

**ASSESSMENT OF ECOLOGICAL EFFECTS  
FOR THE PROPOSED PENCARROW  
STRUCTURE PLAN AREA AT PONGAKAWA**

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# **ASSESSMENT OF ECOLOGICAL EFFECTS FOR THE PROPOSED PENCARROW STRUCTURE PLAN AREA AT PONGAKAWA**

**Contract Report No. 6334**

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## 1. INTRODUCTION

Momentum Planning and Design (MPAD), Tauranga, on behalf of their client (Kevin and Andrea Marsh, 1491 State Highway 2, Pongakawa) require an assessment of potential ecological effects for a proposed plan change they are working on for an area of c.9.7 hectares. It would result in the change of zoning from Rural to mostly Residential with a small area of Commercial, on land north of Arawa Road, at Pongakawa, adjacent to the existing residential area within Pongakawa.

The client supplied the following brief:

- Desktop review of relevant literature, published resources in respect of ecological information at the site.
- Site visit and walkover, non-intrusive investigations.
- Identify areas of terrestrial or aquatic habitat and ecosystems requiring protection within the plan change process (by way of structure planning). This would need to have regard to the NPS-Freshwater.
- Identify ecological enhancement opportunities to drains to be retained at the boundaries of the plan change site. Particularly at the edge of the two communal green spaces proposed. Note overland flow paths will be provided for however at this stage would not be planted and would not be permanent streams.
- The greenspace proposed is the likely location of a stormwater treatment wetland. Advice as to indigenous planting appropriate to local conditions and wetland environments, with high filtration properties if known, would be appreciated.
- Preparation of a report suitable to accompany an application for a plan change.

Plans supplied showed the plan change area, drains and overland flow paths/ponding areas, and current structure plan information.

This report provides a description of vegetation and habitat types within the land parcels which will be affected by the proposed works, an assessment of the current ecological values that are present within the project area, provides an assessment of the potential ecological effects of the proposed development, and outlines options to avoid, remedy, or mitigate any adverse effects. Any constraints to the proposed development resulting from the recent implementation of the National Policy Statement for Freshwater Management (NPS-FM) and the National Environmental Standards for Freshwater (NES-FW) will also be addressed and discussed (definitions relevant to interpretation of the NPS-FM and NES-FW are provided in Appendix 1).

## 2. ECOLOGICAL CONTEXT

### Site Character

The property is located immediately to the north of State Highway 2 and access is via Arawa Road, a largely urban street in the settlement of Pongakawa. The subject property is currently an operational dairy farm.

The land subject to the plan change proposal is mostly gently-sloping or flat land elevated above the low plain (former wetland) which extends northwards to the Little Waihi estuary. There are no streams or drains on the subject land but there is an excavated drain present along the western and northern boundaries of the plan change area. This drain flows into the Wharere Canal about 1.2 kilometres from the site. Upstream of State Highway 2 there is a further 1.4 kilometres of excavated drain and upstream of this is the headwater catchment of the Puanene Stream. The Puanene catchment has a total length, from the headwaters to Little Waihi estuary, of about 16 kilometres.

### Former Wetland Extent

All of the farmland and orchards on low-lying land north of this section of State Highway 2 were originally part of the southern margins of the historically extensive Kawa Swamp. The Kawa Swamp was an extensive freshwater wetland that extended across most of the Kaituna-Pongakawa Plains. Vegetation and habitat types within the wetland historically included *Machaerina* sedgeland, *Empodisma minus* sedgeland, *Gleichenia dicarpa* fernland, raupō (*Typha orientalis*) reedland, harakeke (*Phormium tenax*) flaxland (Newnham *et al.* 1995), mānuka shrubland, and bracken fernland (Kirk 1872). The Kawa swamp at Maketū was described as containing the most extensive habitat for the marsh shield-fern (*Thelypteris confluens*; formerly *Nephrodium thelypteris* var. *squamulosum*) in New Zealand (Kirk 1872). Kahikatea (*Dacrycarpus dacrydioides*), swamp maire (*Syzygium maire*), and pukatea (*Laurelia novae-zelandiae*) are likely to have been present on boggy ground on the margins of the swamp.

