ECOLOGICAL CONSTRAINTS ASSESSMENT FOR A PROPOSED DEVELOPMENT AT 70A & 70B LISLE FARM DRIVE, PUKEKOHE

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ECOLOGICAL CONSTRAINTS ASSESSMENT FOR A PROPROSED DEVELOPMENT AT 70A & 70B LISLE FARM DRIVE, PUKEKOHE

Swamp maire forest in a gully in the north of the property.

Contract Report No.6133

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1. INTRODUCTION

Scott Wilkinson Planning Ltd, on behalf of its client, is preparing a plan change request to rezone 70a and 70b Lisle Farm Drive, Pukekohe, from Future Urban Zone (FUZ) to Mixed Housing Urban (MHU) Zone, in accordance with the zoning applied under Plan Change 78, applied to adjoining residential land to the south and west. The two properties cover areas of 10.13 hectares and 8.52 hectares, with gullies, streams and potential wetlands present at the site. The properties are currently primarily used for grazing with a single existing dwelling present in the north western corner of the property. Most of the property comprises open exotic grassland with areas of fenced indigenous vegetation in two gullies in the northern portion of the property.

A site visit was undertaken on 17 November 2021 to assess the presence of indigenous flora and fauna habitat and delineate areas of wetland. One permanent and two intermittent streams are present on the property along with several small areas of wetland and areas of indigenous forest.

This report provides an assessment of the habitat types and ecological values of the site and includes:

- A map and description of the vegetation and habitat types present including classification and delineation of streams and wetlands.
- An assessment of the ecological values of vegetation and habitat types.
- An assessment of terrestrial habitats against the significance criteria in Appendix 3 of the National Policy Statement on Indigenous Biodiversity (NPS-IB).
- Ecological constraints associated with the development resulting from rezoning of the site to SHZ or MHS zones.
- Opportunities to protect and enhance ecological values at the site, including proposed buffer planting areas and indicative planting schedules.

2. ECOLOGICAL CONTEXT

2.1 Overview

The property at 70a and 70b Lisle Farm Drive lies on the outskirts of Pukekohe within the Manukau Ecological District. Manukau Ecological District covers *c*.62,100 hectares of low altitude rolling hills and flats between the Manukau Harbour in the north and the Waikato River in the south. Most of the district has fertile, well-drained soils derived from weathered volcanic ash.

The fertile soils, in combination with reliable rainfall, mean that the district is well suited for agriculture and horticulture and consequently most of the district has been highly modified. The former forest cover, most often dominated by pūriri, taraire, or kahikatea, has been severely reduced in extent (Auckland Regional Council 2004). Only 908 hectares (two percent) of the original 42,462 hectares of podocarp/broadleaved species forest and kauri forest remains, and of this only 11 percent is protected. The

loss of freshwater wetlands has been even greater, with only 0.4 percent of the original extent remaining, of which only two percent is protected (Lindsay *et al.* 2009).

2.2 Fauna

The small number of remaining freshwater wetlands are a priority for protection within the Manukau Ecological District and support threatened species such as matuku (Australasian bittern; *Botaurus poiciloptilus*; 'Threatened - Nationally Critical') (Lindsay *et al.* 2009).

Very little indigenous forest is left in Manukau Ecological District; thus, the remaining small remnants and suburban gardens are highly valuable as habitat for common bird species such as rironiro; grey warbler (*Gerygone igata*), silvereye (*Zosterops lateralis*) and pīwakawaka; North Island fantail (*Rhipidura fuliginosa placabilis*). Species such as tūī (*Prosthemadera novaeseelandiae*) and kererū (*Hemiphaga novaeseelandiae*) are more common in larger forest remnants. Ruru (morepork; *Ninox novaeseelandiae*) occurs in indigenous and exotic forest, and in open country with areas of mature trees (Heather and Robertson 2000).

2.3 Local context

The site is located on the outskirts of Pukekohe south of Auckland. To the west of the property lies areas of residential development and to the east lies areas of agricultural land with small pockets of indigenous and exotic forest/scrub, streams, shelterbelts and rural dwellings. Streams on the property drain into the Oira and Whangapouri Creek to the north of the property. Two small areas of forest classified as Significant Ecological Areas (SEA_T_4374 & SEA_T_91) are found within 300 metres of the site. Several other small areas of SEA vegetation are present in the surrounding landscape.

3. STATUTORY CONTEXT

3.1 Proposed activity

The client is planning to rezone *c.*18.65 hectares of land across two properties at 70a and 70b Lisle Drive, Pukekohe, from Future Urban Zone to Mixed Housing Urban (MHU) Zone, in accordance with the zoning applied under Plan Change 78, applied to adjoining residential land to the south and west. The zoning regulations affect the number and type of dwelling that can be constructed on the site and minimum setbacks from natural features such as streams. Currently the minimum stream setback under the Future Urban Zone Table H18.6.3.1 is set at 20 metres. If this land is rezoned to Mixed Housing Urban Zone then this will be reduced to a minimum of 10 metres.

3.2 National Policy Statement for Indigenous Biodiversity (NPS-IB)

The National Policy Statement for Indigenous Biodiversity (NPS-IB) came into effect in July 2023. The NPS-IB details the criteria to be used when assessing areas that qualify as Significant Natural Areas (SNAs) or not. Significant indigenous vegetation and significant habitats of indigenous fauna identified as SNAs are protected by avoiding or managing adverse effects from new subdivision, use, and development. Several vegetation and habitat types have been identified as potential SNAs under the NPS-IB criteria, so restrictions may apply to these.

In clause 3.10(2), each of the following adverse effects on an SNA of any new subdivision, use, or development must be avoided unless there is a functional need for the development in that particular location and there is no practicable alternative location:

(a) Loss of ecosystem representation and extent.

(b) Disruption to sequences, mosaics, or ecosystem function.

(c) Fragmentation of SNAs or the loss of buffers or connections within an SNA.

(d) A reduction in the function of the SNA as a buffer or connection to other important habitats or ecosystems.

(e) A reduction in the population size or occupancy of Threatened or At Risk (declining) species that use an SNA for any part of their life cycle.

If there is functional need for the development in that particular location, and no alternative location, the above adverse effects on an SNA must be managed by applying the effects management hierarchy.

3.3 National Environmental Standards for Freshwater (NES-F)

The likely relevant sections of the NES-F applicable the wetlands identified at 71A and 70B Lisle Farm Drive are listed below.

Regulations 54 (c) and (d) require consent for the taking, use, damming, diversion, or discharge of water within, or within a 100-metre setback from a natural wetland if:

- There is a hydrological connection between the taking, use, damming, diversion, or discharge and the wetland; and
- Any discharges are to water (i.e., not to land) and will enter the wetland; and
- There is likely to be a change to the water level range or hydrological function of the wetland.

Regulation 54(a) and (b) may also apply if earthworks or vegetation clearance are required within 10 metres of an area of wetland.

Regulation 52 (non-complying activities) and 53 (prohibited activities) are unlikely to apply as it is unlikely the development will lead to the drainage of all or part of the areas of natural wetland.

Infilling of a natural wetland is a Prohibited Activity under the NES-F.

3.4 Auckland Unitary Plan

Alteration or removal of vegetation within 20 metres of intermittent streams is a Restricted Discretionary activity (activities table E15.4.1, Activity 16).

Alteration or removal of vegetation within 20 metres of a natural wetland is a Restricted Discretionary activity (activities table E15.4.1, Activity 18).

3.5 Wildlife Act 1953

Irrespective of the effect on indigenous fauna, all indigenous lizards, bats and birds, and some indigenous invertebrates are fully protected under the Wildlife Act (1953). A permit under the Wildlife Act must be obtained from the Department of Conservation before any indigenous lizards, bats and birds, and/or their habitats can be disturbed, handled, translocated or killed.

Provided that no vegetation clearance is undertaken within the areas of indigenous forest it is not anticipated that there will be any direct adverse impacts on indigenous fauna as a result of future development on the site. It is therefore not anticipated that indigenous fauna management will be required during the rezoning or initial development works. Fauna management may be required at a later date depending on final design plans.

4. METHODS

4.1 Vegetation and habitat survey

The site was surveyed on 17 November 2021, during which time all vegetation and habitat types were described and mapped. The current ecological values of these vegetation and habitat types were also assessed. All vascular plant species observed were recorded and presented in Appendix 1. Vegetation and habitat types were digitised onto aerial imagery using ArcGis10.7.

4.2 Wetland assessment

'Wetland' is not defined in the Auckland Unitary Plan. The definition used for the purposes of this assessment is included in the Resource Management Act (RMA), as outlined below.

