 174 & 176 Brookvale Road,
Havelock North

Prepared for
Vermont Street Partners No. 4 Ltd

July 2026

DOCUMENT QUALITY ASSURANCE

Wild Ecology (2026). *Ecological Assessment Report prepared for proposed Fast-track development application of Brookvale Green at Brookvale Green, 174–176 Brookvale Road, Havelock North.* Report prepared by Wild Ecology for Vermont Street Partners No.4 Ltd.

Prepared for:	Vermont Street Partners No.4 Ltd	
Version:	FINAL	
Date:	02/07/2026	
Author:	Madara Vilde Principal Ecologist Wild Ecology	<i>MVilde</i>
Revision History		
	FINAL	Issue date: 02/07/2026
	4 th Draft	Issue date: 05/06/2026
	3 rd Draft	Issue date: 07/05/2026
	2 nd Draft	Issue date: 13/04/2026
Status:	1 st Draft	Issue date: 31/03/2026
Use and Reliance	This report has been prepared by Wild Ecology on the specific instructions of our Client. It is solely for our Client's use for the purpose for which it is intended in accordance with the agreed scope of work. This report, all plans, illustrations and other associated material remains the property of Wild Ecology until paid for in full. Copyright and intellectual property rights remain with Wild Ecology. Wild Ecology does not accept any liability or responsibility in relation to the use of this report contrary to the above, or to any person other than the Client. Any use or reliance by a third party is at that party's own risk. Where information has been supplied by the Client or obtained from other external sources, it has been assumed that it is accurate, without independent verification, unless otherwise indicated. No liability or responsibility is accepted by Wild Ecology for any errors or omissions to the extent that they arise from inaccurate information provided by the Client or any external source.	

CONTENTS

Document quality assurance	1
EXECUTIVE SUMMARY	3
1.0 INTRODUCTION.....	4
1.1. Background and project description.....	4
1.2. Purpose and Scope	4
2.0 METHODOLOGY	5
2.1. Desktop Review	5
2.2. Site Investigation	5
2.3. Evaluation of Ecological Value	6
2.4. Evaluation of Ecological Effects.....	6
2.4.1. EIANZ Assessment.....	6
2.4.2. Values Assessment.....	6
2.4.3. Magnitude of Effects Assessment.....	6
3.0 SITE DESCRIPTION	8
3.1. Site description and location	8
3.2. Historic land use	9
3.3. Site characteristics	13
4.0 ECOLOGICAL SURVEY RESULTS	16
4.1. Terrestrial.....	16
4.2. Natural inland wetland areas – exotic wetlands	18
4.3. Aquatic.....	21
4.3.1. Freshwater habitats	21
4.4. Fauna.....	27
4.4.1. Aquatic fauna	27
4.4.2. Avifauna	28
4.4.3. Lizard fauna.....	28
4.4.4. Bats.....	30
4.5. Summary of values	31
5.0 ASSESSMENT OF ECOLOGICAL EFFECTS	34
5.1. Potential Ecological Effects	34
5.1.1. Potential effects on watercourses	34
5.1.2. Effects associated with culvert upgrade	36
5.1.3. Potential effects on natural inland wetland areas (NES-FW).....	37

5.1.4.	Proposed stormwater management, outlet and rip-rap structures	39
5.1.5.	Potential effects on terrestrial vegetation	42
5.1.6.	Potential fauna effects	42
5.1.7.	Potential effects on the Arataki Reserve land	43
6.0	FRESHWATER OFF-SETS	44
6.1.	Baseline Wetland Conditions	44
6.2.	Wetland Offset	45
6.3.	Baseline Watercourse Conditions	46
6.4.	Stream Ecological Valuation (SEV) and Environmental Compensation Ratio (ECR)	47
7.0	RELEVANT PLANNING CONSIDERATIONS	49
7.1.	National Policy Statement for Indigenous Biodiversity (NPS-IB) (2023)	49
7.2.	National Policy Statement for Freshwater Management (2020)	50
7.3.	National Environmental Standards for Freshwater Management (2020)	51
7.4.	Hawke's Bay Regional Resource Management Plan (RRMP) – Freshwater and Biodiversity	52
7.5.	Hastings District Plan – Ecological, Riparian and Biodiversity Provisions	53
8.0	ECOLOGICAL ENHANCEMENT PROPOSAL	55
8.1.	Ecological enhancement areas	55
8.1.1.	Revegetation planting	55
8.1.2.	Pest plant management	58
8.1.3.	Pest animal management	58
8.1.4.	Maintenance	58
8.1.5.	Monitoring	59
9.0	CONCLUSION	59
10.0	REFERENCES	61
	APPENDIX 1 – FAUNA SURVEY LOCATIONS	64

EXECUTIVE SUMMARY

An ecological assessment was undertaken in support of a proposed fast-track development application for 174 and 176 Brookvale Road, Havelock North. The proposal involves the construction of 203 residential dwellings within a well-connected living environment, supported by on-site stormwater systems, an internal transport network, and connections to public water supply and wastewater infrastructure. A key component of the proposal is the delivery of substantial ecological and landscape enhancement, including approximately 4.07 hectares of indigenous riparian and terrestrial buffer planting, pest management, and integration with walking and cycling connections.

The site currently comprises a single residential dwelling with associated commercial operations (Te Mata Mushrooms), horticultural orchards, and exotic pasture. Terrestrial and aquatic habitats are highly modified due to historical land use. Indigenous vegetation is limited to small harakeke plantings along shelterbelts, while scattered mature exotic trees are present. Watercourses have been heavily altered through piping, culverting, channelisation, realignment, and dredging, resulting in minimal natural stream characteristics, low aquatic species diversity, and limited ecological function. Overall, the site is of low ecological significance.

Potential ecological effects have been addressed as associated with watercourse diversion, vegetation clearance, and disturbance to fauna habitat. Temporary effects on wetlands, riparian margins, and aquatic habitats are anticipated during construction activities; however, these are to be managed through the implementation of standard sediment and erosion controls, appropriate fauna management measures, and the timing and staging of works to minimise ecological disturbance.

The proposed ecological works include re-alignment and restoration of Watercourse 1, riparian and wetland-margin planting along Watercourses 1 and 2, and the removal of redundant crossings with reinstatement of open channels. These measures will enhance hydrological function, habitat complexity, and ecological connectivity across the site. By reinstating native vegetation, stabilising banks, and improving wetland and riparian systems, the proposal is expected to deliver a net biodiversity gain, providing long-term ecological benefits and improved habitat quality for native flora and fauna. Quantitative offset accounting confirms this outcome: the realigned 356 m of Watercourse 1 increases the Stream Ecological Valuation (SEV) score from 0.31 (existing channel) to 0.62 (proposed channel), delivering an approximately two-fold uplift in stream ecological value across the reach, and wetland margin habitat created (approximately 6,439 m²) exceeds wetland area temporarily disturbed (approximately 437 m²) by a ratio of greater than 14:1.

On the basis of ecological surveys and desktop assessments, potential adverse ecological effects can be appropriately managed through application of the effects management hierarchy, while the integrated design and proposed restoration works present a clear opportunity to enhance ecological values across the site, resulting in an overall net gain.

1.0 INTRODUCTION

1.1. Background and project description

Vermont Street Partners No.4 Ltd (the Applicant) engaged Wild Ecology to prepare an Ecological Assessment Report in support of a proposed fast-track development application for a site located at 174 and 176 Brookvale Road, Havelock North (the Site).

The Site is located approximately 3 km north-east of Havelock North town centre and has a total area of approximately 24.3 hectares across multiple certificates of title, comprising the primary development site at 174 and 176 Brookvale Road (Vermont Street Partners No.4 Ltd) and the adjoining Arataki Reserve parcel being Lot 3 and Lot 4 DP 481968. It is currently zoned Plains Production under the Hastings District Plan (Operative) (Figure 1).



Figure 1: Showing the site's location in relation to Havelock North with an associated overlay of Hastings District Plan (Operative) Zoning

1.2. Purpose and Scope

The purpose of this report is to provide an assessment of the ecological features present within the fast-track development area and to evaluate whether future development of the Site can occur in a manner consistent with relevant local, regional, and national ecological policy frameworks. The report identifies terrestrial and aquatic habitat types, evaluates their ecological values, and considers potential ecological effects associated with future development. The

extent to which adverse effects can be avoided, remedied, or mitigated is assessed, and both ecological constraints and opportunities are identified.

2.0 METHODOLOGY

2.1 Desktop Review

The desktop investigation included a review of scientific literature (published and unpublished), the Hastings District Plan and Hawkes Bay Regional Resource Management Plan and associated ecological site information, and relevant websites. Ecological databases were also accessed. These included:

- Retrolens historic aerial imagery
- DOC Bio-web Herpetofauna database;
- DOC Bat database;
- iNaturalist New Zealand;
- New Zealand Freshwater Fish Database;
- LENZ Threatened Environments Classification;
- Land Use Classification;
- New Zealand Freshwater Fish Database (NZFFD).

2.2 Site Investigation

The site and surrounding areas were visited between 27th and 31st of January 2025, and a general walk over was conducted over the Site, with terrestrial and aquatic features identified. The natural features were surveyed and recorded using a GPS unit (Trimble DA2). There were no rainfall events prior to January 27th, 2025 site visits (Metservice).

Vegetation was recorded and classified in general accordance with their dominant vegetation type. Watercourses on site were classified in accordance with criteria outlined in the Hawke's Bay Regional Council Resource Management Plan (2006). A wetland delineation survey was carried out during a site visit on 28th January 2025 based on the Ministry for the Environment (MfE) Wetland delineation protocols (2022) which are generally based evaluation of hydrophytic vegetation dominance, presence of hydric soils tool and wetland hydrology.

The following fauna surveys were conducted:

- Opportunistic avifauna surveys were conducted at various parts of the site;
- A high level preliminary acoustic bat survey was undertaken using Acoustic Bat Monitors (ABMs);
- Qualitative habitat assessment of habitat values for native lizards (skinks and geckos) was undertaken during site visits;
- Quantitative assessment of habitat values for native ichthyofauna (fish) was undertaken during site visits including fish surveys and eDNA survey;
- An AR4 acoustic recorder was left on site for 72 hrs to obtain additional avifauna records.

2.3. Evaluation of Ecological Value

The Hastings District Plan identifies Significant Waterbodies as rivers, streams, lakes, wetlands, or other watercourses that possess notable ecological, cultural, landscape, or recreational values. These waterbodies are subject to specific rules and protections designed to preserve their unique characteristics. Accordingly, the assessment of whether the site contains any Significant Waterbodies has been based on an evaluation of their existing ecological values and characteristics.

In addition to this, the remaining habitats on the site have also been assessed based on their level of naturalness, the composition and diversity of indigenous vegetation, and the extent to which they provide habitat for native fauna. This holistic evaluation helps determine the ecological integrity of the site as a whole and informs appropriate management responses. The presence or absence of key habitat features—such as mature native canopy cover, wetland hydrology, and connectivity to surrounding ecosystems—has been considered in this context. These factors are essential not only for identifying significant ecological areas but also for supporting long-term biodiversity conservation and aligning future land use with the objectives of the District Plan.

2.4. Evaluation of Ecological Effects

2.4.1. EIANZ Assessment

As a part of the ecological assessment, potential ecological effects associated with the fast-track development on both terrestrial and aquatic values on site were described and assessed. Where necessary, mitigation measures have been outlined to ensure that the site's active development does not result in adverse effects on the environment. The format of this generally follows that of Ecological Impact Assessment (EclA) Guidelines (EIANZ 2018).

2.4.2. Values Assessment

Four matters were used to determine the ecological value of the ecological features present on-site, these being 'Representativeness, Rarity/distinctiveness, Diversity and Pattern, and Ecological Context' as prescribed under the EIANZ (2018) criteria. The method involves assigning ecological values under each of these four matters, an explanation on each matter and a series of attributes as outlined within Table 4 of the EIANZ guidelines (2018). A scoring system provided in the EIANZ guidelines requires the combination of these assessment values to provide an overall assignment of ecological value to each feature.

2.4.3. Magnitude of Effects Assessment

An assessment of the potential magnitude of effects was evaluated in general accordance with Roper-Lindsay et al. 2018) with the consideration of potential effects associated with potential development proposal on identified ecological values on site. The method involves assessing the

magnitude of effects based on criteria outlined in Table 1 and the overall level of effect using the matrix in Table 2.

Table 1: Criteria for describing magnitude of effect (Roper-Lindsay et al. 2018)

Magnitude	Description
Very high	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ 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 baseline (pre-development) conditions such that post development character/ composition/ 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 baseline conditions such that post development character/composition/attributes of baseline 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 baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns; AND/OR Having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from 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 level of effects (Roper-Lindsay et al. 2018)

Magnitude	Level of effects				
	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

3.0 SITE DESCRIPTION

3.1. Site description and location

The site is located on the residential fringes of Havelock North, approximately 3km north-east of central Havelock North. The site currently supports (Figure 2 and Figure 3) one residential dwelling unit, and several outbuildings, including growing and picking sheds, packhouses, warehouses and carparking areas associated with the current business located onsite; Te Mata Mushrooms, which is a commercial mushroom farm. The remainder of the site is a horticultural orchard, exotic pasture, and most terrestrial and aquatic habitats within the site are highly degraded.



Figure 2: Showing the general characteristics of the site – primarily comprised in orchard areas, exotic pasture and outbuildings



Figure 3: Much of the site comprises commercial buildings, yard areas, and accessways

3.2. Historic land use

The site is located within the Heretaunga Ecological District in the Hawke's Bay region, which encompasses the Heretaunga Plains and surrounding areas, including Hastings and Napier. The landscape is characterised by lowland river terraces and an extensive river network, including the Ngaruroro and Tūtaekurī Rivers. Historically, the district supported extensive indigenous forest and wetland systems dominated by species such as kahikatea, mataī, and tōtara. However, widespread agricultural, horticultural, and urban development has resulted in substantial modification of the natural environment. As a consequence, only small and fragmented remnants of indigenous vegetation and wetland habitats remain, which are now of elevated ecological significance for regional biodiversity conservation.

Following a review of historical imagery from 1950 and the most recent aerial photography from 2022–2023, it is evident that the waterbodies on site have undergone significant modification from their original alignment. By the 1950s, the majority of the site's vegetation had been cleared, with only a few scattered trees remaining (Figure 4). Natural watercourses appeared to extend across the northern and central parts of the site at this time, which is presumed to represent their original configuration.

By the 1980s, commercial operations and development had been established on the site (Figure 5), including buildings located in the northwestern portion that appear to have been constructed over the central stream catchment. These activities continued into the 1990s (Figure 6), during which time the central stream appears to have been channelised and straightened—likely in preparation for piping or infilling to allow for increased land utilisation.

Natural meanders within the northern stream catchment were also straightened to create a more linear corridor for water conveyance. From 1994 onwards until 2022 (Figure 7), the upper sections of the central stream catchment appear to have been removed entirely, likely either infilled or piped underground as part of ongoing horticultural land development. There is no evidence of this upper catchment area remaining on site today.

Further modifications have also occurred within the northern stream catchment, which appears to have been straightened and possibly disconnected from its original hydrological context. It is assessed that currently, no natural portions of either the central or northern stream catchments remain. Both systems have been extensively altered through straightening, culverting, piping, and widening – most likely to facilitate stormwater management. In particular, the central stream catchment now functions primarily as a drainage channel rather than as a natural stream environment.

Neither stream was observed to be actively conveying water during site visits conducted in January 2025. There was minimal evidence to suggest the presence of even ephemeral flows throughout the year in either stream. Indicators such as defined stream channels or beds, hydrophytic vegetation, and flood debris were largely absent, with the exception of some small northern sections of the central stream catchment near Brookvale Road. The northern stream was entirely dry during the surveys, and historical imagery, including Google Earth imagery, shows little to no indication of natural flow patterns across the site.

With regard to terrestrial habitats, the site currently contains no naturally occurring indigenous vegetation. The only indigenous vegetation present consists of planted harakeke (New Zealand flax, *Phormium tenax*), which is located along bunds and shelterbelts. The remainder of the vegetation on site is comprised of exotic species, including Casuarina (*Casuarina spp.*), European oak (*Quercus robur*), walnut (*Juglans regia*), tortured willow (*Salix matsudana* 'Tortuosa'), crack willow (*Salix fragilis*), Japanese privet hedge (*Ligustrum japonicum*), plane trees (*Platanus spp.*), gum (*Eucalyptus spp.*), and a variety of other exotic shelterbelt plantings.

The site and its surrounding landscape appear to have been extensively modified, likely even prior to the earliest available aerial imagery from the 1950s. As such, it is difficult to determine the original vegetation cover with any certainty. The historical and ongoing land uses—primarily horticultural and commercial—have contributed to the loss of natural features and ecological integrity.

Both onsite waterways have undergone significant anthropogenic alteration. Channelisation, straightening, culverting, and, in some areas piping or infilling have been carried out to optimise the land for productive use. These modifications have greatly reduced the ecological functionality of the waterways. At present, the primary role of these stream systems is likely limited to water conveyance, particularly for stormwater drainage, rather than providing meaningful ecological or habitat value.