### Tauranga Ecological District

The property is in the semi-coastal bioclimatic zone within Tauranga Ecological District and Wildland Consultants (2003) provides more information on ecological context and history. Following the arrival of Europeans, vast areas of wetland were drained and secondary shrubland and fernland cleared for farm development. Most of this clearance occurred in the early 1900s and the subsequent loss of wetland habitat led to a dramatic decline in wetland habitats and species (Wildland Consultants 2003). Since European settlement in the area around 1880, extensive wetlands such as the Kaituna Swamp, the Waihi Swamp, and the Kawa Swamp have been reduced to only 248 hectares, or less than 1% of the original extent of the wetland (Ministry for the Environment 1997).

### Water Quality

As noted above, the property is located within the catchment of Waihi Estuary which is in the Kaituna-Pongakawa-Waitahanui Water Management Area (WMA). In the upper catchments of the WMA the water quality is generally 'excellent' based on macroinvertebrates index (MCI) scores. In the lower WMA the water quality decreases with MCI scores indicating only a 'fair' water quality (Brown 2018). Nutrients and sediment levels are also worse in the lower catchments, which has adversely affected the wetland and estuary health further downstream (Brown 2018, Hamill 2020, Zygadlo 2021). The decline in water quality is linked to the land use being more intensive in the lower catchments with intensive dairy farming being the main land use.

Waihi Estuary was heavily modified in the 1800s with various inflowing waterways being channelised to allow for the now predominant land uses of dairy farming and horticulture (Brown 2018). Based on water quality trends in the Bay of Plenty, river catchments with pastoral or agricultural land use have worse visual clarity, total nitrogen, and *Escherichia coli* (*E.coli*) bacteria concentrations (Hamill 2020), which is likely the case for the drain on the western margin of the proposed plan change area.

In summary, waterways in the catchment of Waihi estuary are heavily modified with strong land use pressures such as increased nutrients, sediment and *E.coli*. These pressures affect water quality and the freshwater biotic community, adversely affecting overall stream health.

### 3. METHODS

A walk-through site survey was undertaken on 5 April 2022. An initial walk-over was undertaken in the company of the property owner to discuss the general lie of the land and proposed plans. All vegetation and habitats were then described, mapped using high resolution colour aerial photographs at a scale of 1:1,000, and digitised using ArcMap 10.3. A list of vascular plant species observed during the site survey was compiled (see Appendix 1) and incidental observations of fauna were made. Freshwater fish records were accessed from the NIWA Freshwater Fish Database. A targeted freshwater fauna survey was not undertaken.

### 4. VEGETATION AND HABITAT TYPES

Eight broad vegetation and habitat types have been identified and mapped within the project area, as mapped in Figure 1:

- Pasture/cropping.
- Exotic shelterbelt/trees.
- House and curtilage.
- Sheds/laydown area.
- Excavated pond.
- Planted riparian margin.
- Lane access.
- Dairy waste treatment ponds.

Type descriptions are provided below:

#### 1. Pasture/cropping

Grazed pasture dominated by species such as white clover (*Trifolium repens*), ryegrass (*Lolium rigidum*), and paspalum (*Paspalum dilatatum*), with the following also common: broad-leaved dock (*Rumex obtusifolius*), Californian thistle (*Cirsium arvense*), yarrow (*Achillea millefolium*), dandelion (*Taraxacum*

*officinale*), summer grass (*Digitaria ciliaris*), and willow herb (*Polygonum* sp.). Small area have been cropped for maize (*Zea mays*).

## **2. Exotic shelterbelt/trees**

These are primarily she oak (*Casuarina equisetifolia*) trees up to c.18 metres tall and diameters of 30-70 cm. Poplars (*Populus* sp.) are present along the main drain.

## **3. House and curtilage**

There is one existing farm house within the plan change area, with a garage, mown lawns, and a driveway.

## **4. Sheds/laydown area**

Various farm buildings with associated accessways and scattered items of farm equipment. Patchy weedy cover of species such as tall fescue (*Lolium arundinaceum* subsp. *arundinaceum*), dock, and datura (*Datura stramonium*).

## **5. Excavated pond**

There is an excavated duck pond in the northern corner of the plan change area. This is directly connected to the excavated drain along the margin of the project area.

## **6. Planted riparian margin**

The margins of the excavated pond (Type 5 above) has been planted with various indigenous species, such as harakeke, kohūhū (*Pittosporum tenuifolium*), mānuka (*Leptospermum scoparium*), and kānuka (*Kunzea robusta*).

## **7. Lane access**

Metalled farm lane accessways.

## **8. Dairy waste treatment ponds**

A network of excavated small ponds is present on the eastern side of the excavated drain. The ponds are used for the settling of dairy shed waste prior to spray irrigation. As well as the pond complex there are vehicle accessways and the balance has a dense weedy cover similar to Type 4 above.