Wetland *– permanently or intermittently wet areas, shallow water, and land/water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions, including within the coastal marine area.*

The National Policy Statement for Freshwater Management (NPS-FM) defines 'natural wetland' as outlined below:

Natural wetland *- a wetland (as defined in the Act) that is not:*

(a) a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or

(b) a geothermal wetland; or

(c) any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain derived water pooling.

According to this definition, the pre-requisite for an area to be classed as a natural wetland is for the area to meet the wetland definition under the RMA. This definition requires both suitable hydrological conditions and the presence of plants that are adapted to wet conditions.

4.3 Methods for wetland delineation

The New Zealand vegetation tool for wetland delineation (Clarkson 2013) has become the standard methodology to assess the presence of plants adapted to wet conditions. This methodology classifies all plant species that have been recorded in wetlands into five categories:

- OBL: Obligate. Almost always is a hydrophyte, rarely in uplands (estimated probability >99% occurrence in wetlands).
- FACW: Facultative Wetland. Usually is a hydrophyte but occasionally found in uplands (estimated probability 67–99% occurrence in wetlands).
- FAC: Facultative. Commonly occurs as either a hydrophyte or non-hydrophyte (estimated probability 34–66% occurrence in wetlands).
- FACU: Facultative Upland. Occasionally is a hydrophyte but usually occurs in uplands (estimated probability 1–33% occurrence in wetlands).
- UPL: Obligate Upland. Rarely is a hydrophyte, almost always in uplands (estimated probability <1% occurrence in wetlands).

Species that are classed as OBL, FACW, or FAC are considered hydrophytic and generally indicative of wetland habitat. The relevant dominance of each species, and corresponding classification, can therefore determine whether an area should be defined as a wetland.

4.4 Watercourse assessment

Other streams and watercourses were assessed according to the definitions for 'permanent river or stream', 'intermittent stream', and ‘ephemeral stream’ as stated in Chapter J1.4 of the AUP:

Permanent river or stream
The continually flowing reaches of any river or stream.

Intermittent Stream
Stream reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definition of permanent river or stream and meet at least three of the following criteria:

(a) it has natural pools;

(b) it has a well-defined channel, such that the bed and banks can be distinguished;

(c) it contains surface water more than 48 hours after a rain event which results in stream flow;

(d) rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel;

(e) organic debris resulting from flood can be seen on the floodplain; or

(f) there is evidence of substrate sorting process, including scour and deposition.

Ephemeral Stream
Stream reaches with a bed above the water table at all times, with water only flowing during and shortly after rain events. This category is defined as those stream reaches that do not meet the definition of permanent river or stream or intermittent stream.

4.5 Evaluation of ecological effects

The Environmental Institute of Australia and New Zealand (EIANZ) guidelines for undertaking assessments of ecological affects in New Zealand (Roper-Lindsay *et al.* 2018) have been referred to when preparing this report. The ecological values of affected vegetation and habitats, and the potential effects associated with the change in zoning and associated land use change have been evaluated using the methods outlined in the EIANZ guidelines. The final magnitude and level of affect associated with future development could not be assessed as specific plans for future development have not yet been prepared.

5. VEGETATION AND HABITAT TYPES

5.1 Overview

The two properties cover 18.53 hectares of undulating farmland on the outskirts of Pukekohe. Most of the site comprises open pasture with a dwelling in the western part of the site, surrounded by residential gardens. Discrete areas of terrestrial and freshwater habitats are largely restricted to gullies across the site. Fifteen vegetation types were identified and mapped at the site (Figure 1).

5.2 Terrestrial vegetation and habitat types

5.2.1 Exotic grassland (Vegetation Type 1)

Most of the site comprises exotic grassland dominated by species such as rye grass (*Lolium perenne*) and cocksfoot (*Dactylis glomerata*) (Plate 1). This habitat type also supports herbaceous plant species such as selfheal (*Prunella vulgaris*), narrow-leaved plantain (*Plantago lanceolata*), scarlet pimpernel (*Anagallis arvensis*), common daisy (*Bellis perennis*), lotus (*Lotus pedunculatus*), creeping buttercup (*Ranunculus repens*), and hawkbit (*Leontodon taraxacoides*). Woody shrubs are scattered across parts of this vegetation type and include gorse (*Ulex europaeus*), hawthorn (*Crataegus monogyna*), barberry (*Berberis glaucocarpa*), blackberry (*Rubus fruticosus* agg.), and Chinese privet (*Ligustrum sinense*).

Figure 1. Vegetation and habitat types at 70a & 70b Lisle Farm, Pukekohe

Plate 1: Grazed exotic grassland vegetation covers most of the site. 17 November 2021.

5.2.2 Residential gardens (Vegetation Type 2)

Gardens surrounding the existing dwelling are largely characterised by mown exotic grassland with scattered planted ornamental trees such as ash (*Fraxinus excelsior*), fig (*Ficus carica*), English oak (*Quercus robur*), pōhutukawa (*Metrosideros excelsa*), tītoki (*Alectryon excelsus*), kōhūhū (*Pittosporum tenuifolium*), akeake (*Dodonaea viscosa*), and lacebark (*Hoheria populnea*). Herbaceous garden plants such as agapanthus (*Agapanthus praecox*) and garden nasturtium (*Tropaeolum majus*) are present along the margins (Plate 2).

5.2.1 Kānuka-kahikatea-crack willow forest (Vegetation Type 3)

A small area of co-dominant kānuka and kahikatea (*Dacrycarpus dacrydioides*) occurs a small gully in the north of the property (Plate 3) together with locally common crack willow (*Salix fragilis*) and one emergent swamp cypress (*Taxodium distichum*). Understorey species are largely restricted to harakeke (*Phormium tenax*) and juvenile kahikatea. Groundcover species include Yorkshire fog (*Holcus lanatus*), creeping buttercup, lotus, and soft rush (*Juncus effusus*).

5.2.1 Kānuka forest (Vegetation Type 4)

Kānuka forest occurs on upper slope of the northern gully. Several large pūriri (*Vitex lucens*) are present along the edge of this habitat type. Other occasional canopy species include red oak (*Quercus rubra*), akeake, pūriri, and taraire (*Beilschmiedia tarairi*) (Plate 4). Occasional understorey species include harakeke (*Phormium tenax*), māhoe (*Melicytus ramiflorus*), nīkau (*Rhopalostylis sapida*), karamū (*Coprosma robusta*), koromiko (*Veronica stricta*), and kawakawa (*Piper excelsum*). Yorkshire fog and woolly nightshade (*Solanum mauritianum*) are also present along the margins.

5.2.1 Blackberry-swamp kiokio vineland (Vegetation Type 5)

The blackberry vineland habitat type features abundant blackberry with frequent swamp kiokio (*Parablechnum minus*) (Plate 5). This vegetation type is fenced and occupies the true left riparian margin of an intermittent stream between areas of swamp maire forest and gorse scrub. Other frequently recorded species include pūrei (*Carex virgata*), Yorkshire fog, and creeping buttercup.

5.2.1 Gorse scrub (Vegetation Type 6)

This habitat type is characterised by abundant gorse (*Ulex europaeus*) with occasional woolly nightshade (Plate 6). This area borders the intermittent stream and is fenced off from areas of exotic grassland. Few other plant species were identified within this vegetation type.

5.2.1 Mānuka-kānuka scrub (Vegetation Type 7)

The lower reaches of the permanent stream are bounded by areas of largely planted mānuka-kānuka scrub with a canopy of less than five metres tall (Plate 7). This vegetation type is immediately downstream of taraire-tōtara-pukatea forest (Vegetation Type 8).

Plate 2: Ornamental planted indigenous trees and exotic plants are present surrounding the existing dwelling. 17 November 2021.

Plate 3. Kānuka and kahikatea are common within a gully in the northern portion of the property. 17 November 2021.

Plate 4: Kānuka is abundant with occasional emergent indigenous trees such as pūriri (left) and taraire. 17 November 2021.

Plate 5: Blackberry-swamp kiokio vineland present within the gully. 17 November 2021.

Plate 6: Gorse (left) forms the dominant canopy over the lower reaches of the gully. 17 November 2021.

Plate 7: Planted kānuka and mānuka scrub is present along the lower reaches of the permanent stream. 17 November 2021.

5.2.2 Taraire-tōtara-pukatea forest (Vegetation Type 8)

Mature indigenous forest bounds the upper reaches of the permanent stream, characterised by a canopy of taraire, tōtara (*Podocarpus totara*), and pukatea (*Laurelia novae-zelandiae*) (Plate 7). Pūriri is also present in the canopy. The sub-canopy and understorey tiers include mahoe, mapou (*Myrsine australis*), ponga (*Cyathea dealbata*), nīkau (*Rhopalostylis sapida*), and tītoki (*Alectryon excelsus*). The ground tier supports seedlings of several tree species including pigeonwood (*Hedycarya arborea*), pūriri, miro (*Prumnopitys ferruginea*), and rewarewa (*Knightia excelsa*). Vines and epiphytes such as kiekie (*Freycinetia banksii*), New Zealand jasmine (*Parsonsia heterophylla*), and tātarāmoa (*Rubus cissoides*). Other ground tier species include climbing hard fern (*Icarus filiformis*), hound's tongue (*Zealandia pustulata* subsp. *pustulata*) and *Oplismenus hirtellus* subsp. *imbecillis*.