Figure 4: Showing the site and surrounds in 1950 (Source: Retrolens)



Figure 5: Showing the site and surrounds in 1980 (Source: Retrolens)



Figure 6: Showing the site and surrounds in 1994 (Source: Retrolens)



Figure 7: Showing the site and surrounds in 2022 (Source: LINZ)

3.3. Site characteristics

The site generally has a flat to gently sloping topography (Figure 8). Much of the site is utilised as a commercial growing unit/orchard. Several outbuildings, including growing and picking sheds, packhouses, warehouses and carparking areas are also present on site.



Figure 8: Looking east from the main accessway into the site

Hydrologically, the site is situated within the upper catchment of the Karamu Stream and contains two main watercourses that traverse the northern and central portions of the site, flowing generally northward towards Brookvale Road. These streams are likely intermittent, as observed during a site visit in January 2025, when the northern stream channel was completely dry and the central channel contained surface water only within its northernmost extent. Both streams continue beyond the site through surrounding horticultural and agricultural land. In addition, several artificial drains were noted on the property, likely constructed to manage overland flow and enhance conditions for agricultural productivity.

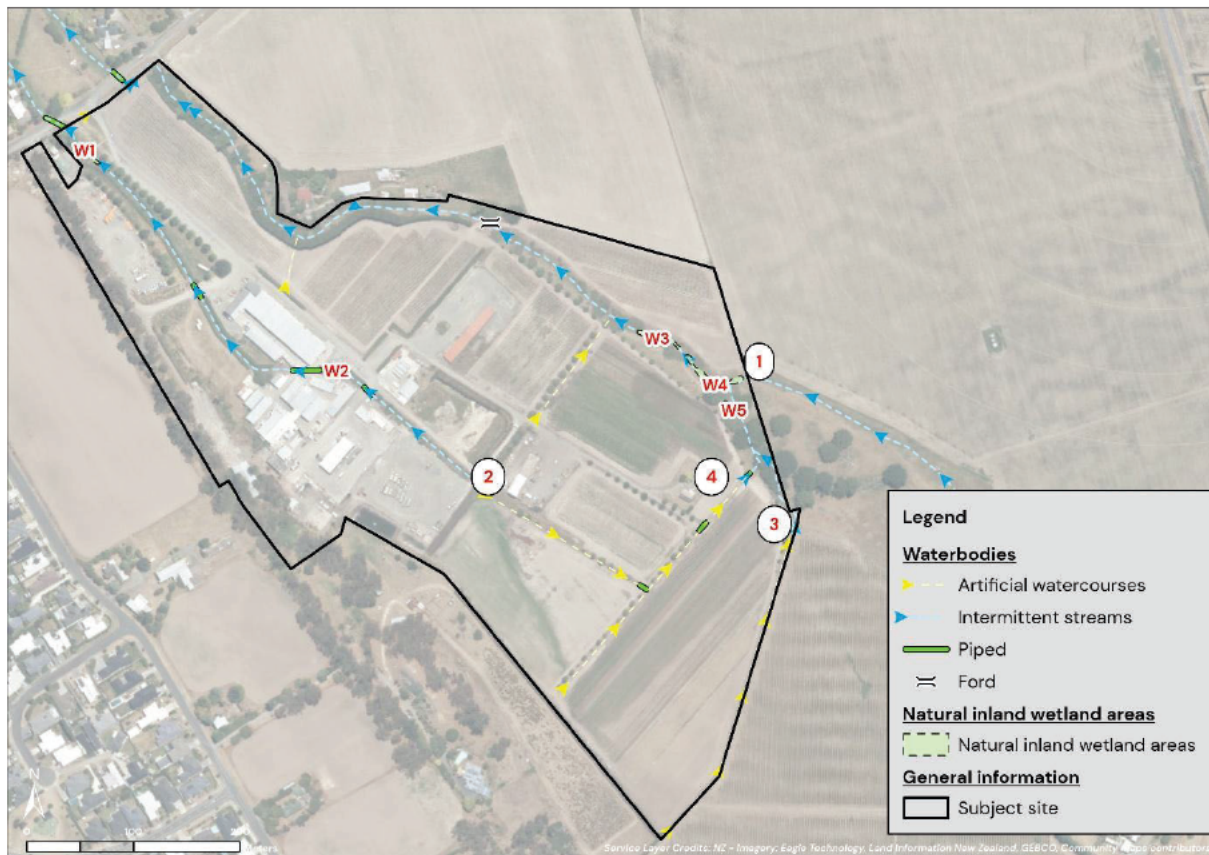


Figure 9: Showing the general hydrological patterns as observed on site during site field visits, wetland areas identified as W1 to W5, and watercourses identified as 1–4

With regard to terrestrial habitats, the site currently contains no naturally occurring indigenous vegetation. The only indigenous vegetation present consists of planted harakeke (New Zealand flax, *Phormium tenax*), which is located along bunds and shelterbelts. The remainder of the vegetation on site is comprised of exotic species, including Casuarina (*Casuarina spp.*), European oak (*Quercus robur*), walnut (*Juglans regia*), tortured willow (*Salix matsudana* 'Tortuosa'), crack willow (*Salix fragilis*), Japanese privet hedge (*Ligustrum japonicum*), plane trees (*Platanus spp.*), gum (*Eucalyptus spp.*), and a variety of other exotic shelterbelt plantings (Figure 10).



Figure 10: Showing the existing scattered terrestrial vegetation limited to exotic ornamental trees

There is no vegetation on the site classified as part of a Protected Natural Area (PNA). The nearest PNA is the Tukituki / Waipawa Riverbed, located approximately 1.5 km to the east. On-site assessments and observations of the wider landscape confirm that the site and its immediate surroundings do not contain any distinctive or ecologically significant terrestrial or aquatic habitats. Indigenous vegetation is virtually absent, and the modified stream systems are highly degraded, offering negligible ecological value. Their primary function is limited to drainage and water conveyance.

Overall, the site and its surrounding landscape have been extensively modified through long-term agricultural activity. Large areas of indigenous vegetation have been historically cleared to accommodate horticultural production. Although the general alignment of stream channels appears to reflect their semi-natural drainage patterns (as supported by 1950s aerial imagery), riparian vegetation has largely been removed, and the channels altered through widening and straightening to accommodate water conveyance, and establishing infrastructure such as tracks and culverts. Accordingly, any remaining waterway features should be considered for ecological enhancement and protection as part of the site's ongoing development planning.

4.0 ECOLOGICAL SURVEY RESULTS

4.1. Terrestrial

Field surveys conducted in January 2025 confirmed that the site contains no naturally occurring indigenous vegetation. Historical land use and commercial development since at least the 1950s have extensively modified the site's terrestrial habitats. The establishment of buildings, agricultural and horticultural operations, and significant hydrological alterations—including channelisation, straightening, culverting, and infilling of streams—have substantially impacted the site's natural vegetation patterns.

The only indigenous vegetation present on site consists of planted harakeke (*Phormium tenax*), located primarily along bunds and shelterbelts. These plantings appear to be intentional and isolated, rather than remnants of any original native forest or scrub communities.

The remainder of the site's vegetation is dominated by exotic species (see Figure 11). These include scattered ornamental and shelterbelt plantings such as Casuarina (*Casuarina* spp.), European oak (*Quercus robur*), walnut (*Juglans regia*), tortured willow (*Salix matsudana* 'Tortuosa'), crack willow (*Salix fragilis*), Japanese privet hedge (*Ligustrum japonicum*), plane trees (*Platanus* spp.), and gum (*Eucalyptus* spp.). Within the Arataki Reserve land a shelterbelt of gum (*Eucalyptus* spp.) are present. These exotic species are generally distributed in small, isolated patches and linear shelterbelts, reflecting their introduction for commercial shelter or aesthetic purposes rather than natural regeneration.

The site's vegetation communities have therefore been largely shaped by human activity, with little to no evidence of native terrestrial ecosystems remaining. The extensive clearance of indigenous vegetation and ongoing horticultural development have resulted in a landscape dominated by modified habitats with low ecological diversity and significance.

Given the site's long history of modification and the near absence of native vegetation, there are no terrestrial vegetation communities of ecological significance present. The surrounding landscape similarly lacks distinctive indigenous vegetation patches, further limiting the ecological connectivity and habitat value of the site. Where feasible and practicable, large exotic ornamental trees—such as walnut and oak—could be retained and integrated into the development proposal.

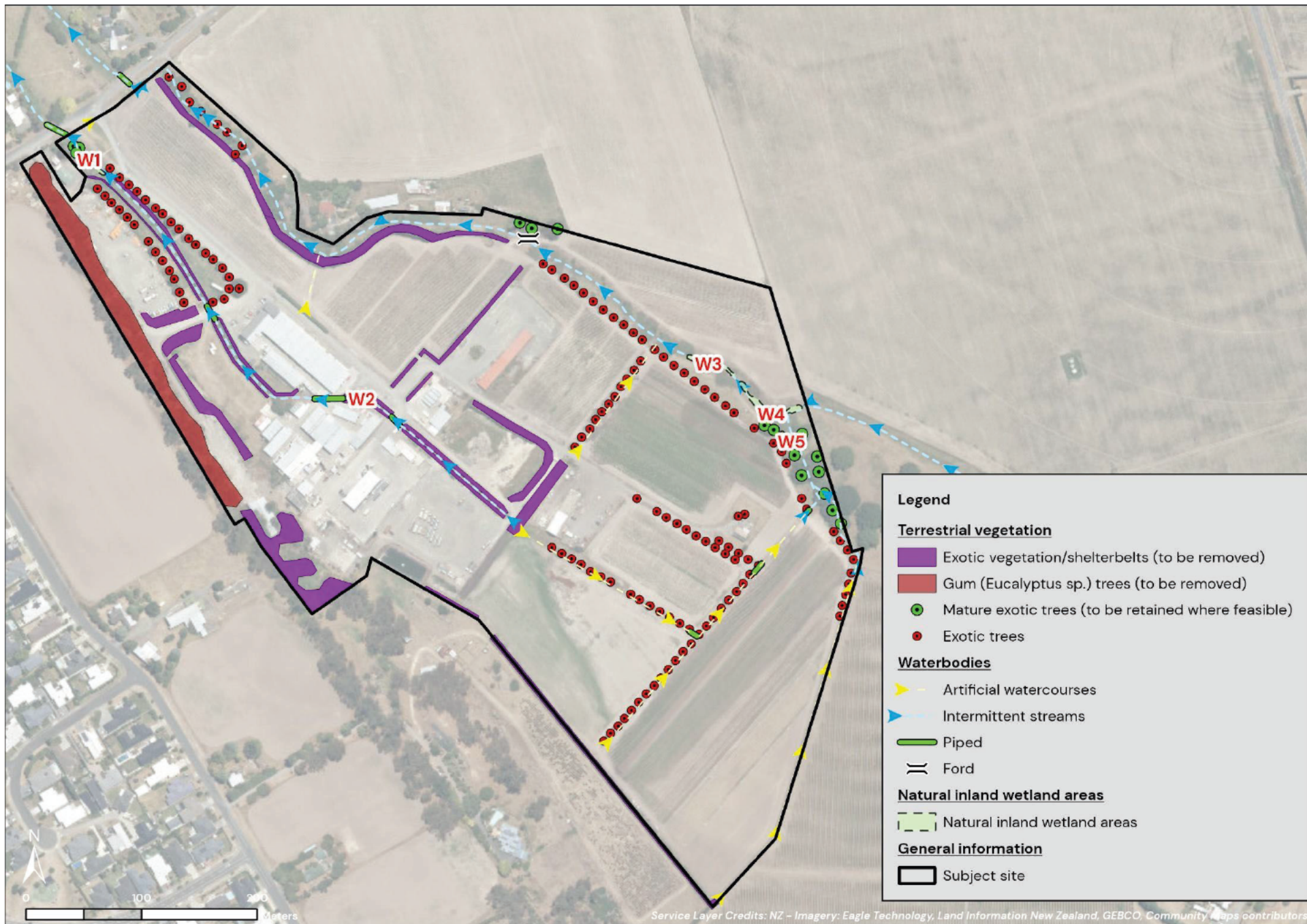


Figure 11: Showing general habitat types noted within the site boundaries

4.2. Natural inland wetland areas – exotic wetlands

The site contains several small, scattered natural inland wetland areas primarily associated with the stream beds of watercourses 1 and 2 (see Figure 12). Wetlands W1 and W2 are considered induced wetlands, formed as a result of culverted crossings that have caused imperfect drainage. This has led to localized standing water, allowing hydrophytic vegetation to establish over time. Wetlands W3 to W5 are located within the stream bed of watercourse 1; however, these are not considered true wetlands. Instead, they reflect ephemeral or intermittent flow conditions within the stream channel rather than self-sustaining wetland systems. Consistent with the overall site condition, these wetland areas are of distinctly low ecological significance and value. They are likely to be periodically disturbed or removed during routine maintenance of the onsite watercourses such as clearing the waterways of accumulated sediment, overgrown vegetation and woody debris. Their presence has been noted primarily to confirm that Watercourses 1 and 2 convey flow intermittently throughout the year, enabling these ephemeral wetland areas to persist temporarily.

They are considered to be representative of novel exotic wetland areas, where non-native hydrophytic species dominate the vegetation assemblage. Key species include creeping bent (*Agrostis stolonifera*), mercer grass (*Paspalum distichum*), grey sedge (*Carex divulsa*), soft rush (*Juncus effusus*), with water pepper (*Persicaria hydropiper*) occurring intermittently.

These wetlands are ephemeral or seasonal, expanding and contracting in response to fluctuations in water levels within the watercourses they are associated with. Given their formation within low-lying areas and drainage features, they are subject to regular disturbance, including routine clearance and maintenance as part of overall stormwater management on site. As a result, they do not exhibit the species composition or ecological characteristics of historic wetlands that once naturally occurred in the area. Instead, they are dominated by common, primarily exotic, wetland-adapted species that have established opportunistically in response to modified hydrological conditions. Their ecological value is assessed as very low.

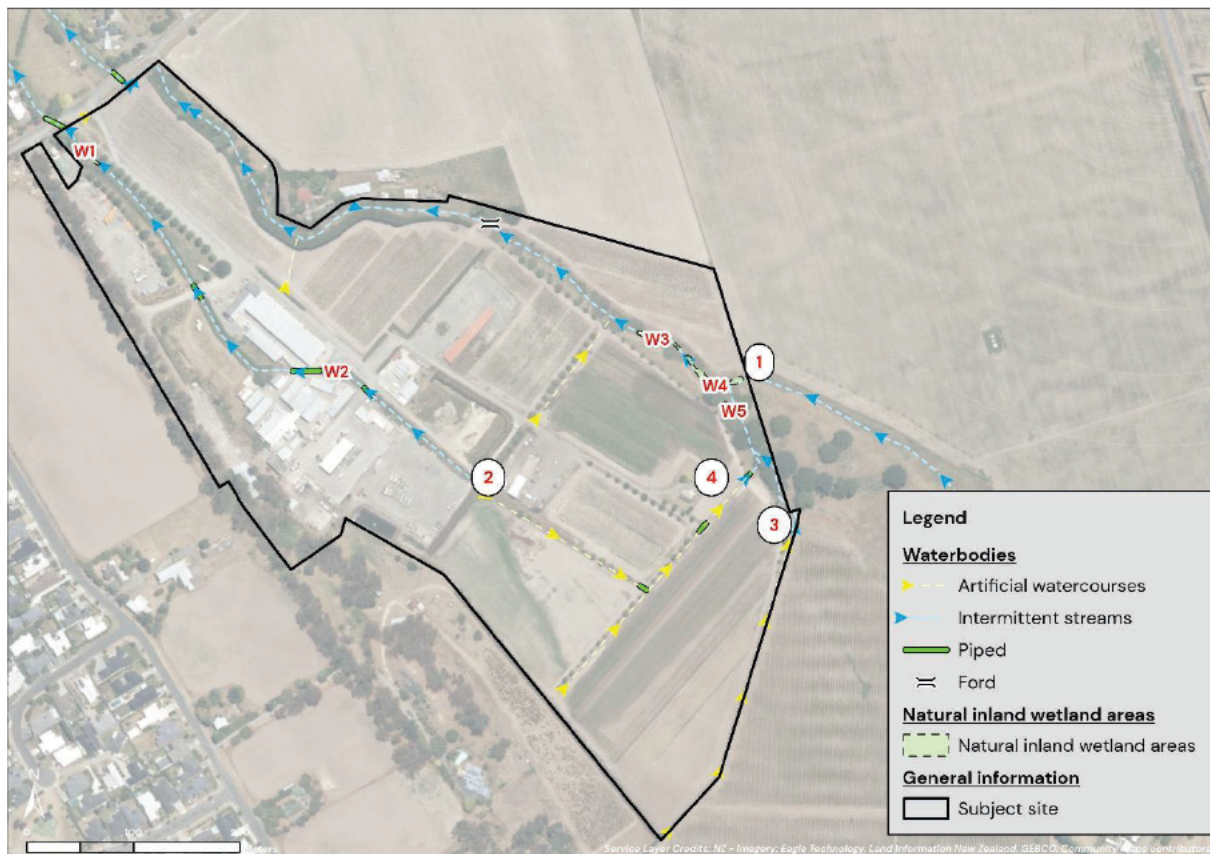


Figure 12: Showing the natural inland wetland areas on site – associated with the stream channel of watercourses 1 and 2



Figure 13: Wetland area W1 associated with watercourse 2 stream channel



Figure 14: Wetland W3 — survey quadrat on the modified streambed of Watercourse 1: an exotic-dominated ephemeral feature rather than a self-sustaining wetland



Figure 15: Wetland W4 — survey quadrat showing the exotic-dominated ephemeral feature on the Watercourse 1 channel bed

4.3. Aquatic

4.3.1. Freshwater habitats

The site contains four watercourses, which can be broadly grouped into two catchments: the northern catchment, comprising Watercourses 1, 3, and 4, and the central catchment, represented by Watercourse 2. All watercourses on the site have been significantly modified from their natural state. The likely original alignment of these historic stream channels has been overlaid with the current alignments, as illustrated in Figure 19. Table 3 below provides brief description of each watercourse.

