

LANDSCAPING

APPENDIX 22 WETLAND RESTORATION REPORT

Plimmerton Farm Stage 1. Wetland Planting. Resource Consent Design Report.

06 December
2023

Isthmus.



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01. Introduction.



Wetlands. Planting Approach.

This report only relates to the main wetland restoration / new wetland area. the other wetland restoration, enhancement and protection works are detailed in the RMA Ecology reports.

Wetland planting palettes have been developed to provide visual stimulation and variation across the prominent site , reflecting the character of adjacent land-use, land form & ecological and vegetation patterns. The palettes are based on the species lists developed by RMA Ecology and included in the Site-Wide Ecological and Indigenous Biodiversity Management Plan.

Plant material will be genetically sourced from the ecological district as much as practical, and emphasis will be given to establishing self sustainable habitats and ecosystems suitable for an attenuation wetland.

A programme of enrichment planting will introduce a broader range of species once initial planting has established.

Rapid and sustained plant growth will be achieved through:

- Using adequate topsoil coupled with the use of plant fertiliser tablets
- Undertaking all planting in late autumn/early winter (peak planting period), to ensure that root structures have developed adequately prior to spring growth
- Using high grade eco-sourced planting stock that is well adapted to regional conditions
- Customising plantings to local site conditions
- Robust maintenance programmes (particularly with respect to plant and animal pest management)



**Existing and new wetland
area current condition.**

Wetlands. Introduction.

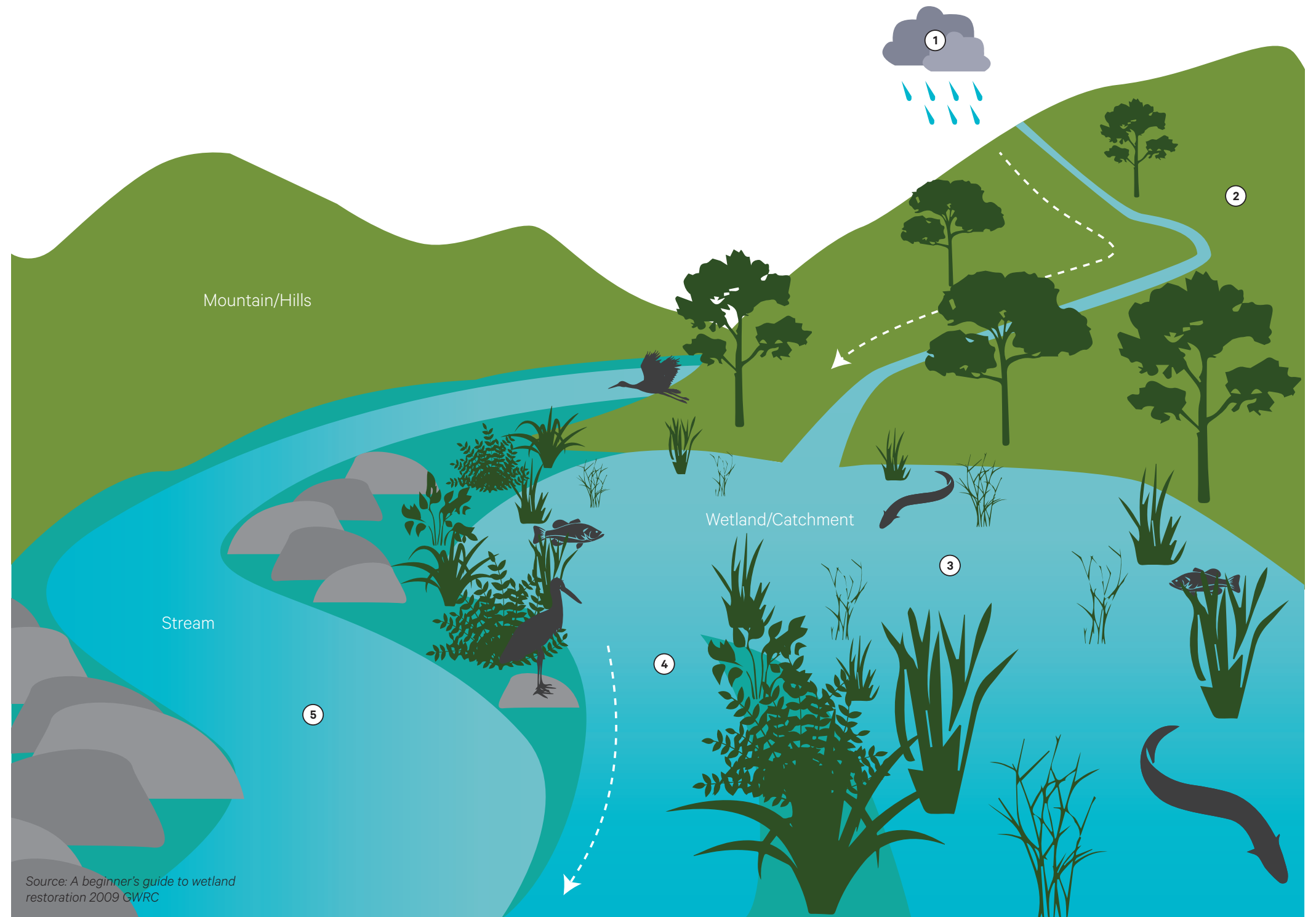
Legend

- ① Rainfall
- ② Runoff from mountain/hills
- ③ Filtration and treatment zone
- ④ Outlet flow
- ⑤ Stream flow

A wetland covers habitats where the water table is at or near the surface of the land. The land may be covered in, or saturated by, water permanently or temporarily.

Wetlands occur in areas where surface water collects or where underground water seeps through to the surface. They include swamps, bogs, salt marshes, lakes and some river edges.

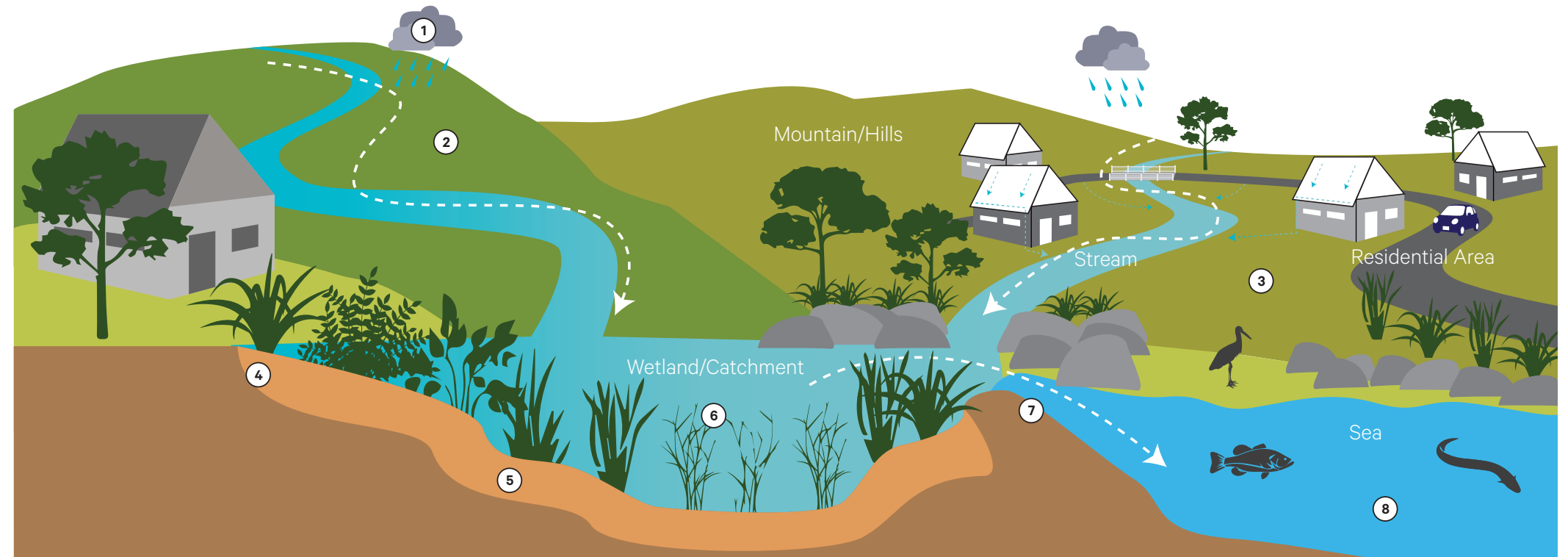
This report relates to the main wetland restoration. Enhancement and protection works are detailed in the RMA Ecology reports.



Source: A beginner's guide to wetland restoration 2009 GWRC

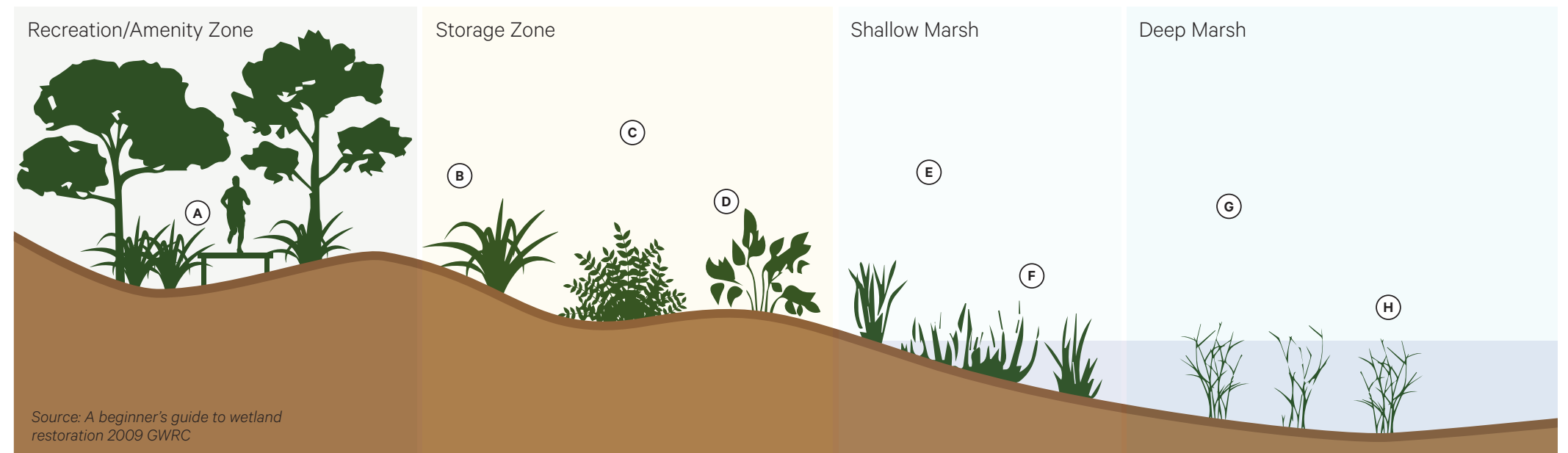
Wetlands. Ecological Process.

