Appendix B Ecological Impact Assessment Guidelines

Appendix B Table 1: Factors to consider in scoring sites values in relation to species representativeness, rarity, diversity and pattern, and ecological context (adapted from EIANZ, 2018)

Value	Species values	Vegetation / Habitat values
Very High	Nationally threatened – endangered, critical, or vulnerable.	Supporting more than one national priority type. Nationally Threatened species found or likely to occur there, either permanently or occasionally.
High	Nationally At Risk– declining.	Supporting one national priority type or naturally uncommon ecosystem and / or a designated SEA in a regional or District Plan. At Risk - Declining species found or likely to occur there, either permanently or occasionally.
Moderate-high	Nationally At Risk– recovering, relict, or naturally uncommon.	A site that meets ecological significance criteria as set out the relevant regional or district policies and plans.
Moderate	Not nationally threatened or At Risk, but locally uncommon or rare.	A site that does not meet ecological significance criteria but that contributes to local ecosystem services (e.g. water quality or erosion control).
Low	Not threatened nationally, common locally.	Nationally or locally common with a low or negligible contribution to local ecosystem services.

Appendix B Table 2: Ecological values assigned to terrestrial habitats (adapted from EIANZ, 2018)

Attributes to be considered when assigning ecological value or importance to a site or area of vegetation / habitat / community	
Matters	**Attributes to be considered**
Representativeness	Attributes for representative vegetation and aquatic habitats: • Typical structure and composition. • Indigenous species dominate. • Expected species and tiers are present. Attributes for representative species and species assemblages: • Species assemblages that are typical of the habitat. Indigenous species that occur in most of the guilds expected for the habitat type.
Rarity / distinctiveness	Attributes for rare / distinctive vegetation and habitats: • Naturally uncommon, or induced scarcity. • Amount of habitat or vegetation remaining. • Distinctive ecological features. • National priority for protection. Attributes for rare / distinctive species or species assemblages:

Attributes to be considered when assigning ecological value or importance to a site or area of vegetation / habitat / community	
	• Habitat supporting nationally Threatened or At-Risk species, or locally uncommon species. • Regional or national distribution limits of species or community. • Unusual species or assemblages. Endemism
Diversity and Pattern	• Level of natural diversity, abundance, and distribution. • Biodiversity reflecting underlying diversity. • Biogeographical considerations – pattern, complexity. Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation.
Ecological context	• Site history, and local environmental conditions which have influenced the development of habitats and communities. • The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (from "intrinsic value" as defined in the RMA). • Size, shape, and buffering. • Condition and sensitivity to change. • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material. Species role in ecosystem functioning – high level, key species identification, habitat as proxy.

Appendix B Table 3: Scoring for sites or areas combining values for four matters in Appendix B Table 2

Value	Description
Very High	Area rates High for three or all the four assessment matters listed in Appendix B Table 2. Likely to be nationally important and recognised as such.
High	Area rates High for two of the assessment matters, Moderate and Low for the remainder, or Area rates High for one of the assessment maters, Moderate for the remainder. Likely to be regionally important and recognised as such.
Moderate	Area rates High for one matter, Moderate and Low for the remainder, or Area rates Moderate for two or more assessment matters Low or Very Low for the remainder Likely to be important at the level of the Ecological District.
Low	Area rates Low or Very Low for majority of assessment matters and Moderate for one. Limited ecological value other than as local habitat for tolerant native species.
Negligible	Area rates Very Low for three matters and Low or Very Low for remainder.

Appendix B Table 4: Factors to consider in scoring ecological freshwater values (adapted from Roper-Lindsay et al., 2018)

Value	Explanation	Characteristics
Very High	A reference quality watercourse in condition close to its pre-human condition with the expected assemblages of flora and fauna and no contributions of contaminants from human induced activities including agriculture. Negligible degradation e.g. stream within a native forest catchment.	Benthic invertebrate community typically has high diversity, species richness and abundance. Benthic invertebrate community contains many taxa that are sensitive to organic enrichment and settled sediments. Benthic community typically with no single dominant species or group of species. MCI scores typically 120 or greater. EPT richness and proportion of overall benthic invertebrate community typically high. SEV scores high, typically >0.8. Fish communities typically diverse and abundant. Riparian vegetation typically with a well-established closed canopy. Stream channel and morphology natural. Stream banks natural typically with limited erosion. Habitat natural and unmodified.
High	A watercourse with high ecological or conservation value but which has been modified through loss of riparian vegetation, fish barriers, and stock access or similar, to the extent it is no longer reference quality. Slight to moderate degradation e.g. exotic forest or mixed forest / agriculture catchment.	Benthic invertebrate community typically has high diversity, species richness and abundance. Benthic invertebrate community contains many taxa that are sensitive to organic enrichment and settled sediments. Benthic community typically with no single dominant species or group of species. MCI scores typically 80-100 or greater. EPT richness and proportion of overall benthic invertebrate community typically moderate to high. SEV scores moderate to high, typically 0.6-0.8. Fish communities typically diverse and abundant. Riparian vegetation typically with a well-established closed canopy. No pest or invasive fish (excluding trout and salmon) species present. Stream channel and morphology natural. Stream banks natural typically with limited erosion. Habitat largely unmodified.
Moderate	A watercourse which contains fragments of its former values but has a high proportion of tolerant fauna, obvious water quality issues and / or sedimentation issues. Moderate to high degradation e.g. high-intensity agriculture catchment.	Benthic invertebrate community typically has low diversity, species richness and abundance. Benthic invertebrate community dominated by taxa that are not sensitive to organic enrichment and settled sediments. Benthic community typically with dominant species or group of species. MCI scores typically 40-80. EPT richness and proportion of overall benthic invertebrate community typically low. SEV scores moderate, typically 0.4-0.6.

