

Lakeside Te Kauwhata

Ecological Restoration Plan
Prepared for Lakeside Developments 2017 Ltd

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Boffa Miskell

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1 INTRODUCTION

Lakeside Developments 2017 Ltd is proposing a residential development of 194 ha of rural land at Scott Rd, Te Kauwhata. Lakes Waikare and Kopuera border the site to the west and east. Approximately 133ha of the site will be utilised for housing. The balance of the site is low-lying land adjacent to the lake margins, and is identified as a flood hazard area. This land is not suitable for residential development, and will instead be either retained as farmland, developed as recreation space, retained as rear undeveloped portions of residential sections, or revegetated and managed for the purposes of ecological enhancement, with opportunities for passive recreation.

This report sets out a plan for the portion of the site intended for ecological restoration, as well as providing some context for how this restoration integrates with recreation and amenity objectives for the proposed development.

2 METHODOLOGY

A walkover survey of the site was undertaken on 1 March, with the aid of a georeferenced map of the site on an i-pad, showing the location of the proposed subdivision and the boundary of the balance area. Field observations and site photographs were georeferenced and recorded on the i-pad. Information recorded included vegetation communities and flora, condition of pasture and drainage channels, and incidental fauna observations. The site visit was undertaken after a long period of dry summer weather.

3 SITE CHARACTERISTICS AND CONTEXT

3.1 General Description

The proposed development site is set within gently rolling hills with the township of Te Kauwhata to the north, Lake Waikare to the east, SH1 to the west and open farmland to the south. The contour of the site is varied and includes valleys, flat plateaus and flood plains. The site is currently used as a dairy farm (though stock densities were low at the time of the site survey). The alluvial flats comprise relatively recent soil from alluvial pumiceous sands and silts deposited by the Waikato River, or from material eroded from surrounding hills. Lakes Waikare and Kopuera, the Whangamarino swamp and other riverine wetlands throughout the Waikato were formed as alluvium accumulated in valleys and dammed watercourses.

Prior to the completion of the Lower Waikato Waipa Flood Control Scheme in 1965, Lake Waikare was part of an extensive hydraulically linked lake-wetland system that included lakes Kopuera, Ohinewai and Rotokawau, the Waikato River, and the Whangamarino Wetland. Conversion of Lake Waikare to a flood storage reservoir has lowered the natural water table in order to allow capacity for flood events, and reduced flushing of inorganic sediments, creating a highly turbid water body, while nutrients and sediment from catchment run-off and livestock access to the lakes have contributed to eutrophication.

Remnant peat soils occur in places along the western margin of Lake Waikare, though the main substrate within the proposed restoration area appears to be silty clay. Eutrophic peats form when ground water is the main water source. The high water tables prevent the rapid breakdown of the dead plant material, and peat builds up in wet hollows or small lakes, until the lake is filled or the upper limit of the groundwater is reached. These eutrophic 'fen peats' are typically vegetated with sedges (mainly *Machaerina*) and manuka and are found in parts of the Whangamarino Wetland, and probably once covered all or part of the proposed restoration area.

3.2 Current Vegetation

The proposed restoration area is largely in flat to undulating pastoral farmland, intersected with deep drainage channels. Hedgerows of exotic trees and shrubs are interspersed along the sides of some drainage channels, and exotic shade trees are present in paddocks.

Water pepper covers large portions of low-lying paddocks close to the lake margin, indicating that these areas tend to be waterlogged much of the time (Plate 1). A few of these low-lying paddocks also contain abundant brassicas and nightshade, which may be the result of cultivation for cropping.



Plate 1: Pastureland with variable cover of water pepper (scattered hedgerows and shade trees also evident).

Numerous drainage channels intersect the pasture land throughout the proposed restoration area (Figure 1), at approximately 50m spacings in the most low-lying parts. Channel depths range between approximately 1 – 2m deep. At approximately 200m or more from the lake margin, water levels in channels were generally very low, and extensive growths of aquatic macrophytes (water pepper, parrot's feather, ludwigia) were present (Plates 2a & b). Nearer to the lake margin, water covered the channels and was generally greater than 15 cm deep, though often stagnant (Plates 2c-f).

An earth bund has been formed around the margin of Lake Waikare (Plate 3) and fenced off from stock, separating paddocks from the open water and the wetland fringe that surrounds the lake. Rank grass and pasture herbs cover the bund, with local patches of blackberry and occasional woody weeds (gorse, cotoneaster, Chinese privet, etc). Swards of water pepper frequently grow around the toe of the bund.



a.



b.



c.



d.



e.



f.

Plate 2: Examples of drainage channels that intersect the proposed restoration area.



Plate 3: Bund along Lake Waikare margin.