Legend	
①	Rainfall
②	Runoff from mountain/hills
③	Runoff from residential area
④	Edge stability and storage
⑤	Break down of sediments/contaminants
⑥	Filtration and treatment zone
⑦	Exit of treated water
⑧	Enhanced water quality and habitat
Ⓐ	Security and connection
Ⓑ	Wet and dry surface storage
Ⓒ	Moist soils/flood infrequently
Ⓓ	Edge stability to prevent erosion
Ⓔ	Wet soils/temporary flooding
Ⓕ	Enhanced water quality and habitat
Ⓖ	Water margin/standing water
Ⓗ	Filtration and treatment zone



Wetlands act as a giant sponge, helping to control water flow and water quality. Their plants slow the flow of water off the land so that, in times of flood, more can be absorbed into the soil. In summer, stored water is slowly released from wetlands, maintaining water flows.

Bacteria in wetlands' damp soils contribute to cleaner water by absorbing and breaking down about 90% of the nitrogen contained in farm run-off (such as in fertilisers, chemicals and animal wastes). Plants also trap waterborne sediment, preventing silt entering streams and harbours.



Source: A beginner's guide to wetland restoration 2009 GWRC

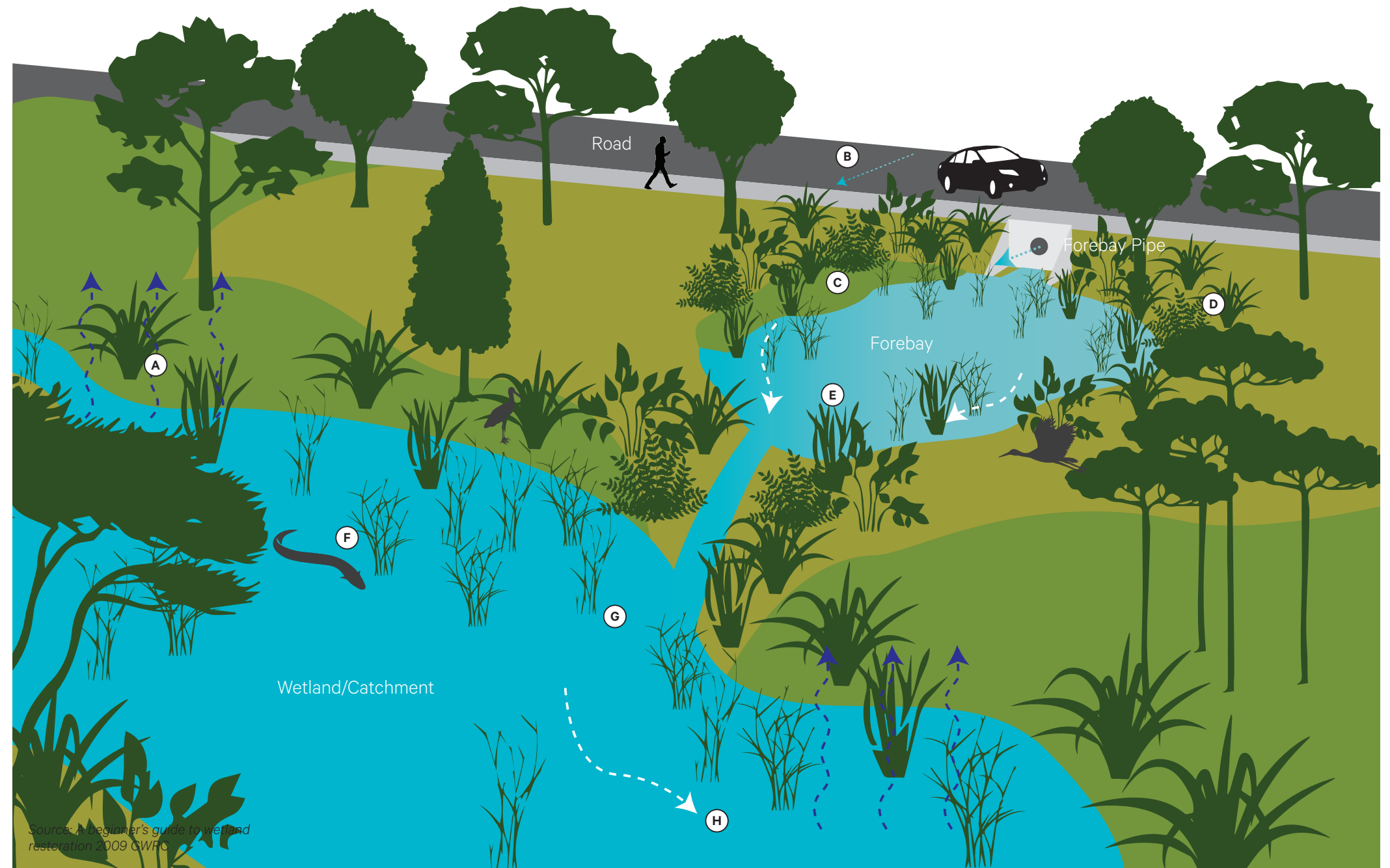
Wetlands. Importance.

Legend	
(A)	Evaporation
(B)	Surface runoff
(C)	Sediment forebay
(D)	Riparian planting/overflow storage
(E)	Slow water flow/prevent flooding
(F)	Enhanced habitat
(G)	Filtration and treatment zone
(H)	Slow release to open stream

Wetlands are important and have a diverse ecosystems. Conserving and restoring them benefits wetland species, and many other aspects of our environment and way of life.

Wetlands form a critical boundary between the land and water. No matter the shape or size, these wet areas are beneficial to our environment and communities. They are crucial for the health of our environment and ecosystems, and provide important habitat for a wide variety of plants and animals.

Wetlands are of significant cultural importance for Māori, featuring in the history and culture of many hapu. Wetland plants are traditional materials for clothing, mats, medicine and dyes. Wetland animals, especially tuna (eels) are valuable food sources.



Source: A beginner's guide to wetland restoration 2009 GWPC



02. Site Analysis.



Wetland Restoration. Vision.

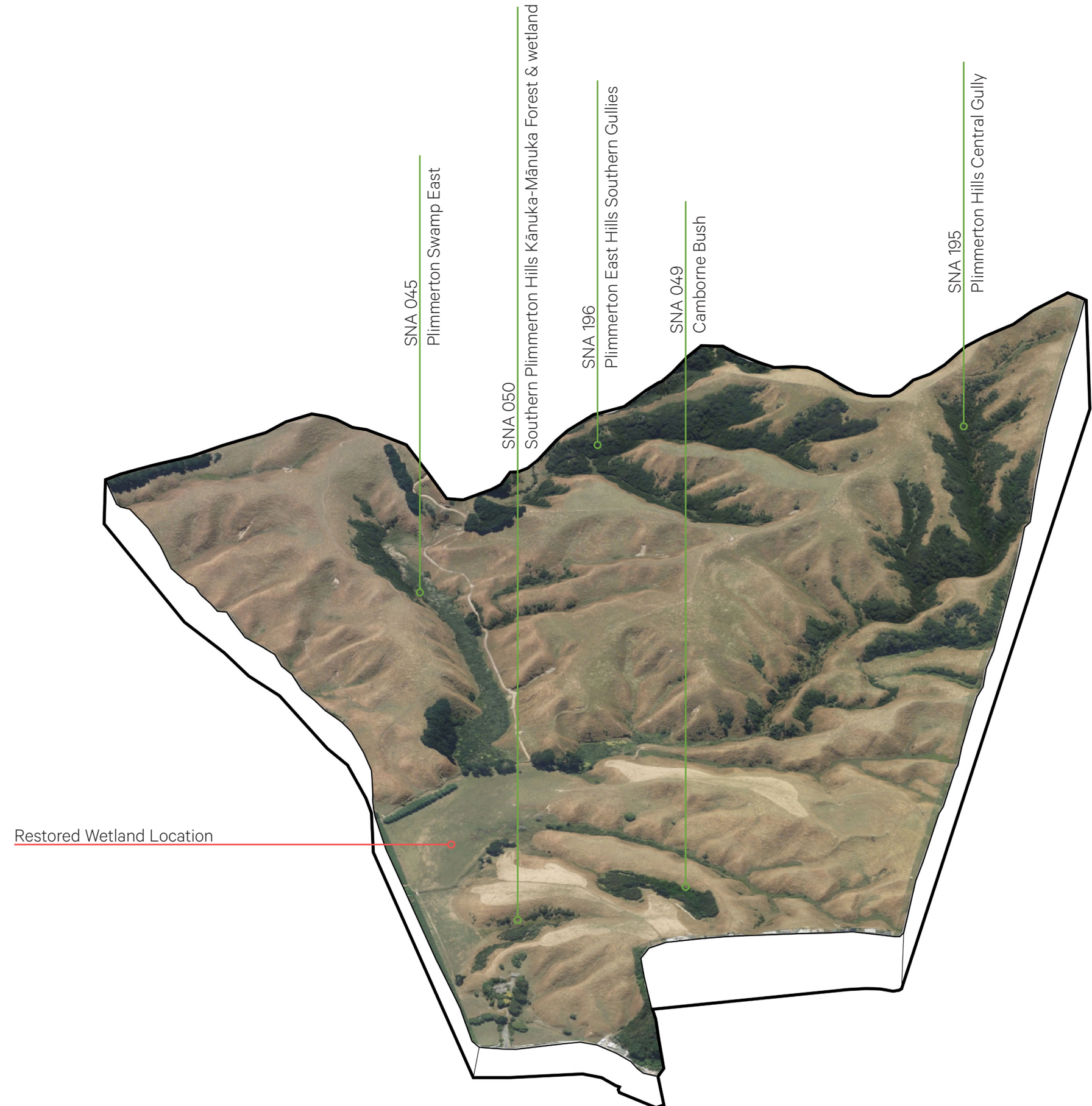
Wetland Restoration.