Value	Explanation	Characteristics
		Fish communities typically moderate diversity of only 3-4 species. Pest or invasive fish species (excluding trout and salmon) may be present. Stream channel and morphology typically modified (e.g. channelised). Stream banks may be modified or managed and may be highly engineered and / or evidence of significant erosion. Riparian vegetation may have a well-established closed canopy. Habitat modified.
Low	A highly modified watercourse with poor diversity and abundance of aquatic fauna and significant water quality issues. Very high degradation e.g. modified urban stream.	Benthic invertebrate community typically has low diversity, species richness and abundance. Benthic invertebrate community dominated by taxa that are not sensitive to organic enrichment and settled sediments. Benthic community typically with dominant species or group of species. MCI scores typically 60 or lower. EPT richness and proportion of overall benthic invertebrate community typically low or zero. SEV scores low to moderate, typically less than 0.4. Fish communities typically low diversity of only 1-2 species. Pest or invasive fish (excluding trout and salmon) species present. Stream channel and morphology typically modified (e.g. channelised). Stream banks often highly modified or managed and maybe highly engineered and / or evidence of significant erosion. Riparian vegetation typically without a well-established closed canopy. Habitat highly modified.

Appendix B Table 5: Summary of the criteria for describing the magnitude of effect (EIANZ, 2018)

Magnitude	Heading
Very High	Total loss of, or very major alteration to, key elements / features / of the existing baseline conditions, such that the post-development character, composition and / or attributes will be fundamentally changed and may be lost from the site altogether; AND / OR Loss of a very high proportion of the known population or range of the element / feature.
High	Major loss or major alteration to key elements / features of the existing baseline conditions such that the post-development character, composition and / or attributes will be fundamentally changed; AND / OR Loss of a high proportion of the known population or range of the element / feature.

Magnitude	Heading
Moderate	Loss or alteration to one or more key elements / features of the existing baseline conditions, such that the post-development character, composition and / or attributes will be partially changed; AND / OR Loss of a moderate proportion of the known population or range of the element / feature.
Low	Minor shift away from existing baseline conditions. Change arising from the loss / alteration will be discernible, but underlying character, composition and / or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND / OR Having a minor effect on the known population or range of the element / feature.
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND / OR Having negligible effect on the known population or range of the element / feature.

Note: Baseline conditions are defined as 'the conditions that would pertain in the absence of a proposed action' (Roper-Lindsay et al., 2018).

Appendix B Table 6: Timescale for duration of effect (EIANZ, 2018)

Timescale	Description
Permanent	Effects continuing for an undefined time beyond the span of one human generation (taken as approximately 25 years).
Long-term	Where there is likely to be substantial improvement after a 25-year period (e.g. the replacement of mature trees by young trees that need >25 years to reach maturity, or restoration of ground after removal of a development) the effect can be termed 'long term'.
Temporary[1]	Long term (15-25 years or longer – see above). Medium term (5-15 years). Short term (up to 5 years). Construction phase (days or months).

Note: [1]Note that in the context of some planning documents, 'temporary' can have a defined timeframe.

Appendix B Table 7: Criteria for describing overall levels of ecological effects (EIANZ, 2018)

Magnitude of effect	Ecological value				
	Very high	High	Moderate	Low	Negligible
Very High	Very high	Very high	High	Moderate	Low
High	Very high	Very high	Moderate	Low	Very low
Moderate	High	High	Moderate	Low	Very low
Low	Moderate	Low	Low	Very low	Very low
Negligible	Low	Very low	Very low	Very low	Very low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

Note: Overall level-of-effect categories are used to determine if residual effects management is required over and above measures to reduce the severity of effects through efforts to avoid, remedy or mitigate adverse effects. Usually, if the level of residual effect is assessed as being "Moderate" or greater, this warrants efforts to offset or compensate for these effects.

Appendix C Species tables

Table Appendix C.1: Plant species observed within wetland, terrestrial and riparian margin habitats within and / or within 100 m of the proposed designation

Common name	Scientific name	Conservation status (de Lange et al 2024)
Coprosma	*Coprosma virescens*	At Risk - Declining
Oioi	*Apodasmia similis*	Not Threatened
Shore hard fern	*Austroblechnum banksii*	Not Threatened
Lance fern	*Austroblechnum lanceolatum*	Not Threatened
Little hard fern	*Austroblechnum penna-marina*	Not Threatened
Rereti	*Blechnum chambersii*	Not Threatened
Rautahi	*Carex geminata*	Not Threatened
Rautahi	*Carex lessoniana*	Not Threatened
Māori sedge	*Carex maorica*	Not Threatened
Purei / Pukio, swamp sedge	*Carex secta*	Not Threatened
Pukio, swamp sedge	*Carex virgata*	Not Threatened
Mingimingi	*Coprosma propinqua*	Not Threatened
Karamū	*Coprosma robusta*	Not Threatened
Coprosma hybrid	*Coprosma* x *cunninghamii*	Not Threatened
Tī kōuka, cabbage tree	*Cordyline australis*	Not Threatened
Bachelor's button	*Cotula coronopifolia*	Not Threatened
Kiwakiwa, creek fern	*Cranfillia fluviatilis*	Not Threatened
	Deparia petersenii	Not Threatened
Akeake	*Dodonea viscosa*	Not Threatened
Sharp spike sedge	*Eleocharis acuta*	Not Threatened
Water fern	*Histiopteris incisa*	Not Threatened
Hydrocotyle	*Hydrocotyle robusta*	Not Threatened
Pig fern	*Hypolepis ambigua*	Not Threatened
Pig fern	*Hypolepis rufobarbata*	Not Threatened
Slender clubrush	*Isolepis cernua*	Not Threatened
Leafless rush	*Juncus australis*	Not Threatened
Wiwi, Edgar's rush	*Juncus edgariae*	Not Threatened
Giant rush	*Juncus pallidus*	Not Threatened
Broom rush	*Juncus sarophorus*	Not Threatened
Duckweed	*Lemna disperma*	Not Threatened
Pōhuehue	*Muehlenbeckia australis*	Not Threatened