5.2.1 Kānuka-mānuka-tōtara scrub (Vegetation Type 9)

A discrete area of planted indigenous scrub is characterised by co-dominant kānuka, manuka, and tōtara (Plate 9). Occasional shrub species include akeake, karo (*Pittosporum crassifolium*), mahoe, lemonwood (*P. eugenioides*), karamu, and tī kōuka (*Cordyline australis*). The understorey is sparse apart from occasional inkweed (*Phytolacca octandra*) and exotic grass species such as Yorkshire fog, cocksfoot, and prairie grass.

5.2.1 Eucalyptus-radiata pine treeland (Vegetation Type 10)

A row of mature eucalyptus trees (*Eucalyptus* sp.) and radiata pine (*Pinus radiata*) form a shelterbelt along the northeastern property boundary (Plate 10). Few other species were recorded in this area apart from exotic grasses in the ground tier.

5.2.1 Hawthorn shrubland (Vegetation Type 11)

Several hawthorn (*Crataegus monogyna*) shrubs are present within a small gully in the south of the site, which partially buffer a small wetland characterised by creeping buttercup and water celery herbfield (1). Grazing currently inhibits the establishment of understorey vegetation or tree seedlings beneath the shrubs.

Plate 8: Mature indigenous trees are present along the edge of the permanent stream. 17 November 2021.

Plate 9. Planted kānuka, mānuka and tōtara occupy a slope above the permanent steam. 17 November 2021.

Plate 10: Eucalyptus and radiata pine are present along a shelter belt on the eastern property boundary. 17 November 2021.

Plate 11: Scattered hawthorn shrubland occupies a small gully in the southern portion of the property. 17 November 2021.

5.3 Wetland habitats

5.3.1 Overview

Five wetland habitat types were identified on the property, ranging from small degraded exotic wetlands to a large area of high-value swamp maire forest. Where required, these wetlands were delineated according to standard wetland delineation protocols for New Zealand outlined in Clarkson (2013). The reasoning for the classification of each of these areas as 'natural wetland' is provided in Table 1.

5.3.1 Swamp maire forest (Vegetation Type 12)

Swamp maire (*Syzygium maire*) forest occupies a wet gully floor a gully in the north of the property (Plate 12). Swamp maire (OBL) forms the canopy with occasional kahikatea (FACW) over an area of inundated soil and shallow pools. Indigenous understorey species include whekī (*Dicksonia squarrosa,* FACU), nīkau (FACU), ponga (UPL), pūriri (UPL), pigeonwood, karamū (FACU), tawa (*Beilschmiedia tawa*), kiekie (FACU), kawakawa (UPL), and forest cabbage tree (tī ngāhere/*Cordyline banksii*; UPL). Ground cover species comprise *Deparia petersenii* subsp. *congrua* (FAC), swamp kiokio (FACW), *Eleocharis acuta* (OBL), and swamp sedge (*Carex virgata,* FACW). Open areas comprise locally abundant Yorkshire fog (FACW) with frequent soft rush (FACW) and creeping buttercup (FAC). Other occasional species include swamp kiokio (FACW), harakeke (FACW), blackberry (FACU), and gorse (FACU). Pest plants such as barberry (FACU) and woolly nightshade (FACU) are present on the boundary of the swamp forest, together with the indigenous vine *Muehlenbeckia australis* (FACU). Areas of pooling were evident underneath the tree canopy (Plate 13).

This area is dominated by an Obligate plant species (swamp maire) and therefore satisfies the rapid test for the presence of hydrophytic vegetation (Table 1).

Table 1: Assessment of potential wetland habitat against wetland delineation criteria as per the NPS-FM and RMA.

Criteria	Swamp maire forest	Soft rush-water celery rushland	Creeping buttercup-Yorkshire fog herbfield	Creeping buttercup-water celery herbfield
Wetland (as per RMA definition)	Yes	Yes	Yes	Yes
Constructed by artificial means	No	No	No	No
Geothermal	No	No	No	No
Satisfies rapid test	Yes	Yes	No	No
Dominance index %	N/A	N/A	100%	100%
Prevalence index %	N/A	N/A	2.46	2.76
Hydrophytic vegetation?	Yes	Yes	Yes	Yes
Resulting classification	**Natural wetland**	**Natural wetland**	**Natural wetland**	**Natural wetland**

Plate 12: Swamp maire forest with indigenous and exotic dryland species on the margin. 17 November 2021.

Plate 13: Areas of inundation and pooling are evident beneath the swamp maire canopy. 17 November 2021.

5.3.2 Soft rush-water celery rushland (Vegetation Type 13)

Soft rush and water celery are co-dominant in a gully wetland near the eastern property boundary (Plate 14). Creeping buttercup (FAC) is an occasional species together with exotic pasture grasses. This wetland contains hydric soils that have been heavily pugged by stock.

This area satisfies the rapid test for the presence of hydrophytic vegetation as dominant species (soft rush and water celery) are Facultative Wetland species (Table 1).

5.3.1 Creeping buttercup-Yorkshire fog herbfield (Vegetation Type 14)

This wetland supports co-dominant creeping buttercup and Yorkshire fog (FACW) downstream of the hawthorn shrubland (Vegetation Type 11) (Plate 15). Soft rush (FACW) and lotus (*Lotus pedunculatus*, FAC) are frequent with occasional water pepper (*Persicaria hydropiper*, FACW), sweet vernal (FACU), creeping bent (*Agrostis stolonifera*, FACW), rye grass, clustered dock (*Rumex conglomeratus*, FAC), and *Eleocharis gracilis* (OBL).

This area is classified as a natural wetland based on the dominance test for hydrophytic vegetation (Table 1).

5.3.1 Creeping buttercup-water celery herbfield (Vegetation Type 15)

Two small areas of creeping buttercup-water celery herbfield occur near in a narrow gully near the southwestern property boundary. This vegetation type is defined by common creeping buttercup (FAC) and water celery (OBL) with frequent soft rush (FACW), lotus (FACW), and Yorkshire fog (FACW) (Plate 16). Other occasional species recorded within these areas of wetland include sweet vernal (UPL), jointed rush (*Juncus articulatus*, FACW), *Eleocharis gracilis* (OBL), and narrow-leaved plantain (FACU).

This area is classified as a natural wetland based on the dominance test for hydrophytic vegetation (Table 1).

Plate 14: Soft rush and water celery are abundant within a degraded wetland gully near the eastern property boundary. 17 November 2021.

Plate 15: Creeping buttercup and Yorkshire fog are common within a shallow gully on the southern property boundary. 17 November 2021.

Plate 16: Creeping buttercup is dominant with water celery locally abundant in heavily saturated areas in the base of the gully. 17 November 2021.

5.4 Streams

5.4.1 Permanent stream

A permanent stream is present in the northeastern part of the property. This stream is soft-bottomed and deeply incised with a maximum wetted width of between 1.5-2 metres and a depth of approximately 5-10 centimetres (Plate 17). Pools and undercut banks are present, providing good aquatic habitat for indigenous fish species. The stream is shaded and buffered by mature taraire-totara-pukatea forest (Vegetation Type 8) and mānuka-kānuka scrub (Vegetation Type 9).

5.4.1 Intermittent stream 1 (IS1)

This intermittent stream originates downstream of the swamp maire forest (Figure 1) and features a clear channel free from terrestrial rooted vegetation, with areas of natural pooling. The stream met four of the six criteria required to be classified as an intermittent stream under per the AUP (Table 2).

Table 2: Assessment of intermittent stream 1 against criteria provided in the AUP.

Criteria	Criteria Met?	Comment
(a) Has natural pools	✓	Natural pools are present in the upper reaches of the stream.
(b) Has a well-defined channel, such that the bed and banks can be distinguished	✓	The watercourse has a well-defined channel.
(c) Contains surface water more than 48 hours after a rain event which results in stream flow	×	7.5 mm of rain fell in the 48 hours prior to the site visit so this criterion could not be assessed.
(d) Rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel	✓	The watercourse channel was clear of rooted terrestrial vegetation.
(e) Organic debris resulting from flood can be seen on the floodplain	✓	Organic debris was visible along upper reaches.
(f) There is evidence of substrate sorting process, including scour and deposition	×	No obvious signs of sediment sorting or scour.