### Drain and Margins

As noted above, a reasonably large excavated drain is present on the western and northwestern boundaries of the proposed plan change area. The channel is generally about one metre wide and c.30 cm deep, and is reasonably fast-flowing, with a sandy substrate. In places the channel is wider and shallower: about two metres across and



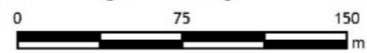


- Legend**
- Site boundary
  - Vegetation and habitat types
    - 1. Pasture / cropping
    - 2. Exotic shelterbelt / trees
    - 3. House and curtilage
    - 4. Sheds / laydown area
    - 5. Excavated pond
    - 6. Planted riparian margin
    - 7. Lane access
    - 8. Dairy waste treatment ponds

**Data Acknowledgment**  
 Map contains data sourced from LINZ  
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**Figure 1. Vegetation and habitat types within the proposed Pongakawa plan change area**



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Scale: 1:3,000  
 Date: 27/04/2022  
 Cartographer: LD  
 Format: A3R

20 centimetres deep. The steep riparian margins have a thick cover of mostly weeds, such as tradescantia (*Tradescantia fluminensis*), barberry (*Berberis glaucocarpa*), blackberry (*Rubus fruticosus* agg.), pampas (*Cortaderia selloana*), with local indigenous species such as wheki (*Dicksonia squarrosa*), ponga (*Cyathea dealbata*), pohuehue (*Muehlenbeckia australis*), which can be locally dominant, and harakeke.

## 5. FLORA

Ninety-six (96) vascular plant species comprising 17 indigenous species and 79 adventive species were recorded within the area inspected during the April 2022 site inspection (refer to Appendix 1 for a list of these species). These were all common species, typical of a highly modified dairy farm environment. No nationally ‘Threatened’ or ‘At Risk’ indigenous vascular plant species as per de Lange *et al.* (2018) were recorded, nor were any regionally rare species recorded.

## 6. AVIFAUNA

Sixteen bird species were recorded during the site visit, or are likely to be present, including the following six indigenous species: paradise shelduck (pūtangitangi; *Tadorna variegata*), kāhu (swamp harrier; *Circus approximans*), pūkeko (*Porphyrio melanotus melanotus*), spur-winged plover (*Vanellus miles novaehollandiae*), welcome swallow (*Hirundo neoxena neoxena*), and white-faced heron (*Egretta novaehollandiae*). No nationally ‘Threatened’ or ‘At Risk’ indigenous bird species, as per Robertson *et al.* (2017), were recorded during the site visit.

Ten introduced bird species were also recorded, or are likely to be present: Australian magpie (*Gymnorhina tibicen*), chaffinch (*Fringilla coelebs*), common pheasant (*Phasianus colchicus*), starling (*Sturnus vulgaris vulgaris*), song thrush (*Turdus philomelos clarkei*), mallard (*Anas platyrhynchos*), Eurasian blackbird (*Turdus merula*), Eurasian skylark (*Alauda arvensis*), house sparrow (*Passer domesticus*), and Indian myna (*Acridotheres tristis*).

## 7. FRESHWATER FAUNA

The waterway on the western and northwestern edge of the project area is a part of the Puanene catchment which drains into the Wharere Canal, out to the Waihi Estuary. There are 23 records in the Freshwater Fish Database of fish surveys in the Waihi Estuary catchment. One survey is from the Puanene Stream, roughly two kilometres upstream of the property. There are also three other records from nearby in the adjacent Wharere stream. The remaining 19 records are from the wider Waihi estuary catchment. These records are from 1983 to 2008, and from various survey methods.

Fish and invertebrate species recorded during these surveys are listed in Table 1 below. Threat classifications for fish and invertebrates are from Dunn *et al.* (2018) and Grainger *et al.* (2018) respectively. The ‘likelihood’ column is the estimated likelihood of each species being detected within the property, based on how frequently they have

been recorded locally and in the wider area, the number of individuals found in each survey, and the altitude and distance inland of the site.

Table 1: Freshwater fish and invertebrate species recorded in the 23 surveys in the Waihi Estuary catchment, including the estimated likelihood of each species being present. Species recorded two kilometres upstream are indicated with an asterisk.