Common name	Scientific name	Conservation status (de Lange et al 2024)
Common water milfoil	*Myriophyllum propinquum*	Not Threatened
Piupiu, gully fern	*Pakau pennigera*	Not Threatened
Swamp kiokio	*Parablechnum minus*	Not Threatened
Kiokio	*Parablechnum novae-zelandiae*	Not Threatened
Small kiokio	*Parablechnum procerum*	Not Threatened
Harakeke, flax	*Phormium tenax*	Not Threatened
Tarata, lemonwood	*Pittosporum eugenioides*	Not Threatened
Kōhūhū	*Pittosporum tenuifolium*	Not Threatened
Mānatu, lowland ribbonwood	*Plagianthus regius* subsp. *regius*	Not Threatened
Tōtara	*Podocarpus totara* var *totara*	Not Threatened
Pūniu / prickly shield fern	*Polystichum vestitum*	Not Threatened
	Polystichum sp	
Red pondweed	*Potamogeton cheesemani*	Not Threatened
Hairy buttercup	*Ranunculus reflexus*	Not Threatened
Cutleaf burnweed	*Senecio glomeratus*	Not Threatened
Fireweed	*Senecio hispidulus*	Not Threatened
Small leaved kōwhai	*Sophora microphylla*	Not Threatened
Raupō	*Typha orientalis*	Not Threatened
Yarrow	*Achillea millefolium*	Exotic
Browntop	*Agrostis capillaris*	Exotic
Creeping bent	*Agrostis stolonifera*	Exotic
Alder	*Alnus glutinosa*	Exotic
Sweet vernal	*Anthoxamthum odoratum*	Exotic
Silver birch	*Betula pendula*	Exotic
Brome	*Bromus sp.*	Exotic
Marram	*Calamagrostis arenaria*	Exotic
Starwort	*Callitriche stagnalis*	Exotic
Bindweed	*Calystegia silvatica*	Exotic
Lawsons cypress	*Chamaecyparis lawsoniana*	Exotic
Old man's beard	*Clematis vitalba*	Exotic
Poison hemlock	*Conium maculatum*	Exotic
Pampas	*Cortaderia selloana*	Exotic
Hawthorn	*Crataegus monogyna*	Exotic
Montbretia	*Crocosmia x crocosmiiflora*	Exotic
Japanese red cedar	*Cryptomeria japonica*	Exotic
Umbrella sedge	*Cyprus eragrostis*	Exotic

Common name	Scientific name	Conservation status (de Lange et al 2024)
Broom	*Cytisus scoparius*	Exotic
Cocksfoot	*Dactylis glomerata*	Exotic
German ivy	*Delairea odorata*	Exotic
Canadian pondweed	*Elodea canadensis*	Exotic
Epilobium sp.	*Epilobium* sp.	Exotic
Broad-leaved fleabane	*Erigeron bonariensis*	Exotic
Musky storksbill	*Erodium moschatum*	Exotic
Monkey musk	*Erythranthe moschata*	Exotic
Gum	*Eucalyptus sp.*	Exotic
Spindle	*Euonymus europaeus*	Exotic
Fatsia	*Fatsia japonica*	Exotic
Fennel	*Foeniculum vulgare*	Exotic
Cleavers	*Gallium aparine*	Exotic
Ground ivy	*Glechoma hederacea*	Exotic
Blue sweetgrass	*Glyceria declinata*	Exotic
Floating sweetgrass	*Glyceria fluitans*	Exotic
Common ivy	*Hedera helix*	Exotic
Macrocarpa	*Hesperocyparis macrocarpa*	Exotic
Yorkshire fog	*Holcus lanatus*	Exotic
Catsear	*Hypochaeris radicata*	Exotic
European holly	*Ilex aquifolium*	Exotic
Stinking iris	*Iris foetidissima*	Exotic
Yellow flag iris	*Iris pseudacorus*	Exotic
Sharp-fruited rush	*Juncus acuminatus*	Exotic
Jointed rush	*Juncus articulatus*	Exotic
Soft rush	*Juncus effusus*	Exotic
Tall fescue	*Lolium arundinaceum* subsp. *arundinaceum*	Exotic
Perennial ryegrass	*Lolium perenne*	Exotic
Japanese honeysuckle	*Lonicera japonica*	Exotic
Lotus	*Lotus pedunculata*	Exotic
Lupin	*Lupinus arboreus*	Exotic
Southern magnolia	*Magnolia grandiflora*	Exotic
Rayless chamomile	*Matricaria discoidea*	Exotic
Pennyroyal	*Mentha pulegium*	Exotic
Watercress	*Nasturtium officinale*	Exotic
Mercer grass	*Paspalum distichum*	Exotic

Common name	Scientific name	Conservation status (de Lange et al 2024)
Water pepper	*Persicaria hydropiper*	Exotic
Radiata pine	*Pinus radiata*	Exotic
Pine	*Pinus* sp.	Exotic
Narrow-leaved plantain	*Plantago lanceolata*	Exotic
Rough-stalked meadow grass	*Poa trivialis*	Exotic
Lombardy poplar	*Populus nigra*	Exotic
Poplar	*Populus* sp.	Exotic
Curley-leaf pondweed	*Potamogeton crispus*	Exotic
Jersey cudweed	*Pseudognaphalium luteoalbum*	Exotic
Douglas fir	*Pseudotsuga menziesii*	Exotic
Selfheal	*Prunella vulgaris*	Exotic
English oak	*Quercus robur*	Exotic
Creeping buttercup	*Ranunculus repens*	Exotic
Climbing rose	*Rosa rubiginosa*	Exotic
Rose	*Rosa sp.*	Exotic
Blackberry	*Rubus fruticosus* agg.	Exotic
Sheep's sorrel	*Rumex acetosella*	Exotic
Broad-leaved dock	*Rumex obtusifolius*	Exotic
Weeping willow	*Salix babylonica*	Exotic
Grey willow	*Salix cinerea*	Exotic
Crack willow	*Salix* x *fragilis*	Exotic
Tortured willow	*Salix matsudana*	Exotic
Willows	*Salix* sp.	Exotic
Coast redwood	*Sequoia sempervirens*	Exotic
Velvety nightshade	*Solanum chenopodiodes*	Exotic
Dandelion	*Taraxicum officinale*	Exotic
Swamp cypress	*Taxodium distichum*	Exotic
Red clover	*Trifolium pratense*	Exotic
White clover	*Trifolium repens*	Exotic
Gorse	*Ulex europaeus*	Exotic
Water speedwell	*Veronica anagallis-aquatica*	Exotic
Periwinkle	*Vinca major*	Exotic