Several artificial drainage features are also present across the site; however, as these are not of natural origin, they are excluded from further consideration in this assessment. They are artificial in nature, of negligible ecological value and are therefore of no existing or potential ecological value.



Figure 16: Watercourse 1 — representative channel cross-section recorded during the January 2025 survey: the bed and banks are vegetated, with no defined low-flow channel and no surface water



Figure 17: Watercourse 1 — channel overgrown with rank grasses and blackberry and no wetted channel, typical of conditions from the upper catchment to Brookvale Road



Figure 18: Watercourse 2 – channel largely overgrown blackberry and no wetted channel, typical of conditions from the upper catchment to Brookvale Road

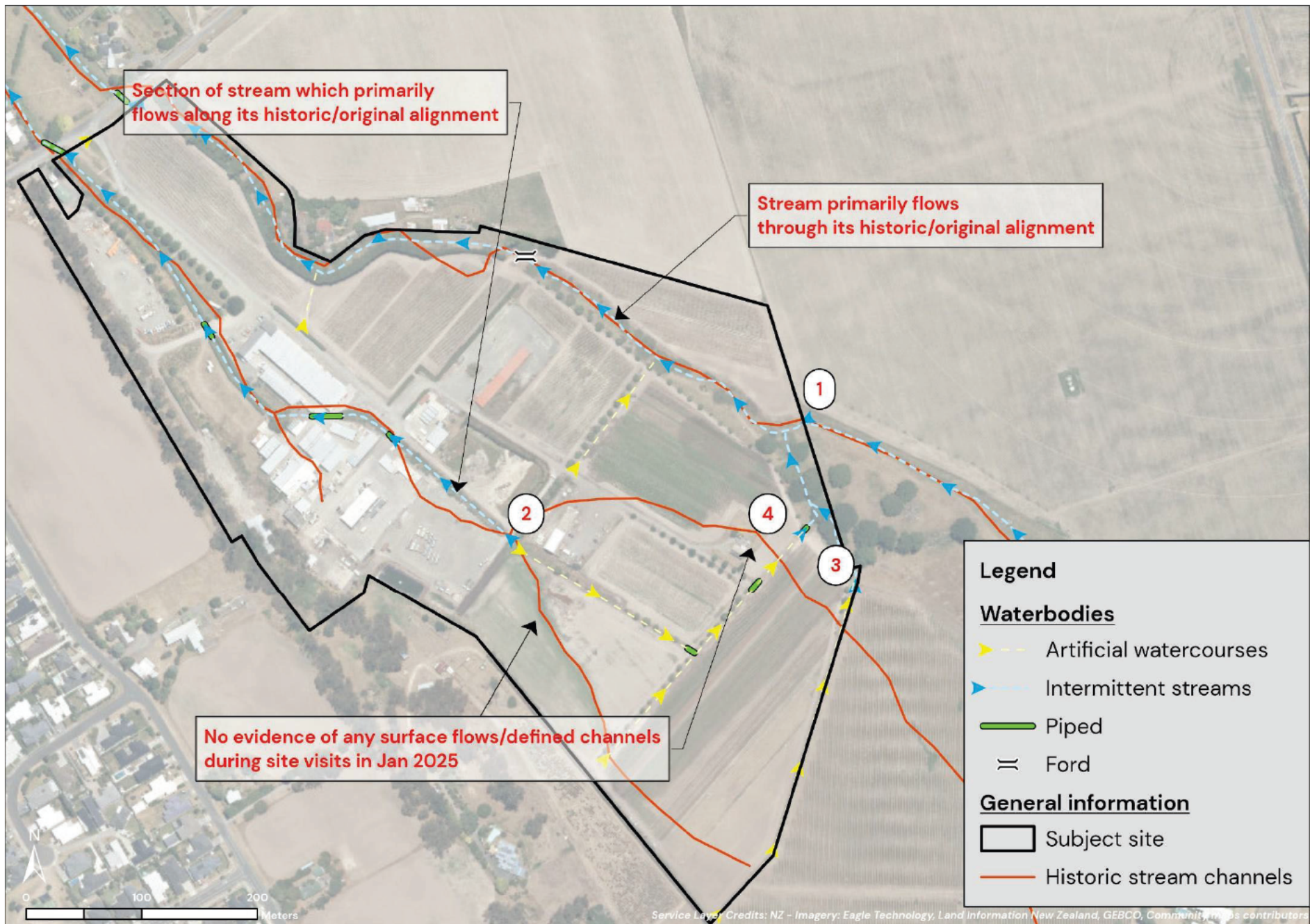


Figure 19: Showing the watercourses on site with black line outlining 'historic watercourse alignment'

Table 3: Watercourse description within site boundaries

ID	Technical definition	Reasoning	Stream length within site boundaries	Characteristics	Ecological value	Representative photo
1	Intermittent stream	Stream bed can be identified, some evidence of historic water flows. Dry during site visit in January 2025	740 m	The stream is highly modified, exhibiting a straightened channel with some isolated wetland areas associated with its bed. During surveys, the streambed was dry, and due to extensive alteration, it was not possible to accurately measure the stream width, as no distinct bed, banks, or channel features were evident. The modified channel width—measured from bank to bank—is estimated to exceed 3 meters; however, this does not reflect the original, natural stream width. The channel is predominantly overgrown with common exotic pest species, primarily a dense stand of blackberry (<i>Rubus fruticosus</i> spp.), with the remaining vegetation consisting mainly of exotic pasture grasses. There is minimal evidence of sustained water flow, suggesting the stream may be dry year-round or only convey water during and shortly after significant rainfall events. Unlikely to provide habitat for any fish species.	Very low	

ID	Technical definition	Reasoning	Stream length within site boundaries	Characteristics	Ecological value	Representative photo
2	Intermittent stream	Stream bed can be identified, some evidence of historic water flows. Mostly dry during site visit in January 2025	484 m	A linear watercourse runs through the central portion of the site, with clearly identifiable bed and banks, suggesting it is likely subject to regular maintenance. Surface water was observed only along the northern section, likely caused by a backwater effect due to an undersized culvert beneath Brookvale Road. The remainder of the watercourse is heavily modified, with multiple stormwater pipe outlets directing runoff into the stream. Shortfin eel (<i>Anguilla australis</i>) were recorded within this watercourse. The average bankfull width is approximately 2 meters; however, this measurement reflects the modified, artificially created channel rather than the original natural stream dimensions.	Very low	
3	Intermittent stream	Stream bed can be identified, some evidence of historic water flows. Dry during site visit in January 2025	82 m	Similar to other watercourses on site, this stream retains no natural characteristics due to ongoing channelisation and its primary use for stormwater drainage. While the streambed was moist underfoot, no continuous surface water was observed, with only occasional pooling in some areas. The average bankfull width is approximately 1.2 meters. The watercourse is in poor condition, lacking riparian vegetation and offering minimal ecological value. It is unlikely to provide suitable habitat for fish species.	Very low	

ID	Technical definition	Reasoning	Stream length within site boundaries	Characteristics	Ecological value	Representative photo
4	Intermittent stream	Stream bed can be identified, some evidence of historic water flows. Dry during site visit in January 2025	93 m	This watercourse likely conveys channelised flows from artificial waterways that have been diverted toward Watercourse 1. The majority of its length is overgrown with common exotic pasture species, with no riparian vegetation present aside from pastoral grasses. While some sections are wet underfoot, the stream is largely dry. The average bankfull width is approximately 1.1 meters. Given its condition, it is unlikely to provide suitable habitat for fish species.	Very low	

4.4. Fauna

4.4.1. Aquatic fauna

The onsite watercourses are considered to provide limited low-quality habitat for indigenous fish species. These channels are primarily managed as functional drains, which involves periodic dredging and the removal of aquatic and riparian vegetation to maintain drainage efficiency. Such maintenance practices significantly reduce habitat complexity, limit the presence of aquatic vegetation, and disrupt natural hydrological conditions—factors that are critical for supporting indigenous fish populations. Additionally, the straightened and uniform nature of these watercourses, combined with limited shading and variable surface water and water quality, further reduces their suitability as habitat for native aquatic fauna.

Irrespective of the above, an aquatic diversity survey was undertaken utilising minnow and henaki traps as well as through eDNA surveys utilising WilderLab test kit for multi-species analysis by DNA metabarcoding (WilderLab 2025) during site visits in January 2025. The combined results of the aquatic diversity survey can be found in Table 1. Please note that the northern stream catchment (Streams 1–3) did not contain any surface water during the site visit, so the aquatic survey results are only representative of stream catchment 2.

It is noted that the only fish species recorded on site during field surveys were shortfin eel (*Anguilla australis*) (see Figure 20). These species are disturbance tolerant and have adapted to various forms of environmental disturbance, such as changes in water flow, ongoing dredging or habitat degradation. It is likely that following cessation of the sites horticultural use, and watercourse ongoing maintenance, and re-naturalising of the watercourses on site, a wider range of indigenous fish species may inhabit the site.

As part of the proposed development, stream works are anticipated, including recontouring and modification of the existing on-site watercourse 1. Accordingly, freshwater fish management measures will be required to avoid adverse effects on aquatic fauna. These measures should be implemented in accordance with the Fauna Management Plan prepared by Stantec (dated 8 May 2026) reference (The Fauna Management Plan) and are expected to include, where necessary, pre-construction fish surveys, salvage and relocation of fish prior to works, and appropriate timing and methodologies for instream works to minimise effects on aquatic fauna.

Table 4: Freshwater fish recorded within the wider stream catchment (combined results from fish and eDNA survey carried out in January 2025)

Scientific name	Common name	Conservation status	Recorded via
<i>Anguilla australis</i>	Shortfin eel	Endemic and Not Threatened	eDNA & fish survey



Figure 20: Only a low number of shortfin eel were recorded within stream catchment 2

4.4.2. Avifauna

Avifauna were recorded on site via opportunistic observations and were limited to common introduced and native bird species such as pukeko (*Porphyrio melanotus*) and spur winged plover (*Vanellus miles*). Sacred kingfishers (*Todiramphus sanctus*) were observed flying along the riparian corridor of the northern stream catchment. Mallard (*Anas platyrhynchos*) and paradise shelduck (*Tadorna variegata*) were observed in the wetland areas extending along the site's southern boundary.

Overall, the diversity of bird species observed was low, reflective of the broader agricultural landscape matrix. This assemblage indicates a typical mix of species that have adapted to urban and rural environments, utilizing the available habitats within the site for foraging and movement.

4.4.3. Lizard fauna

A visual inspection and habitat suitability assessment of areas likely to be utilized by native lizards for sheltering or foraging (e.g., beneath logs, boulders, and manmade objects) was conducted during site visit in January 2025.

DOC BioWeb data revealed records of forest gecko (*Mokopirirakau granulatus*) and *Oligosoma aff. infrapunctatum* "Hawke's Bay" within a 15 km radius of the subject site (Figure 22). The forest gecko typically inhabits native forest environments, favouring mature, undisturbed forests with abundant trees and dense vegetation. It prefers moist, sheltered habitats such as forest canopies, tree trunks, and areas beneath loose bark. While occasionally found in shrublands or

regenerating forest, this species generally avoids highly modified or open habitats. In contrast, *Oligosoma aff. infrapunctatum* "Hawke's Bay" skinks prefer habitats that provide cover, such as forest edges, scrublands, or grasslands with plentiful rocks, logs, or debris for shelter. They are often found in relatively dry environments but require access to shelter and basking sites.

The site currently provides very limited habitat for indigenous lizards due to historical vegetation clearance and ongoing horticultural and agricultural land use. Natural ground- and shrub-layer vegetation has been largely removed, and the land use regime prevents the development of rank grass, shrub, or structural cover. Consequently, shelter, foraging opportunities, and thermal refugia for indigenous lizards are highly constrained, and overall habitat suitability is assessed as low. However, low-quality habitat may persist within some of the existing shelterbelts, offering limited cover or structural complexity.

As a precaution, and given that vegetation removal is required, basic herpetofauna management measures should be implemented prior to any clearance or earthworks to avoid potential effects on indigenous lizards. These measures should follow the draft Fauna Management Plan prepared by Stantec, including pre-clearance inspections and management protocols as required.

While the site does not currently provide optimal habitat, future ecological restoration associated with the proposed development—including riparian and shelterbelt enhancement—may improve habitat suitability for indigenous lizard species over time.

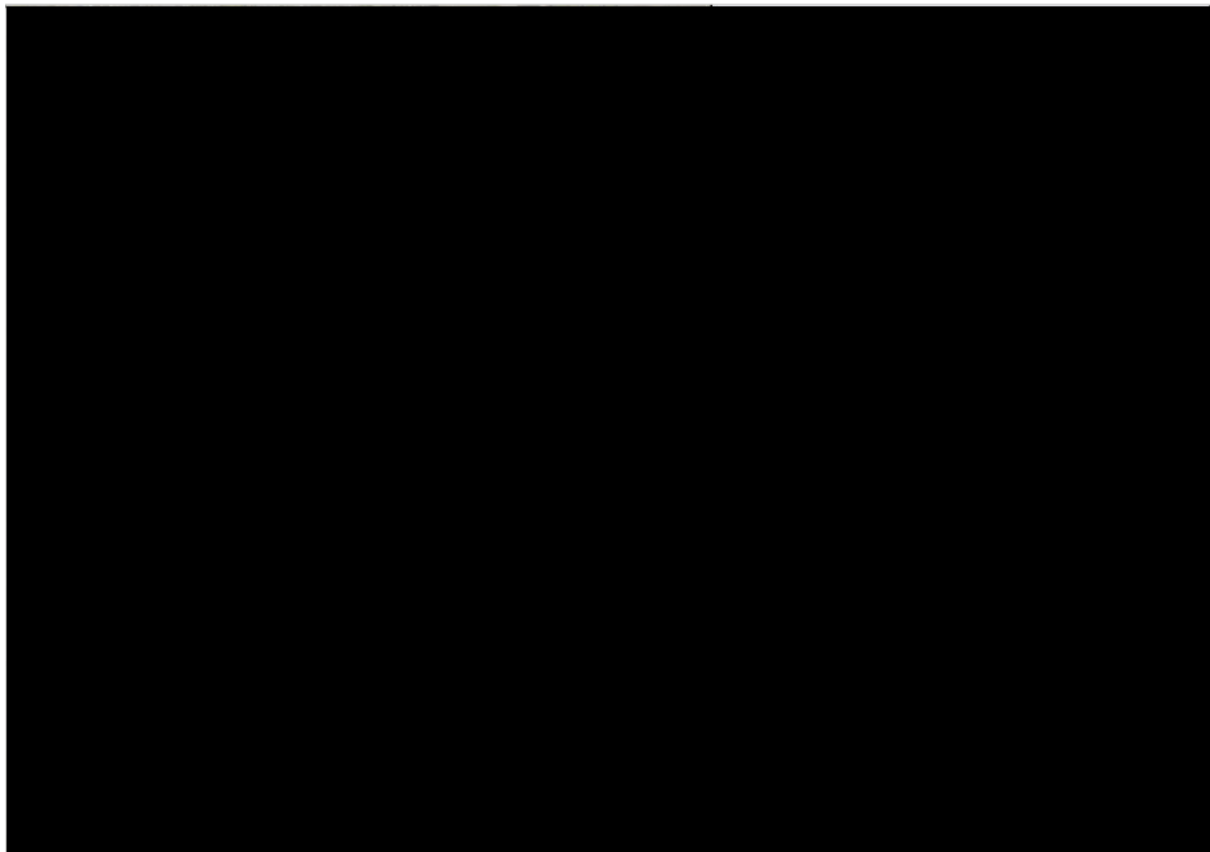


Figure 21: Showing DoC BioWeb database records for lizards within 15-km radius from the subject site

4.4.4. Bats

New Zealand has two native bat species, being the long-tailed bat (*Chalinolobus tuberculatus*: Threatened–Nationally Critical) and the lesser short-tailed bat (*Mystacina tuberculata*: Threatened–Nationally Vulnerable). Native bats are ‘absolutely protected’ under the Wildlife Act (1953).

A search of DOC BioWeb (2026) database shows that the closest confirmed long-tailed and short-tailed bat records are located approximately 13km south-west of the site, but anecdotal evidence have also recorded long tailed bats within 3–5 km from the site at Tukituki River.