Common Name	Scientific Name	Threat Classification	Records	Likelihood
*Longfin eel	<i>Anguilla dieffenbachii</i>	At Risk - Declining	13	High
*Shortfin eel	<i>Anguilla australis</i>	Not Threatened	13	High
*Redfin bully	<i>Gobiomorphus huttoni</i>	Not Threatened	12	High
*Common smelt	<i>Retropinna retropinna</i>	Not Threatened	13	High
Banded kokopu	<i>Galaxias fasciatus</i>	Not Threatened	7	Moderate
Giant kokopu	<i>Galaxias argenteus</i>	Declining	1	Very Low
Inanga	<i>Galaxias maculatus</i>	At Risk - Declining	12	Moderate
Common bully	<i>Gobiomorphus cotidianus</i>	Not Threatened	10	Moderate
Giant bully	<i>Gobiomorphus gobioides</i>	At Risk - Naturally Uncommon	6	Moderate
Rainbow trout	<i>Oncorhynchus mykiss</i>	Introduced	2	Low
Gambusia	<i>Gambusia affinis</i>	Introduced	2	Low
Yelloweye mullet	<i>Aldrichetta forsteri</i>	Not Threatened	3	Low
Estuarine triplefin	<i>Grahamina</i>	Not Threatened	1	Very Low
Torrentfish	<i>Cheimarrichthys fosteri</i>	At Risk - Declining	1	Very Low
Unidentified eel	<i>Anguilla</i>	-	7	-
Unidentified bully	<i>Gobiomorphus</i>	-	1	-
Unidentified salmonid	<i>Salmo</i>	-	1	-
Koura/ crayfish	<i>Paranephrops</i>	Not Threatened	7	Moderate
Freshwater Shrimp	<i>Paratya curvirostris</i>	Not Threatened	11	Moderate

The fish community present in the Waihi catchment is dominated by eel species (*Anguilla*), bully species (*Gobiomorphus*) and Inanga (*Galaxias maculatus*). Assuming there are no barriers preventing fish access to the property, it is likely that a good variety of native fish species found in the Waihi Estuary catchment, could also be found on the property.

## 8. TERRESTRIAL PEST FAUNA

A range of pest animal species typical of farmland and orchard habitats are likely to be present, including rabbits (*Oryctolagus cuniculus cuniculus*) hedgehogs (*Erinaceus europaeus*), ship rats (*Rattus rattus*), Norway rats (*R. norvegicus*), mice (*Mus musculus*), and mustelids (stoats, *Mustela erminea*; ferrets, *M. furo*; and weasels, *M. nivalis vulgaris*). Feral and domestic cats (*Felis catus*) are also likely to be present.

## 9. ECOLOGICAL VALUES

### 9.1 Vegetation and flora

There are no vegetation or habitat types dominated by indigenous species within the proposed plan change area. Indigenous plant species are generally present as occasional individuals or small clumps within vegetation and habitat types that are dominated by exotic species.

No Threatened or At Risk indigenous vascular plant species, or regionally uncommon species, were recorded in the project area. Ecological values for indigenous vegetation and plant species at the site are therefore considered to be low.

## 9.2 Avifauna and avifauna habitat

The indigenous avifauna species assemblage within the project area is typical of highly modified semi-coastal farmland habitat within Tauranga Ecological District, and contains no Threatened or At Risk indigenous species. The excavated duck pond in the northwestern corner of the site provides a limited area of habitat for ducks and other water birds and the drain on the western boundary will also be used by water birds. There is abundant similar habitat within the surrounding landscape to provide sufficient habitat for the avifauna to disperse to as a result of loss of this habitat. Habitat values for indigenous avifauna are therefore considered to be low.

## 9.3 Freshwater fauna and freshwater habitat

Apart from the duck pond, there are no watercourses within the proposed plan change area.

A good diversity of indigenous fish species has been recorded in the Little Waihi catchment and it is likely that many of those utilise the drain on the western side of the site, and also the excavated duck pond. Although channelised, with compromised water quality, the drain nevertheless provides reasonably good quality freshwater habitat and is also the key linkage and route for migratory fish species that utilise the upper catchment of the Puanene Stream.

Evaluation of historic aerial photographs indicates that drains in the general area appeared to be either existing water courses or modified natural water courses around the time that the drains were excavated. The drain on the western margin of the proposed plan change area is therefore a 'drain' or 'farm drain' as per the definitions in the National Environmental Standards for Freshwater (NES-FW) (2020), the National Planning Standards (2019), and the Bay of Plenty Regional Natural Resources Plan (2008) (refer to Appendix 1).