5.4.2 Intermittent stream 2 (IS2)

This intermittent stream flows through a wetland comprising creeping buttercup and water celery (Vegetation Type 15), and features a grazed channel with natural pools (Plate 18) and areas of exposed bedrock. The stream meets three of the six criteria for classification as an intermittent stream as it features natural pools, a defined channel, and there is evidence of scour and in some areas (Table 3).

Table 3: Assessment of intermittent stream 2 against criteria provided in the AUP.

Criteria	Criteria Met?	Comment
(g) Has natural pools	✓	Natural pools were present.
(h) Has a well-defined channel, such that the bed and banks can be distinguished	✓	The watercourse has a well-defined channel.
(i) Contains surface water more than 48 hours after a rain event which results in stream flow	×	7.5 mm of rain fell in the 48 hours prior to the site visit so this criterion could not be assessed.
(j) Rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel	×	Terrestrial rooted vegetation present in places.
(k) Organic debris resulting from flood can be seen on the floodplain	×	Organic debris was present however this was mostly leaf litter rather than flood debris.
(l) There is evidence of substrate sorting process, including scour and deposition	✓	Some evidence of scour and deposition in places including exposed bedrock.

Plate 17: The permanent stream flows through areas of indigenous forest across most of the surveyed reach. 17 November 2021.

Plate 18: Intermittent stream flows through wetland vegetation in the westernmost gully. 17 November 2021.

6. FLORA

Forty-six indigenous plant species were recorded during the site visit (Appendix 1). Three of the indigenous vascular plants recorded at the property haves a national-level threat classification: swamp maire (*Syzygium maire*) is 'Threatened = Nationally Critical', kānuka (*Kunzea robusta*) is 'Threatened - Nationally Vulnerable', and mānuka (*Leptospermum scoparium agg.*) is classified as 'At Risk - Declining' by de Lange *et al.* (2018). These plants are Myrtaceae species which are at risk of infection by myrtle rust (*Austropuccinia psidii*), a potentially devastating rust which has no known treatment. Along with other species in the Myrtaceae family, the threat statuses of swamp maire, kanuka, and mānuka have been elevated as a precautionary measure based on the potential threat posed by myrtle rust.

Swamp maire is now often scarce or absent over large parts of its former range due to the clearance of swamp forest (NZPCN 2022)[1]. It has a regional threat classification of 'Regionally Chronically Threatened – Gradual Decline' as per Stanley *et al.* (2005). The presence of swamp maire at the site is therefore likely to be of regional significance.

Thirty-four exotic species were recorded including pest plant species such as crack willow, woolly nightshade, gorse, blackberry, and agapanthus.

7. FAUNA

7.1 Aquatic fauna

The three streams that flow through the property form part of the Oira Creek catchment. Aquatic fauna records from within the Oira Creek catchment and adjacent Whangapouri Creek catchment are held in the New Zealand Freshwater Fish Database (NIWA 2021) are listed in Table 4. Five indigenous fish and one indigenous invertebrate species have been recorded within these catchments in the past 20 years, including two species classified as 'At Risk – Declining' by Dunn *et al.* (2018).

Table 4: Aquatic fauna species recorded within the Oira Creek and Whangapouri Creek catchments (NIWA 2021).

Species Name	Common Name	Threat Classification
Anguilla australis	Shortfin eel	Not threatened
Anguilla dieffenbachii	Longfin eel	At Risk – Declining
Galaxias fasciatus	Banded kōkopu	Not threatened
Galaxias maculatus	Inanga	At Risk – Declining
Gobiomorphus basalis	Crans bully	Not threatened
Paranephrops planifrons	Kōura	Not threatened

[1] https://www.nzpcn.org.nz/flora/species/syzygium-maire/

7.2 Avifauna

Ten indigenous bird species were recorded at the property:

- Pukeko (*Porphyrio melanotus*).
- Piwakawaka (fantail).
- Welcome swallow (*Hirundo neoxena neoxena*).
- Kōtare (New Zealand Kingfisher; *Todriamphus sanctus*).
- Tūī.
- Pipiwharauroa (shining cuckoo; *Chrysococcyx lucidus*).
- Riroriro (grey warbler).
- Pūtangitangi (paradise shelduck; *Todorna variegata*).
- Tauhou (silvereye).
- Kererū.

None of these species are classified as 'Threatened' or 'At Risk' as per Robertson *et al.* (2021). Pockets of vegetation at the property provide good quality habitat for indigenous birds and likely act as stepping stones to larger nearby areas of habitat and SEA.

Nine exotic bird species were recorded at the site:

- Eastern rosella (*Platycercus eximus*).
- Song thrush (*Turdus philomelos*).
- Blackbird (*Turdus medulla*).
- Chaffinch (*Fringilla coelebs*).
- Eurasian skylark (*Alauda arvensis*).
- Pheasant (*Phasianus colchicus*).
- Common myna (*Acridotheres tristis*).
- Common starling (*Sturnus vulgaris*).
- Goldfinch (*Carduelis carduelis*).

7.3 Long-tailed bats

Long-tailed bats (*Chalinolobus tuberculatus*) occur in the Auckland Region and are classified as 'Threatened - Nationally Critical' by O'Donnell *et al.* (2018). They are known to favour forest edge and riparian habitats of both indigenous and exotic forest types, having adapted to roosting in exotic tree species such as pine (*Pinus* spp.) and macrocarpa (*Cupressus macrocarpa*). They also forage over farmland and urban areas (O'Donnell 2001).

Records of indigenous bats are held in the Department of Conservation's bat database. A search of this database reveals two records of bats within 500 metres of the site in

2018. Two further records are present within 6.5 kilometres of the site recorded in 2020. There is suitable bat roost habitat at the site including mature indigenous and exotic trees with epiphytes and crevices favoured by long tailed bats. It is therefore likely that bats use the site at least periodically.

7.4 Herpetofauna

The nearest record of an indigenous lizard to the project site is of an ornate skink (*Oligosoma ornatum*) approximately 2.5 kilometres from the project site, although this record is from 1955 and ornate skinks may no longer be present. The nearest recent record of indigenous lizards from the project site are of copper skink (*Oligosoma aeneum*) approximately five kilometres to the north of the site. Both ornate and copper skink are classified as 'At Risk – Declining' by Hitchmough *et al.* (2021). There is high-quality habitat for indigenous skinks and geckos within the indigenous forest remnants (e.g., ground cover vegetation and woody debris, and epiphytes).

7.5 Introduced pest mammals

Pest animals likely to be present at the site include possums (*Trichosurus vulpecula*), ship rats (*Rattus rattus*), Norway rats (*R. norvegicus*), mice (*Mus musculus*), and hedgehogs (*Erinaceus europaeus*). Mustelids (stoats, *Mustela erminea*; ferrets, *M. furo*; and weasels, *M. nivalis vulgaris*) and feral and domestic cats (*Felis catus*) may also use the site occasionally.

8. ECOLOGICAL VALUES

8.1 Terrestrial values

Ecological values assessments for indigenous-dominant terrestrial habitat types present at the site have been assessed against the criteria outlined in Section 5.2 of the EIANZ Guidelines (Table 5).

Table 5: Ecological value assessment for terrestrial vegetation and habitat types (as per the EIANZ Guidelines).

Vegetation /Habitat type	Attributes to be considered	Assigned value
Kānuka-kahikatea-crack willow forest	Representativeness – Early successional stage of indigenous kahikatea forest.	Moderate
	Rarity/distinctiveness – No rare or distinctive species or ecosystem types.	Low
	Diversity & Pattern –Moderate diversity of indigenous plants.	Moderate
	Ecological context - Buffers and overland flow path.	Moderate
	Overall ecological value	**Moderate**
Kānuka forest	Representativeness – Early successional indigenous plant species with occasional forest trees.	Moderate
	Rarity/distinctiveness – Some large mature pūriri and taraire trees.	Moderate

Vegetation /Habitat type	Attributes to be considered	Assigned value
	Diversity & Pattern - Moderate diversity of indigenous plant species.	Moderate
	Ecological context – Provides slope stabilisation and buffering to an area of swamp maire wetland downslope.	High
	Overall ecological value	**High**
Mānuka-kānuka scrub	Representativeness – Although mainly planted, the vegetation is representative of regenerating indigenous bush in the Auckland region.	Moderate
	Rarity/distinctiveness – Few rare or distinctive features.	Low
	Diversity & Pattern – Moderate diversity of indigenous plant species.	Moderate
	Ecological context – Contiguous with high-value taraire-totara-pukatea forest and buffers the permanent stream.	High
	Overall ecological value	**Moderate**
Taraire-tōtara-pukatea forest	Representativeness – Representative of WF9 ecosystem type (Taraire, tawa, podocarp forest) as per Singers *et al.* (2017).	High
	Rarity/distinctiveness – Large mature taraire and pukatea trees. Forest type has a regional IUCN threat status of 'Endangered' (Singers *et al.* 2017).	High
	Diversity & Pattern – High diversity of indigenous plant species in all tiers.	High
	Ecological context – Provides good quality habitat for indigenous fauna and buffering for permanent stream.	High
	Overall ecological value	**Very high**
Kānuka-mānuka-totara scrub	Representativeness – Fenced planted indigenous scrub that is representative of regenerating indigenous bush in the Auckland region.	Moderate
	Rarity/distinctiveness – No rare or distinctive habitat features.	Low
	Diversity & Pattern – Moderate diversity of indigenous plant species.	Moderate
	Ecological context – Provides habitat corridor to area of high value indigenous vegetation.	Moderate
	Overall ecological value	**Moderate**
	Overall ecological value	Very low

8.2 Wetland and aquatic values

The ecological values associated with wetlands and streams based on the criteria of Roper-Lindsay et al. (2018) in Table 6.