Ecological restoration is the process of re-establishing a self-sustaining habitat, bio-tope or ecosystem similar to what is likely to have existed before human intervention. Ecological restoration is not usually a one-off activity. It may require a number of interventions in order to restore natural patterns and processes.

The aim is to re-introduce species and establish appropriate plants in a way that replicates natural dispersal patterns.

The objectives for the Plimmerton Farm Wetland are to:

- provide food and habitat for wetland birds
- reintroduce plant species that have historically been present or our found in the Taupō Swamp area
- develop a useable resource of culturally important species for fibre and medicine
- reduce flooding risk to the surround area
- create a seed source for other future local wetland restoration projects
- attenuation of surrounding stormwater flows



Wetland Restoration. Vision.

Endemic Enrichment.

Many of New Zealand's iconic wetland species are endemic meaning they are found nowhere else in the world. Wetlands also contain a disproportionately high number of New Zealand's threatened plants and animals, a consequence of extreme habitat loss and ongoing human-induced degradation. Restoration of wetland structure and function is therefore extremely important to provide suitable habitat for wetland species and ensure that biodiversity values will be preserved for future generations.



Succession and Enrichment.

Succession is the process whereby one plant community gradually changes into another. It involves both arrivals and losses of species, coupled with changes in the relative abundance of different plants. This process is brought about by changes in the environment and biotic interactions such as declining light levels or competition from seed-dispersed plants.

Wetland species that can cope with full sun, exposed, and/or frosty conditions are typical of early succession and are planted in the first season. They are hardy, fast-growing species that attract birds to encourage the natural seeding of other native species. They will provide protection for later successional plants that are slower-growing, more shade-tolerant, and more susceptible to frost and wind. Some wetland species, such as swamp maire (*Syzygium microphylla*), perform better within a nurse crop of first-season plantings.

This planting strategy includes enrichment planting mixes designed to be installed three years after the first season's planting. Some of these species, like swamp maire, and many of the epiphytes, climbers, and small ground-cover herbaceous species included, also establish better in later successional stages. In the case of some of these rarer species, the nearby Taupō Swamp will serve as a natural seed source. If necessary, the first season's planting in the areas intended for these species may be culled to allow for better establishment. The enrichment mixes also feature hardy species such as harakeke (*Phormium tenax*) and raupō (*Typha orientalis*), which are designed to colonize gaps from the first season as well as maximize plant coverage across the wetland.

All plant mix numbers have been calculated based on a density of one plant per one square meter. This has been calculated as an average with a margin of error to be refined as the project develops. The percentage areas and densities of enrichment mixes, in some cases, will be reappraised upon evaluating the success of first-season plantings to ensure an approach that contributes positively to overall plant coverage and encourages ecological succession within the wetland.

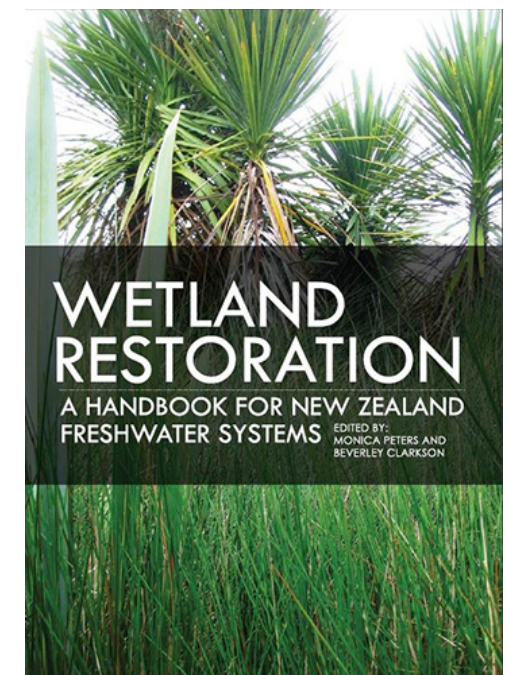
Plant Palette Research.

Friends of Taupō Swamp & Catchment, Manaaki Whenua – Landcare Research Guidebooks, New Zealand Plant Conservation Network Resources, QE Natural Trust resources, Friends of and several academic journal articles focused on the nearby Taupo Swamp were reviewed and referenced when creating the various plant mixes for Plimmerton Farm.

1. A Directory of Wetlands in New Zealand <https://www.doc.govt.nz/globalassets/documents/science-and-technical/nzwetlands08.pdf>
2. R. G. Bagnall & C. C. Ogle (1981) The changing vegetation structure and composition of a lowland mire at Plimmerton, North Island, New Zealand, *New Zealand Journal of Botany*, 19:4, 371-387, DOI: 10.1080/0028825X.1981.10426394
3. Vegetation of Swamp Pockets Near Plimmerton https://bts.nzpcn.org.nz/site/assets/files/22090/well_1978_40__24-29.pdf
4. Wetland Restoration: A Handbook for New Zealand Freshwater Systems published by Manaaki Whenua – Landcare Research. <https://www.landcareresearch.co.nz/publications/wetland-restoration/>
5. Te Reo o Te Repo – the Voice of the Wetland published by Manaaki Whenua – Landcare Research. <https://www.landcareresearch.co.nz/publications/te-reo-o-te-repo/>
6. Te Reo o Te Repo – Kei konei tonu au: The Voice of the Wetland – I am still here is the second volume of the Te Reo o Te Repo cultural wetland handbook series published by Manaaki Whenua – Landcare Research. <https://www.landcareresearch.co.nz/publications/te-reo-o-te-repo-kei-konei-tonu-au/>
7. <https://qeiiinternationaltrust.org.nz/taupo-swamp-an-outstanding-wetland-treasure/>
8. Friends of Taupō Swamp & Catchment FOTS. <https://www.tauposwamp.org/z>



Friends of Taupō Swamp & Catchment



Planting. Establishment & Extensive Management.



Eco-Sourcing.

Ecosourcing refers to the propagation of native plants from naturally occurring wild populations and the planting of the resulting plants back within the same geographic area. Eco-sourced plants are adapted to local growing conditions and are a crucial element of restoration and supported by the New Zealand Biodiversity Strategy. It is suggested that eco-sourcing, nursery selection and final planting palettes are selected in collaboration with Mana Whenua and Friends of Taupō Swamp & Catchment.

Management not Maintenance.

Landscape planting is not installed as a finished static product. It takes many years for a planting to mature and to get to a point where it needs less hand holding. A site specific wetland management plan will be required for the long term success of Plimmerton Farm wetland planting.

Weeds.

Weeds are one of the most visually obvious signs of human-induced impacts on a wetland. A weed, or pest plant, is most simply defined as a plant growing where it is not wanted. In wetland restoration projects weeds are usually introduced or exotic plants that are not native to Aotearoa. Weeds pose a threat to wetlands as they can

modify the structure or function of the wetland, including nutrient and hydrology, out-compete native plants, change the vegetation, alter the habitat and resources available for native insects, birds and fish, and affect access for management activities.

A regular weed surveillance regime will provide early detection of new weeds and allows a rapid response. Control of recent invaders at an early stage will be cost effective, more likely to be successful in eradication, and will prevent the formation of a seed bank.

Successful control or eradication of weeds requires skilful targeted application of treatment, appropriate timing, and rigorous follow up.



Timing of Management.

Selecting the appropriate time of year for treatment is one of the most critical steps for successful weed control. It is important to consider not only the optimal time to strike target weeds, but also when other non-target species are less susceptible, such as undertaking weed control after orchids have flowered and died back to a bulb below the ground. The optimal time for herbicide applications is generally when the pest plant is actively growing, but before it flowers or sets seed. Most weed control will occur in spring or summer months when plants are growing vigorously and in full leaf.



Habitat Creation.

Several exotic trees will be felled as part of the development. The restored wetlands and other biodiversity offsetting areas provide an opportunity to repurpose the trunks, large branches and rootwads as habitat features.

Trunks will be placed into the wetland to simulate dead (snags) or fallen trees (logs) to provide suitable roosts for birds.

Snags will be arranged in strategic locations to cater to distinct bird species preferences. Some bird species prefer the wetland edge while others will be clustered in the core.

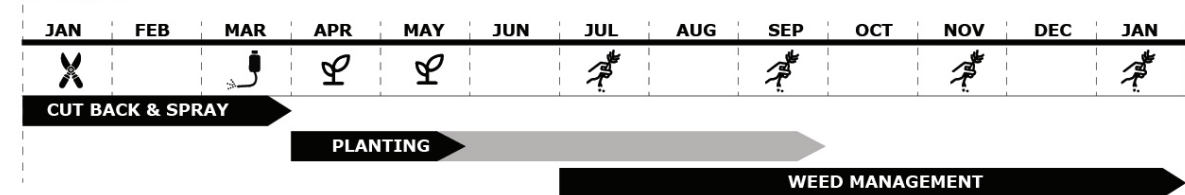
Fallen logs become colonised with fungi and insects. As the log decomposes, nutrients are recycled into the soil and a microhabitat favorable for the growth of new successional species is often created.

Rootwads will create micro-shading and provide homes to invertebrates and smaller species that drive the ecosystem. The most obvious value of these smaller species is as food for many species of birds and skinks.