# 10. POTENTIAL ECOLOGICAL EFFECTS

## 10.1 Overview

Potential effects are assessed below in relation to:

- Terrestrial vegetation habitats.
- Freshwater habitat.
- Contamination of receiving aquatic habitats.

## 10.2 Terrestrial vegetation habitat

Terrestrial vegetation and habitats within the proposed plan change area are highly modified, and an extensive area of similar habitat is present in the surrounding landscape. Ecological effects associated with the loss of the vegetation and terrestrial habitats as a result of development of the plan change area will be minor.

## 10.3 Freshwater habitat

The drain on the western side of the project area is not to be affected directly, and the excavated pond is also not to be affected. As such, there will be no direct adverse effects on freshwater habitats. Potential indirect effects are addressed below.

## 10.4 Contamination of receiving aquatic habitats

### Nutrients

Cessation of dairy farming will reduce nutrient inputs to the land and nutrient losses into waterways.

Removal of the dairy shed waste ponds adjacent to the drain will remove a source of nutrients that are undoubtedly being lost to groundwater and waterways by infiltration.

### Sediment

Sediment laden run-off has the potential to affect aquatic and downstream fisheries values. Significant discharges of suspended sediments can adversely affect stream ecosystems. Ryan (1991) found that the impacts of suspended sediments could affect fish by reducing food items and making them harder to find for fish that utilise visual cues. Construction and development adjacent to the drain on the site boundary has the potential to increase the amount of suspended sediment within waterways, potentially reducing the quality of fish habitat.

### Stormwater Contamination

Without careful stormwater management, such as the proposed stormwater detention basin, stormwater from the proposed plan change area has the potential to contaminate local drains and the Little Waihi estuary. Typical stormwater contaminants that pose a risk to downstream freshwater environments include arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc (Stewart *et al.* 2017), which are toxic to fish and also have the potential to accumulate in the environment and the food chain.

## 11. OPPORTUNITIES TO AVOID, MITIGATE, OR REMEDY POTENTIAL ADVERSE EFFECTS

### 11.1 Overview

The proposed plan change area is a highly modified dairy farm environment and cessation of nutrient inputs associated with dairy farming will be a positive effect. It will be important, nevertheless, to ensure that enabling urban development to occur does not also result in adverse effects on the local environment, particularly on receiving waterways.

Opportunities to avoid, mitigate, or remedy potential adverse effects are set out below, along with opportunities to enhance the environment, under the following topics:

- Terrestrial vegetation and habitats.
- Stormwater detention pond.
- Sediment management.

### 11.2 Terrestrial vegetation and habitats

The streetscape in the proposed plan change area should be planted with indigenous species, to provide habitat for indigenous avifauna. Species such as pūriri (*Vitex lucens*) would be particularly suitable as it is an attractive long-lived tree that provides flowers and fruit year-round for nectivorous and frugivorous birds.

### 11.3 Stormwater detention pond

Impacts of the proposed development and associated earthworks can be mitigated by sensitive and appropriate ecological enhancement planting and design of the stormwater detention reserve.

The proposed stormwater detention area offers a considerable opportunity for ecological restoration and enhancement. Planting of the entire stormwater retention area with indigenous species suited to damp/wet substrates would not only improve indigenous wetland biodiversity in the area, but would also provide additional filtration function for stormwater contaminants which may reach the reserve. This would thereby improve the quality of the water entering the wider drainage network and ultimately contribute to an increase in water quality.

Species suitable for planting in the permanently wet part of the detention pond include raupō (*Typha orientalis*), kuta (*Eleocharis sphacelata*), and *Machaerina arthropophylla*. Dry margins could be planted with harakeke (flax; *Phormium tenax*), pūrei (*Carex secta* and *Carex virgata*), and maire tawake (swamp maire; *Syzygium maire*).

The terrestrial margin of the wet areas could also be planted in suitable indigenous species to provide buffering, and additional biodiversity habitat and enhancement. In addition to harakeke, this could include semi-coastal tree species such as pūriri (*Vitex lucens*), pōhutukawa (*Metrosideros excelsa*), tōtara (*Podocarpus totara*), kohekohe (*Dysoxylum spectabile*), and karo (*Pittosporum crassifolium*).

If a good quality restoration and enhancement plan is implemented, the project offers a very positive opportunity to re-establish indigenous habitats into at least a part of the site and the wider landscape which is depauperate in indigenous biodiversity.