Table 6: Ecological values assessment for freshwater habitat types (as per Roper-Lindsay *et al*. 2018).

Habitat type/ Ecological feature	Attributes to be considered	Assigned value
Swamp maire forest	Representativeness – Representative of indigenous lowland swamp forest ecosystem (WF8 – Kahikatea, pukatea forest) as per Singers *et al.* (2017).	High
	Rarity/distinctiveness- Regionally significant area of swamp maire forest. This ecosystem type has a regional IUCN threat status of 'Critically Endangered' (Singers *et al.* (2017).	Very High
	Diversity & Pattern – High diversity of canopy and understorey species.	High
	Ecological context – Forms part of a terrestrial-freshwater ecological sequence. Provides buffering to the headwaters of an intermittent stream.	High
	Overall ecological value	**Very high**
Soft rush-water celery rushland	Representativeness **–** Degraded grazed exotic wetland.	Very low
	Rarity/distinctiveness – Wetlands are a threatened habitat type with less than 10% original extent remaining. As such, all areas of wetland are considered as having at least 'moderate' value for this criterion.	Moderate
	Diversity & Pattern – Low diversity of indigenous plants.	Very low
	Ecological context – Limited connectivity to surrounding habitats.	Very low
	Overall ecological value	**Low**
Creeping buttercup-Yorkshire fog herbfield	Representativeness **–** Degraded grazed exotic wetland.	Very low
	Rarity/distinctiveness – Wetlands are a threatened habitat type with less than 10% original extent remaining. As such, all areas of wetland are considered as having at least 'moderate' value for this criterion.	Moderate
	Diversity & Pattern – Low diversity of indigenous plants.	Very low
	Ecological context – Limited connectivity to surrounding habitats.	Very low
	Overall ecological value	**Low**

Habitat type/ Ecological feature	Attributes to be considered	Assigned value
Creeping buttercup–water celery herbfield	Representativeness – Degraded grazed exotic wetland.	Very low
	Rarity/distinctiveness – Wetlands are a threatened habitat type with less than 10% original extent remaining. As such, all areas of wetland are considered as having at least 'moderate' value for this criterion.	Moderate
	Diversity & Pattern – Low to moderate diversity of indigenous plants.	Very low
	Ecological context – Limited connectivity to surrounding habitats.	Very low
	Overall ecological value	**Low**
Permanent stream	Representativeness – Permanent rural stream shaded by mature indigenous forest. Catchment modified by agriculture and grazing.	Moderate
	Rarity/distinctiveness – Likely to support 'At Risk' indigenous aquatic fauna, e.g., longfin eel.	High
	Diversity & Pattern – Contains a moderate diversity of in-stream habitat, including small pools and undercut banks.	Moderate
	Ecological context – Forms a significant part of the Oira creek catchment.	Moderate
	Overall ecological value	**High**
Intermittent stream 1	Representativeness – Rural stream with indigenous and exotic riparian vegetation.	Moderate
	Rarity/distinctiveness – Narrow stream channel with limited fauna habitat. Unlikely to support threatened fauna species.	Low
	Diversity & Pattern – Low diversity of in-stream habitat.	Low
	Ecological context – Forms part of the Oira Creek catchment.	Moderate
	Overall ecological value	**Moderate**
Intermittent stream 2	Representativeness – Degraded exposed stream channel.	Very low
	Rarity/distinctiveness – Narrow stream channel with limited fauna habitat. Unlikely to support threatened fauna species.	Very low
	Diversity & Pattern – Low diversity of indigenous plant species and limited flow.	Very low
	Ecological context – Forms part of the Oira Creek catchment.	Moderate
	Overall ecological value	**Negligible**

9. ECOLOGICAL SIGNIFICANCE

The ecological significance of each indigenous-dominant habitat types present at the site has been assessed against the criteria of NPS-IB (Table 7).

Table 7: Ecological significance assessment against the NPS-IB for indigenous-dominant habitat types.

Habitat type/ Ecological feature	Attributes to be considered	Achieved
Swamp maire forest	***Representativeness*** Highly representative of indigenous lowland swamp forest ecosystem (WF8 – Kahikatea, pukatea forest) that would have once been widespread in the ecological district (7a).	Yes (7a)
	Diversity & Pattern Supports a moderate diversity of indigenous plant species in the context of the ecological district (5a). Forms part of a freshwater-terrestrial ecotone with contiguous terrestrial habitats (5b).	Yes (5a, 5b)
	Rarity/distinctiveness Provides habitat for swamp maire, which has a conservation ranking of 'Threatened – Nationally Critical' (6a). Comprises an indigenous vegetation type that is uncommon within the ecological district (6b). Comprises is an indigenous vegetation type that has been significantly reduced (this ecosystem type has a regional IUCN threat status of 'Critically Endangered' (Singers *et al.* (2017) (6d).	Yes (6a, 6b, 6d)
	Ecological context Locally important for the natural functioning of a rare swamp forest type relative to remaining habitats in the ecological district (3d).	Yes (3d)
Kānuka-kahikatea-crack willow forest	***Representativeness*** Does not have the ecological integrity that is typical of the character of the ecological district.	No
	Diversity & Pattern Forms part of a freshwater-terrestrial ecotone with endangered swamp forest habitat (5b).	Yes (5b)
	Rarity/distinctiveness Does not meet any rarity or distinctiveness criteria.	No
	Ecological context Provides a partial buffer to endangered swamp forest habitat (3c),	Yes (3c)

Habitat type/ Ecological feature	Attributes to be considered	Achieved
Mānuka-kānuka scrub	**Representativeness** This habitat type is planted (less than 20 years old) and therefore does not meet this criterion.	No
	Diversity & Pattern Does not meet any rarity or distinctiveness criteria.	No
	Rarity/distinctiveness Does not meet any rarity or distinctiveness criteria.	No
	Ecological context Provide partial buffer to high value taraire-tōtara-pukatea forest and buffers a high-quality permanent stream (3c).	Yes (3c)
Taraire-tōtara-pukatea forest	***Representativeness*** Has ecological integrity typical of the character of the ecological district (7a).	Yes (7a)
	Diversity & Pattern Supports a high diversity of indigenous plant species in all tiers in the context of the ecological district (5a).	Yes (5a)
	Rarity/distinctiveness Comprises an indigenous vegetation type that is uncommon within the ecological district (forest type has a regional IUCN threat status of 'Endangered' (Singers *et al.* 2017)) (6a). Comprises is an indigenous vegetation type that has been significantly reduced in the ecological district (6d).	Yes (6a, 6d)
	Ecological context Provide an important buffer to a high-quality permanent stream (3c).	Yes (3c, 3d)
Kānuka-mānuka-totara scrub	**Representativeness** This habitat type is planted (less than 20 years old) and therefore does not meet this criterion.	No
	Diversity & Pattern Does not meet any diversity and pattern criteria.	No
	Rarity/distinctiveness Does not meet any rarity or distinctiveness criteria.	No
	Ecological context Only provides limited buffering to adjacent Taraire-tōtara-pukatea forest	No

10. ECOLOGICAL CONSTRAINTS OF THE PROPOSED DEVELOPMENT

10.1 Terrestrial vegetation

All indigenous vegetation at the site is currently fenced and largely restricted to gullies, which means any future development of the site can easily avoid direct adverse impacts indigenous vegetation. An important ecological constraint is the proximity at which construction can be undertaken in relation to high value habitats such as taraire-tōtara-pukatea forest and swamp maire forest. Given that these two habitat types (and various contiguous habitats) meet the NPS-IB criteria for significance, a minimum construction setback of lineal 20 metres should be applied, noting that undertaking earthworks and building at a closer distance are also constrained by the site topography.