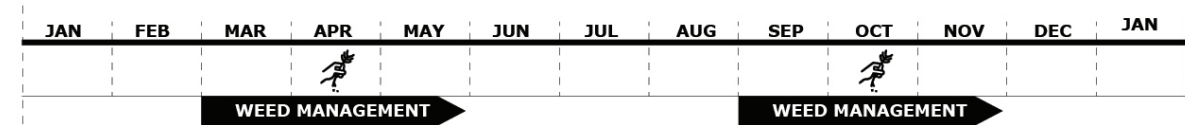
Micro-Grading for Plant Niches.

Wetlands create a hummock-and-hollow surface, where plant growth and peat accumulation are favoured on ground elevated above the water table. The wetland restoration plan will use micro-grading to recreate several hummock and hollows that may provide unique growing conditions for later successional and enrichment species.

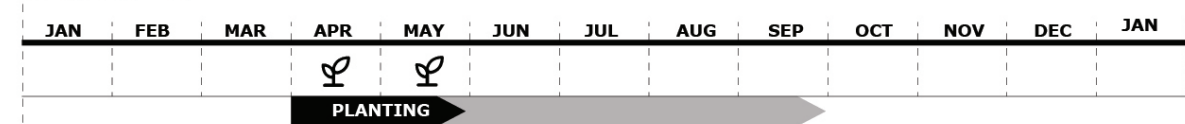
YEAR 0



YEAR 1 - 3



YEAR 3 - 5



Biodiversity Offsetting. Native Fauna.

Wetlands provide specialised habitats for a variety of fauna, including birds, fish, skinks, geckos, frogs and invertebrates – both terrestrial and aquatic. Many of New Zealand’s wetland fauna are endemic, in other words, found nowhere else in the world.

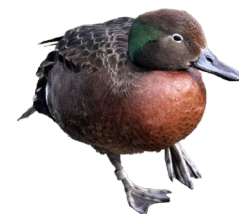
Despite the limited area covered by remnant wetlands in New Zealand, wetlands are home to 22% of our bird species and 30% of our native freshwater fish. The Wetland restoration projects at Plimmerton Farm will provide important wetland habitat that this diverse range of fauna need and also help ensure our wildlife survives into the future.

There are numerous terrestrial, bird and aquatic species found in the existing environment and surrounds of Plimmerton Farm, including brown skinks, kārearea, warou, kōura, kokupu and tuna.

The wetland will contribute to improved ecology and biodiversity values through a native plant palette, eco-sourcing and habitat creation with felled trees.

The wetland is likely to attract nesting birds to the area, largely due to its size and protective qualities - hidden from view and away from human interaction. Pūkeko are the most obvious species. They live in family groups, and several females will sometimes lay their eggs in the same nest and share the role of raising chicks.

Text adapted from source: Wetland Restoration: A Handbook for New Zealand Freshwater Systems brings together expertise from specialists and groups actively engaged in restoring wetlands throughout the country. Manaaki by Whenua/Landcare Research.



Brown Teal/Pāteke
Anas chlorotis
At Risk - Recovering



North Island Saddleback/Tieke
Philesturnus rufusater
At Risk - Recovering



Pied Stilt/Poaka
Himantopus himantopus leucocephalus
At Risk - Declining



Pied Shag/Kāruhiruhi
Phalacrocorax varius varius
Threatened - Nationally Vulnerable



Red-crowned Parakeet/Kākāriki
Cyanoramphus novaeseelandiae novaseelandiae
At Risk - Relict



Longfin Eel/Tuna
Anguilla dieffenbachii
At Risk - Declining



Shortfin Eel/Tuna
Anguilla australis
Regionally Threatened



Bellbird/Korimako
Anthornis melanura melanura
Regionally Threatened



Woodpigeon/Kererū
Hemiphaga novaeseelandiae
Regionally Threatened



Bush Falcon/Kārearea
Falco novaeseelandiae "bush"
Threatened - Nationally Vulnerable



Barking Gecko
Naultinus punctatus
At Risk - Declining



Copper Skink
Oligosoma aeneum
Regionally Threatened



Morepork/Ruru
Ninox novaeseelandiae novaseelandiae
Regionally Threatened



Stitchbird/Hihi
Notiomystic cincta'
Threatened - Nationally Endangered



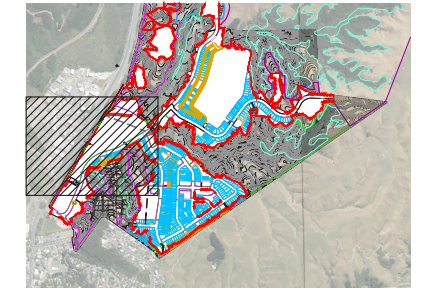
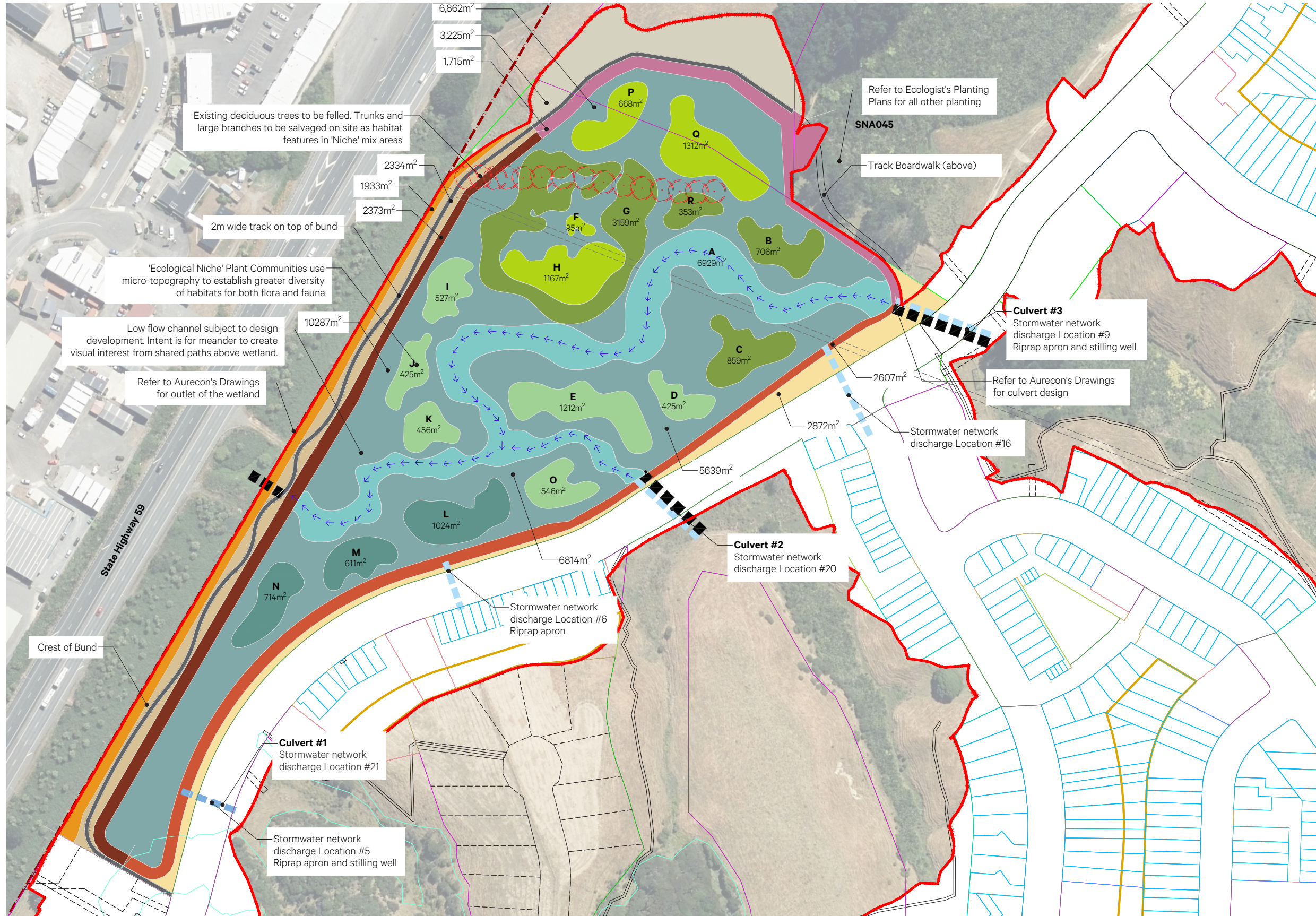
North Island Kākā
Nestor meridionalis septentrionalis
Threatened - Nationally Vulnerable



03. Plant Palettes.



Wetland. Planting Plan.



Key Plan.

Landscape Legend.
Key. Description.

Planting Mixes.		Area.
Fill Slope Tie-in 1:2 Slopes		3,225m ²
Footpath Buffer 1:2 Slopes		2,872m ²
Bund Top		2,334m ²
Bund - Highway Batter 1:2 Slopes		1,933m ²
Wetland - Wet Planting Low Flow Channels		6,929m ²
Wetland - Damp Planting (Frequent inundation)		19,315m ²
Wetland - Lower Basin Niche		2351m ²
Wetland - Mid-Basin Niche (Micro topography zones)		3,594m ²
Wetland - Swamp Forest		1,263m ²
Wetland - Upper Basin Niche		5,068m ²
Wetland - Banks West Facing 1:2 Slopes		2,373m ²
Wetland - Banks East Facing 1:2 Slopes		2,607m ²
Wetland - Top Toe 1:2 Slopes		1,715m ²

- Property Boundary
- → → Low Flow Channel Flow Direction (Indicative Only)
- ■ ■ Culvert (Indicative)
- Stormwater Discharge Point (Indicative)
- 1m Design Contours
Refer to Aurecon Drawings
- 1m Existing Contours (Undisturbed Grade)
- Extent of Earthworks

Planting Mixes.