Table Appendix C.2: Bird species observations and database records

Common name	Scientific name	Conservation status (Roberston et al., 2021)	Recorded online*	Observed on site
Kōtuku / white heron	*Ardea modesta*	Threatened – Nationally Critical	√	
Matuku-hūrepo / Australasian bittern	*Botaurus poiciloptillus*	Threatened – Nationally Critical	√	
Pārera / grey duck	*Anas superciliosa*	Threatened – Nationally Vulnerable	√	
Pūteketeke / Australasian crested grebe	*Podiceps cristatus australis*	Threatened-Nationally Vulnerable	√	√
Kawau tikitiki / spotted shag	*Strictocarbo punctatus*	Threatened – Nationally Vulnerable	√	
Weweia / New Zealand dabchick	*Poliocephalus rufopectus*	Threatened – Nationally Increasing	√	
Pohowera / banded dotterel	*Anarhynchus bicinctus*	At Risk - Declining	√	
Pīhoihoi / New Zealand pipit	*Anthus novaeseelandiae*	At Risk - Declining	√	
Tarāpunga / red-billed gull	*Chroicocephalus novaehollandiae*	At Risk - Declining	√	
Tōrea / South Island Pied Oystercatcher	*Haematopus finschi*	At Risk - Declining	√	
Tarāpuka / black-billed gull	*Larus bulleri*	At Risk - Declining	√	
Kotoreke / marsh crake	*Zapornia pusilla*	At Risk - Declining	√	
Pūweto / spotless crake	*Zapornia tabuensis*	At Risk - Declining	√	
Tōrea pango / variable oystercatcher	*Haematopus unicolor*	At Risk - Recovering	√	
Kāruhiruhi / Pied shag	*Phalacrocorax varius*	At Risk-Recovering	√	√
Kawaupaka / Little shag	*Microcarbo melanoleucos*	At Risk-Relict	√	√
Māpunga / black shag	*Phalacrocorax carbo*	At Risk - Relict	√	
Australian coot	*Fulica atra australis*	At Risk – Naturally Uncommon	√	√
Kawau tūī / little black shag	*Phalacrocorax sulcirostris*	At Risk – Naturally Uncommon	√	
Kōtuku ngutupapa / royal spoonbill	*Platalea regia*	At Risk – Naturally Uncommon	√	
Tētē-moroiti / grey teal	*Anas gracilis*	Not Threatened	√	
Korimako / bellbird	*Anthornis melanura*	Not Threatened	√	
Pāpango / scaup	*Aythya novaeseelandiae*	Not Threatened	√	√

Common name	Scientific name	Conservation status (Roberston et al., 2021)	Recorded online*	Observed on site
Pīpīwharauroa / Shining cuckoo	*Chrysococcyx lucidus*	Not Threatened	√	
Kahu / Australasian harrier	*Circus approximans*	Not Threatened	√	√
Kakīānau / black swan	*Cygnus atratus*	Not Threatened	√	√
Matuku moana / white-faced heron	*Egreta novaehollandiae*	Not Threatened	√	
Riroriro / grey warbler	*Gerygone igata*	Not Threatened	√	√
Kererū	*Hemiphaga novaeseelandiae*	Not Threatened	√	
Poaka / pied stilt	*Himantopus himantopus*	Not Threatened	√	
Warou / welcome swallow	*Hirundo neoxena*	Not Threatened	√	√
Karoro / black-backed gull	*Larus diminicanus*	Not Threatened	√	
Pūkeko	*Porphyrio melanotus*	Not Threatened	√	√
Pīwakawaka / Fantail	*Rhipidura fuliginosa*	Not threatened	√	√
Kuruwhengi / Australasian shoveler	*Spatula rhynchotis*	Not Threatened	√	
Pūtangitangi / paradise shelduck	*Tadorna variegata*	Not Threatened	√	√
Kōtare / sacred kingfisher	*Todiramphus sanctus*	Not Threatened	√	√
Spur-winged plover	*Vanellus miles*	Not Threatened	√	√
Tauhou / silvereye	*Zosterops lateralis*	Not Threatened	√	√
Tokitokipio / Australasian little grebe	*Tachybaptus novaehollandiae novaehollandiae*	Non-resident Native - Coloniser	√	
Skylark	*Alauda arvensis*	Introduced and Naturalised	√	√
Canada goose	*Branta Canadensis*	Introduced and Naturalised	√	√
Feral pigeon	*Columba livia*	Introduced and Naturalised	√	√
Yellowhammer	*Emperiza citrinella*	Introduced and Naturalised	√	√
Dunnock	*Prunella modularis*	Introduced and Naturalised	√	√
Starling	*Sturnus vulgaris*	Introduced and Naturalised	√	√
Blackbird	*Turdus merula*	Introduced and Naturalised	√	√

*eBird records from Kaiapoi Lakes – South Pond hotspot, iNaturalist within 10 km of Quarry Lakes.

Table Appendix C.3: NZFFD records of freshwater fauna and BML 2025 eDNA results

Common name	Scientific name	National conservation status (Dunn et al., 2023)	Recorded in	Locations captured / detected
Īnanga	*Galaxias maculatus*	Threatened – Nationally Vulnerable	NZFFD & BML (2025)	• Kaiapoi River • Cam River / Ruataniwha • McIntosh Drain • Taranaki Stream • Taranaki Stream Tributary
Tuna / longfin eel	*Anguilla dieffenbachii*	At Risk – Declining	NZFFD & BML (2025)	• Kaiapoi River • Cam River / Ruataniwha • McIntosh Drain • Taranaki Stream
Paraki / common smelt	*Retropinna retropinna*	At Risk – Declining	NZFFD	• Kaiapoi River • Cam River / Ruataniwha • McIntosh Drain
Koukoupara / upland bully	*Gobiomorphus breviceps*	At Risk – Naturally Uncommon	BML (2025)	• Kaiapoi River • Cam River / Ruataniwha
Māruru / giant bully	*Gobiomorphus gobioides*	At Risk – Naturally Uncommon	NZFFD & BML (2025)	• Kaiapoi River • Cam River / Ruataniwha • McIntosh Drain
Redfin bully	*Gobiomorphus huttoni*	At Risk – Naturally Uncommon	BML (2025)	• Kaiapoi River
Aua / yelloweye mullet	*Aldrichetta forsteri*	Not Threatened	NZFFD & BML (2025)	• Cam River / Ruataniwha • McIntosh Drain