In terms of potential bat roosting or commuting habitat, the site is considered to have limited suitability. While some scattered mature exotic trees contain minor potential roost features such as cracks and knot holes, these trees generally lack the structural characteristics typically associated with bat roosting, including well-developed cavities, exfoliating bark, or complex branch architecture that would provide secure shelter and protection. Extensive historical vegetation clearance has substantially reduced the availability of suitable roost trees across the site. Ongoing land use practices have further constrained vegetation regeneration and resulted in an open and exposed landscape, which is generally unfavourable for bat roosting.

Notwithstanding the limited habitat potential, a brief preliminary acoustic bat survey was undertaken due to the presence of scattered mature trees. Passive acoustic monitoring was carried out using AR4 acoustic recorders deployed on site for four consecutive nights during optimal conditions between 27 and 31 January 2025. No long-tailed bat activity was detected during the survey period. However, it is acknowledged that the survey duration was limited and does not provide definitive evidence of absence.

Accordingly, as a precautionary measure, should any future vegetation clearance or tree removal be proposed that involves trees with potential bat roost features, it is recommended that bat management measures are implemented prior to works commencing. These measures should include a high-risk bat roost assessment and, where necessary, additional targeted bat surveys, in accordance with the Fauna Management Plan prepared by Stantec, to ensure that any potential adverse effects on indigenous bats are avoided.

Overall, the proposed development is highly unlikely to result in adverse effects on indigenous bat populations. Potential foraging habitat is expected to be enhanced through the restoration and enhancement of on-site watercourses and associated riparian planting, which will contribute to the establishment of linear landscape corridors facilitating bat movement and connectivity with the wider environment.

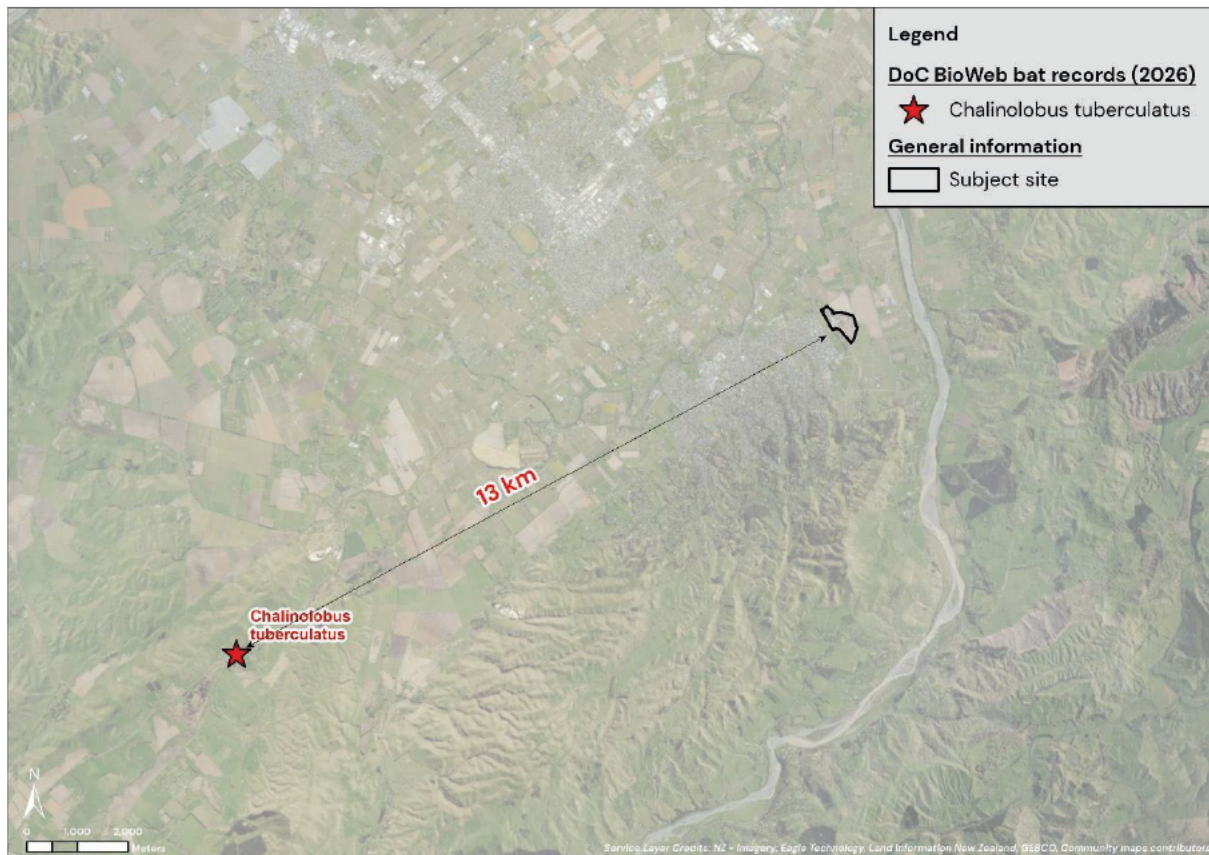


Figure 22: Showing DoC BioWeb database records for bats within 25-km radius from the subject site

4.5. Summary of values

The ecological values of the site have been assessed using the EIANZ (2018) criteria of Representativeness, Rarity/Distinctiveness, Diversity and Pattern, and Ecological Context. Field surveys undertaken in January 2025 confirm that the site has experienced extensive modification, with historical clearance of indigenous vegetation and long-term agricultural and horticultural land use shaping the current landscape.

Terrestrial Habitats:

The site contains no naturally occurring indigenous vegetation. The only native plantings are isolated harakeke (*Phormium tenax*), intentionally planted and not remnants of original ecosystems. The remainder of the vegetation is dominated by exotic species, including walnut (*Juglans regia*), European oak (*Quercus robur*), Casuarina (*Casuarina spp.*), willows (*Salix spp.*), plane trees (*Platanus spp.*), and gum (*Eucalyptus spp.*). Large exotic trees provide structural habitat and, where feasible, should be retained and integrated into ecological enhancement areas to improve habitat complexity and connectivity.

Wetlands and Aquatic Habitats:

The site contains several small, ephemeral wetlands associated with the stream channels of watercourses 1 and 2. These wetlands are dominated by exotic hydrophytic vegetation such as creeping bent (*Agrostis stolonifera*), mercer grass (*Paspalum distichum*), grey sedge (*Carex divulsa*), water pepper (*Persicaria hydropiper*), and soft rush (*Juncus effusus*). Wetlands W3–W5 reflect intermittent flows rather than self-sustaining wetland systems. All watercourses have

been extensively channelized, modified, and maintained for drainage purposes, resulting in very low ecological value. Proposed site development includes recontouring of these watercourses, and freshwater fish management measures will be implemented in accordance with the Fauna Management Plan prepared by Stantec. These measures are expected to include pre-construction surveys, salvage and relocation of fish, and the timing of instream works to minimise potential effects on aquatic fauna.

Avifauna:

Bird surveys recorded low diversity typical of modified rural landscapes, including common native and introduced species such as pūkeko (*Porphyrio melanotus*), spur-winged plover (*Vanellus miles*), sacred kingfisher (*Todiramphus sanctus*), mallard (*Anas platyrhynchos*), and paradise shelduck (*Tadorna variegata*). No threatened or at-risk species were observed.

Herpetofauna:

No indigenous reptiles were recorded, and habitat suitability for lizards is very low due to historical vegetation clearance and ongoing cropping practices. As a precautionary measure, basic herpetofauna management will be implemented prior to vegetation clearance or ground disturbance in accordance with the Fauna Management Plan prepared by Stantec. This will include pre-clearance inspections and management protocols where necessary. Future ecological restoration may increase habitat suitability in the enhancement areas.

Bats:

No evidence of roosting or foraging bats was detected. Scattered exotic trees with minor features such as cracks or knot holes do not provide suitable roosting habitat. The closest confirmed records of long-tailed and short-tailed bats are over 10 km from the site. Any proposed removal of trees with potential roosting features will trigger high-risk bat assessments and, if required, targeted surveys and mitigation measures under the Fauna Management Plan prepared by Stantec. Riparian restoration associated with the development will enhance potential foraging and commuting habitat.

Freshwater fish:

Shortfin eel (*Anguilla australis*), a disturbance-tolerant species, was the only fish recorded during field surveys. The site's streams are highly modified, which currently limits habitat suitability for a wider range of native fish species. Potential adverse effects may arise during earthworks and stream modification activities, particularly through sedimentation, habitat disturbance, and temporary dewatering and diversion. To address these risks, all works within or adjacent to watercourses will be undertaken in accordance with a Fauna Management Plan prepared by Stantec. This will include measures such as pre-construction fish surveys (where water is present), salvage and relocation of indigenous fish to suitable nearby habitats, and the humane disposal of any pest fish species encountered. Works will also be timed to avoid sensitive periods where practicable, and erosion and sediment control measures will be implemented to maintain water quality.

Overall Ecological Value:

The site is heavily modified, with very low to low ecological value across terrestrial, aquatic, and fauna components. Opportunities exist to improve ecological function and habitat quality

through targeted restoration and integration of retained exotic trees into enhancement areas, along with the implementation of precautionary and management measures outlined in the Fauna Management Plan prepared by Stantec.

Table 5: Summary of terrestrial and aquatic ecological values across the site

Feature	Representativeness, Rarity/distinctiveness, Diversity and Pattern, Ecological Context:	Value
Terrestrial habitat/vegetation	No naturally occurring indigenous vegetation. Only planted vegetation present. Dominated by exotic species; retain large trees where feasible.	Very Low
Aquatic habitat/vegetation	Network of highly modified intermittent streams and artificial drainage channels. Wetlands formed from altered hydrology dominated by exotic hydrophytic species. Subject to regular disturbance. Overall low ecological significance but considered as potential restoration and enhancement opportunity.	Very Low
Avifauna	Low diversity and abundance; typical of modified rural environments. Species observed include common native and introduced birds such as pukeko, spur-winged plover, sacred kingfisher, mallard, and paradise shelduck. No threatened or at-risk species recorded.	Low
Herpetofauna	No indigenous herpetofauna recorded. Habitat considered to be of low optimal suitability due to intensive horticultural land use. Potential habitat could improve with future restoration.	Very Low
Bats	No evidence of roosting or foraging bats detected during surveys. Limited potential roosting habitat on site. Closest records are over 10 km away. Site unlikely to support bats.	Very Low
Ichthyofauna	Only shortfin eel (<i>Anguilla australis</i>) recorded, a disturbance-tolerant species. Streams highly modified, limiting habitat suitability for other native fish. Potential for improved habitat with future watercourse restoration.	Low
Overall	Highly modified landscape with very low to low ecological values. Opportunities exist for ecological enhancement.	Very Low to Low

5.0 ASSESSMENT OF ECOLOGICAL EFFECTS

5.1. Potential Ecological Effects

Fast-track consent applications are required to consider potential adverse ecological effects and ensure that measures are put in place to avoid, remedy, mitigate, or compensate actions to ensure that the site development does not result in adverse ecological effects or a net loss of ecological value. Where possible, measures are to be put in place to result in positive ecological outcomes or net ecological benefit.

The following sections describe the potential ecological effects based on the general layout and location plan shown in the Brookvale Green Masterplan prepared by B&A, together with the Engineering Drawings and Infrastructure Report prepared by Maven. The development layout has been comprehensively designed to, where feasible and practicable, avoid potential adverse effects on indigenous habitats and species within the site boundaries. Where avoidance alone is not possible, the effects management hierarchy has been applied, progressing through minimisation and mitigation. The design also provides opportunities for ecological enhancement, enabling the restoration and improvement of onsite terrestrial and aquatic habitats as part of the proposal.

An assessment of potential ecological effects and corresponding mitigation measures is provided in the following sections.

5.1.1. Potential effects on watercourses

The project will include construction of the proposed realignment of Watercourse 1, with impacted reach across 2 separate locations within watercourse 1 being 355 m in total length with the new channel length being approximately 356 m in length (see Figure 23), and the installation of new stream crossings over Watercourse 2 which could result in temporary effects on watercourses. These may include short-term sedimentation, disturbance of aquatic habitats, and minor disruption to terrestrial and aquatic fauna. Removal of vegetation and earthworks associated with realignment and crossing construction could also temporarily reduce habitat availability. Existing crossings that are no longer required will be removed, and the stream channels reinstated as open flows, which may temporarily disturb sections of the watercourse. With the implementation of standard sediment and erosion controls, and fauna management measures such as fish salvage and relocation, where necessary, and lizard salvage and relocation (if required) during vegetation clearance, these short-term effects are expected to be low, localised, and transient.

Despite these temporary impacts, the proposed works are anticipated to deliver substantial long-term ecological benefits. The realignment of Watercourse 1 allows the creation of a continuous ecological restoration corridor, improving hydrological function and the reliability of water conveyance, with greater in-stream habitat complexity anticipated to develop over time through natural channel processes rather than engineered in-stream structures. Riparian

revegetation planting along Watercourses 1 and 2 will stabilise banks, increase shading, improve water quality, and enhance both aquatic and terrestrial habitats. Retention of larger exotic trees, where practicable, will provide ongoing shade, structural habitat, and ecological connectivity during the establishment of native vegetation. Reinstatement of open channels in place of redundant crossings will improve hydrological connectivity and reduce habitat fragmentation.

The scale of in-stream improvement should be considered in the context of the highly degraded baseline. The existing channel is heavily modified and, as recorded during the January 2025 surveys, was largely dry and conveyed little or no surface water, providing negligible in-stream open water habitat in their current state.

Consistent with the baseline observations, the realigned watercourse 1 portions will likely only ephemeral flows are expected across the great majority of the year, with meaningful in-channel conveyance anticipated only during high-intensity rainfall events. It would therefore be neither realistic nor ecologically appropriate to install fixed, engineered in-stream structures within a channel that is expected to be dry, or only ephemerally wetted, for the majority of the time. The design accordingly prioritises a naturalised, densely planted corridor in which physical in-stream habitat is allowed to develop over time through natural fluvial processes, rather than relying on hard-engineered features.

The realigned reach of Watercourse 1 is of comparable length to the existing impacted reach (approximately 356 m proposed against approximately 355 m existing), and no material increase in channel sinuosity or meandering is proposed; the anticipated ecological uplift is therefore not reliant on increased planform complexity. It is instead anticipated that, once wetland/riparian vegetation establishes, the channel will progressively develop greater physical heterogeneity through natural fluvial deposition and erosion processes over time. The predicted improvement in stream ecological value should accordingly be understood as a realistic long-term trajectory driven by shading and riparian function, rather than the immediate creation of a structurally complex natural channel.

Overall, the combined effect of realignment, riparian planting, and habitat restoration is expected to strengthen ecological function, increase habitat availability, and enhance the ecological value of both streams and their margins. With careful application of mitigation measures, adverse effects on water quality, aquatic habitats, or hydrological function are mitigated, while long-term outcomes deliver net ecological gain and improved landscape-scale integration.

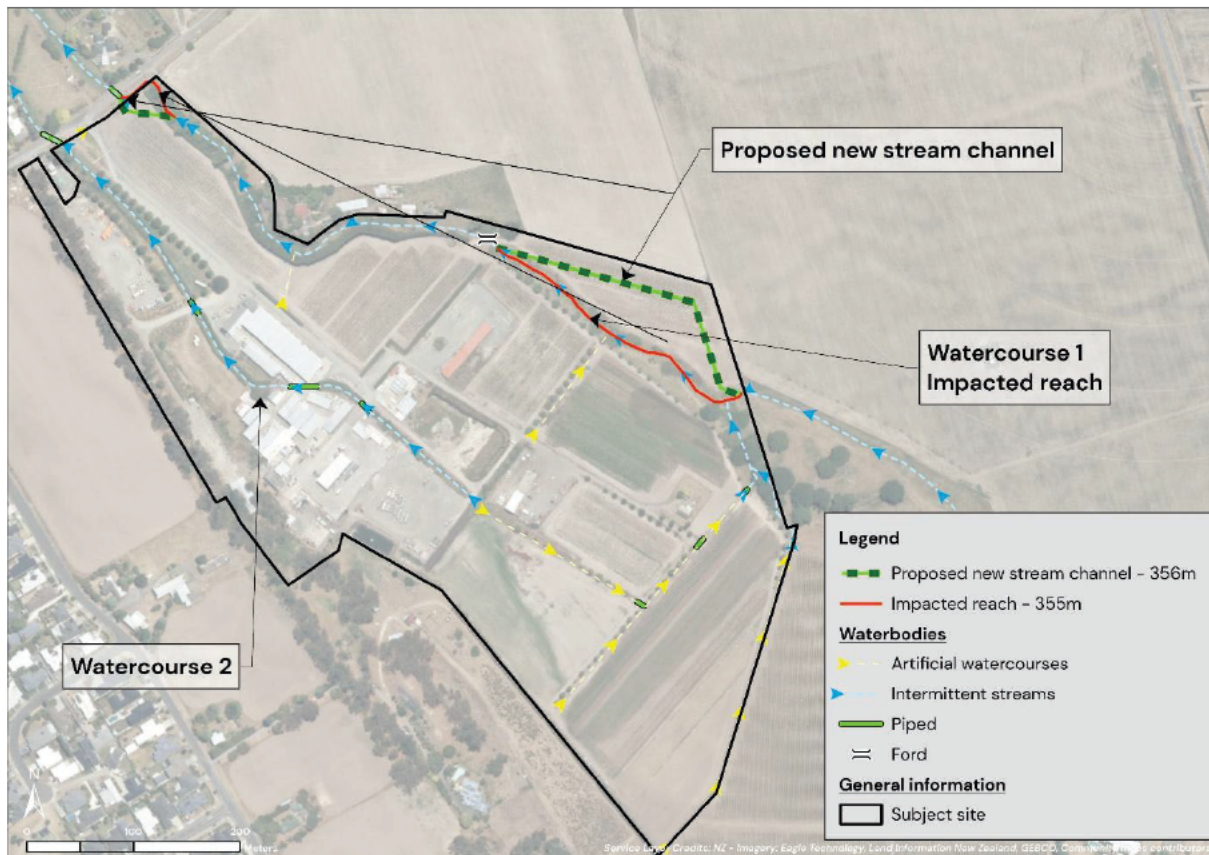


Figure 23: Showing the proposed new stream alignment of Watercourse 1

5.1.2. Effects associated with culvert upgrade

Any new structures to be installed within the site boundaries to facilitate the development will be designed and constructed in accordance with the specifications detailed under Regulation 70 of the National Environmental Standards for Freshwater 2020.