10.2 Proposed levelling of gully heads

To maximise the total area of stable land available for development, it is intended that the land at the heads of three gullies will be levelled. A *c.*20-metre-wide buffer will be maintained between areas affected by earthworks and natural wetland habitats on the gully floors (see Appendix 2). As such, the earthworks associated with the proposed gully head levelling will only be considered a non-complying activity under Regulation 52(1)(a) of the NES-FW if it will result, or is likely to result, in the complete or partial drainage of a natural wetland.

Alterations to topography at the gully heads has the potential to result in changes to the hydrological inputs that feed the wetlands within the gullies. This is proposed to be addressed by achieving hydrological neutrality through the installation of an underground drainage network. If this drainage network functions as expected, effects on wetland hydrology should be negligible. However, as this will represent the diversion of water within 100 metres of a natural wetland, the levelling of the gully heads will be a non-complying activity under Regulation 54(c) of the NES-FW.

10.3 Increased stormwater discharge and creation of new impervious surfaces

The rezoning of the land at 70A and 70B Lisle Farm Drive will allow for the creation of new dwellings and accessways, and will lead to an increase in impervious surface area at the property. Increases in impervious surface area are associated within increased peak stormwater flows and the release of contaminants into receiving aquatic environments such as streams and wetlands. Increases in peak stormwater discharges are also associated with increases in erosion and scour of stream channels during storm events and the discharge of pollutants into the aquatic environment. The overall magnitude of this effect will depend on the final design and amount of new impervious surface area to be created. Maximising pervious surface area and ensuring adequate stormwater management will help minimise the impact on aquatic habitats.

10.4 Stream and estuarine sedimentation

Streams and wetlands on the property form part of the Oira Creek and Whangapouri Creek catchments, which ultimately drain into the Manukau Harbour to the north. Sediment discharged from the site risks contributing to increased sedimentation within the wider catchment. Increased sedimentation can lead to negative impacts on aquatic fauna.

The proposed levelling of the gully heads and construction of new dwellings and accessways will require earthworks. The overall impact of sediment on stream and wetlands at the site will depend on location and extent of earthworks on the site. Earthworks located within the gullies with steep slopes carry a higher risk of sediment mobilisation than those in flatter areas. If earthworks were to take place within 10 metres of wetlands, it would be a non-complying activity under regulation 54(b) of the NES-FW.

The potential impact of sediment discharge from earthworks can be minimised by ensuring that the design and implementation of the works complies with industry best practice. An Erosion and Sediment Control Plan (ESCP) will have to be submitted for approval by Auckland Council before the commencement of earthworks and should comply with the recommendations outlined in GD2016/005 – Erosion and Sediment Control Guide for Land Disturbing activities in the Auckland Region.

10.5 Increased light and disturbance

Increased light levels resulting from increased human activity as a result of rezoning the site has the potential to adversely affect indigenous fauna. Most significantly is the potential impact on indigenous long-tailed bats that may utilise the site. Bats are known to avoid areas with excess artificial light levels, which can disrupt foraging and roosting behaviour.

Disturbance to indigenous bats can be minimised by reducing light levels as much as possible and avoiding the use of unnecessary outdoor lighting. An Environmental Court decision for the Amberfield subdivision in Hamilton indicates that the acceptable upper light limit for bats is 0.3 lux and that light levels should not exceed 0.1 lux within three metres of high-quality bat habitat such as indigenous forest or large roost trees. These controls are also considered appropriate for any future developments at 70A and 70B Lisle Farm Drive, although a preliminary bat survey would need to be undertaken in the first instance.

11. OPPORTUNITIES TO PROTECT AND ENHANCE ECOLOGICAL VALUES

11.1 Overview

A transition in land use away from FUZ towards to MHU also presents opportunities to enhance ecological values at the site. Excluding stock from wetland habitats will allow these areas to recover and significantly improve the quality of water flowing into downstream receiving environments. Planting steep gully sides with appropriate indigenous plant species would establish valuable buffers for existing natural areas, prevent erosion and slopes, and help to improve the condition of wetlands and watercourses. An indicative planting plan is provided in Section 11.2.

11.2 Protection and enhancement of SEA/SNA quality habitats

The following five vegetation and habitat types qualify as significant under the NPS-IB criteria:

- Swamp maire forest.
- Kānuka-kahikatea-crack willow forest.
- Kānuka forest.
- Mānuka-kānuka scrub.
- Taraire-tōtara-pukatea forest.

Together, these habitats form two discrete areas within large gullies in the northwestern corner of the property that lend themselves to protection and enhancement (Figure 2). It is important to include small areas of exotic-dominant vegetation (e.g., gorse and blackberry) within the proposed protected area for the swamp maire forest. Exotic vegetation currently provides buffering functions to swamp forest vegetation and it will eventually be replaced by indigenous species under an appropriate management programme (see below). It is recommended that the SEA/SNA quality vegetation, and their associated buffer planting areas, are legally protected in perpetuity under a QEII Open Space Covenant or similar at the time of subdivision or development, noting that few QEII covenants are present in the Pukekohe area.

There are excellent restoration opportunities in and around the area of swamp maire forest. This habitat type has become extremely rare in the Auckland region due to land drainage and clearance for agricultural and residential purposes. The area of swamp maire found on site is currently fenced and intact, although it is small and vulnerable to incursions by pest plant species such as blackberry, gorse, woolly nightshade, and climbing asparagus, which are present along the forest margins. Control of exotic species and the planting of indigenous species in canopy gaps would increase the extent of this habitat and improve its resilience to further degradation and disturbance. Consideration should also be given to undertaking pest animal control in high value habitats at the site, targeting species such as possums and ship rats.

Specific precinct plan provisions to protect and enhance ecological values at the site should include:

- a 20-metre buffer around ecological features within the central northern gully and a 20-metre buffer along both sides of the western stream gully (as per Planting Areas 1 and 2a&b in Figure 2); and
- a 15-metre buffer around wetland habitat within the small gullies along the southern property boundary along the eastern side of the western stream gully (as per Planting Areas 3 and 4 in Figure 2).

The buffers should be planted with indigenous vegetation be protected at the time of subdivision to the satisfaction of Auckland Council.

Furthermore, the owners or their successors in title of the site shall:

i. Protect the indigenous vegetation, wildlife habitats, and the natural landscape within these covenanted areas, including the installation of stock-proof fences where appropriate.
ii. Not do anything that would prejudice the health or ecological value of the covenanted areas.
iii. Not (without prior approval from Council and then only in strict compliance with conditions imposed by council) cut down, damage or destroy, or permit the cutting down, damage or destruction of the native vegetation or wildlife habitats within the covenanted areas.
iv. Control invasive plants and pest animals within the within the covenant, in accordance with a management plan prepared at the time of consent.

Figure 2. Vegetation proposed for protection and proposed buffering planting at 70a & 70b Lisle Farm, Pukekohe

11.3 Buffer planting

11.3.1 Overview

Four buffer planting areas (PAs) have been identified at the property. These consist of:

- Revegetation planting in areas of exotic grassland surrounding existing indigenous vegetation to enhance buffering capacity (PA1 and PA2).
- Riparian and upslope planting throughout areas of exotic grassland to provide buffering for an intermittent stream and a wetland (PA3 and PA4).

The locations of the planting areas are shown in Figure 2. All planting within these areas should follow the plant schedules provided below. Percentages for each plant species have been provided in the plant schedules. Total plant numbers will be calculated once the planting areas have been confirmed.

11.3.2 Indigenous buffer revegetation (PA1 and PA2)

These areas comprise exotic grassland on mainly drier moderate to steep slopes. Canopy cover is expected to be reached within three to five years, and the shade created will naturally suppress light-dependent exotic grass, shrub, and herb species. The planting schedule for these areas is provided in Table 8.

Table 8: Indicative planting schedule for PA1 and PA2

Species	Common Name	Size	Spacing (m)	%	PA1 (9,560 m²)	PA2a (2,840 m²)	PA2b (3,660 m²)
Beilschmiedia tarairi[1]	taraire	2L	5	1.5	30	5	5
Coprosma robusta	karamū	1L	1.4	10	730	180	230
Cordyline australis	tī kōuka	1L	1.4	10	730	180	230
Dacrycarpus dacrydioides[1]	kahikatea	2L	5	2.5	20	10	10
Kunzea robusta	kānuka	1L	1.4	25	1,450	400	515
Leptospermum scoparium	mānuka	1L	1.4	12	730	180	235
Melicytus ramiflorus	māhoe	1L	1.4	10	730	145	190
Pittosporum eugenioides	tarata	1L	1.4	10	350	110	140
Podocarpus totara[1]	tōtara	2L	5	3	120	35	45
Pseudopanax arboreus	five-finger	2L	3	5	240	70	95
Veronica stricta	koromiko	1L	1.4	5	240	70	95
Vitex lucens[1]	pūriri	2L	5	3	120	35	45
Total				**100**	**5,490**	**1,420**	**1,835**

1. Plant in Years 3-5 when sufficient shelter is provided from surrounding plants. Taraire should be planted in damper, less exposed areas, e.g., top slope.