Common name	Scientific name	National conservation status (Dunn et al., 2023)	Recorded in	Locations captured / detected
Hao / shortfin eel	*Anguilla australis*	Not Threatened	NZFFD & BML (2025)	• Kaiapoi River • Cam River / Ruataniwha • McIntosh Drain • Taranaki Stream • Taranaki Stream Tributary
Toitoi / common bully	*Gobiomorphus cotidianus*	Not Threatened	NZFFD & BML (2025)	• Kaiapoi River • Cam River / Ruataniwha • Quarry Lakes • McIntosh Drain • Taranaki Stream
Pātiki mohoao / black flounder /	*Rhombosolea retiaria*	Not Threatened	NZFFD	• Kaiapoi River Cam River / Ruataniwha
Goldfish	*Carassius auratus*	Introduced and naturalised	BML (2025)	• Quarry Lakes
Chinook salmon	*Oncorhynchus tshawytscha*	Introduced and naturalised	NZFFD	• Kaiapoi River
Perch	*Perca fluviatilis*	Introduced and naturalised	BML (2025)	• Quarry Lakes
Brown trout	*Salmo trutta*	Introduced and naturalised	NZFFD & BML (2025)	• Kaiapoi River • Cam River / Ruataniwha • McIntosh Drain • Taranaki Stream • Taranaki Stream Tributary
Rudd	*Scardinius erythrophthalmus*	Introduced and naturalised	BML (2025)	• Quarry Lakes
Tench	*Tinca tinca*	Introduced and naturalised	BML (2025)	• Quarry Lakes

Common name	Scientific name	National conservation status (Dunn et al., 2023)	Recorded in	Locations captured / detected
Large macroinvertebrates				
Kākahi / freshwater mussel	*Echyridella menziesii*	At Risk – Declining*	BML (2025)	• Kaiapoi River • Cam River / Ruataniwha

* = conservation status per Grainger et al., 2018

Appendix D Photographs of representative terrestrial vegetation types

Photograph Appendix D.1: Representative photograph of 'Rank grass' and 'Pasture' vegetation type within the terrestrial riparian margin of Rossiters Drain. Taken 29 April 2025.

Photograph Appendix D.2: Representative photograph of 'Rank grass' and 'Managed grass' vegetation type within the terrestrial riparian margin of Wilsons Drain. Taken on 19 June 2025.

Photograph Appendix D.3: Representative photograph of 'Exotic treeland' vegetation type within the terrestrial riparian margin of Cam River / Ruataniwha to Williams Street section. Taken on 22 July 2025.

Photograph Appendix D.4: Representative photograph of 'Exotic treeland' and 'Rank grass' vegetation type within the terrestrial riparian margin of Cam River / Ruataniwha to Williams Street section. Taken on 22 July 2025.

Photograph Appendix D.5: Representative photograph of 'Rank grass' vegetation type within the terrestrial riparian margin of CR_W2_NPSFM. Taken on 05 May 2025.

Photograph Appendix D.6: Representative photograph of 'Exotic shelterbelt' and 'Pasture' vegetation type within Quarry Ponds to Woodend Beach Rd Section. Taken on 05 May 2025.

Photograph Appendix D.7: Representative photograph of 'Exotic shelterbelt' vegetation type within Gladstone Road to SH1 section. Taken on 05 May 2025.

Photograph Appendix D.8: Exotic shrubland and grassland mosaic within Gladstone Road to SH1 section. Taken on 10 April 2025.

Photograph Appendix D.9: Exotic shrubland and grassland mosaic within Quarry Lakes to Woodend Beach Road section. Taken on 10 April 2025.

Photograph Appendix D.10: Representative photograph of 'Buildings and gardens' vegetation type within the Woodend Beach Road to Gladstone Road section. Taken 21 May 2025.

Appendix E T+T 2025 wetland delineation summary of results

Appendix E Table 1: Summary of wetland delineation protocol outputs for each confirmed wetland where delineation was undertaken within or within 100 m of the Proposed Project designation.

	Rapid test	Dominance test		Prevalence test		Hydric soils test	Hydrology test	Threatened sp. test	Pasture test	
Site	Pass / Fail	Index	Pass / Fail	Index	Pass / Fail	Pass / Fail	Pass / Fail		Pass / Fail	Classification
CR_W1	Fail	67%	Pass	2.9	Pass	Pass	Not required	Fail	Fail (24%)	Wetland
CR_W2_Plot 1	Pass	100%	Pass	2.2	Pass	Not required	Not required	Fail	Fail (7%)	Wetland
CR_W2_plot 2	Fail	100%	Pass	2.6	Pass	Not required	Not required	Fail	Fail (0%)	Wetland
FA_W1	Fail	50%	Fail	2.9	Pass	Pass	Pass	Fail	Fail (45%)	Wetland
QP_W1_Plot 1	Fail	67%	Pass	3	Pass	Pass	Fail	Fail	Fail (60%)	Wetland
QP_W1_Plot 2	Fail	100%	Pass	2.4	Pass	Pass	Pass	Fail	Fail (26%)	Wetland
QP_W4_Plot 1	Pass	100%	Pass	2.7	Pass	Pass	Pass	Fail	Fail (33%)	Wetland
QP_W4_Plot 2	Pass	100%	Pass	2.1	Pass	Fail	Pass	Fail	Fail (3%)	Wetland
FR_W2	Fail	33%	Fail	3	Pass	No evidence	Pass	Fail	Fail (50%)	Wetland
FR_W3	Fail	67%	Pass	2.4	Pass	Not required	Not required	Fail	Fail (23%)	Wetland
FR_W4	Pass	100%	Pass	2	Pass	Not required	Not required	Fail	Fail (19%)	Wetland
FA_W2	Fail	100%	Pass	2.8	Pass	Fail	Not required	Fail	Fail (64%)	Wetland
WC_W1	Fail	100%	Pass	2.4	Pass	Not required	Not required	Fail	Fail (21%)	Wetland
WC_W2_Plot 1	Pass	100%	Pass	2	Pass	Not required	Not required	Fail	Fail (0%)	Wetland
WC_W2_Plot 2	Fail	80%	Pass	2.4	Pass	Not required	Not required	Fail	Fail (19%)	Wetland
WC_W2_Plot 3	Pass	100%	Pass	1.8	Pass	Not required	Not required	Fail	Fail (0%)	Wetland
WC_W3	Fail	75%	Pass	2.2	Pass	Not required	Not required	Fail	Fail (0%)	Wetland
WC_W4	Pass	100%	Pass	2.4	Pass	Not required	Not required	Fail	Fail (0%)	Wetland
WC_W5	Fail	50%	Fail	3	Pass	No evidence	Pass	Fail	Fail (50%)	Wetland
WC_W6_Plot 1	Pass	100%	Pass	2	Pass	Not required	Not required	Fail	Fail (0%)	Wetland
WC_W6_Plot 2	Fail	100%	Pass	2.5	Pass	Not required	Not required	Fail	Fail (50%)	Wetland
GC_W1	Pass	100%	Pass	1.7	Pass	Not required	Not required	Fail	Fail (0%)	Wetland
GS_W1	Pass	100%	Pass	1.9	Pass	Not required	Not required	Fail	Fail (0%)	Wetland
RW_CW1	Pass	100%	Pass	2	Pass	Not required	Not required	Fail	Fail (0%)	Wetland
RW_CW2	Pass	100%	Pass	2	Pass	Not required	Not required	Fail	Fail (0%)	Wetland