The proposal includes the upgrade of existing culvert crossings beneath Brookvale Road, which receive flows from the two primary on-site stream channels. Existing infrastructure comprises a 1.4 m × 1.1 m box culvert at the head of the eastern channel (Stream 1), and 400 mm and 800 mm diameter culverts at the head of the western channel (Stream 2). While no formal downstream capacity constraints have been identified, hydraulic modelling undertaken by Maven indicates that upgrades to these culverts are required to accommodate the 100-year ARI storm event (inclusive of climate change allowances) and to ensure adequate conveyance and freeboard for the proposed development.

The proposed culvert upgrades are therefore intended to improve hydraulic performance and maintain consistency with the site-wide flood management strategy, which seeks to mimic pre-development flow behaviour and avoid any exacerbation of upstream or downstream flood risk. This includes ensuring that overland flow paths are maintained, and that floodwaters can be safely conveyed beneath Brookvale Road without increasing flood hazard elsewhere.

Culvert design will be informed by detailed hydraulic modelling and will include appropriate sizing, invert level alignment with existing streambeds, and integration with upstream and

downstream channel works. While full containment of extreme flood events within culvert structures is not anticipated, the overall stormwater and flood management approach ensures that exceedance flows are appropriately managed via overland flow paths and open channels, consistent with the broader engineering design.

All culvert upgrade works will be undertaken in accordance with the National Environmental Standards for Freshwater 2020, including requirements to maintain fish passage, minimise bed disturbance, avoid perched outlets, and preserve natural flow characteristics as far as practicable.

From an ecological perspective, the proposed culvert upgrades are considered to present a low to moderate level of risk, primarily associated with temporary disturbance during construction and potential modification of in-stream habitat. These effects will be appropriately managed through implementation of erosion and sediment controls, timing of works to avoid sensitive periods, and adherence to a Fauna Management Plan.

In the longer term, the upgrades are expected to provide a net benefit by improving hydraulic connectivity and reducing the potential for upstream ponding. This will be complemented by stream enhancement measures, including riparian planting, which will support ecological function, improve habitat values, and contribute to the overall resilience of the aquatic environment.

5.1.3. Potential effects on natural inland wetland areas (NES-FW)

Several scattered natural inland wetlands are present within the site boundaries, primarily associated with the existing stream channels of Watercourses 1 and 2. These wetlands are largely ephemeral and opportunistic, forming in low-lying areas where periodic ponding allows hydrophytic vegetation to establish. Wetlands W1 and W2 have developed in response to culverted crossings and imperfect drainage, while W3 to W5 reflect intermittent or ephemeral flow within the stream bed rather than self-sustaining wetland systems. Vegetation is dominated by exotic species such as creeping bent (*Agrostis stolonifera*), mercer grass (*Paspalum distichum*), grey sedge (*Carex divulsa*), water pepper (*Persicaria hydropiper*), and soft rush (*Juncus effusus*), and these wetlands are therefore assessed as being of very low ecological value.

The proposed realignment of Watercourse 1, approximately 356 m in length, and the installation of new stream crossings over Watercourse 2 may cause temporary effects on these wetlands, including short-term changes to water levels, sedimentation, and disturbance of vegetation and aquatic habitats. Earthworks, vegetation removal, and channel reinstatement associated with the realignment and removal of redundant crossings could temporarily affect the hydrology and physical structure of the wetlands, particularly in areas directly linked to stream flow. Wetlands W3 and W4 are located within the proposed diversion footprint and will be temporarily disturbed during construction (see Figure 24). Wetlands W3 and W4 are approximately 185 m² and 252 m² in size, respectively, with a combined area of approximately 437 m². It is noted, however, that both wetlands are directly associated with the stream channel rather than functioning as independent wetland systems. Following completion of the realignment works, extensive

riparian and wetland margin planting will be undertaken along the restored Watercourse 1, effectively reinstating these wetland areas. As such, the disturbance will be temporary, and the restored system is expected to provide enhanced ecological and habitat values.

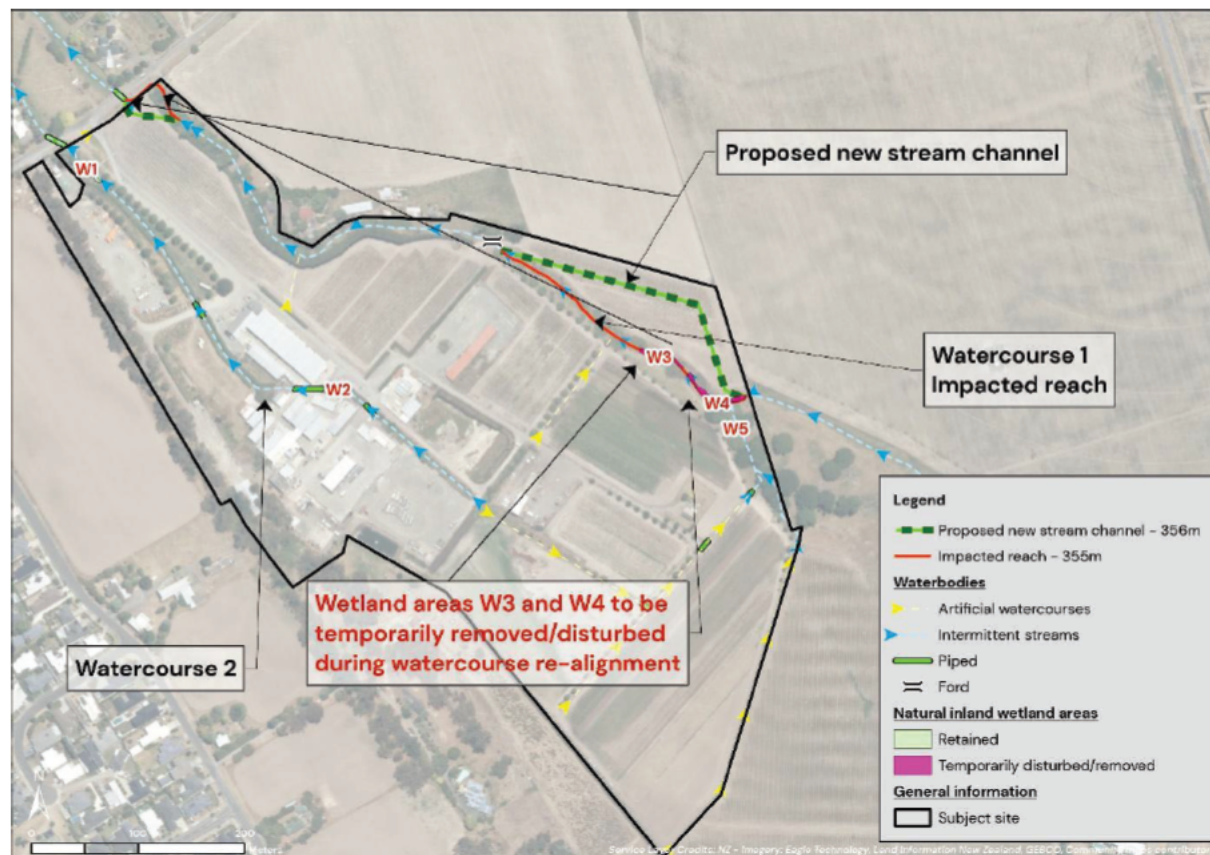


Figure 24: Wetland areas W1, W2 and W5 will be retained, and wetland areas W3 and W4 will be temporarily disturbed/removed during watercourse re-alignment

All riparian margins along Watercourses 1 and 2 will be revegetated with appropriate native species, creating a cohesive riparian/wetland-margin system that strengthens ecological connectivity along Watercourse 1. Standard sediment and erosion controls, combined with fauna management measures such as fish salvage, relocation where required, and lizard protection during vegetation clearance, will minimise short-term impacts on wetlands and associated aquatic and terrestrial fauna.

In the longer term, the works are expected to enhance wetland resilience and overall ecological function by stabilising stream banks, improving riparian structure, increasing shading, and providing greater habitat complexity. Any potential effects on wetland areas are considered temporary and are primarily associated with the diversion of Watercourse 1. Following construction, wetlands will be reinstated along the new channel margins, and the restored riparian and wetland-margin system will deliver improved habitat quality, strengthened ecological connectivity, and long-term ecological benefits across the site.

This activity is considered to fall under regulation 54 of NES-FW (2020). The works are necessary to achieve the functional design of the development and will result in a re-established stream channel that continues to provide water conveyance and drainage functions. In addition,

wetland margins alongside the realigned channel will be re-established and extended through targeted revegetation planting (approximately 4.07 ha of riparian planting), creating habitat of higher ecological value, diversity, and structural complexity than currently exists. Given the low existing ecological value, and functional integration of the existing wetlands with the stream environment, this approach is considered the most appropriate and consistent with NES-FW provisions for non-complying activities.

5.1.4. Proposed stormwater management, outlet and rip-rap structures

It is understood that a suite of stormwater management devices, including one wetland basin with extended detention, a dry basin, raingardens, and enlarged conveyance channels, are proposed to service the development, as outlined in the engineering design documentation and overlaid in Figure 25. These devices will provide both stormwater treatment and attenuation, with runoff directed via a reticulated network generally aligned with proposed road corridors and discharging to the existing on-site stream channels.

All stormwater infrastructure will be designed in accordance with the NZS 4404:2010 and the Hastings District Council Engineering Code of Practice 2020. The primary stormwater network will be designed to convey up to the 1 in 5-year ARI rainfall event within pipes, with exceedance flows managed via overland flow paths directed toward receiving environments.

Stormwater attenuation will be achieved through integrated wetland and extended detention design, ensuring that post-development discharge rates do not exceed pre-development flows for the 2- and 10-year ARI events, and are limited to up to 80% of pre-development flows for the 100-year ARI event. This approach is consistent with best practice guidance and reflects outcomes sought by regional planning frameworks, including the Hawke's Bay Regional Council Plan Change 9. Given local geotechnical constraints, soakage is not feasible, and accordingly the wetland basin will incorporate a lined base to prevent infiltration.

While the majority of stormwater devices are located outside the 10 m setbacks from identified streams and wetland habitats, some associated infrastructure (e.g. outlet structures and rip-rap aprons) will encroach within these setbacks. These elements will be designed to avoid works within the active stream bed, terminating at or above the stream banks to enable controlled discharge. Appropriate erosion and sediment controls as well as spill management controls will be implemented during construction and operation.

Runoff from impervious surfaces, including new road corridors, will be directed to treatment devices such as wetlands and raingardens prior to discharge. These systems will improve water quality through filtration and biological uptake processes, consistent with low impact design principles outlined in the Hawke's Bay Regional Council Waterway and Wetland Design Guidelines 2009.

All stormwater devices, including wetland basins and raingardens, will be appropriately revegetated in accordance with the Landscape Management Plan prepared by LA4. Planting will utilise indigenous species to support ecological function, enhance water quality treatment, and

provide bank stabilisation and habitat values. Where practicable, engineered features such as rip-rap outlets will be softened through naturalisation with planting.

Vegetation clearance required to facilitate stormwater infrastructure will be managed in accordance with a Fauna Management Plan. Although vegetation within these areas is generally of low ecological value (predominantly exotic pasture or scrub), it provides some riparian function, including shading, bank stability, and habitat connectivity.

Stormwater discharge within proximity to mapped wetlands (including Wetland W2) will be appropriately managed through erosion, sediment, and engineering controls, with no significant adverse effects on downstream wetland features anticipated.

Overall, the proposed stormwater management approach maintains pre-development hydrological regimes, supports water quality improvement, and integrates ecological enhancement measures. The level of ecological effect, with mitigation in place, is considered to be low

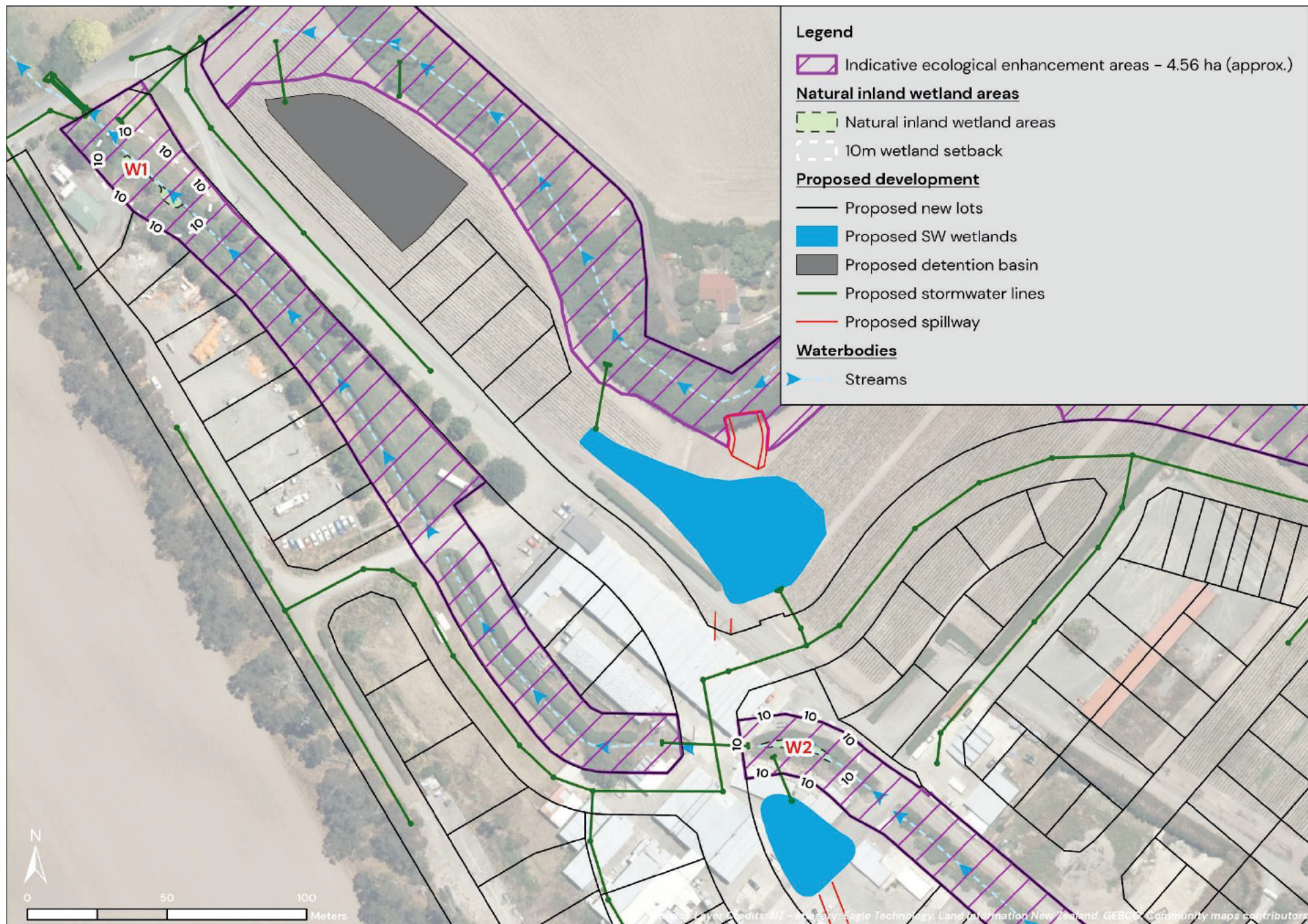


Figure 25: Showing the proposed SW infrastructure in proximity to streams and wetland areas

5.1.5. Potential effects on terrestrial vegetation

The majority of the site is comprised of existing orchard areas, sheds and/or pasture, and as such, these areas are considered to be of distinctively low ecological value. These modified landscapes provide minimal habitat for indigenous flora and fauna, and their ecological contribution is limited. Consequently, vegetation management within these areas presents relatively low risk to the overall ecological integrity of the site.