#### 11.4 Sediment management

During the construction phase, implementation of robust and appropriate sediment and stormwater management plans will be required to avoid or minimise the potential for sediment-laden runoff and stormwater contaminants entering the adjacent drain.

## 12. CONCLUSION

The proposed plan change area is currently a dairy farm operation. Vegetation and habitats to be affected within the proposed plan change area are heavily modified and have low ecological values.

Cessation of dairy farming will result in a reduction in the level of nutrients being lost to the adjacent drain, and to the Waihi estuary.

It is also important that inputs of sediment and other waterborne contaminants to the drain are avoided or kept to a minimum. Adverse ecological effects can be avoided by ensuring that receiving waterways are not subject to increased inputs of sediment or nutrients.

If ecologically-appropriate indigenous revegetation is included in the design for the proposed stormwater detention area, indigenous vegetation and habitat within the reserve will be improved significantly compared with the current vegetation, and this will also improve overall indigenous biodiversity values in the landscape. If these mitigation measures are implemented, the ecological effects of the proposed plan change will be no more than minor.

Positive effects can also be generated by the use of appropriate indigenous species in the streetscape of the plan change area.

## ACKNOWLEDGMENTS

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## POTENTIALLY RELEVANT STATUTORY AND NON-STATUTORY DEFINITIONS

This section includes definitions copied verbatim from any relevant statutory and non-statutory documents which are, or may be relevant to this project.

### Resource Management Act

The following definitions are provided in the Resource Management Act (RMA) 1991:

<b>Freshwater or fresh water</b>	All water except coastal water and geothermal water.
<b>River</b>	A continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal).
<b>Water body</b>	Fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.
<b>Wetland</b>	Includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.

The following definitions from the RMA may also be relevant:

<b>Bed</b>	(a) In relation to any river - for the purposes of esplanade reserves, esplanade strips, and subdivision, the space of land which the waters of the river cover at its annual fullest flow without overtopping its banks; in all other cases, the space of land which the waters of the river cover at its fullest flow without overtopping its banks;
<b>Biological diversity</b>	The variability among living organisms, and the ecological complexes of which they are a part, including diversity within species, between species, and of ecosystems.

### National Policy Statement - Freshwater Management

The following definitions are from the National Policy Statement - Freshwater Management (NPS-FM) 2020:

<b>Improved pasture</b>	Means an area of land where exotic pasture species have been deliberately sown or maintained for the purpose of pasture production, and species composition and growth has been modified and is being managed for livestock grazing.
<b>Natural inland wetland</b>	A natural wetland that is not in the coastal marine area.
<b>Natural wetland</b>	A wetland (as defined in the Act) that is not:

	a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or a geothermal wetland; or 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.
<b>Naturally occurring process</b>	A process that occurs, or would occur, in the absence of human activity.
<b>Receiving environment</b>	Includes, but is not limited to, any water body (such as a river, lake, wetland or aquifer) and the coastal marine area (including estuaries).
<b>Threatened species</b>	Any indigenous species of flora or fauna that: (a) Relies on water bodies for at least part of its life cycle; and (b) Meets the criteria for nationally critical, nationally endangered, or nationally vulnerable species in the <i>New Zealand Threat Classification System Manual</i>

## National Environmental Standards - Freshwater

The following definitions are from the National Environmental Standards for Freshwater (NES-FW) 2020:

<b>Natural wetland</b>	Has the meaning given by the National Policy Statement for Freshwater Management.
<b>Drain</b>	Has the meaning given by the National Planning Standards 2019.
<b>Improved pasture</b>	Has the meaning given by the National Policy Statement for Freshwater Management.
<b>River or connected area</b>	(a) a river; or (b) any part of the coastal marine area that is upstream from the mouth of a river

## National Planning Standards

The following definitions are from the Ministry for the Environment National Planning Standards, November 2019:

<b>Drain</b>	Means any artificial watercourse designed, constructed, or used for the drainage of surface or subsurface water, but excludes artificial watercourses used for the conveyance of water for electricity generation, irrigation, or water supply purposes.
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## Bay of Plenty Regional Natural Resources Plan

The following definitions are from the Bay of Plenty Regional Natural Resources Plan (2008):