Wetland vegetation forms a near-continuous fringe around the lake margin (Plate 4), generally outside the property boundary and separated from the bund by a wide channel filled with murky water containing abundant koi carp. The composition of the wetland fringe is varied, with a patchy canopy of crack and grey willow interspersed with cabbage trees, above dense swards of raupo and *Bolboschoenus fluviatilis*, with local patches of *Carex secta*, *Carex geminata* and flax. A variety of other native sedges are also present and locally common, including *Machaerina articulata*, *Machaerina teretifolia*, *Elaeocharis sphacelata* and *Schoenoplectus tabernaemontanii*. In a few places along the lake margin the channel between the bund and the wetland fringe widens to form a pond-like feature, with a large expanse of open water surrounded by willows, flax, sedges and rank grass (with occasional pampas).

The NZ Plant Conservation Network database includes a record of *Ricciocarpos natans* (a nationally endangered aquatic Liverwort) in the wetland fringe adjacent to the subject property. Royal fern (a weedy exotic invader of peat habitats) was noted on the bund alongside the channel margin.



a.

b.



c.



d.



e.



f.

Plate 4: Examples of wetland vegetation along Lake Waikare fringe.

3.3 Significant Ecological Features

The proposed restoration area adjoins Lake Waikare, a highly eutrophic (i.e. nutrient enriched) waterbody with degraded water quality and heavy pest fish (koi carp) infestations. Nevertheless, this feature is connected to the internationally significant Whangamarino Wetland, which provides habitat for several threatened bird species, including grey teal, spotless crake, North Island fernbird and around 25% of New Zealand's population of Australasian bittern. A variety of native fish including black mudfish are also present within the Whangamarino Wetland. Significant birdlife have been previously recorded around the margins of Lake Waikare, including White heron (Nationally critical¹), Australasian bittern (Nationally Endangered) and NZ dabchick (Nationally Vulnerable).

¹ As per Townsend et al. 2008

4 PROPOSED ECOLOGICAL RESTORATION

4.1 Objectives

The aim of the proposed restoration is to establish a sequence of wetland and shrubland associations that reinstate some of the habitats, processes and functions of the Waikato Region's once - extensive wetland ecosystems, and in particular, expansion of 'fen' vegetation communities dominated by manuka and 'twig rushes' (*Machaerina teretifolia* and *M. rubiginosa*). The plant assemblage to be used for revegetation is intentionally simple, as manuka and fast-growing, rhizomatous rush and sedge species will most effectively establish dense cover and prevent weed infestation, while other wetland species present in the immediate vicinity are likely to naturally colonise in due course.

Hence, establishment of the proposed vegetation communities will be through both active revegetation and natural recolonisation from restored 'source populations'. Benefits anticipated include:

- Increased extent and diversity of wetland habitats for significant avifauna known to be present in the vicinity;
- A gradual return of the natural water table level to surrounding land as revegetated drains infill;
- Reintroduction of peat-forming vegetation assemblages, which will improve soil condition and may promote the return of characteristic flora and fauna from fen communities present in the wider area;
- A reduction in the prevalence of pest fish damaging plant roots within the drainage system as a result of modifications to the channels to reduce water depth;
- Improved aesthetic and ecological values within the drainage channel network as stagnant growths of aquatic macrophytes are suppressed through shading and displacement by more desirable species;
- Progressive reduction of weed management requirements over retired pastoral land in the medium to long term as woody scrub establishes and suppresses infestations through shading.

4.2 Approach

Three broad restoration 'treatments' are proposed for the following site features:

- existing drainage channels;
- lower-lying parts of the site (generally more proximate to the lake margin); and
- relatively more elevated parts of the proposed restoration area.

Each of these treatments is described below, and indicatively mapped in Figure 1 (note that the precise extent and specific locations of the above treatments are yet to be determined).

4.2.1 Drainage channels

Surface drains will be recontoured to create graded margins, to enable establishment of permanent and intermittent wetland zones. Recontouring of drains to make them somewhat wider and shallower will enable establishment of a continuous cover of rush and sedge vegetation over the wetted part of the channel and a surrounding cover of sedgeland beneath an emergent canopy of manuka. Planting 'zones' and associated species are summarized in Table 1. Broadly, *Machaerina* species and manuka will be planted in intermittently wet zones, while sections of channel that permanently contain standing water will be revegetated in Raupo and *Bolboschoenus fluviatilis*. Figure 1 shows approximately 7 ha of drainage channel wetlands, at a nominal width of 20 m wide in total (though in practice the margins would be undulating and sinuous).



- Legend
- Land to be Retained in Current Grazing Regime
 - Areas to be Filled for Walkway Access
 - Location of Indicative Excavated Wetlands
 - Retired Grassland with Native Plants in Places
 - Managed Open Space
 - Roads
 - Lot Boundaries
 - Site Boundary
 - Recontoured and Revegetated Drains

Table 1: Planting zones within drainage channels

Zone	Species
Permanently wet channel	Raupo (50%), <i>Bolboschoenus fluviatilis</i> (50%)
Intermittently wet channel	<i>Machaerina teretifolia</i> (50%), <i>M. rubiginosa</i> (50%)
Recontoured channel sides	Manuka (25%), <i>Machaerina teretifolia</i> (25%), <i>M. rubiginosa</i> (25%), flax (25%)
Crest of bank/ riparian margins	As desired for enrichment, amenity or connectivity purposes – manuka, flax, ti kouka, <i>Coprosma tenuicaulis</i> , <i>Coprosma propinqua</i> , <i>Carex virgata</i> , ribbonwood, mingimingi, kahikatea, kowhai and putaputaweta.