The remaining vegetation effects associated with the proposed development fall into two main categories:

- Exotic scrub, treeland, shelterbelt, and orchard clearance: Clearance of these vegetation types is required to facilitate the site development footprint. Most of these plantings are non-native and provide limited habitat value for indigenous species. This includes removal of the mature eucalyptus (gum) stand within the adjoining Arataki Reserve land, which is exotic and of low indigenous ecological value.
- Exotic weed clearance within riparian enhancement areas: Targeted removal of invasive species, primarily blackberry (*Rubus fruticosus*), is necessary to prepare proposed riparian areas for indigenous restoration planting. Clearing these weeds reduces competition, increases light availability, and creates suitable conditions for native plant establishment and long-term growth. This approach will enhance the ecological values of the reserves, improving habitat for native fauna and supporting the successful development of resilient indigenous vegetation communities.

All vegetation clearance and management activities will be carried out in strict accordance with the Fauna Management Plan prepared by Stantec. The plan outlines measures to protect lizards, bats, birds, and fish where required, ensuring that adverse effects on fauna present within the site are avoided or minimised wherever practicable.

5.1.6. Potential fauna effects

The potential effects of the proposed development on fauna are expected to be low overall, reflecting the already modified nature of much of the site, the limited extent of indigenous habitat, and the presence of largely common and adaptable species. Fauna effects are discussed below by group, consistent with Section 4.4.

Freshwater fish: The proposed realignment of Watercourse 1 and associated stream works may cause short-term disturbance to instream habitats, including temporary increases in sedimentation and minor changes in water levels. With appropriate sediment and erosion controls and fish salvage and relocation where required, these effects are expected to be low, localised, and transient. The restored stream and riparian margins will provide improved aquatic habitat over the longer term.

Birds: Observed bird communities are dominated by common introduced species (e.g., house sparrow, myna, blackbird), alongside widespread native species such as pūkeko (*Porphyrio melanotus*). Potential effects on avifauna are expected to be low, as most species are mobile

and can avoid construction disturbance. Vegetation removal required for site development and preparation of riparian and wetland–margin planting areas will be undertaken, where practicable, outside peak bird breeding periods or following pre-clearance checks to minimise direct mortality. Over the longer term, ecological planting will enhance foraging and nesting habitat for native birds.

Lizards: No native lizards have been recorded within the immediate development footprint, and habitat quality is currently low. Some potential habitat exists within onsite shelterbelts. While the likelihood of encountering lizards is low, it cannot be fully discounted. Vegetation clearance and earthworks in areas of potential habitat will follow lizard-sensitive protocols. A Fauna Management Plan has been prepared by Stantec and will guide pre-clearance surveys, salvage, and relocation as required.

Bats: The site is located approximately 13 km north-east of confirmed long-tailed bat (*Chalinolobus tuberculatus*) records. No bats have been recorded onsite to date, although some mature exotic trees may provide potential roosting opportunities. Bats are fully protected under the Wildlife Act 1953. As the proposed works recommend removal of exotic trees for indigenous revegetation, a Fauna Management Plan has been prepared by Stantec which shall implemented by a suitably qualified bat ecologist prior to the clearance of any exotic tree with a DBH >15 cm.

A Fauna Management Plan has been prepared by Stantec, detailing species-specific mitigation measures and construction protocols. With the implementation of these measures, potential adverse effects on fauna are expected to be very low, with no significant residual effects anticipated. In the longer term, the proposed ecological enhancement planting—including riparian and wetland–margin restoration along Watercourse 1 and 2—will improve habitat quality, connectivity, and ecological function, contributing to sustained benefits for native fauna across the site.

5.1.7. Potential effects on the Arataki Reserve land

The application area includes the adjoining Arataki Reserve parcel (Lot 3 and Lot 4 DP481968), a narrow reserve strip of approximately 10 m width along the western site boundary. The reserve works comprise removal of the existing mature eucalyptus (gum) stand and associated vegetation, earthworks and battering along the majority of the reserve frontage to form the road corridor and its interface with the development, construction of retaining walls where required, extension of the public road into the reserve for a short section near Brookvale Road, installation of associated infrastructure and services within the road corridor, and revegetation of the reserve with indigenous tree and shrub species as described under reporting prepared by LA4.

Consistent with the assessment of the wider site, the reserve strip supports no indigenous vegetation of ecological significance. Its vegetation cover is limited to the exotic eucalyptus stands. Removal of this vegetation therefore presents a low risk to indigenous biodiversity. The principal ecological consideration associated with the reserve works is the potential for the mature eucalyptus to provide habitat for indigenous fauna, in particular roosting habitat for long-tailed bats and nesting habitat for birds. To manage this, the Fauna Management Plan

prepared by Stantec also covers the vegetation removal and associated fauna management works within Arataki Reserve land.

The reserve works are located outside the bed and margins of Watercourses 1 and 2 and the mapped natural inland wetland areas, and are not connected to the natural flow regime of these features. No direct effects on freshwater habitats are anticipated. Earthworks, battering and retaining wall construction within the reserve will be undertaken in accordance with standard erosion and sediment control measures to manage the potential for sediment-laden runoff during construction.

Overall, the ecological effects of the reserve land works are considered low and are able to be appropriately avoided or mitigated through the measures set out above. The replacement of the exotic eucalyptus stand with indigenous tree and shrub planting will, over time, improve the indigenous vegetation cover and habitat value of the reserve strip, contributing to a net ecological gain consistent with the enhancement outcomes proposed across the wider site.

6.0 FRESHWATER OFF-SETS

6.1. Baseline Wetland Conditions

Five natural inland wetlands (W1–W5) are present on site, all associated with the modified channels of Watercourses 1 and 2. They were delineated during site visits in January 2025 using the Ministry for the Environment Wetland Delineation Protocols (2022). All five wetlands are of very low ecological value — they are ephemeral or seasonal, dominated by exotic hydrophytic species, and are directly associated with modified drainage channels subject to ongoing stormwater maintenance. Table 6 summarises the baseline conditions.

Table 6: Baseline condition of natural inland wetland areas on site

Wetland ID	Area (m ²)	Type	Dominant Vegetation	Ecological Value	Status
W1	58 m ²	Induced wetland	<i>Agrostis stolonifera</i> , <i>Paspalum distichum</i> , <i>Juncus effusus</i>	Very Low	RETAINED
W2	63 m ²	Induced wetland	<i>Agrostis stolonifera</i> , <i>Juncus effusus</i> , <i>Persicaria hydropiper</i>	Very Low	RETAINED
W3	185 m ²	Ephemeral streambed	<i>Agrostis stolonifera</i> , <i>Paspalum distichum</i> , <i>Carex divulsa</i>	Very Low	TEMPORARILY DISTURBED
W4	252 m ²	Ephemeral streambed	<i>Agrostis stolonifera</i> , <i>Juncus effusus</i> , <i>Persicaria hydropiper</i>	Very Low	TEMPORARILY DISTURBED

W5	141 m ²	Ephemeral streambed	<i>Juncus effusus</i> , <i>Agrostis stolonifera</i>	Very Low	RETAINED
----	--------------------	---------------------	--	----------	----------

6.2. Wetland Offset

The proposed realignment of Watercourse 1 requires the temporary disturbance of Wetlands W3 and W4 (combined area approximately 437 m²). Both wetlands are exotic-dominated ephemeral features directly associated with the modified streambed; they are not self-sustaining wetland systems. Wetlands W1, W2, and W5 (combined area approximately 262 m²) are retained and protected throughout construction.

Wetland offset is achieved through reinstatement of disturbed wetland features within the realigned channel margins and the creation of new wetland margin habitat of substantially higher ecological value (see Figure 26 which outlines the proposed wetland off-set re-instatement areas identified in the LA4 landscape plan as bank toe/water's edge mix). The new wetland margin will be indigenous-dominated and structurally diverse. Table 7 sets out the offset summary.

Table 7: Wetland offset — areas lost versus areas created

Offset Component	Area (m ²)	Notes
Wetland area temporarily disturbed (W3 + W4)	-437 m ²	Exotic-dominated ephemeral wetlands of very low ecological value.
Wetland margin reinstatement	+6,439 m ²	Indigenous sedge-dominated wetland margin (<i>Carex geminata</i> , <i>C. virgata</i> , <i>Cyperus ustulatus</i> , <i>J. edgariae</i>) along new channel alignment and retained watercourses
NET WETLAND GAIN	+6,002 m ²	Offset ratio 14:1 — substantially exceeds minimum like-for-like replacement.

The offset ratio of greater than 14:1 substantially exceeds the minimum like-for-like replacement requirement. The proposal is considered to achieve no net loss of natural inland wetland extent and to deliver a net gain in wetland ecological value, consistent with Regulation 54 of the NES-FW 2020 and the NPS-FM 2020.

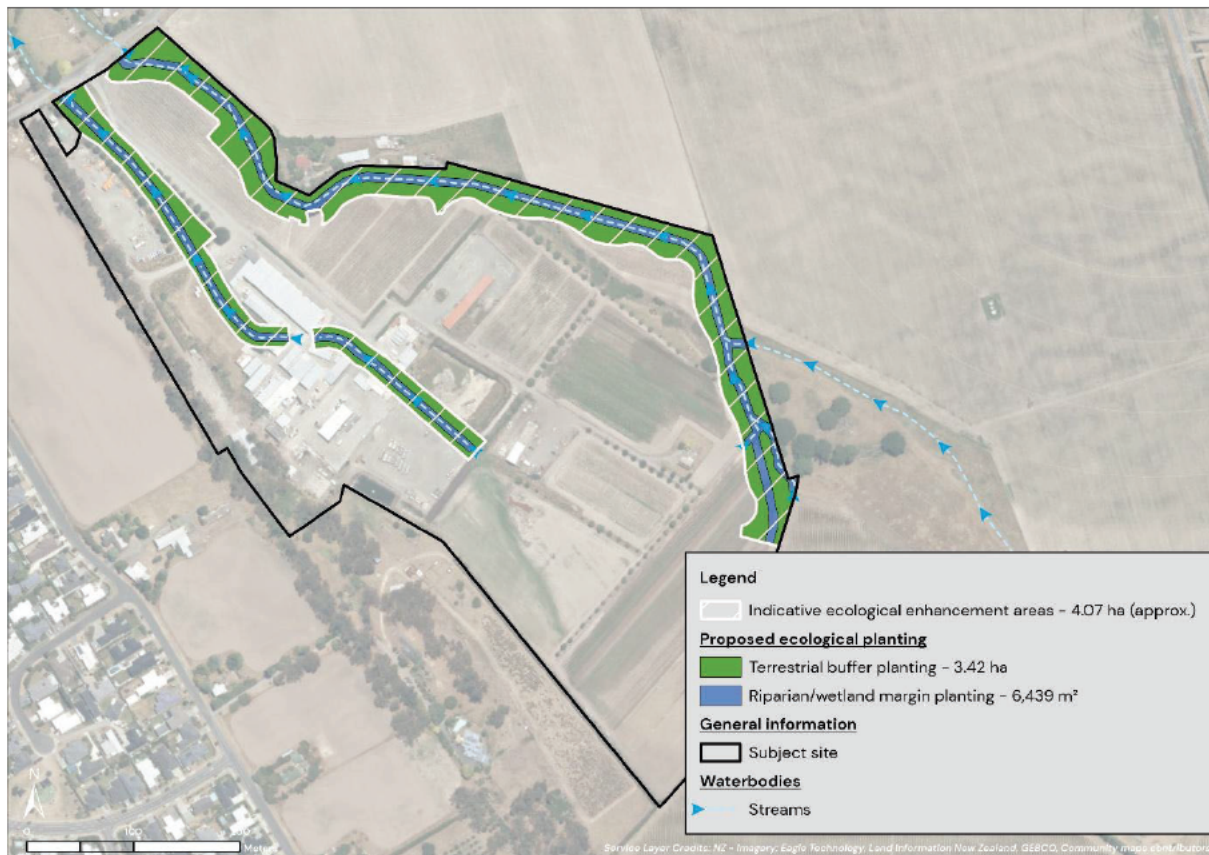


Figure 26: Showing the proposed wetland off-set planting areas identified as riparian/wetland margin planting

6.3. Baseline Watercourse Conditions

The site contains four watercourses (Watercourses 1–4), all of which have been extensively modified from their natural state through channelisation, straightening, culverting, and partial infilling. Each is assessed as having very low ecological value, functioning primarily as drainage conveyance features rather than functional ecological systems.

Watercourse 1 (the impacted reach, approximately 355 m) has been classified as an intermittent stream; however, this classification should be treated with professional judgement given its highly modified condition. Although its historic origin as a natural stream channel can not be argued as the watercourse appears on historical aerial imagery, the watercourse has been substantially altered, and both site observations by Wild Ecology and broader project assessments indicate a persistent absence of meaningful surface water within the channel. As such, while it may technically meet the definition of an intermittent stream, its present-day hydrological behaviour is more consistent with an ephemeral system at best and is largely aligned with the function of a stormwater conveyance channel.

Watercourse 1 is characterised by steep, incised banks, an artificially straightened and deepened channel form, and limited riparian vegetation.

6.4. Stream Ecological Valuation (SEV) and Environmental Compensation Ratio (ECR)

A Stream Ecological Valuation (SEV) was undertaken for the impacted reach of Watercourse 1 (355 m) and the proposed realigned diversion channel (356 m), using the SEV methodology (Storey et al., 2011; Auckland Council Technical Report 2011/009). The methodology assesses stream habitat attributes on a scale of 0 (low quality) to 1 (high quality) across four functional categories – Hydraulic, Biogeochemical, Habitat Provision, and Biodiversity – to produce an overall reach score.

It should be emphasised that the SEV methodology was developed for perennial streams, not for ephemeral or intermittent watercourses such as Watercourse 1. Several of SEV calculation variables assume the presence of permanently flowing water, and where the method is applied to a channel in which no surface flow was observed during the surveys, those variables sit at the margins of their intended application. The SEV scores presented here have necessarily been derived on the assumption that ephemeral or intermittent flows occur within the channel – rather than perennial flow, or a complete absence of flow – and the flow- and aquatic-habitat-related variables have been scored on that basis. The scores (and the ECR derived from them) are therefore best understood as an indicative, largely potential-flow-based quantification of ecological function. They should be interpreted with caution, and read alongside the qualitative assessment of ecological values set out above, rather than as precise measures of ecological function.

Because Watercourse 1 carried no surface flow during the surveys, and only ephemeral flows are expected following development (other than conveyance during high-intensity rainfall events), the SEV uplift is driven principally by those functions that do not depend on permanent flow – in particular riparian vegetation intactness, organic matter input, water temperature control, floodplain connectivity and bank stability. These improve directly through the proposed indigenous planting and the revised, gently-battered channel geometry. The flow- and aquatic-biota-dependent variables – notably fish, aquatic faunal habitat and dissolved oxygen maintenance – are inherently constrained by the ephemeral flow regime; the potential scores for these variables are accordingly best-case estimates contingent on episodic wetting and the establishment of marginal wetland vegetation, rather than on sustained baseflow throughout the year.

The Environmental Compensation Ratio (ECR) was calculated using the standard formula:

$$ECR = [(SEVi-P - SEVi-I) / (SEVm-P - SEVm-C)] \times 1.5$$

where SEVi-P and SEVi-I are the potential and post-impact SEV scores for the impacted stream, and SEVm-P and SEVm-C are the potential and current SEV scores for the new diversion channel. In this case SEVi-I is 0 (the existing channel is removed) and SEVm-C is 0 (the diversion channel does not yet exist).

The ECR equation should, however, be interpreted with particular caution in a diversion context, because several of its underlying assumptions do not hold here. The equation was developed primarily to quantify the mitigation length required to offset a permanent loss of ecological function – such as piping or culverting, where a stream is removed with little prospect of recovery. A realigned open channel is fundamentally different: it continues to exist as a

functioning waterbody and retains the full potential for future ecological restoration through ongoing riparian planting, in-stream habitat enhancement and natural succession. The equation does not account for this retained restoration potential and therefore tends to overstate the compensation required. Furthermore, where the diversion channel is designed and constructed to a higher ecological standard than the existing reach, such as within this proposal, the denominator (SEV_m-P – SEV_m-C) approaches the numerator, driving the ECR towards zero; and where the potential value of the new channel equals or exceeds that of the existing channel, the denominator becomes zero and the ECR is mathematically undefined. For these reasons the ECR is presented here for transparency and consistency with standard reporting practice, but it is not considered the most informative measure of ecological outcome for a diversion of this nature; a direct comparison of SEV scores between the existing and proposed channels provides a more meaningful basis for assessment.

Table 8 presents the SEV scores and Table 9 presents the ECR result.