The following Plant mixes are proposed to provide diversity to flora and fauna. The species list is derived from observations of the Taupo Mire - west of MainTrunk railway (TAUW) on the NZPCN website, from Greater Wellington Regional Council Wetland Planting lists, and from the RMA Ecology species list.

-  **Footpath Buffer.**
-  **Bund Top.**
-  **Fill Slope Tie-in.**
-  **Bund - Highway Batter.**
-  **Wetland - Wet Planting Low Flow Channels.**
-  **Wetland - Damp Planting (Frequent Inundation).**
-  **Wetland - Lower Basin Niche.**
-  **Wetland - Mid-Basin Niche (Micro topography zones).**
-  **Wetland - Swamp Forest.**
-  **Wetland - Upper Basin Niche.**
-  **Wetland - 10yr Flood Banks West Facing.**
-  **Wetland - 10yr Flood Banks East Facing.**
-  **Wetland - Top Toe.**

Footpath Buffer.

This planting zone between the footpath and wetland incorporates native species with amenity and sustainability qualities to create a buffer zone that enhances the wetland's edge, providing an attractive and ecologically sensitive transition. Sightlines to wetland will be maintained with addition of some selected amenity trees at intermittent spacings and clustered spacings.



Rhopalostylis sapida
Nikau



Sophora microphylla
Kōwhai



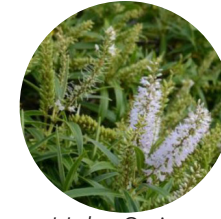
Coprosma lucida
Shiny karamu



Coprosma virescens
Mikimiki



Cortaderia fulvida
Toetoe



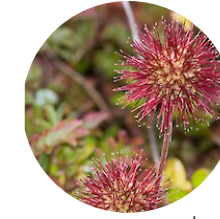
Hebe stricta
Koromiko



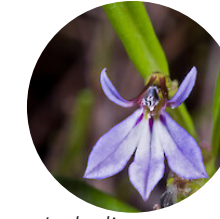
Carex virgata
Pukio



Poa anceps
Broad Leaved Poa



Acaena novae-zelandiae
Red Piripiri



Lobelia anceps
Shore Lobelia



Polystichum neozelandicum
subsp. *zerophyllum*



Dodonaea viscosa
Akeake

	Original Area	Slope Multiplier	Adjusted Area
Flat	2872	1	2872.00
1:2 Slope (Additional ~12%)		1.118	0.00
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
		Total Area	2872.00

Footpath Buffer

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Cortaderia fulvida</i>	Toetoe	PB3/4 - 1L	1	25%	718.00	1	718	Grass - 1.5m x 2m
<i>Dodonaea viscosa</i>	Akeake	PB3/4 - 1L	1	1%	28.72	1	29	Tree - 4m x 2m
<i>Coprosma lucida</i>	Shiny Karamu	PB3/4 - 1L	1	1%	28.72	1	29	Shrub - 3m x 2m
<i>Coprosma virescens</i>	Mikimiki	PB3/4 - 1L	1	1%	28.72	1	29	Shrub - 2m x 1.5m
<i>Rhopalostylis sapida</i>	Nikau	PB3/4 - 1L	1	1%	28.72	1	29	Palm - 5m x 3m
<i>Poa anceps</i>	Broad Leaved Poa	PB3/4 - 1L	1	25%	718.00	1	718	Grass - 0.5m x 0.5m
<i>Carex virgata</i>	Pukio	PB3/4 - 1L	1	25%	718.00	1	718	Grass - 0.5m x 0.5m
<i>Hebe stricta</i>	koromiko	PB3/4 - 1L	1	6%	172.32	1	172	Shrub - 2.5m x 2.5m
<i>Acaena novae-zelandiae</i>	Red Bidibid	PB3/4 - 1L	0.25	5%	143.60	1	144	Herb - 0.15m x 1m
<i>Lobelia anceps</i>	Punakuru	PB3/4 - 1L	0.25	5%	143.60	1	144	Herb - 0.1m x 0.3m
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L	1	5%	143.60	1	144	Flax - 3m x 3m
				100%			2872	

Footpath Buffer Enrichment Planting @ 3yrs

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Polystichum neozelandicum subsp. zerophyllum</i>	Prickly Shield Fern	PB3/4 - 1L	1	8%	229.76	1	230	Fern - 0.5m x 0.5m
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L	1	5%	143.60	1	144	Flax - 3m x 3m
<i>Sophora microphylla</i>	Kōwhai	PB3/4 - 1L	2	3%	86.16	0.5	43	Tree - 8m x 5m
				16%			416	

Bund Top.

This planting zone features erosion-resistant trees and shrubs, to stabilise the terrain whilst adding additional native character and visual interest. Species like Pōhuehue and Oioi are typically rare in a wetland context but are found at the Taupo mire. Positioned at the coastal facing side of the wetland they gesture towards the shoreline of Karehana Bay.



Phormium tenax
Harakeke



Cortaderia fulvida
Toetoe



Muehlenbeckia complexa
Pōhuehue



Apodasmia similis
Oioi



Lachnagrostis filiformis
New Zealand Wind Grass



Carex virgata
Pukio



Poa anceps
Broad Leaved Poa

	Original Area	Slope Multiplier	Adjusted Area
Flat	2334	1	2334.00
1:2 Slope (Additional ~12%)		1.118	0.00
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
		Total Area	2334.00

Bund Top

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L	1	15%	350.10	1.5	525	Flax - 3m x 3m
<i>Cortaderia fulvida</i>	Toetoe	PB3/4 - 1L	1	15%	350.10	1.5	525	Grass -1.5m x 2m
<i>Muehlenbeckia complexa</i>	Pōhuehue	PB3/4 - 1L	1	10%	233.40	1	233	Herb -5m x 5m
<i>Apodasmia similis</i>	Oioi	PB3/4 - 1L	1	15%	350.10	1.5	525	Rush -1.5m x 1m
<i>Lachnagrostis filiformis</i>	New Zealand Wind Grass	PB3/4 - 1L	0.5	10%	233.40	2	467	Grass -0.5m x 0.3m
<i>Carex virgata</i>	Pukio	PB3/4 - 1L	1	15%	350.10	1.5	525	Sedge -0.5m x 0.5m
<i>Poa anceps</i>	Broad Leaved Poa	PB3/4 - 1L	1	20%	466.80	1.5	700	Grass -0.5m x 0.5m
				100%			3501	

Bund Top Enrichment Planting @ 3yrs

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Polystichum neozelandicum subsp. zerophyllum</i>	Prickly Shield Fern	PB3/4 - 1L	1	5%	116.70	2	233	Fern - 0.5m x 0.5m
<i>Cortaderia fulvida</i>	Toetoe	PB3/4 - 1L	1	5%	116.70	1.5	175	Grass -1.5m x 2m
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L	1	5%	116.70	1	117	Flax - 3m x 3m
				15%			525	

Fill Slope Tie-In.

This planting zone ties in with the species used elsewhere in the Plimmerton Farm development on fill slopes.

Draft for discussion only.



Coprosma lucida
Shiny karamu



Coprosma propinqua
Miki



Coprosma robusta
Karamū



Dianella nigra
Turutu



Dodonaea viscosa
Akeake



Griselinia littoralis
Kapuka



Leptospermum scoparium
Rangiora



Hebe stricta
Koromiko



Piper excelsum
Kawakawa



Brachyglottis repanda
Rangiora



Pennantia corymbosa
Kaikōmako



Pseudopanax crassifolius
Horoeka



Pseudopanax arboreus
Whauwhaupaku



Phormium tenax
Harakeke



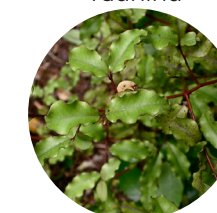
Ozothamnus leptophylla
Tauhinu



Pseudopanax ferox
Kānuka



Metrosideros perforata
Akatea



Myrsine australis
Mapou



Kunzea robusta
Kānuka



Olearia solandri
Coastal tree daisy



Sophora microphylla
Kōwhai



Carmichaelia australis
Neinei

	Original Area	Slope Multiplier	Adjusted Area
Flat		1	
1:2 Slope (Additional ~12%)	3225	1.118	3605.55
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
Total Area			3605.55

Fill Slope Tie-in

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Carmichaelia australis</i>		PB3/4 - 1L	1	2%	72.11	1	72	Tree -4m x 3m
<i>Coprosma lucida</i>	<i>Karamū</i>	PB3/4 - 1L	1	2%	72.11	1	72	Shrub -3m x 2m
<i>Coprosma propinqua</i>	<i>Miki</i>	PB3/4 - 1L	1	2%	72.11	1	72	Shrub -3m x 2m
<i>Coprosma rhamnoides</i>		PB3/4 - 1L	1	2%	72.11	1	72	Shrub -1.5m x 1m
<i>Coprosma robusta</i>	<i>Karamū</i>	PB3/4 - 1L	1	4%	144.22	1	144	Shrub -5m x 2m
<i>Dianella nigra</i>	<i>Turutu</i>	PB3/4 - 1L	1	4%	144.22	1	144	Herb -0.5m x 1m
<i>Dodonaea viscosa</i>	<i>Akeake</i>	PB3/4 - 1L	1	8%	288.44	1	288	Tree -4m x 2m
<i>Griselinia littoralis</i>	<i>Kapuka</i>	PB3/4 - 1L	1	4%	144.22	1	144	Tree -6m x 3m
<i>Leptospermum scoparium</i>	<i>Mānuka</i>	PB3/4 - 1L	1	25%	901.39	1	901	Tree -4m x 2m
<i>Metrosideros perforata</i>	<i>Akatea</i>	PB3/4 - 1L	1	2%	54.08	1	54	Vine -6m x 1.5m
<i>Myrsine australis</i>	<i>Mapou, Matipo</i>	PB3/4 - 1L	1	8%	288.44	1	288	Tree -5m x 2m
<i>Olearia solandri</i>		PB3/4 - 1L	1	13%	468.72	1	469	Shrub -4m x 3m
<i>Ozothamnus leptophyllus</i>	<i>Tauhinu</i>	PB3/4 - 1L	1	7%	234.36	1	234	Shrub -2m x 2m
<i>Phormium cookianum</i>	<i>Wharariki</i>	PB3/4 - 1L	1	8%	288.44	1	288	Flax -3m x 3m
<i>Pseudopanax arboreus</i>	<i>Whauwhaupaku</i>	PB3/4 - 1L	1	5%	180.28	1	180	Tree -5m x 2m
<i>Hebe stricta</i>	<i>Koromiko</i>	PB3/4 - 1L	1	5%	180.28	1	180	Shrub -2.5m x 2.5m