11.3.3 Riparian buffer planting areas (PA3 and PA4)

These planting areas provide a 15-metre buffer zone along Intermittent Stream 2 (and its associated wetland) and the wetland associated with vegetation type 14. The plantings will achieve canopy closure within three to five years and will buffer much of the existing stream and wetland habitats. The planting schedule for the two riparian zones is presented in Table 9 and includes species that are tolerant of flooding events.

Table 9: Indicative planting schedule for PA3 and PA4

Species	Common Name	Grade	Spacing (m)	(%)	PA3 (2,230 m²)	PA4 (2,270 m²)
Aristotelia serrata	wineberry	1L	1.4	5	55	60
Dacrycarpus dacrydioides[1]	kahikatea	2L	5	2.5	10	15
Carex lessoniana[2]	rautahi	0.5L	0.75	7.5	300	305
Carex virgata[2]	pūrei	0.5L	0.75	7.5	300	305
Cordyline australis	tī kōuka	1L	1.4	12.5	140	145
Kunzea robusta	kānuka	1L	1.4	20	230	230
Leptospermum scoparium	mānuka	1L	1.4	15	170	175
Melicytus ramiflorus	māhoe	1L	1.4	7.5	85	85
Veronica stricta	koromiko	1L	1.4	7.5	85	85
Phormium tenax[2]	harakeke	0.5L	1.4	15	170	175
Sophora chathamica[1]	kōwhai	1L	1.4	5	10	12
Total				**100**	**1,555**	**1,592**

1. Plant in Years 3-5 when sufficient shelter is provided from surrounding plants.
2. Plant on stream edge and damp floodplain areas.

11.4 Site preparation

Appropriate site preparation is essential to the success of indigenous revegetation plantings. All environmental pest plants should be controlled within the planting areas, (if present) and all non-invasive exotic grasses and herbaceous plants should also be blanket sprayed before planting work is carried out. As rank kikuyu is present within the planting areas, spraying should be undertaken at least 12 weeks prior to planting, to allow time for the vegetation to break down.

11.5 Plant stock and availability

All plants should be sourced from the Manukau Ecological District, in line with Auckland Council's eco-sourcing Code of Practice. To ensure availability, the plant stock should be ordered as far in advance as possible, especially for slower-growing species required in larger grades (e.g., kahikatea).

11.6 Plant layout and spacing

In general, most shrub and smaller tree species should be planted at 1.4 metre centres. Larger growing species (e.g., kahikatea, pūriri) should be planted further apart at approximately five metre centres, while maintaining an overall coverage of 1.4 metre spacing between all plants. Sedge species (e.g., *Carex* spp.) should be planted at 0.75 metre centres.

11.7 Maintenance

Revegetated areas should be inspected at least three times during the first three years following planting, and annually for the next two years. During these visits, plants should be released from exotic vegetation to ensure they are able to receive sufficient sunlight to thrive. As the plants become established, they will begin to out-compete other exotic species and the amount of maintenance required will decrease.

Infill planting may be required depending on plant survival. Infill plants should be of the same grade as those used in the initial planting. The number and species of infill plants should be identified in the February or March preceding the infill planting season.

If planting is carried out during July and/or August (while soil moisture is high), watering should not be required during the summer months. However, if plants start to show signs of water stress (e.g., wilting or dropping leaves) watering should be carried out to reduce plant losses and infill planting requirements. Conclusions

12. CONCLUSIONS

Scott Wilkinson Planning Ltd, on behalf of its client, is preparing a plan change request to rezone 70A and 70B Lisle Farm Drive, Pukekohe, from Future Urban Zone (FUZ) to Mixed Housing Urban (MHU) Zone. Vegetation on the property is characterised by large areas of exotic grassland with small gully features that support containing small streams, wetlands, and remnants of indigenous forest and scrub.

During a site visit undertaken on 17 November 2021, all natural features were mapped and assessed, and all wetlands were delineated. Watercourses were also assessed against the stream classification criteria outlined in the AUP. One permanent stream, two intermittent streams and several areas of wetland were identified during the site survey.

Two high value indigenous habitats (swamp maire forest and taraire-tōtara-pukatea forest and contiguous vegetation) are present in the larger, fenced gullies, and both are considered significant as per the NPS-IB criteria. Targeted surveys for indigenous fauna surveys were not undertaken as part of this assessment, however, potential habitat is present for indigenous fish, birds, lizards, and long-tailed bats. Long-tailed bats have been recorded in close proximity to the site and there is suitable habitat within mature trees at the site.

Ecological and statutory constraints of the rezoning relate to the construction of new dwellings and associated infrastructure have been discussed, together with the proposed levelling of three gully heads in close proximity to natural wetlands. The development on the site will only trigger regulation 54(c) of the NPS-FM if discharges within 100 metres of areas of wetlands result in changes to wetland hydrology. It is important that the proposed levelling of three gully heads does not modify flows into the wetlands, in particular, the high value swamp maire forest (a regionally threatened ecosystem type). However, the overall magnitude of this effect will depend on the final design and amount of new impervious surface area to be created.

Ecological benefits will be achieved once stock are excluded from wetlands and streams. Key opportunities for protecting and enhancing the ecological values of the SEA/SNA quality vegetation include covenanting, undertaking targets pest plant and animal control, and undertaking buffer planting. These actions can be included in the precinct provisions that will be drafted as part of this application.

ACKNOWLEDGMENTS

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REFERENCES

Auckland Regional Council 2004: Awhitu and Manukau Ecological Districts: Indigenous Vegetation Survey. Volume 1. Auckland Regional Council.

Clarkson B.R. 2013: A Vegetation tool for wetland delineation in New Zealand. Landcare Research, Hamilton.

de Lange P.J., Rolfe J.R., Barkla J.W., Courtney S.P., Champion P.D., Perrie L.R., Beadel S.M., Ford K.A., Breitwieser I., Schonberger I., Hindmarsh-Walls R., Heenan P.B. and Ladley K. 2018: Conservation status of New Zealand indigenous vascular plants, 2017. *New Zealand Threat Classification Series 22*. Department of Conservation, Wellington.

Dunn N.R., Allibone R.M., Closs G.P., Crow S.K., David B.O., Goodman J.M., Griffiths M., Jack D.C., Ling N., Waters J.M., and Rolfe J. R. 2017: *Conservation status of New Zealand freshwater fishes, 2017*. New Zealand Threat Classification Series 24. 11 pp.

Fraser. S., Singleton P and Clarkson B. 2018: Hydric soils – field identification guide. Landcare research contract report prepared for Tasman District Council, June 2018. 75 pp.

Heather B. & Robertson H, 2000: *The field guide to the birds of New Zealand* (Revised edition). Viking\Penguin books.

Hitchmough R. A., Barr B., Knox C., Lettink M., Monks J.M., Patterson G.B., Reardon J.T., van Winkel D., Rolfe J., and Michel P. 2021: Conservation status of New Zealand reptiles, 2021. *New Zealand Threat Classification Series 35*. Department of Conservation, Wellington. 15 pp.

Lindsay H., Wild C., and Byers S. 2009: *Auckland Protection Strategy: A Report to the Nature Heritage Fund Committee*. Nature Heritage Fund.

Ministry for the Environment. 2021: *Wetland delineation hydrology tool for Aotearoa New Zealand*. Wellington.

Morrisey D., Beard C., Morrison M., Craggs R., and Lowe M. 2007: The New Zealand mangrove: Review of the current state of knowledge. *Auckland Regional Council Publication Number 325*.

NIWA 2021: New Zealand Freshwater Fish Database. National Institute of Water and Atmospheric Research. https://nzffdms.niwa.co.nz/. Accessed 27 November 2021.

O'Donnell C.F.J. 2001: Home range and use of space by Chalinolobus tuberculatus, a temperate rainforest bat from New Zealand. *Journal of Zoology (London)* 253: 253 264.

O'Donnell C.F.J., Borkin K.M., Christie J.E., Lloyd B., Parsons S., Hitchmough R.A. 2018: Conservation status of New Zealand bats, 2017. *New Zealand Threat Classification Series 21*. Department of Conservation, Wellington 4 pp.

Robertson H.A., Baird K.A., Elliott G.P., Hitchmough R.A., McArthur N., Miskelly C.M., O'Donnell C.J., Sagar P.M., Scofield R.P., Taylor G.A., and Michel P. 2021: Conservation status of New Zealand birds, 2021. *New Zealand Threat Classification Series 36*. Department of Conservation, Wellington. 43 pp.