4.2.2 Excavated wetlands

Raised bunds will be created through parts of the restoration area and around its landward perimeter in order to create walking trails (refer Figure 1). These bunds will close off portions of drainage channels and create impounded areas of standing water. Restoration of these areas will entail excavating out a continuous, gently contoured depression to reinstate groundwater-fed wetland systems that would once have been a feature of the area. A similar treatment will be applied to boggy depressions and highly flood-prone land in low-lying paddocks close to the lake margin where water tables are persistently near the soil surface. Fig. 1 shows approximately 7 ha of excavated wetland.

Water sources for these wetlands will primarily be rainwater and groundwater, other than during flood events where these areas will receive spillover from adjacent drains (such events may result in pest fish invasion where connections with the lake waterbody are retained, but it is anticipated that any pest populations that establish will die out during summer-dry periods). Creation of these features will reinstate the function and habitat of natural shallow water wetlands that once occurred extensively on low-lying land throughout the Waikato Region.

Table 2: Planting zones within excavated wetlands

Zone	Species
Intermittently wet basin	Manuka (25%), <i>Machaerina teretifolia</i> (25%), <i>M. rubiginosa</i> (25%), flax (25%)
Group plantings	As desired for enrichment, amenity or connectivity purposes – manuka, ti kouka, <i>Coprosma tenuicaulis</i> , <i>Coprosma propinqua</i> , <i>Carex virgata</i> (etc).

4.2.3 Higher topography and hinterland

Approximately 21 ha of the proposed restoration area appears to be generally well above the water table and will be retained as ungrazed "meadow grassland" (with existing mature trees retained and/ or new trees planted, primarily for amenity purposes), and will function as 'loafing' area for birds. Buffer areas (generally 10m wide or greater) surrounding and connecting restored wetland features will be planted in manuka, flax, cabbage tree, mahoe and other fast growing native species.

Walking tracks (as shown on Figure 1) will be established on existing accessways and bunds where these exist while new bunds will be constructed as required to provide connectivity and ensure paths are not inundated. Walkway margins will be revegetated in order to minimise maintenance requirements and improve amenity, while also providing a buffer to minimise disturbance to wildlife within restored wetlands as a result of human activity. The plant selection for land surrounding walkways is chosen to complement both the site's overall ecological context and habitat value, and for aesthetic reasons.

Table 3: Planting zones in dry, more elevated areas

Zone	Species
Areas retained in ungrazed grassland	No planting.
Buffers to restored wetlands	Manuka - Flax - Cabbage trees - Mahoe and others
Walkway margins and bund slopes	As desired for enrichment, amenity or connectivity purposes – manuka, flax, ti kouka, <i>Coprosma tenuicaulis</i> , <i>Coprosma propinqua</i> , <i>Carex secta</i> , ribbonwood, mingimingi, kowhai.

4.2.4 Weed and pest management

No significant terrestrial weed problems are currently present, however woody shrubs (e.g., Chinese privet, gorse) and vines (e.g., Japanese honeysuckle) are present in hedgerows and are likely to spread following the cessation of grazing. Hence, eradication of weeds should be undertaken promptly once stock are removed. Adjacent wetlands along the lake margin contain significant weed threats, the most invasive species being grey willow and pampas. Surveillance and control of these species is likely to be required within reinstated wetlands until continuous vegetation cover is well established (approximately 3 years, depending on density of plantings).

Pukeko are common in the existing wetlands and can be very destructive to restoration plantings, hence staking of plants may be required if birds show a propensity to uproot plants. Rabbits may also require control during the establishment phase if browsing of planted specimens is noted.

Fish traps/ screens may initially be required in permanently wet drains to prevent koi carp uprooting plants.

5. SUMMARY

Lakeside Developments 2017 Ltd is proposing to undertake an ecological restoration of low-lying land adjacent to the margins of Lake Waikare as part of a residential development. The proposed restoration area is largely in flat to undulating pastoral farmland, intersected with deep drainage channels.

Remnant peat soils occur in places along the western margin of Lake Waikare, and eutrophic peatland fen communities are found in parts of the Whangamarino Wetland. The proposed restoration will establish a sequence of wetland and shrubland associations that reinstate some of the habitats, processes and functions of the Waikato Region's once - extensive wetland ecosystems, and in particular, expansion of 'fen' vegetation communities dominated by manuka and 'twig rushes' (*Machaerina teretifolia* and *M. rubiginosa*).

Weed and pest management of the restoration area will be required during the establishment phase, until plants are well-anchored (i.e., resistant to uprooting), and a largely continuous canopy of vegetation has developed in the wetland areas to suppress weeds. Unplanted parts of the restoration area that are retained in grassland may require a low level of ongoing weed management to suppress gorse, and other weeds.