100%

3606

Fill Slope Tie-in Enrichment Planting @ 3 yrs

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Brachyglottis repanda</i>	<i>Rangiora</i>	PB3/4 - 1L	1	1%	36.06	1	36	Tree -4m x 2m
<i>Kunzea robusta</i>	<i>Kānuka</i>	PB3/4 - 1L	1	10%	360.56	1	361	Tree -20m x 3m
<i>Pennantia corymbosa</i>	<i>Kaikōmako</i>	PB3/4 - 1L	1	1%	36.06	1	36	Tree -5m x 3m
<i>Piper excelsum</i>	<i>Kawakawa</i>	PB3/4 - 1L	1	1%	36.06	1	36	Shrub -3m x 2m
<i>Pseudopanax crassifolius</i>	<i>Horoeka</i>	PB3/4 - 1L	1	1%	36.06	1	36	Shrub -6m x 2m
<i>Pseudopanax ferox</i>		PB3/4 - 1L	1	1%	36.06	1	36	Tree -5m x 2m
<i>Sophora microphylla</i>	<i>Kōwhai</i>	PB3/4 - 1L	1	1%	36.06	1	36	Tree -8m x 5m

16%

577

Bund - Highway Batter.

This planting zone features erosion-resistant trees and shrubs, to stabilise the terrain whilst adding additional native character and visual interest. Species like Pōhuehue and Oioi are typically rare in a wetland context but are found at the Taupo mire. Positioned at the coastal facing side of the wetland they gesture towards the shoreline of Karehana Bay.



Phormium tenax
Harakeke



Cortaderia fulvida
Toetoe



Muehlenbeckia complexa
Pōhuehue



Apodasmia similis
Oioi



Lachnagrostis filiformis
New Zealand Wind Grass



Carex virgata
Pukio



Poa anceps
Broad Leaved Poa

	Original Area	Slope Multiplier	Adjusted Area
Flat		1	0.00
1:2 Slope (Additional ~12%)	1933	1.118	2161.09
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
		Total Area	2161.09

Bund - Highway Batter

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)	
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L		1	45%	972.49	1	972	Flax - 3m x 3m
<i>Cortaderia fulvida</i>	Toetoe	PB3/4 - 1L		1	20%	432.22	1	432	Grass -1.5m x 2m
<i>Muehlenbeckia complexa</i>	Pōhuehue	PB1/2 - 0.5L		1	5%	108.05	1	108	Herb -5m x 5m
<i>Apodasmia similis</i>	Oioi	PB3/4 - 1L		1	5%	108.05	1	108	Rush -1.5m x 1m
<i>Lachnagrostis filiformis</i>	New Zealand Wind Grass	PB1/2 - 0.5L		1	5%	108.05	1	108	Grass -0.5m x 0.3m
<i>Carex virgata</i>	Pukio	PB3/4 - 1L		1	5%	108.05	1	108	Sedge -0.5m x 0.5m
<i>Poa anceps</i>	Broad Leaved Poa	PB1/2 - 0.5L		1	15%	324.16	1	324	Grass -0.5m x 0.5m
					100%			2161	

Bund - Highway Batter Enrichment Planting @ 3yrs

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)	
<i>Polystichum neozelandicum subsp. zerophyllum</i>	Prickly Shield Fern	PB3/4 - 1L		1	5%	108.05	1	108	Fern - 0.5m x 0.5m
<i>Cortaderia fulvida</i>	Toetoe	PB3/4 - 1L		1	5%	108.05	1	108	Grass -1.5m x 2m
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L		1	5%	108.05	1	108	Flax - 3m x 3m
					15%			2917	

Wetland - Wet Planting Low Flow Channels.

Sedgeland positioned in the low flow channel, this planting zone design employs water-loving natives to thrive in saturated conditions, providing habitat, improve water flow dynamics and enhance the health and resilience of the wetland ecosystem. Designed to mirror the species composition of flow channels at the Taupo Mire.



Carex lessoniana
Rautahi



Carex germinata
Rautahi



Carex secta
Pūrei



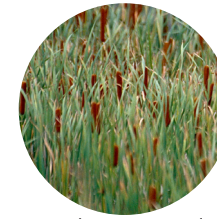
Machaerina rubiginosa



Baumea teretifolia
Pakihi



Carex Maorica
Māori Sedge



Typha orientalis
Raupo



Cyperus ustulatus
Giant umbrella sedge

	Original Area	Slope Multiplier	Adjusted Area
Flat	6929	1	6929.00
1:2 Slope (Additional ~12%)		1.118	0.00
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
		Total Area	6929.00

Low Flow Channel

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Carex lessoniana</i>	Rautahi	PB3/4 - 1L	1	35%	2425.15	1	2425	Sedge -1m x 1m
<i>Carex germinata</i>	Rautahi	PB3/4 - 1L	1	15%	1039.35	1	1039	Sedge -1m x 1m
<i>Carex secta</i>	Pūrei	PB3/4 - 1L	1	15%	1039.35	1	1039	Sedge -1m x 1m
<i>Baumea rubiginosa</i>		PB3/4 - 1L	1	25%	1732.25	1	1732	Rush -1m x 1.5m
<i>Baumea teretifolia</i>	Pakihi	PB3/4 - 1L	1	10%	692.90	1	693	Rush -1m x 1.5m
				100%			6929	

Low Flow Channel Enrichment Planting @ 3yrs

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Carex Maorica</i>	Māori Sedge	PB3/4 - 1L	1	3%	207.87	1	208	Sedge -1m x 1m
<i>Typha orientalis</i>	Raupo	PB3/4 - 1L	1	6%	415.74	1	416	Sedge -2.5m x 5m
<i>Cyperus ustulatus</i>	Giant umbrella sedge	PB3/4 - 1L	1	6%	415.74	1	416	Sedge -1.5m x 2m
				15%			1039	

Wetland - Damp Planting (Frequent Inundation).

Phormium tussockland positioned in the frequent inundation zone, this planting zone design employs semi-aquatic natives to thrive in saturated conditions, providing habitat, improving water quality, and enhancing the ecological vitality of the wetland. Designed to mirror the species composition of damp ground at the Taupo Mire with some additional large trees.



Phormium tenax
Harakeke



Carex secta
Purei



Carex lessoniana
Rautahi



Carex germinata
Rautahi



Cortaderia fulvida
Toetoe



Cordyline australis
Ti kōuka



Syzygium microphylla
Swamp maire



Dacrycarpus dacrydiodes
Kahikatea



Carex Maorica
Māori Sedge



Cyperus ustulatus
Giant umbrella sedge

	Original Area	Slope Multiplier	Adjusted Area
Flat	19315	1	19315.00
1:2 Slope (Additional ~12%)		1.118	0.00
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
	Total Area		19315.00

Wetland - Damp Planting

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)	
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L		1	65%	12554.75	1	12555	Flax - 3m x 3m
<i>Carex secta</i>	Purei	PB3/4 - 1L		1	5%	965.75	1	966	Sedge -1m x 1m
<i>Carex lessoniana</i>	Rautahi	PB3/4 - 1L		1	13%	2510.95	1	2511	Sedge -1m x 1m
<i>Carex germinata</i>	Rautahi	PB3/4 - 1L		1	5%	965.75	1	966	Sedge -1m x 1m
<i>Cortaderia fulvida</i>	Toetoe	PB3/4 - 1L		1	8%	1545.20	1	1545	Grass - 1.5m x 2m
<i>Cordyline australis</i>	Ti Kōuka	PB3/4 - 1L		1	1%	193.15	0.2	39	Tree -5m x 2m
<i>Syzygium microphylla</i>	Swamp maire	PB3/4 - 1L		1	1%	193.15	0.2	39	Tree -8m x 4m
<i>Dicksonia squarrosa</i>	Wheki	PB3/4 - 1L		1	1%	193.15	0.2	39	Tree -5m x 2.5m
<i>Dacrycarpus dacrydiodes</i>	Kahikatea	PB3/4 - 1L		1	1%	193.15	0.2	39	Tree -20m x 10m
				100%			18697		

Wetland - Damp Planting Enrichment Planting @ 3yrs

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)	
<i>Carex maorica</i>	Māori sedge	PB3/4 - 1L		1	5%	965.75	1	966	Sedge -1m x 1m
<i>Cyperus ustulatus</i>	Giant umbrella sedge	PB3/4 - 1L		1	5%	965.75	1	966	Sedge -1m x 1m
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L		1	10%	1931.50	1	1932	Flax - 3m x 3m
				20%			3863		

Wetland - Lower Basin Niche.

Reed Sedgeland, this planting zone is comprised of submerged oxygenators to optimize water quality, support diverse aquatic life, and create a flourishing, balanced ecosystem. Designed to mirror the species composition of deeper areas of the Taupo Mire.