Roper-Lindsay J., Fuller S. A., Hooson S., Sanders M.D., and Ussher G.T. 2018: Ecological impact assessment EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition *EIANZ Melbourne, Australia.*

Stanley R., de Lange P., and Cameron E. 2005: Auckland regional threatened and uncommon vascular plants list. *Auckland Botanical Society Journal 60*: 152-157.

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

LIST OF VASCULAR PLANTS RECORDED AT 70A AND 70B LISLE FARM DRIVE, PUKEKOHE

INDIGENOUS SPECIES

Gymnosperms

Dacrycarpus dacrydioides	kahikatea
Pectinopitys ferruginea	miro

Monocot. trees and shrubs

Cordyline australis	tī kōuka, cabbage tree
Cordyline banksii	tī ngāhere, forest cabbage tree
Rhopalostylis sapida	nīkau

Dicot. trees and shrubs

Alectryon excelsus subsp. *excelsus*	tītoki
Beilschmiedia tarairi	taraire
Beilschmiedia tawa	tawa
Coprosma robusta	karamū, kāramuramu
Dodonaea viscosa	akeake
Hebe stricta var. *stricta*	koromiko, kōkōmuka
Hedycarya arborea	porokaiwhiri; pigeonwood
Hoheria populnea	houhere, lacebark
Knightia excelsa	rewarewa
Laurelia novae-zelandiae	pukatea
Leptospermum scoparium agg.	mānuka
Melicytus ramiflorus subsp. *ramiflorus*	māhoe
Myrsine australis	māpou, matipou, māpau
Piper excelsum subsp. *excelsum*	kawakawa
Pittosporum crassifolium	karo
Pittosporum eugenioides	tarata; lemonwood
Pittosporum tenuifolium	kōhūhū, rautāhiri, rautāwhiri
Syzygium maire	maire tawake, swamp maire
Vitex lucens	pūriri

Monocot. lianes

Freycinetia banksii	kiekie

Dicot. lianes

Muehlenbeckia australis	puka
Parsonsia heterophylla	akakaikiore
Rubus cissoides agg.	tātarāmoa, tātaraheke , bush lawyer

Ferns

Asplenium flaccidum	makawe, ngā makawe o Raukatauri
Blechnum minus	swamp kiokio
Cyathea dealbata	ponga, silver fern
Dicksonia squarrosa	whekī
Doodia australis	pukupuku
Histiopteris incisa	mātātā, water fern
Lastreopsis glabella	

Microsorum pustulatum	kōwaowao, pāraharaha, hound's tongue fern
Paesia scaberula	mātātā
Pyrrosia elaeagnifolia	leather-leaf fern

Grasses

Austroderia fulvida (*Cortaderia fulvida*)	toetoe
Oplismenus hirtellus subsp. *imbecillis*	

Sedges

Carex dissita	
Carex virgata	swamp sedge
Eleocharis acuta	spike sedge
Eleocharis gracilis	

Monocot. herbs (other than orchids, grasses, sedges, and rushes)

Astelia solandri	kōwharawhara
Phormium tenax	harakeke, flax

NATURALISED AND EXOTIC SPECIES

Gymnosperms

Pinus radiata	radiata pine
Taxodium distichum	Swamp cypress

Dicot. trees and shrubs

Berberis glaucocarpa	barberry
Ficus pumila	creeping fig
Fraxinus excelsior	ash
Quercus robur	English oak
Rubus sp. (*R. fruticosus* agg.)	blackberry
Salix ×fragilis	crack willow
Solanum mauritianum	woolly nightshade
Ulex europaeus	gorse

Monocot. lianes

Asparagus scandens	climbing asparagus

Ferns

Grasses

Agrostis stolonifera	creeping bent
Anthoxanthum odoratum	sweet vernal
Bromus willdenowii	prairie grass
Dactylis glomerata	cocksfoot
Holcus lanatus	Yorkshire fog
Lolium perenne	rye grass

Sedges

Isolepis sepulcralis

Rushes

Juncus articulatus	jointed rush
Juncus effusus var. *effusus*	soft rush, leafless rush

Monocot. herbs (other than orchids, grasses, sedges, and rushes)

Agapanthus praecox	agapanthus

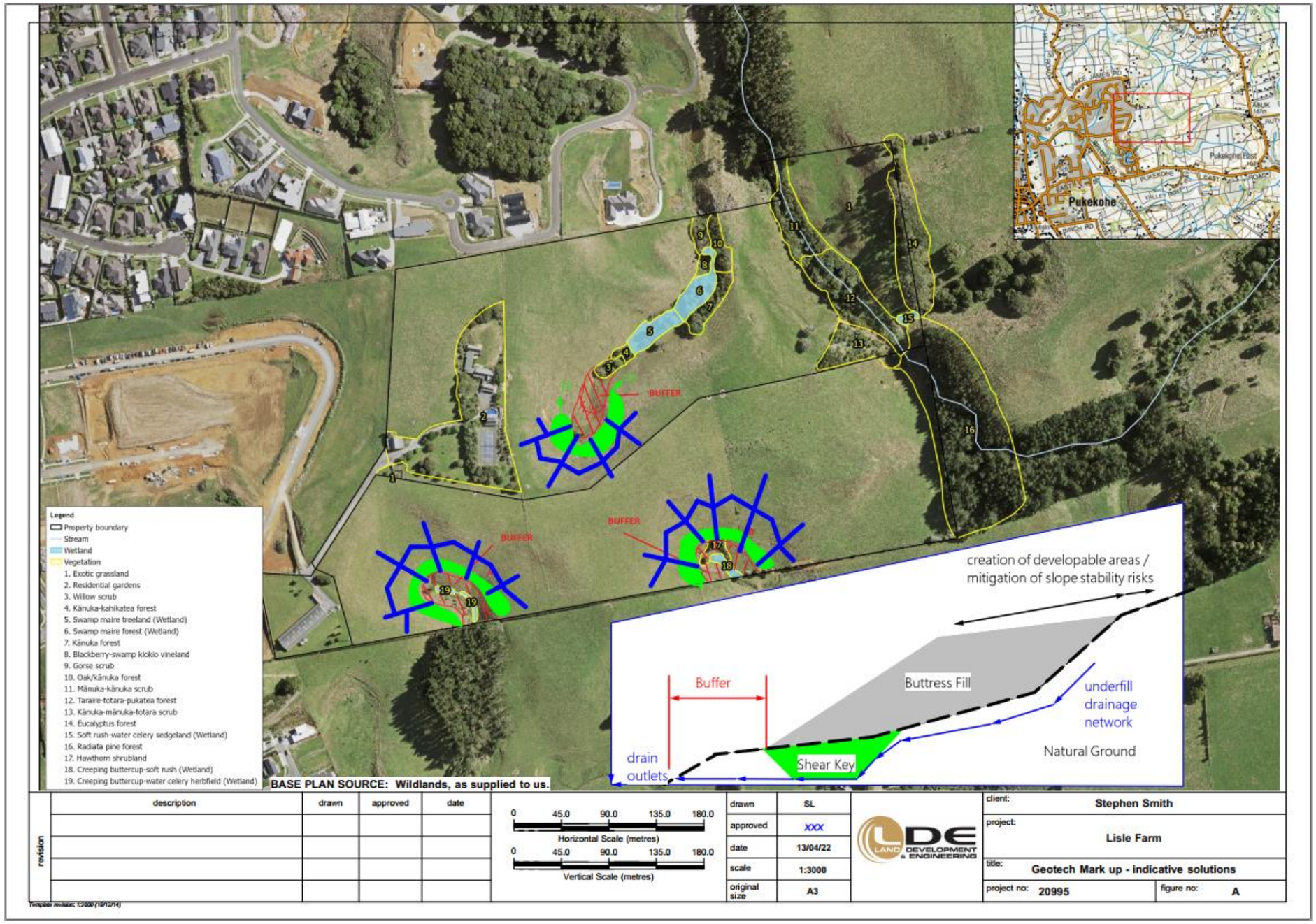
Composite herbs

Bellis perennis	lawn daisy
Cirsium vulgare	Scotch thistle
Leontodon taraxacoides	hawkbit

Dicot. herbs (other than composites)

Apium nodiflorum	water celery
Galium aparine	cleavers
Geranium dissectum	cut-leaved geranium
Lotus pedunculatus	lotus
Mentha pulegium	penny royal
Phytolacca octandra	inkweed
Prunella vulgaris	selfheal
Ranunculus repens	creeping buttercup
Rumex pulcher	fiddle dock
Tropaeolum majus	garden nasturtium

MARKED UP PLAN SHOWING PROPOSED GULLIES FOR LEVELLING (PREPARED BY LDE LTD)



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