<b>Artificial water course</b>	A watercourse which meets the following criteria: (a) Is not a natural or modified watercourse, and (b) Is a completely human-made channel along which water would not naturally flow.
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	Includes irrigation canals, water supply race, canals for the supply of water for electricity power generation, farm drains and other drains (for example, roadside drains). Excludes Land Drainage Canals.
<b>Drain</b>	An artificial watercourse used for land drainage purposes, excluding Land Drainage Canals. Also refer to the definitions of Farm drain and Roadside drain.
<b>Ephemeral flow path</b>	<p>An ephemeral flowpath is where any one of the following criteria are met:</p> <p>(a) The flow path is an entrenched dry gully greater than 1 metre deep.  (b) There is clear evidence of a channel within the valley system where overland flow occurs from time to time.  (c) There is clear evidence of erosion (such as gullying or headward gully erosion) associated with short term water flow from time to time within the valley system.</p> <p>An ephemeral flowpath excludes the following:</p> <p>(a) A valley that does not show any evidence of overland flow channels, or erosion as a result of overland flow.</p>
<b>Farm drain</b>	An artificial watercourse on production land that is used for land drainage purposes.
<b>Intermittent Watercourse</b>	<p>A watercourse that:</p> <p>(a) Flows for most of the year or is only dry for short periods of the year, and during such dry periods has stable pools or ‘wet patches’; and  (b) Has a defined water channel and banks; and  (c) Connects with a permanently flowing surface water body; and  (d) Provides habitat for aquatic flora and/or fauna species.</p>
<b>Land Drainage Canal</b>	A modified watercourse that is part of a land drainage scheme.
<b>Modified watercourse</b>	<p>A watercourse that meets any of the following criteria:</p> <p>(a) Is a river or stream that has been channelled or diverted.  (b) Is a Land Drainage Canal (as defined in this regional plan) constructed through a wetland or swamp, that generally follows the path of a historic natural watercourse or reasonably defined natural drainage channel.  (c) Is a watercourse that has a natural headwater of either a channel or spring, and generally follows the path of a historic natural watercourse or reasonably defined natural drainage channel.  (d) Is the oxbow of a diverted river.</p>
<b>Riparian Management Zone</b>	The area of land that covers a specified horizontal distance from any wetland, or from the bed of any permanently or intermittently flowing river, stream or a lake. For the avoidance of doubt, the Riparian Management Zone does not apply to areas of land adjacent to ephemeral flowpaths and artificial watercourses.

## VASCULAR PLANT SPECIES RECORDED DURING THE SITE INSPECTION IN APRIL 2022

### INDIGENOUS SPECIES

#### Gymnosperms

<i>Dacrycarpus dacrydioides</i>	kahikatea
<i>Podocarpus totara</i> var. <i>totara</i>	tōtara

#### Monocot. trees and shrubs

<i>Cordyline australis</i>	tī kōuka, cabbage tree
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#### Dicot. trees and shrubs

<i>Kunzea robusta</i>	kānuka
<i>Leptospermum scoparium</i>	mānuka
<i>Pittosporum tenuifolium</i>	kohūhū, rautāhiri, rautāwhiri
<i>Sophora tetraptera</i>	kōwhai

#### Dicot. lianes

<i>Muehlenbeckia australis</i>	puka
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#### Ferns

<i>Azolla filiculoides</i>	retoretore
<i>Histiopteris incisa</i>	mātātā, water fern
<i>Hypolepis ambigua</i>	
<i>Parablechnum novae-zelandiae</i>	kiokio

#### Sedges

<i>Carex secta</i>	pūrei, makura, pūreirei, pūrekireki, pūkio
<i>Isolepis prolifera</i>	

#### Rushes

<i>Juncus edgariae</i>	wī, wīwī
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#### Monocot. herbs (other than orchids, grasses, sedges, and rushes)

<i>Lemna disperma</i>	karearea
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## Dicot. herbs (other than composites)

*Persicaria decipiens* tutunawai

## **NATURALISED AND EXOTIC SPECIES**

### Dicot. trees and shrubs

*Berberis glaucocarpa* barberry  
*Casuarina* sp. she oak  
*Datura stramonium* thorn apple  
*Ligustrum lucidum* tree privet  
*Ligustrum sinense* Chinese privet  
*Populus* sp. poplar  
*Rubus* sp. (*R. fruticosus* agg.) blackberry  
*Salix ×fragilis* crack willow  
*Ulex europaeus* gorse

### Dicot. lianes

*Araujia hortorum* moth plant  
*Calystegia silvatica* greater bindweed  
*Hedera helix* ivy