Carex lessoniana
Rautahi



Carex germinata
Rautahi



Carex secta
Pūrei



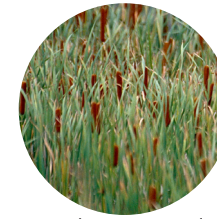
Machaerina rubignosia



Baumea teretifolia
Pakihi



Carex Maorica
Māori Sedge



Typha orientalis
Raupo



Cyperus ustulatus
Giant umbrella sedge



Sparganium subglobosum
Maru

	Original Area	Slope Multiplier	Adjusted Area
Flat	2351	1	2351.00
1:2 Slope (Additional ~12%)		1.118	0.00
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
		Total Area	2351.00

Wetland - Lower Basin Niche

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Carex secta</i>	Pūrei	PB3/4 - 1L		1	5%	117.55	12	141 Sedge -1m x 1m
<i>Baumea teretifolia</i>	Pakihi	PB3/4 - 1L		1	20%	470.20	12	564 Rush -1m x 1.5m
<i>Machaerina rubignosia</i>		PB3/4 - 1L		1	45%	1057.95	12	1270 Rush -1m x 1.5m
<i>Carex lessoniana</i>	Rautahi	PB3/4 - 1L		1	10%	235.10	12	282 Sedge -1m x 1m
<i>Cyperus ustulatus</i>	Giant umbrella sedge	PB3/4 - 1L		1	5%	117.55	12	141 Sedge -1.5m x 2m
				100%			2398	

Low Flow Channel Enrichment Planting @ 3yrs

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Carex Maorica</i>	Māori Sedge	PB3/4 - 1L		1	2%	47.02	1	47 Sedge - 1m x 1m
<i>Typha orientalis</i>	Raupo	PB3/4 - 1L		1	6%	141.06	1	141 Sedge - 2.5m x 5m
<i>Sparganium subglobosum</i>	Maru	PB3/4 - 1L		1	3%	70.53	1	71 Herb - 1m x 5m
<i>Cyperus ustulatus</i>	Giant umbrella sedge	PB3/4 - 1L		1	5%	117.55	1	118 Sedge - 1.5m x 2m
				16%			376	

Wetland - Mid-Basin Niche (Micro topography zones).

These plant zones are designed to create periodically damp herb and turf fields suit micro-topographic nichess, allowing for the establishment of a diverse range of habitats for flora and fauna. Designed to mirror the species composition of herb fields at the Taupo Mire.



Carex lessoniana
Rautahi



Carex germinata
Rautahi



Carex virgata
Pukio



Urtica perconfusa
swamp nettle



Epilobium chionanthum
Marsh Willowherb



Ranunculus macropus
Raoriki



Epilobium pallidiflorum
Tarawera



Acaena novae-zelandiae
Red Piripiri



Lobelia anceps
Shore Lobelia



Thelypteris confluens



Carex cirrhosa
Curly sedge



Geranium microphyllum



Hiya distans

	Original Area	Slope Multiplier	Adjusted Area
Flat	3594	1	3594.00
1:2 Slope (Additional ~12%)		1.118	0.00
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
		Total Area	3594.00

Mid-Basin Niche

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Carex lessoniana</i>	Rautahi	PB3/4 - 1L		1	60%	2156.40	1	2156 Sedge -1m x 1m
<i>Carex germinata</i>	Rautahi	PB3/4 - 1L		1	20%	718.80	1	719 Sedge -1m x 1m
<i>Carex virgata</i>	Pukio	PB3/4 - 1L		1	20%	718.80	1	719 Sedge -1m x 1m
				100%			3594	

Mid-Basin Niche Enrichment Planting @ 3 yrs

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Urtica perconfusa</i>	Swamp Nettle	PB3/4 - 1L		0.5	7%	251.58	1	252 Herb - 0.3m x 0.3m
<i>Epilobium chionanthum</i>	Marsh Willowherb	PB3/4 - 1L		0.5	3%	107.82	1	108 Herb - 0.3m x 0.3m
<i>Ranunculus macropus</i>	Raoriki	PB3/4 - 1L		0.5	1%	35.94	1	36 Herb - 0.15m x 1m
<i>Epilobium pallidiflorum</i>	Tarawera	PB3/4 - 1L		0.5	1%	35.94	1	36 Herb - 0.15m x 1m
<i>Acaena novae-zelandiae</i>	Red Piripiri	PB3/4 - 1L		0.5	7%	251.58	1	252 Herb - 0.15m x 1m
<i>Lobelia anceps</i>	Shore Lobelia	PB3/4 - 1L		0.5	3%	107.82	1	108 Herb - 0.1m x 0.3m
<i>Carex cirrhosa</i>	Curly sedge	PB3/4 - 1L		0.5	7%	251.58	1	252 Herb - 0.1m x 0.2m
<i>Geranium microphyllum</i>		PB3/4 - 1L		0.5	1%	35.94	1	36 Herb - 0.1m x 0.2m
<i>Hiya Distans</i>		PB3/4 - 1L		0.5	7%	251.58	1	252 Fern - 0.5m x 0.3m
<i>Thelypteris confluens</i>		PB3/4 - 1L		0.5	7%	251.58	1	252 Fern - 0.4m x 0.4m
				44%			1581	

Wetland - Swamp Forest

A planting zone with a concentration of larger trees and shade loving sedges and ferns, designed to mature into an indigenous swamp forest, provide unique habitat niches and shade for the wetland.



Dacrydium dacrydioides
Kahikatea



Syzygium microphylla
Swamp maire



Carex virgata
Pukio



Cyperus ustulatus
Giant umbrella sedge



Gahnia xanthocarpa
Māpere



Parablechnum minus
Swamp kiokio



Hiya distans

	Original Area	Slope Multiplier	Adjusted Area
Flat	1263	1	1263.00
1:2 Slope (Additional ~12%)		1.118	0.00
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
Total Area			1263.00

Wetland - Swamp Forest

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)	
<i>Dacrydium dacrydioides</i>	Kahikatea	PB3/4 - 1L		1	18%	227.34	0.1	23	Tree - 20m x 10m
<i>Syzygium microphylla</i>	Swamp maire	PB3/4 - 1L		1	12%	151.56	0.1	15	Tree - 8m x 4m
<i>Carex virgata</i>	Pukio	PB3/4 - 1L		1	22%	277.86	1	278	Sedge - 1m x 1m
<i>Cyperus ustulatus</i>	Giant umbrella sedge	PB3/4 - 1L		1	25%	315.75	1	316	Sedge - 1.5m x 2m
<i>Gahnia xanthocarpa</i>	Māpere	PB3/4 - 1L		1	23%	290.49	1	290	Sedge - 3m x 3m
							100%	922	

Wetland - Swamp Forest Enrichment Planting @ 3 years

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)	
<i>Cyperus ustulatus</i>	Giant umbrella sedge	PB3/4 - 1L		1	5%	63.15	1	63	Sedge - 1.5m x 2m
<i>Gahnia xanthocarpa</i>	Māpere	PB3/4 - 1L		1	4%	50.52	1	51	Sedge - 3m x 3m
<i>Hiya distans</i>		PB3/4 - 1L		1	5%	63.15	1	63	Fern - 0.5m x 1m
<i>Parablechnum minus</i>	Swamp kiokio	PB3/4 - 1L		1	6%	75.78	1	76	Fern - 0.5m x 1m
							20%	253	

Wetland - Upper Basin Niche.

Reed Sedgeland, this planting zone is comprised of submerged oxygenators to optimize water quality, support diverse aquatic life, and create a flourishing, balanced ecosystem. Designed to mirror the species composition of deeper areas of the Taupo Mire.



Carex lessoniana
Rautahi



Carex germinata
Rautahi



Carex secta
Pūrei



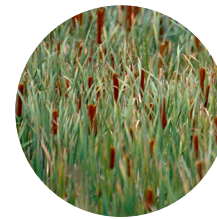
Machaerina rubignosia



Baumea teretifolia
Pakihi



Carex Maorica
Māori Sedge



Typha orientalis
Raupo



Cyperus ustulatus
Giant umbrella sedge



Sparganium subglobosum
Maru

	Original Area	Slope Multiplier	Adjusted Area
Flat	5068	1	5068.00
1:2 Slope (Additional ~12%)		1.118	0.00
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
		Total Area	5068.00

Wetland - Upper Basin Niche

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Carex secta</i>	Pūrei	PB3/4 - 1L		1	5%	253.40	1	Sedge -1m x 1m
<i>Baumea teretifolia</i>	Pakihi	PB3/4 - 1L		1	20%	1013.60	1	Rush -1m x 1.5m
<i>Machaerina rubignosia</i>		PB3/4 - 1L		1	45%	2280.60	1	Rush -1m x 1.5m
<i>Carex lessoniana</i>	Rautahi	PB3/4 - 1L		1	10%	506.80	1	Sedge -1m x 1m
<i>Cyperus ustulatus</i>	Giant umbrella sedge	PB3/4 - 1L		1	5%	253.40	1	Sedge -1.5m x 2m
				100%			4308	

Upper Basin Niche Enrichment Planting @ 3yrs

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Carex Maorica</i>	Māori Sedge	PB3/4 - 1L		1	2%	101.36	1	Sedge - 1m x 1m
<i>Typha orientalis</i>	Raupo	PB3/4 - 1L		1	6%	304.08	1	Sedge - 2.5m x 5m
<i>Sparganium subglobosum</i>	Maru	PB3/4 - 1L		1	3%	152.04	1	Herb - 1m x 5m
<i>Cyperus ustulatus</i>	Giant umbrella sedge	PB3/4 - 1L		1	5%	253.40	1	Sedge - 1.5m x 2m
				16%			811	

Wetland - Wet Planting Banks West.

Some areas of Phormium tussock land, with intermittent areas of Toetoe dominance and shrubland. This flood bank planting features indigenous wetland species which enhance flood resilience while safeguarding the unique wetland ecosystem, providing habitat and ecological benefits.