Appendix F Stream offset: SEV impacts and offset reach scores, and potential stream function assumptions

Appendix F Table 1: SEV impacts and offset reach calculations for stream realignments (excludes biotic functions)

Function category	Function	Variable (code)	Taranaki Stream i-C	Taranaki Stream i-P	Taranaki Stream Trib i-C	Taranaki Stream Trib i-P	Waihora Stream i-C (US SH1)	Waihora Stream i-P (US SH1)	Waihora Stream i-C (DS SH1)	Waihora Stream i-P (DS SH1)	McIntosh Drain i-C	McIntosh Drain i-P	McIntosh m-P Offset site
Hydraulic		Vchann	0.420	0.420	0.100	0.100	0.400	0.400	0.400	0.400	0.100	0.100	0.100
		Vlining	0.800	0.800	0.800	0.800	0.880	0.880	0.800	0.800	0.800	0.800	0.800
		Vpipe	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.300
	Natural Flow Regime	=	0.547	0.547	0.333	0.333	0.560	0.560	0.533	0.533	0.333	0.333	0.100
		Vbank	0.200	0.200	0.020	0.020	1.000	1.000	1.000	1.000	0.000	0.400	0.200
		Vrough	1.000	0.940	1.000	0.940	0.490	0.940	0.350	0.940	0.260	0.940	0.780
	Floodplain effectiveness	=	0.200	0.188	0.020	0.019	0.490	0.940	0.350	0.940	0.000	0.376	0.160
		Vbarr	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.300	0.300	1.000
	Connectivity for natural species migration	=	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.300	0.300	1.000
		Vchanshape	0.840	0.840	0.200	0.200	0.900	0.900	0.900	0.900	0.200	0.200	0.200
		Vlining	0.800	0.800	0.800	0.800	0.880	0.880	0.800	0.800	0.800	0.800	0.800
	Natural connectivity to groundwater	=	0.813	0.813	0.600	0.600	0.887	0.887	0.833	0.833	0.600	0.600	0.600
Hydraulic function mean score			0.640	0.637	0.488	0.488	0.734	0.847	0.679	0.827	0.308	0.402	0.460
Biogeochemical		Vshade	0.220	0.620	0.520	0.620	0.080	0.580	0.180	0.380	0.000	0.620	0.480
	Water temperature control	=	0.220	0.620	0.520	0.620	0.080	0.580	0.180	0.380	0.000	0.620	0.480
		Vdod	0.675	0.675	0.675	0.675	0.335	0.335	0.335	0.335	0.400	0.400	0.680
	Dissolved oxygen levels maintained	=	0.675	0.675	0.675	0.675	0.335	0.335	0.335	0.335	0.400	0.400	0.680
		Vripar	0.100	0.100	0.000	0.000	0.100	0.100	0.100	0.100	0.000	0.100	0.750
		Vdecid	1.000	1.000	1.000	1.000	0.845	1.000	0.000	1.000	1.000	1.000	1.000
	Organic matter input	=	0.100	0.100	0.000	0.000	0.092	0.100	0.050	0.100	0.000	0.100	0.750
		Vmacro	0.533	0.533	0.812	0.812	0.050	0.050	0.730	0.730	0.523	0.523	0.550
		Vretain	0.320	0.320	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
	Instream particle retention	=	0.320	0.320	0.200	0.200	0.050	0.050	0.200	0.200	0.200	0.200	0.200
		Vsurf	0.941	1.000	0.417	0.491	0.993	1.000	0.970	1.000	1.000	1.000	1.000
		Vripfilt	0.680	0.800	0.600	0.800	0.280	0.800	0.200	0.800	0.600	0.800	0.720
	Decontamination of pollutants	=	0.810	0.900	0.509	0.645	0.637	0.900	0.585	0.900	0.800	0.900	0.860
Biogeochemical function score			0.425	0.523	0.381	0.428	0.239	0.393	0.270	0.383	0.280	0.444	0.590
Habitat Provision		Vgalspwn	0.000	0.000	0.400	0.400	0.000	0.000	1.000	1.000	0.000	0.000	0.000
		Vgalqual	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.750
		Vgobspwn	0.800	0.800	0.200	0.800	0.100	0.800	0.100	0.800	0.100	0.800	1.000
	Fish spawning habitat	=	0.400	0.400	0.100	0.400	0.050	0.400	0.050	0.400	0.050	0.400	0.500
		Vphyshab	0.412	0.506	0.353	0.482	0.094	0.424	0.094	0.412	0.071	0.447	0.620