Table 8: Current and predicted SEV scores for the existing and proposed watercourse

Function	SEV _i -C (existing)	SEV _i -I (after impact)	SEV _i -P (potential existing)	SEV _m -P (potential new channel)	SEV _m -C (current new channel)
NFR	0.34	0	0.37	0.70	0
FLE	0.10	0	0.13	0.80	0
CSM	0.70	0	0.70	1.00	0
CGW	0.40	0	0.40	0.45	0
WTC	0.10	0	0.60	0.60	0
DOM	0.35	0	0.45	0.55	0
OMI	0.15	0	0.50	0.60	0
IPR	0.30	0	0.44	0.60	0
DOP	0.35	0	0.47	0.84	0
FSH	0.05	0	0.05	0.25	0
HAF	0.16	0	0.40	0.45	0
RVI	0.05	0	0.08	0.70	0
SEV Score	0.31	0	0.40	0.62	0

Table 9: ECR parameter and score for stream values

SEV _i -C	SEV _i -I	SEV _i -P	SEV _m -P	ECR
0.31	0	0.40	0.62	0.97

The proposed diversion channel is 356 m long – 1 m longer than the 355 m impacted reach – so there is no net loss of stream length. The uplift between the current and potential SEV_i scores

reflects the degree of channel modification and the absence of riparian vegetation in the existing channel, whereas the diversion channel will be constructed with gently sloping banks, improved floodplain connectivity, and indigenous riparian and wetland margin planting, with conditions conducive to the development of in-stream habitat complexity over time. The potential SEV score is predicated on the successful establishment of riparian planting and the progressive development of channel features through natural fluvial deposition and erosion processes, rather than on engineered in-stream structures; it therefore represents a realistic longer-term outcome rather than the as-constructed condition.

On the basis of this assessment, the proposed stream diversion will not result in a loss of stream ecological values or stream length. The new diversion channel, combined with the proposed riparian margin restoration, is considered to achieve no net loss of stream values and will in fact result in a net gain in ecological values across all functional categories.

7.0 RELEVANT PLANNING CONSIDERATIONS

The following section summarises the ecological considerations relevant to the proposed development at the site, in relation to local, regional, and national planning policy and regulations concerning the protection, restoration, and management of ecological values.

From an ecological perspective, key planning instruments relevant to the site include:

- National Policy Statement for Indigenous Biodiversity (NPS-IB) 2023
- National Policy Statement for Freshwater Management (NPS-FM) 2020
- Resource Management (National Environmental Standards for Freshwater) Regulations (NES-FW) 2020
- Hawke's Bay Regional Resource Management Plan (RRMP) – Freshwater and Biodiversity Provisions
- Hastings District Plan – Ecological, Riparian, and Biodiversity Provisions

Policies and regulations from these instruments provide direction for the protection of freshwater bodies, wetlands, and indigenous biodiversity, and inform the management of potential effects associated with earthworks, vegetation clearance, stormwater, and infrastructure development.

7.1 National Policy Statement for Indigenous Biodiversity (NPS-IB) (2023)

National Policy Statement for Indigenous Biodiversity (NPS-IB) came into force on August 4th, 2023 (commencement date) and applies to indigenous biodiversity in the terrestrial environment throughout Aotearoa New Zealand. The objective of NPS-IB is to maintain indigenous biodiversity across Aotearoa New Zealand so that there is at least no overall loss in indigenous biodiversity after the commencement date.

It is deemed that the proposal gives effect to the objectives and policies of NPS-IB through

- (a) Having been shaped by a careful design-led approach to development that integrates the necessary infrastructure of the proposal with the existing ecological context.
- (b) Maximising the environmental benefits that can be achieved from the development works through the protection and enhancement of all aquatic features within the site boundaries.
- (c) Avoiding or mitigating potential adverse ecological effects through utilising areas that have been historically built upon or cleared to facilitate access and further site development. Where any earthworks are to take place near sensitive terrestrial or aquatic environments, best practice measures are recommended to be put in place.
- (d) Illustrates how urban development and growth can be balanced with ecological restoration and protection through highlighting and complementing the existing ecological values of the site and wider area, while also retaining appropriate areas for open space/recreation.
- (e) Presents a high standard development proposal in relation to ecological matters, striking a balance between protecting and enhancing areas of higher existing or potential ecological values, while concentrating the site's development on areas with low existing ecological values or functionality.

The proposal prioritises avoiding potential adverse effects on indigenous biodiversity through development design. Where avoidance is not possible, management recommendations are provided to ensure these effects are appropriately mitigated through the implementation of FMP, CMP, ESCP and spill management plans.

Furthermore, the proposal includes the restoration and ongoing management of the ecological features on site through a site-specific Ecological Management Plan, which underscores a commitment to the restoration and enhancement of indigenous biodiversity. This plan promotes the reestablishment of native species and habitats, contributing to the long-term ecological health and resilience of the area. Through these efforts, the proposal not only mitigates potential impacts but also actively supports the objectives of the NPS-IB 2023 by fostering a thriving and sustainable natural environment.

7.2. National Policy Statement for Freshwater Management (2020)

New Zealand has historically lost most of its wetland extent, and those that remain are rare and valuable ecosystems. The core intent of the NPS-FM (2020) is to provide stronger protection for freshwater bodies and wetlands, and it places a statutory responsibility on territorial and consenting authorities to give effect to Te Mana o te Wai by prioritising the health and wellbeing of waterways. The hierarchy of obligations is:

1. first, the health and well-being of water bodies and freshwater ecosystems;
2. second, the health needs of people (such as drinking water); and
3. third, the ability of people and communities to provide for their social, economic and cultural well-being, now and in the future.

The application demonstrates a commitment to upholding this hierarchy. The primary objective has been to avoid adverse effects on the natural inland wetlands and watercourses on the site

and in its immediate surrounds, and the development layout has been designed to retain key freshwater features within ecological corridors and open space areas, thereby maintaining their hydrological function, connectivity and ecological integrity.

Complete avoidance is not practicable in all cases. Some temporary disturbance and removal of wetland areas W3 and W4 is required during the realignment of Watercourse 1, and earthworks, vegetation clearance, stream realignment and stormwater works are required within – or within a 10 m setback of – natural inland wetlands and watercourses to enable accessways, pedestrian connections and essential infrastructure. Where effects cannot be avoided, the proposal applies the effects management hierarchy, minimising and remedying adverse effects through detailed design and construction management – including erosion and sediment controls, staged works, and fauna management measures such as fish salvage where required – so that effects on water quality and aquatic habitat remain localised, temporary and appropriately managed.

Consistent with the NPS-FM (2020), the proposal has been developed to achieve no net loss of freshwater extent and ecological values, and a net gain where practicable. To demonstrate this, a quantitative offset accounting has been undertaken for both the watercourse and the affected wetlands, comparing the extent and value of freshwater habitat impacted against that created, reinstated or restored.

The existing wetland and stream habitats on the site are generally ephemeral, fragmented and exotic-dominated, and therefore of relatively low ecological value. In contrast, the proposed restoration and planting will establish a larger, better-connected and higher-quality freshwater environment, with enhanced habitat complexity and ecological function. While some temporary and localised loss or disturbance of freshwater habitat will occur, the scale and quality of the restoration and enhancement measures are of equal or greater magnitude than the values affected. The offset is predicated on like-for-like reinstatement of the disturbed features within the realigned channel margins, supplemented by a substantially larger area of newly created wetland margin habitat of demonstrably higher ecological value – indigenous-dominated, structurally diverse and functionally connected to the stream system.

The proposal is therefore considered to achieve at least no net loss of freshwater ecological values, and more appropriately a net ecological gain over the long term. Through this approach the development is consistent with the intent of the NPS-FM (2020), giving effect to Te Mana o te Wai by prioritising the long-term health and resilience of freshwater ecosystems while appropriately enabling development.

7.3. National Environmental Standards for Freshwater Management (2020)

The proposed development (refer to the Brookvale Green Masterplan prepared by B&A) has been designed with reference to the habitat classification and delineation undertaken by Wild Ecology. Several small, scattered natural inland wetlands occur within the site, primarily associated with Watercourses 1 and 2. These wetlands are largely ephemeral, opportunistic, and dominated by exotic species, and are therefore considered to be of very low ecological value. Minor earthworks, vegetation clearance, and stormwater discharges are proposed within or within 10 m wetland setback, including the direct discharge of treated stormwater to these areas.

Additional activities outside the 10 m setback but within the wider 100 m buffer, such as temporary water diversions or construction works, will be carefully managed using standard sediment and erosion controls, staged construction, and fauna protection measures to avoid adverse effects on wetland hydrology, vegetation, and associated fauna.

Because the works involve temporary disturbance and removal of wetland areas associated with the realignment of Watercourse 1, these activities will require consent under Regulation 54 of the NES-FM (2020). The development is designed to ensure that any effects on wetland values are temporary. Proposed restoration measures, including extensive riparian and wetland-margin planting covering approximately 4.07 ha, will reinstate wetland function, enhance habitat complexity, and strengthen ecological connectivity.

During construction, the sensitivity of these natural features will be addressed through measures such as erosion and sediment controls, stormwater attenuation, and careful management of vegetation removal. The identified wetlands and their associated margins will be protected and enhanced through the proposed revegetation plan, ensuring they are integrated into a cohesive, functioning open space. With these mitigation measures in place, the overall effects of the proposed development on natural inland wetlands are considered low.

The realignment of Watercourse 1 also involves the reclamation of part of the existing channel bed and is therefore a discretionary activity under Regulation 57 of the NES-FM (2020). The functional need for the activity, and the application of the effects management hierarchy under Regulation 57(2), are addressed in the planning and engineering assessments prepared for the application, however the ecological considerations are summarised here. The affected reach is a highly modified, intermittent to ephemeral drainage channel of low ecological value, and the works represent a realignment (relocation) of that channel rather than a net loss of watercourse extent. Adverse effects are avoided and minimised through design and construction management, including sediment and erosion controls, staged works, and fish salvage and relocation where required, and residual effects are remedied and offset through reinstatement of the channel and riparian and wetland margin planting, delivering an uplift in Stream Ecological Valuation score from 0.31 to 0.62 across the reach. On this basis the works are considered to achieve no net loss, and a net gain, in stream ecological values, consistent with the effects management hierarchy.

7.4. Hawke's Bay Regional Resource Management Plan (RRMP) – Freshwater and Biodiversity

The Hawke's Bay Regional Resource Management Plan (RRMP) provides the regional framework for managing freshwater, groundwater, land, and biodiversity resources in an integrated manner. The Plan seeks to maintain or enhance water quality and quantity while sustaining the life-supporting capacity, natural character, and ecological values of freshwater systems.

Under the RRMP, surface water bodies are to be managed so that existing aquatic species and ecosystem health are maintained, while also providing for a range of uses including groundwater recharge and consumptive water use. The Plan also seeks to maintain appropriate water quality

parameters such as temperature, dissolved oxygen, and nutrient levels to ensure the ongoing health of aquatic ecosystems.

In addition, the RRMP establishes a precautionary and effects-based approach to managing discharges and land use activities, requiring that water quality is maintained where it is already high, and improved where it is degraded over time through both regulatory and non-regulatory methods.

In the context of the proposed development:

- Riparian and wetland margin planting along Watercourses 1 and 2 contributes directly to the RRMP's freshwater objectives by improving buffer functions, reducing sediment inputs, and enhancing instream ecological health, consistent with the Plan's direction to maintain aquatic ecosystems and natural character.^{1 2}
- The design and location of stormwater management devices seek to minimise runoff, sediment, and contaminant discharge into receiving environments, supporting the RRMP's water quality guidelines and its objective of avoiding degradation of surface water quality.³
- Earthworks and construction activities will be managed in accordance with best practice erosion and sediment control measures to ensure consistency with the RRMP's land and water management provisions, which seek to avoid adverse effects on soil and freshwater systems.⁴
- Any culvert or in-stream works are designed to maintain fish passage and avoid disruption to aquatic habitat, in line with the RRMP's objectives to sustain ecological function and aquatic connectivity.⁵

Overall, the proposed development is consistent with the intent of the RRMP, as it maintains or enhances freshwater values through integrated design, erosion and sediment control, and riparian enhancement. The proposal aligns with the Plan's overarching direction to sustain aquatic ecosystems and natural character while providing for appropriate land use and development.

7.5. Hastings District Plan – Ecological, Riparian and Biodiversity Provisions

The Hastings District Plan includes specific objectives and policies aimed at recognising, protecting, and enhancing indigenous vegetation, habitats of indigenous fauna (including wetlands and riparian margins), and the associated ecosystems that support biodiversity across the District. The Plan acknowledges that historic modification of the natural environment has

¹ RRMP Objective 40 / Policy 71 – surface water quality and aquatic ecosystem maintenance

² RRMP Policy 71 – environmental water quality guidelines (oxygen, nutrients, temperature)

³ RRMP Policy 72 & Policy 67 – implementation approach and effects-based management of land and water

⁴ RRMP Policy 72 & Policy 67 – implementation approach and effects-based management of land and water

⁵ RRMP Objective 40 & Objective 45 – maintenance of aquatic ecosystems, natural character, and river/lake bed values

resulted in the loss of many indigenous ecosystems and seeks to maintain and improve the biodiversity that remains, including the natural values of wetlands and watercourse margins.

In addition, the Plan recognises that subdivision is a key mechanism through which the potential adverse effects of land use and development on the natural environment can be addressed, including effects on ecological values, natural character, and waterbodies.⁶

Key objectives include protecting areas of significant indigenous vegetation and habitats of indigenous fauna and maintaining and enhancing the biodiversity of indigenous species and their supporting ecosystems.

Relevant Objectives and Policies:

- Objectives seek to protect and encourage the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna, including wetlands, and to maintain and enhance the biodiversity of indigenous species and the natural habitats and ecosystems that support them. Policies support these objectives by encouraging voluntary protection, providing incentives for protection, and introducing rules to control vegetation modification that could adversely affect these values.⁷
- Policies also control the adverse effects of exotic and introduced species on indigenous vegetation and habitats of indigenous fauna to avoid, remedy or mitigate biodiversity loss.
- The subdivision framework requires that land use and development enabled through subdivision is consistent with the wider objectives and policies of the District Plan, including those relating to ecological values and natural systems.⁸
- Policies require that earthworks and land development associated with subdivision avoid adverse environmental effects, including impacts on natural systems such as wetlands, riparian margins, and watercourses.⁹
- Subdivision also provides an opportunity to protect ecological features through mechanisms such as conservation lots and esplanade reserves or strips, particularly in relation to riparian margins and waterbodies.¹⁰

Although the site does not contain any areas of significant indigenous vegetation or habitats of indigenous fauna listed in the Plan's schedules (and there are no identified significant waterbodies on site under the Plan definitions), the broader objectives and policies still apply in terms of avoiding, remedying, and mitigating adverse effects on indigenous biodiversity and maintaining ecological function.

⁶ Section 30.1.1 – Introduction

⁷ Section 30.1 (read in conjunction with District Wide Indigenous Biodiversity provisions – Section 20.1): Protection and enhancement of indigenous vegetation, habitats, and management of pest species.

⁸ Objective SLDO1 – Subdivision to be consistent with the objectives and policies of the District Plan.

⁹ Policy SLDP14 – Earthworks associated with subdivision shall avoid adverse environmental effects, including effects on natural systems.

¹⁰ Policy SLDP2 and Policy SLDP19 – Provision for conservation lots and esplanade reserves/strips to protect indigenous vegetation, habitats, and riparian margins.

The Plan's direction for control of vegetation clearance, protection of wetlands, and encouragement of ecological enhancement aligns with the proposed development's proposal of integrated riparian restoration planting, and pest control measures. This approach also reflects the Plan's intention that subdivision is used as a mechanism to address potential environmental effects at an early stage and secure positive outcomes.

This planning context supports the development's approach to retaining and enhancing buffer areas along Watercourses 1 and 2, restoring wetland margins where temporary disturbance occurs, and protecting remaining ecological values through targeted revegetation, erosion and sediment controls, and fauna management.

8.0 ECOLOGICAL ENHANCEMENT PROPOSAL

8.1. Ecological enhancement areas

The Applicant as a part of the site's development proposes to enhance an area of approximately 4.07 ha encompassing onsite watercourses 1 and 2 and their margins (Figure 27). The plan depicted under Figure 27 has been prepared by LA4, informed by input from Wild Ecology Ltd, particularly in relation to proposed planting zones, species selection, and planting densities.

The planting design adopts a structured riparian restoration approach, with vegetation established according to functional zones and successional stages. Wetland and riparian species are proposed at approximately 0.7 m spacing within the lowest elevation areas, adjacent to the watercourses. Pioneer species are generally proposed at 1.0–1.4 m spacing to facilitate rapid establishment and ground cover, while climax species are proposed at approximately 2.0 m spacing to support longer-term canopy development and habitat complexity.

Of the overall enhancement area, approximately 6,439 m² will comprise riparian and wetland planting associated with the bank toe and water's edge zone. This planting zone will extend approximately 2 m from either side of the stream channels. A further approximately 6,413 m² will comprise bank face planting, forming a 2 m-wide transitional belt between the lower riparian zone and upper bank. Above this, upper stream bank and terrestrial planting will extend beyond 6 m in width, covering an area of approximately 27,900 m², and will provide longer-term structural vegetation and habitat continuity across the riparian corridor.