Cortaderia fulvida
Toetoe



Phormium tenax
Harakeke



Carex lessoniana
Rautahi



Carex germinata
Rautahi



Carex virgata
Pukio



Coprosma virescens
Mikimiki



Coprosma lucida
Shiny karamu



Hebe stricta
Koromiko



Coprosma tenuicaulis
Hukihuki



Freycinetia banksii
Kiekie

	Original Area	Slope Multiplier	Adjusted Area
Flat	0	1	0.00
1:2 Slope (Additional ~12%)	2373	1.118	2653.01
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
		Total Area	2653.01

Wetland - Banks West Facing									
Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)	
<i>Cortaderia fulvida</i>	Toetoe	PB3/4 - 1L	1	35%	928.55	1	929	Grass - 1.5m x 2m	
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L	1	25%	663.25	1	663	Flax - 3m x 3m	
<i>Carex lessoniana</i>	Rautahi	PB3/4 - 1L	1	10%	265.30	1	265	Sedge - 1m x 1m	
<i>Carex germinata</i>	Rautahi	PB3/4 - 1L	1	10%	265.30	1	265	Sedge - 1m x 1m	
<i>Carex virgata</i>	Pukio	PB3/4 - 1L	1	7%	185.71	1	186	Sedge - 1m x 1m	
<i>Coprosma virescens</i>	Mikimiki	PB3/4 - 1L	1	3%	79.59	1	80	Shrub - 2m x 1.5m	
<i>Coprosma lucida</i>	Shiny karamu	PB3/4 - 1L	1	3%	79.59	1	80	Shrub - 3m x 2m	
<i>Hebe stricta</i>	Koromiko	PB3/4 - 1L	1	5%	132.65	1	133	Shrub - 2.5m x 2.5m	
<i>Coprosma tenuicaulis</i>	Hukihuki	PB3/4 - 1L	1	2%	53.06	1	53	Shrub - 2m x 1m	
				100%			2653		

Wetland - Banks West Facing Enrichment Planting @ 3 years									
Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)	
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L	1	8%	212.24	1	212	Flax - 3m x 3m	
<i>Freycinetia banksii</i>	Kiekie	PB3/4 - 1L	0.5	7%	185.71	1	186	Vine - 3m x 1m	
				15%			398		

Wetland - Wet Planting Banks East.

Some areas of Phormium tussock land, with intermittent areas of Toetoe dominance and shrubland. This flood bank planting features indigenous wetland species which enhance flood resilience while safeguarding the unique wetland ecosystem, providing habitat and ecological benefits. Greater numbers of trees than in the Western bank mix.



Cortaderia fulvida
Toetoe



Phormium tenax
Harakeke



Carex lessoniana
Rautahi



Carex germinata
Rautahi



Carex virgata
Pukio



Coprosma virescens
Mikimiki



Coprosma lucida
Shiny karamu



Hebe stricta
Koromiko



Coprosma tenuicaulis
Hukihuki



Leptospermum scoparium
Mānuka



Dicksonia squarrosa
Wheki

	Original Area	Slope Multiplier	Adjusted Area
Flat		1	0.00
1:2 Slope (Additional ~12%)	2607	1.118	2914.63
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
		Total Area	2914.63



Cordyline australis
Ti kōuka



Laurelia novae-zelandiae
Pukatea



Freycinetia banksii
Kiekie

Wetland - Banks East Facing

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Austroderia fulvida</i>	Toetoe	PB3/4 - 1L	1	30%	874.39	1	874	Grass - 1.5m x 2m
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L	1	30%	874.39	1	874	Flax - 3m x 3m
<i>Carex lessoniana</i>	Rautahi	PB3/4 - 1L	1	5%	145.73	1	146	Sedge - 1m x 1m
<i>Carex germinata</i>	Rautahi	PB3/4 - 1L	1	5%	145.73	1	146	Sedge - 1m x 1m
<i>Carex virgata</i>	Pukio	PB3/4 - 1L	1	5%	145.73	1	146	Sedge - 1m x 1m
<i>Coprosma virescens</i>	Mikimiki	PB3/4 - 1L	1	2%	58.29	1	58	Shrub - 2m x 1.5m
<i>Coprosma lucida</i>	Shiny karamu	PB3/4 - 1L	1	5%	145.73	1	146	Shrub - 3m x 2m
<i>Hebe stricta</i>	Koromiko	PB3/4 - 1L	1	6%	174.88	1	175	Shrub - 2.5m x 2.5m
<i>Coprosma tenuicaulis</i>	Hukihuki	PB3/4 - 1L	1	1%	29.15	1	29	Shrub - 2m x 1m
<i>Leptospermum scoparium</i>	Mānuka	PB3/4 - 1L	1	5%	145.73	1	146	Tree - 4m x 2m
<i>Rhopalostylis sapida</i>	Nikau	PB3/4 - 1L	1	1%	29.15	1	29	Palm - 5m x 3m
<i>Dacrycarpus dacrydoides</i>	Kahikatea	PB3/4 - 1L	1	1%	29.15	1	29	Tree - 20m x 10m
<i>Cordyline australis</i>	Ti kouka	PB3/4 - 1L	1	4%	116.59	1	117	Tree - 5m x 2.5m

100%

2887

Wetland - Banks East Facing Enrichment Planting @ 3 years

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Dicksonia squarrosa</i>	Wheki	PB3/4 - 1L	1	3%	87.44	1	87	Tree - 5m x 2.5m
<i>Sophora microphylla</i>	Kōwhai	PB3/4 - 1L	1	1%	29.15	1	29	Tree - 8m x 5m
<i>Laurelia novae-zealandiae</i>	Pukatea	PB3/4 - 1L	1	1%	29.15	1	29	Tree - 10m x 3m
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L	1	5%	145.73	1	146	Flax - 3m x 3m
<i>Freycinetia banksii</i>	Kiekie	PB3/4 - 1L	1	5%	145.73	1	146	Vine - 3m x 1m

15%

437

Wetland - Top Toe.

This planting zone ties in with the species used elsewhere in the Plimmerton Farm development on fill slopes. Smaller species have been selected to ensure sightlines from the boardwalk to the wetland.



Coprosma lucida
Shiny karamu



Coprosma propinqua
Miki



Coprosma robusta
Karamū



Dianella nigra
Turutu



Griselinia littoralis
Kapuka



Dodonaea viscosa
Akeake



Hoheria sexstylosa
Houhere



Brachyglottis repanda
Rangiora



Myrsine australis
Mapou



Kunzea robusta
Kānuka



Phormium tenax
Harakeke

	Original Area	Slope Multiplier	Adjusted Area
Flat	0	1	0.00
1:2 Slope (Additional ~12%)	1715	1.118	1917.37
1:3 Slope (Additional ~5.4%)		1.0541	0.00
1:5 Slope (Additional ~1.9%)		1.019803903	0.00
		Total Area	1917.37



Fuchsia exortica
Kōtukutuku



Pseudopanax crassifolius
Horoeka



Pseudopanax arboreus
Whauwhaupaku

Wetland - Top Toe

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Coprosma lucida</i>	Shiny Karamū	PB3/4 - 1L	1	5%	95.87	1	96	Shrub -3m x 2m
<i>Coprosma robusta</i>	Karamū	PB3/4 - 1L	1	5%	95.87	1	96	Shrub -5m x 2m
<i>Dianella nigra</i>	Turutu	PB3/4 - 1L	1	15%	287.61	1	288	Herb -0.5m x 1m
<i>Dodonaea viscosa</i>	Akeake	PB3/4 - 1L	1	5%	95.87	1	96	Tree -4m x 2m
<i>Griselinia littoralis</i>	Kapuka	PB3/4 - 1L	1	6%	115.04	1	115	Tree -6m x 3m
<i>Hoheria sexstylosa</i>	Houhere	PB3/4 - 1L	1	6%	115.04	1	115	Tree -8m x 3m
<i>Leptospermum scoparium</i>	Mānuka	PB3/4 - 1L	1	25%	479.34	1	479	Tree -4m x 2m
<i>Myrsine australis</i>	Mapou, Matipo	PB3/4 - 1L	1	17%	325.95	1	326	Tree -5m x 2m
<i>Phormium tenax</i>	Harakeke	PB3/4 - 1L	1	7%	124.63	1	125	Flax - 3m x 3m
<i>Pseudopanax arboreus</i>	Whauwhaupaku	PB3/4 - 1L	1	5%	95.87	1	96	Tree -6m x 5m
<i>Hebe stricta</i>	Koromiko	PB3/4 - 1L	1	4%	76.69	1	77	Shrub -2.5m x 2.5m

100%

1908

Wetland - Top Toe Enrichment Planting @ 3 yrs

Botanical Name	Ingoa	Minimum Grade	Spacing (m)	Percent (%)	Area (m2)	Density	Plant No.	Size (H x W)
<i>Brachyglottis repanda</i>	Rangiora	PB3/4 - 1L	1	2%	38.35	1	38	Tree -4m x 2m
<i>Kunzea robusta</i>	Kānuka	PB3/4 - 1L	1	2%	38.35	1	38	Tree -20m x 3m
<i>Pseudopanax ferox</i>		PB3/4 - 1L	1	2%	38.35	1	38	Tree -5m x 2m
<i>Pseudopanax crassifolius</i>	Horoeka	PB3/4 - 1L	1	2%	38.35	1	38	Shrub -6m x 2m
<i>Knightia excelsa</i>	Rewarewa	PB3/4 - 1L	1	1%	19.17	0.3	6	Tree - 12m x 4m
<i>Fuchsia exortica</i>	Kōtukutuku	PB3/4 - 1L	1	1%	19.17	0.3	6	Tree -5m x 2m
<i>Piper excelsum</i>	Kawakawa	PB3/4 - 1L	1	3%	57.52	1	58	Shrub -3m x 2m
<i>Sophora microphylla</i>	Kōwhai	PB3/4 - 1L	1	2%	38.35	1	38	Tree - 8m x 5m

15%

261



Hebe stricta
Koromiko



Knightia excelsa
Rewarewa



Pseudopanax ferox



Sophora microphylla
Kōwhai



Leptospermum scoparium
Mānuka



Piper excelsum
Kawakawa

**Land.
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Culture.
Isthmus.**

Tāmaki Makaurau

Auckland
Level 6
246 Queen Street
PO Box 90366
Auckland Central 1010

+64 9 309 9442

Te Whanganui-a-Tara

Wellington
Level 5
56 Victoria Street
PO Box 24116
Wellington 6030

+64 4 499 9832

Ōtautahi

Christchurch
Matai Common
10 Mollett Street
PO Box 1153
Christchurch 8011

+64 3 983 7360