Function category	Function	Variable (code)	Taranaki Stream i-C	Taranaki Stream i-P	Taranaki Stream Trib i-C	Taranaki Stream Trib i-P	Waihora Stream i-C (US SH1)	Waihora Stream i-P (US SH1)	Waihora Stream i-C (DS SH1)	Waihora Stream i-P (DS SH1)	McIntosh Drain i-C	McIntosh Drain i-P	McIntosh m-P Offset site
		Vwatqual	0.142	0.378	0.243	0.378	0.047	0.181	0.064	0.147	0.040	0.224	0.200
		Vimperv	0.400	0.400	0.300	0.300	0.400	0.400	0.400	0.400	0.800	0.800	0.400
	Habitat for aquatic fauna	=	0.341	0.447	0.312	0.411	0.159	0.357	0.163	0.343	0.245	0.480	0.460
Habitat provision function mean score			0.371	0.424	0.206	0.405	0.104	0.378	0.106	0.371	0.148	0.440	0.480
Biodiversity		Vfish	0.467	0.467	0.333	0.333	0.000	0.000	0.000	0.000	0.000	0.000	-
	Fish fauna intact	=	0.467	0.467	0.333	0.333	0.000	0.000	0.000	0.000	0.000	0.000	-
		Vmci	0.358	0.358	0.157	0.157	0.327	0.327	-	-	-	-	-
		Vept	0.833	0.833	0.167	0.167	0.667	0.667	-	-	-	-	-
		Vinvert	0.350	0.350	0.117	0.117	0.350	0.350	1.000	1.000	1.000	1.000	-
	Invertebrate fauna intact	=	0.514	0.514	0.147	0.147	0.448	0.448	-	-	-	-	-
		Vripcond	0.400	0.460	0.400	0.460	0.250	0.460	0.280	0.460	0.120	0.460	0.450
		Vripconn	0.300	0.300	0.100	0.100	1.000	1.000	1.000	1.000	0.000	0.000	0.650
	Riparian vegetation intact	=	0.120	0.138	0.040	0.046	0.250	0.460	0.280	0.460	0.000	0.000	0.290
Biodiversity function mean score			0.367	0.138	0.173	0.046	0.233	0.460	0.280	0.460	0.000	0.000	0.290
Overall mean SEV score (excl. IFI and FFI)													
			0.462	**0.512**	**0.359**	**0.412**	**0.382**	**0.547**	**0.380**	**0.535**	**0.244**	**0.392**	**0.510**

Note: Overall SEV score excludes biotic functions.

Appendix F Table 2: SEV assumptions

		Taranaki Stream and Tributary Potential Score (SEVi-P)	McIntosh Drain Potential Score (SEVm-P)	Waihora Stream (DS and US of SH1): Potential Score (SEVm-P)	McIntosh Drain Potential Score (SEVm-P) – Offset site
Proposed enhancements		Assume 10 m wide native planting (consisting of sedges, rushes, grasses, shrubs, and trees) on both sides of the stream. Benefit considered 10 years after planting.	Assume 10 m wide native planting (consisting of sedges, rushes, grasses, shrubs and trees) on both sides of the stream. Benefit considered 10 years after planting.	Assume 10 m wide native planting total of both sides (consisting of sedges, rushes, grasses, shrubs and trees) on both sides of the stream. Benefit considered 10 years after planting.	Variables adjusted for proposed stream enhancement 10 years after establishment. Scores based on general understanding of stream riparian enhancement design. Assume thick well established wetland bench and low stature flood plain planting, and forest planting has reached 5 m in height with high proportion of canopy closure. The planted riparian corridor will be a minimum of 10 m wide on both sides, where only one side can be planted riparian corridor is 30 m wide.
Hydraulic	**Vchannel**	No change from existing.	No change from existing.	No change from existing.	Assumed small meandering channel within a wider flood conveyance channel will develop over time due to revegetation of riparian zone. All of channel natural but upper banks wide to increase flood capacity.
	Vlining	Assume no change to existing. Bed with unnatural loading of fine sediment.	Assume no change to existing. Bed with unnatural loading of fine sediment.	Assume no change to existing. Bed with unnatural loading of fine sediment.	Assume no change to existing. Bed with unnatural loading of fine sediment.
	Vpipe	No pipes	No additional pipes – 1 small farm access culvert present.	No pipes	Two piped in flows from stormwater wetlands. Project culvert designed to meet NES-FW permitted activity status.
	Vbank	No change from existing stream channel. Floodplain present but connectivity reduced by channel deepening.	No change from existing stream channel. Floodplain present but connectivity reduced by channel deepening.	No change from existing stream channel. Floodplain present but connectivity reduced by channel deepening.	Assumed slight meandering channel will naturally develop within a wider flood conveyance channel. All of channel