The Ecological Management Plan (EMP), to be prepared as a condition of consent, will provide detailed guidance for the implementation and long-term management of the enhancement areas. The EMP will be based on the LA4 Landscape Plan and will set out key measures including site preparation for planting, pest plant and animal control, biosecurity and pathogen management, as well as establishment maintenance and long-term monitoring requirements to ensure successful ecological outcomes.

8.1.1. Revegetation planting

The proposed revegetation strategy for the ecological enhancement areas (Figure 27) is based on the detailed planting design prepared by LA4 Landscape Architects, informed by ecological input from Wild Ecology Ltd. The planting framework adopts a zoned riparian restoration approach, incorporating a diverse mix of eco-sourced native species suited to Havelock North climatic conditions, including seasonal drought stress, episodic high rainfall events, and variable soil moisture regimes associated with lowland stream environments.

In total, approximately 4.07 ha of ecological enhancement planting is proposed across the site. Of this, approximately 0.64 ha comprises riparian and wetland margin planting associated with the on-site stream network and low-lying hydrological features. These areas are intended to stabilise stream margins, improve aquatic shading, enhance riparian and wetland habitat values, promote sediment and contaminant filtering functions, and contribute to long-term improvements in freshwater ecological health. The remaining approximately 3.42 ha comprises terrestrial ecological buffer planting. These terrestrial planting areas are intended to provide habitat connectivity throughout the site including creating linkages with the wider landscape planting across the site, increase indigenous vegetation cover, buffer edge effects associated with adjacent land uses, and enhance overall ecological resilience across the site.

The planting palette incorporates a structured gradient of species assemblages across hydrologically and topographically distinct zones, including bank toe/water's edge, bank face, and upper riparian/terrestrial margins. This approach ensures species are appropriately matched to moisture gradients and inundation frequency, with wetter-tolerant sedges and rushes concentrated at lower elevations and more drought-tolerant woody species established on upper banks.

The proposed species mix includes pioneer species to ensure rapid site colonisation and early-stage ground stabilisation, reducing the establishment window for invasive weed species. Mid-successional and climax species are included to provide long-term structural diversity, canopy development, and habitat complexity. Dense initial planting is proposed across all zones, with spacings varying in accordance with LA4's specifications (approximately 0.7 m for wetland/riparian sedges and rushes, 1.0–1.4 m for pioneer woody species, and approximately 2.0 m for longer-lived canopy and structural species).

This planting methodology is expected to achieve rapid canopy closure in key areas, thereby suppressing weed establishment through competition for light, nutrients, and space. In addition, the establishment of dense root networks across riparian margins will contribute to bank stabilisation, reducing erosion risk and improving long-term geomorphic resilience of the watercourses. Overall, the proposed revegetation approach will enhance watercourse stability, improve habitat quality, and progressively restore indigenous vegetation structure and function within the ecological enhancement areas, consistent with best practice riparian restoration outcomes.

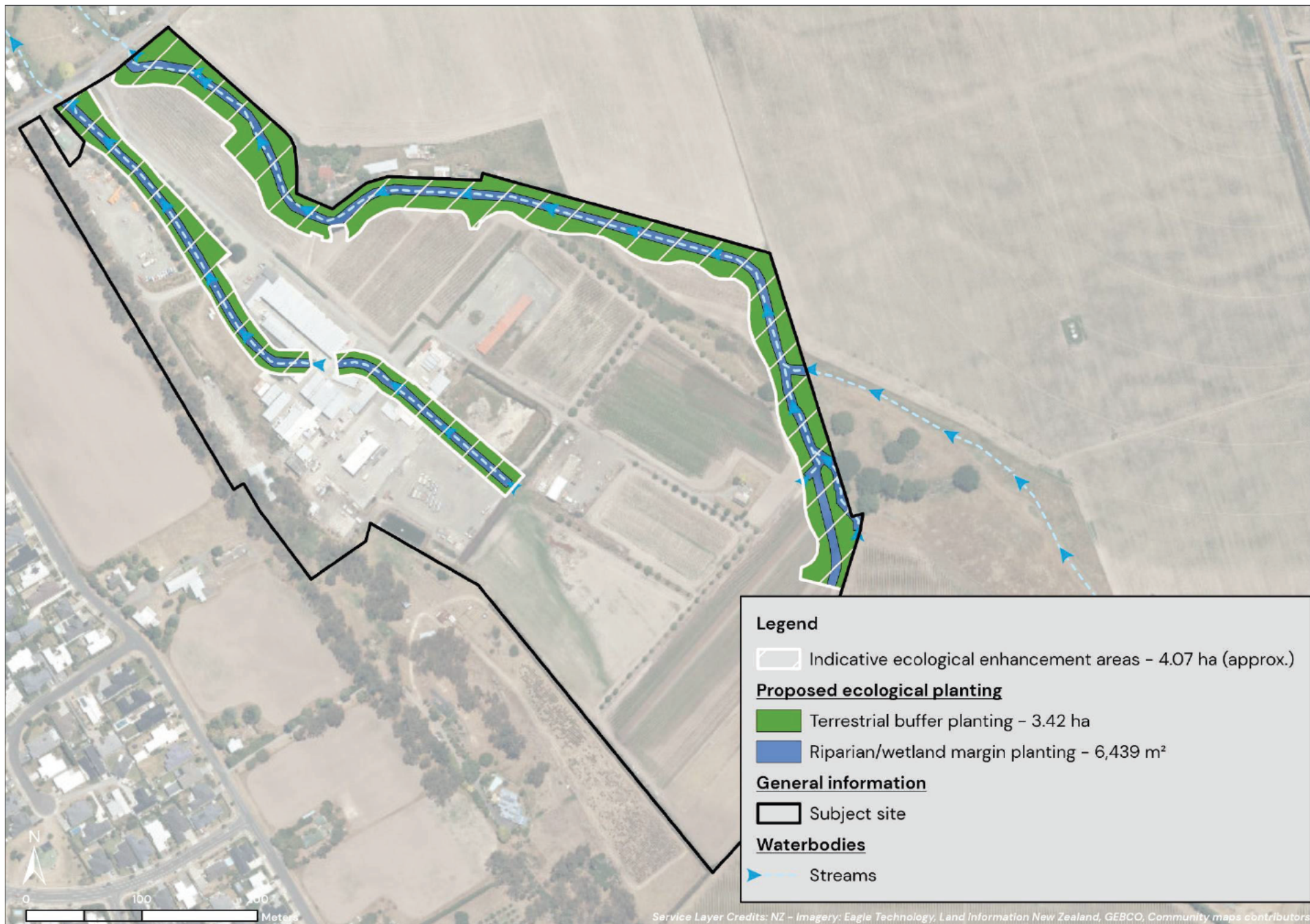


Figure 27: Showing the proposed ecological enhancement areas plan (trace-over from LA4 Landscape Plan)

8.1.2. Pest plant management

The proposed ecological enhancement areas contain a high density of pest plant species or weedy species that will be required to be controlled. Exotic pest plants included a heavy density of blackberry (*Rubus fruticosus* agg.) growing within the existing stream channels, as well as Wooley nightshade (*Solanum mauritianum*), tree privet (*Ligustrum lucidum*), Arum lily (*Zantedeschia aethiopica*), and gorse (*Ulex europaeus*). Management efforts to control these species to practicable minimum density is required. Pest plants and weedy species observed within the proposed ecological enhancement areas are briefly summarized under Table 10 below.

An Ecological Management Plan (EMP) is to be prepared as a condition of consent to act as a practical management document which can be utilised by the Applicant or their contractor to carry out the recommended ecological management actions. The EMP will outline specific management actions and detail species identification and control of the pest plants, and ongoing maintenance and monitoring requirements that weedy species are controlled to a practicable minimal density.

Table 10: Pest plants and weedy species recorded within the proposed ecological enhancement areas their designation and abundance (A = Abundant, C = Common, O = Occasional, S = Sparse)

Latin name	Common name	Abundance
<i>Cortaderia selloana</i>	Pampas	O
<i>Ligustrum lucidum</i>	Tree privet	O
<i>Rubus fruticosus</i> agg.	Blackberry	C
<i>Solanum mauritianum</i>	Woolley nightshade	O
<i>Ulex europaeus</i>	Gorse	C
<i>Zantedeschia aethiopica</i>	Arum lily	C

8.1.3. Pest animal management

While not directly observed during site visits, the site likely supports a full suite of exotic mammalian pest animal species, including possum (*Trichosurus vulpecula*), rats (*Rattus rattus* and *R. norvegicus*), stoats (*Mustela erminea*), and hedgehogs (*Erinaceus europaeus*). The adverse ecological effects of exotic mammals on native flora and fauna are well documented, and their ability to interfere with revegetation plantings through active browsing can be detrimental to overall plant health and survival.

A comprehensive control and monitoring program for pest animals is to be developed within the body of an Ecological Management Plan (EMP).

8.1.4. Maintenance

Ongoing maintenance including pest plant control and pest animal control within the proposed ecological enhancement areas is to take place for minimum of 5 years following the completion of round of pest plant control and establishment of a pest animal control network. Maintenance

should be carried out bi-annually during Years 1-3 and annually during Years 4 & 5 for a minimum period of five years in spring and late summer.

Ongoing maintenance and monitoring will be described in more detail under an Ecological Management Plan (EMP) which is to be prepared as a condition of consent.

8.1.5. Monitoring

For this ecological enhancement proposal to be successful, keeping up to date records of pest plant and animal control efforts, and monitoring of general planting establishment success rates are key to determine the success of restoration efforts.

It is proposed that at the time of physical ecological works completion (site preparation, first round of pest weed control and revegetation planting) the consent holder shall provide an Ecological Works Completion Report from a suitably qualified ecologist following the implementation of physical ecological works completion (planting, first round of pest weed, and pest animal control implemented) to be submitted to Council, and the Council will undertake inspections as required to confirm compliance. All works shall be demonstrated to the satisfaction of the HBRC Compliance Monitoring Officer or similar position.

Example monitoring forms are to be provided within the body of the Ecological Management Plan which can be used by the Consent Holder or their engaged suitably qualified contractor to keep up to date maintenance/monitoring records for any pest plant, pest animal control works carried out on site during the 5-year maintenance and monitoring period.

9.0 CONCLUSION

The ecological values of the terrestrial and aquatic habitats within the site at 174 & 176 Brookvale Road are currently assessed as low, largely due to historic and ongoing horticultural and pastoral activities. Indigenous vegetation is sparse, and fauna presence is limited to common, disturbance-tolerant species. Onsite watercourses and wetland features are highly modified and offer limited ecological function in their current state.

The proposed Brookvale Green development has been carefully designed in consultation with Wild Ecology to avoid or minimise potential adverse effects on the site's ecological values. The layout incorporates ecological features and applies the effects management hierarchy, including avoidance, mitigation, and off-set measures. Recommended actions, such as riparian revegetation planting, pest plant and animal control, stormwater management, and proposed fauna management measures during construction and development – will protect existing values while improving habitat quality for native flora and fauna. Exotic vegetation and weed removal, combined with targeted indigenous planting, will enhance terrestrial and aquatic habitats, increasing structural diversity and ecological function over time.

With the implementation of these measures, residual ecological effects are expected to be low, and the proposal delivers a quantified net ecological gain. The development will enhance

ecological function within the site, improve habitat connectivity, and contribute positively to the broader landscape context. Additionally, the inclusion of open spaces will provide recreational and educational benefits, fostering community appreciation and stewardship of local biodiversity.

In summary, potential ecological effects associated with the development can be effectively managed through integrated design and adherence to effects management hierarchy and best-practice ecological management. Provided these measures are successfully implemented, the project is expected to achieve positive biodiversity outcomes while demonstrating that the site can support residential development under the fast-track consenting pathway while enhancing its ecological values.

10.0 REFERENCES

- Allibone, R., David, B., Hitchmough, R., Jellyman, D., Ling N., Ravenscroft, P., and Waters, J. (2010). *Threat ranking of New Zealand Freshwater Fish*. Journal of Marine and Freshwater Research 2010: 1-17.
- Atkinson, I.A.E. (1985). *Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand*. New Zealand Journal of Botany 23: 361-378.
- Boubée, J., Dean, T., West, D., & Barrier, R. (1997). *Avoidance of suspended sediment by the juvenile migratory stage of six New Zealand native fish species*. New Zealand Journal of Marine and Freshwater Research, 31, 61-69.
- Carr, L. (2019) *The long-tailed bats (Chalinolobus tuberculatus) of Pukenui Forest likely to connect with Otaika and possibly Glenbervie Forests, Whangarei*. Department of Applied and Environmental Sciences, Unitec.
- Clarkson, B. (2013). *A vegetation tool for wetland delineation in New Zealand*. Prepared for Meridian Energy Limited, December 2013.
- Clarkson B.R., Fitzgerald N.B., Champion P.D., Forester L., Rance B.D. (2021). *New Zealand wetland plant list 2021*. Manaaki Whenua – Landcare Research contract report LC3975 for Hawke's Bay Regional Council
- Clayton, R., & Cowan, P. (2010). *Management of animal and plant pests in New Zealand – patterns of control and monitoring by regional agencies*. Wildlife Research 37, 360-371.
- Dawson, D., & Bull, P. (1975). *Counting birds in New Zealand forests*. Notornis. 22(2), 101-109.
- de Lange, P. J., Rolfe, J. R., Barkla, J. W., Courtney, S. P., Champion, P. D., Perrie, L. R., . . . Ladley, K. (2017). *Conservation status of New Zealand indigenous vascular plants, 2017*. Wellington: Department of Conservation.
- Dunn, N., Allibone, R., Closs, G., Crow, S., David, B., Goodman, J., . . . Rolfe, J. (2017). *Conservation status of New Zealand freshwater fishes*. Wellington: Department of Conservation.
- Franklin, P., Gee, E., Baker, C., & Bowie, S. (2018). *New Zealand Fish Passage Guidelines*. National Institute of Water & Atmospheric Research Ltd. Hamilton: NIWA. Retrieved from <https://www.niwa.co.nz/static/web/freshwater-and-estuaries/NZ-FishPassageGuidelines-upto4m-NIWA-DOC-NZFPAG.pdf>
- Fraser, S., Singleton, P., Clarkson, B. (2018). *Hydric Soils – Field Identification guide*. Contract report LC3233 for Tasman District Council 2018.

Hare, K.M. (2012). *Herpetofauna: systematic searches Version 1.0. Department of Conservation Inventory and Monitoring Toolbox: Herpetofauna*. Retrieved from <http://www.doc.govt.nz/our-work/biodiversity-inventory-and-monitoring/herpetofauna/>

Hitchmough, R.A., Barr B., Lettnink, M., Monks, J., Reardon, J., Tocher, M., van Winkel, D., Rolfe, J. (2015). *Conservation status of New Zealand reptiles*. New Zealand Threat Classification Series 17. Retrieved from <https://dxcprod.doc.govt.nz/globalassets/documents/science-and-technical/nztcs17entire.pdf>

Joy, M., David, B., & Lake, M. (2013). *New Zealand Freshwater Fish Sampling Protocols. Part 1. Wadable rivers and streams*. Massey University, Auckland, New Zealand.

Landcare Research. (2022). *The New Zealand Land Resource Inventory (NZLRI)*. Retrieved from: <https://lris.scinfo.org.nz/layer/48076-nzlri-land-usecapability/>

Landcare Research. (2026). *Soils Portal*. Retrieved from <https://soils.landcareresearch.co.nz/soil-data>

Ministry for the Environment. (2020). *National Policy Statement for Freshwater Management 2020*. Retrieved from <https://environment.govt.nz/publications/national-policy-statement-for-freshwater-management-2020/>

Ministry for the Environment. (2020). *Wetland Delineation Protocols*. Wellington: Ministry for the Environment.

New Zealand Government (2020). *National Policy Statement for Freshwater Management 2020*. Retrieved from <https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/national-policy-statement-for-freshwater-management-2020.pdf>

NIWA. (2026). *NZ Freshwater Fish Database*. Retrieved from <https://nzffdms.niwa.co.nz/search>

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

River Lake Ltd (2018). *Fish Recovery and Rescue Protocols*. Retrieved from <https://www.nzta.govt.nz/assets/projects/awakino-gorge-to-mt-messenger-programme/mt-messenger-bypass/rma-applications/draft-management-plans/elmp-draft-fish-rescue-and-recovery-protocols.pdf>

Robertson, H., Baird, K., Dowding, J., Elliott, G., Hitchmough, R., Miskelly, C., O'Donnell J.O., Sagar P.M., Scofield R.P., Taylor G.A., Michel P. (2021) *Conservation status of birds in Aotearoa New Zealand*. Department of Conservation

Singers, N., & Rogers, G. (2014). *A classification of New Zealand's terrestrial ecosystems*. Publishing Team, Department of Conservation.

Singers, N. Osborne, B. Lovegrove, T. Jamieson, A. Boow, J. Sawyer, J. Hill, K. Andrews, J. Hill, S. Webb, C. (2017). *Indigenous terrestrial and wetland ecosystems of Auckland*. Auckland Council.

Stewart A., Kerr G., Lissaman W., Rowarth J. (2014). *Pasture and Forage Plants for New Zealand*. New Zealand Grassland Association, Grassland Research and Practice Series No. 8, Fourth Edition