### Grasses

*Agrostis capillaris* browntop  
*Alopecurus pratensis* meadow foxtail  
*Anthoxanthum odoratum* sweet vernal  
*Bromus willdenowii* prairie grass  
*Cenchrus clandestinus* kikuyu grass  
*Cortaderia selloana* pampas  
*Dactylis glomerata* cocksfoot  
*Glyceria maxima* reed sweetgrass  
*Holcus lanatus* Yorkshire fog  
*Lolium arundinaceum* subsp. *arundinaceum* tall fescue  
*Lolium perenne* rye grass  
*Paspalum dilatatum* paspalum  
*Paspalum distichum* Mercer grass  
*Poa annua* annual poa

### Sedges

*Carex vulpinoidea* fox sedge

### Rushes

*Juncus acuminatus* sharp-fruited rush  
*Juncus articulatus* jointed rush

<i>Juncus effusus</i> var. <i>effusus</i>	soft rush, leafless rush
<i>Juncus tenuis</i> var. <i>tenuis</i>	track rush

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

<i>Agapanthus praecox</i>	agapanthus
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Composite herbs

<i>Achillea millefolium</i>	yarrow
<i>Bellis perennis</i>	lawn daisy
<i>Bidens frondosa</i>	beggars' ticks
<i>Cirsium arvense</i>	Californian thistle
<i>Crepis capillaris</i>	hawksbeard
<i>Erigeron sumatrensis</i>	broad-leaved fleabane
<i>Gamochaeta coarctata</i>	purple cudweed
<i>Hypochaeris radicata</i>	catsear
<i>Jacobaea vulgaris</i>	ragwort
<i>Lapsana communis</i>	nipplewort
<i>Leontodon taraxacoides</i>	hawkbit
<i>Leucanthemum vulgare</i>	oxeye daisy
<i>Matricaria discoidea</i>	rayless chamomile
<i>Matricaria recutita</i>	wild chamomile
<i>Sonchus asper</i>	prickly puha
<i>Taraxacum officinale</i>	dandelion

Dicot. herbs (other than composites)

<i>Anagallis arvensis</i>	scarlet pimpernel
<i>Arenaria serpyllifolia</i>	sandwort
<i>Callitriche stagnalis</i>	starwort
<i>Capsella bursa-pastoris</i>	shepherd's purse
<i>Daucus carota</i>	wild carrot
<i>Euphorbia peplus</i>	milkweed
<i>Fumaria muralis</i>	scrambling fumitory
<i>Galium aparine</i>	cleavers
<i>Lavatera arborea</i>	tree mallow
<i>Lepidium africanum</i> agg.	pepper cress
<i>Lotus pedunculatus</i>	lotus
<i>Ludwigia palustris</i>	water purslane
<i>Nasturtium officinale</i>	watercress
<i>Modiola caroliniana</i>	creeping mallow
<i>Myriophyllum aquaticum</i>	parrot's feather
<i>Oxalis latifolia</i>	fishtail oxalis
<i>Persicaria hydropiper</i>	water pepper
<i>Phytolacca octandra</i>	inkweed
<i>Plantago lanceolata</i>	narrow-leaved plantain
<i>Plantago major</i>	broad-leaved plantain
<i>Polygonum aviculare</i>	wireweed
<i>Portulaca oleracea</i>	wild portulaca

*Prunella vulgaris*  
*Ranunculus repens*  
*Rorippa sylvestris*  
*Rumex obtusifolius*  
*Silene gallica*  
*Solanum nigrum*  
*Trifolium repens*  
*Verbena bonariensis*  
*Veronica persica*

selfheal  
creeping buttercup  
creeping yellow cress  
broad-leaved dock  
catchfly  
black nightshade  
white clover  
purple-top  
scrambling speedwell



SITE PHOTOGRAPHS



Plate 1: Excavated pond in the northern corner of the proposed plan change area.



Plate 2: Junction of excavated pond and the Puanene catchment drain.



Plate 3: Excavated drain on the western margin of the project area.



Plate 4: Excavated drain on the western margin of project area.



Plate 5: Drain on the western margin of the project area.



Plate 6: Drain on the western margin of the project area.



Plate 7: Drain channel on the western side of the project area.



Plate 8: Metalled farm laneway.



Plate 9: Farm house and curtilage within the project area.



Plate 10: Farm buildings within the project area.



Plate 11: Dairy shed waste pond within the project area.



Plate 12: Former maize crop.



Plate 13: Grazed pasture within the project area.



Plate 14: Grazed pasture.





Plate 15: She oak shelter belt.



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