		Taranaki Stream and Tributary Potential Score (SEVi-P)	McIntosh Drain Potential Score (SEVm-P)	Waihora Stream (DS and US of SH1): Potential Score (SEVm-P)	McIntosh Drain Potential Score (SEVm-P) – Offset site
					floodplain present, but connectivity to the full floodplain is restricted by modification.
	Vrough	Assume 10 m planted margin, planted with natives. Assume rest of 20 m margin remains similar to existing.	Assume 10 m fenced and planted margin, planted with natives. Assume rest of 20 m margin remains grazed and similar to existing.	Assumed fenced 5 m riparian strip on both banks of low diversity regenerating bush (shrub) with stock excluded and remaining 15 m grazed pasture.	Assumed a minimum of 10 m planted riparian margin on both banks, with some mown grass in places and Beach Road (artificial surface) at downstream end. Were only the true right bank is planted this will be a minimum of 30 m planted riparian margin. Assumed 10 – 20 % diverse wetland margin, 25 % Low diversity regenerating bush and 34 % mature flax (must be at the outside of the riparain edge), long grasses and sedges. 5% short grass and 1 % artificial surface.
	Vbarr	No barriers to fish passage with reach.	Assume no barriers to fish passage with reach. One farm access culvert present – may be potential barrier in future.	Assume no barriers to fish passage with reach.	Assume no barriers to fish passage with reach.
Biogeochemical	**Vshade**	Assume substantial increase in shading due to increase in planting diversity. Increase in tree species compared to current state.	Assume substantial increase in shading due to increase in planting diversity. Increase in tree species compared to current state.	Assume increase in shading due to the establishment of a riparian strip not 100% long grass like existing. Increase in shading limited by width of stream.	Assumed 70 % moderate shading due dense wetland floodplain planting and forest margins. Assumed 30% low shading due to wider pool sections.
	Vdod	Assume restoration of just this reach unlikely to change anaerobic processes.	Assume restoration of just this reach unlikely to change anaerobic processes.	Assume restoration of just this reach unlikely to change anaerobic processes.	Assumed suboptimal due to unnatural loading of fine sediments and wetland margin.
	Vveloc	Assume no change.	Assume no change.	Assume no change.	Assume no change.
	Vdepth	Assume no change.	Assume no change.	Assume no change.	Assumed 70 % run habitat will naturally develop with an average depth of 0.48 m. Assumed 30 % pool habitat with an average depth of 0.28.
	Vripar	Based on Vrough assumptions.	Based on Vrough assumptions.	Based on Vrough assumptions.	Based on Vrough assumptions.
	Vdecid	Assume no deciduous.	Assume no deciduous.	Assume no deciduous.	Assume no deciduous.
	Vmacro	Assume no change due to the presence of shade tolerant macrophytes.	Assume no change due to the presence of shade tolerant macrophytes.	Assume no change due to the presence of shade tolerant macrophytes.	Assumed 40 % bankside vegetation and emergent macrophytes due to wetland benches, and 40 % below surface macrophytes due to only 40 -50 % shading.
	Vsurf	Assume sediment regime essentially unchanged but increase in organic / woody debris due to greater diversity of planted riparian margins.	Assume sediment regime essentially unchanged but slight increase in organic / woody debris due to greater diversity of planted riparian margins.	Assume sediment regime essentially unchanged but very slight increase in organic / woody debris due to greater diversity of planted riparian margins.	Assume sediment regime essentially unchanged but increase in organic / woody debris due to greater diversity of planted riparian margins.
	Vripfilt	Assumed slight increase filtering activity based on denser ground cover than existing.	Assumed slight increase filtering activity based on denser ground cover than existing.	Assumed slight increase in filtering activity based on denser ground cover than existing.	Assumed high filtering activity based on denser ground cover than existing.
Habitat Provision	**Vgalspwn**	Assumed all of reach unsuitable based on steep existing banks.	Assumed all of reach unsuitable based on steep existing banks.	Assumed all of reach unsuitable based on steep existing banks.	Assumed all of reach suitable due to flat banks.
	Vgalqual	Assume remains unsuitable.	Assume remains unsuitable.	Assume remains unsuitable.	Assumed medium due to thick grasses / sedges creating moderate shading at ground level likely inundated by high rainfall events.
	Vphyshab	Slight increase in function score due to increased shading and woody debris input into stream from riparian planting.	Slight increase in function score due to increased shading and woody debris input into stream from riparian planting.	Slight increase in function score due to increased shading and woody debris input into stream from riparian planting.	Habitat diversity suboptimal (13) due to 4 habitat types inclining wood, overhanging vegetation, roots, rooted aquatic vegetation. Habitat abundance optimal as most of channel will contain suitable habitat for the species expected present. Hydrologic heterogeneity existing poor due to channel being relatively uniform.

		Taranaki Stream and Tributary Potential Score (SEVi-P)	McIntosh Drain Potential Score (SEVm-P)	Waihora Stream (DS and US of SH1): Potential Score (SEVm-P)	McIntosh Drain Potential Score (SEVm-P) – Offset site
	Vwatqual	No change to upstream catchment (largely unvegetated).	No change to upstream catchment (largely unvegetated).	No change to upstream catchment (largely unvegetated).	No change to upstream catchment (largely unvegetated), with some areas of riparian enhancement completed.
	Vimperv	Assume no change.	Assume no change.	Assume no change.	Assumed 10 -25 % impervious with high control due to stormwater wetlands.
Biodiversity	**Vfish**	Excluded form model.	Excluded form model.	Excluded form model.	Excluded form model.
	Vmci	Excluded form model.	Excluded form model.	Excluded form model.	Excluded form model.
	Vept	Excluded form model.	Excluded form model.	Excluded form model.	Excluded form model.
	Vinvert	Excluded form model.	Excluded form model.	Excluded form model.	Excluded form model.
	Vripconn	Assume no change from current due to incising.	Assume no change from current due to incising.	Assume no change from current.	Assumed connected due to low gradient wetland margins.

Appendix G Wetland offset BOAM approach and calculations

G1 BOAM biodiversity components

The BOAM model used for calculating offset area values accounts for the following habitat metrics at both the impact sites and proposed offset site:

- Canopy height (m).
- Canopy foliar cover (%).
- Canopy tree basal diameter (m^2 per ha).
- Groundcover foliar cover (%).
- Groundcover height (m).
- Native plant species diversity.
- Fauna habitat and food provision richness.
- Emergent trees (count per ha).

G2 Reference wetland type approach

All impacted wetlands within the Project area comprise vegetation associations and soils types that result in systems or areas dominated by Facultative Wetland (FACW) species. That is, they contain species that, whilst found in wetland areas, can tolerate seasonal fluctuations in water levels. Consequently, the reference habitat type used in the BOAM calculations has been chosen as a native species wetland type that is also dominated by FACW species and would naturally occur in coastal areas of the Canterbury Plains Ecological Region. This habitat type has been nominally defined as a tī kōuka / cabbage tree, harakeke, and mānuka type that was once originally found within the project area along waterways.

In terms of demonstrating net gains in accordance with Biodiversity offsetting guidelines (Ministry for the Environment 2014), the replacement habitat type is like-for-like with regard to replacing:

a Wetland habitat with wetland habitat.

b Similar / the same wetland hydrological function (wetland species assemblages tolerant of fluctuating water levels with wetland species assemblages tolerant of fluctuating water levels).

c Species commonly found on riparian margin wetland habitat with species commonly found on riparian margin wetland habitat.

However, because the proposed offset habitat type does not also include willow species in the canopy, the offsetting approach does not strictly meet the exact 'like-for-like' approach in terms of direct species replacement. However, in this scenario, the proposed offsetting wetland type is considered to be a 'trade up' in both native biodiversity values and wetland extent, which will therefore result in increased native biodiversity within the Project area and improved conservation and wetland ecosystem services outcomes.

The section that follows provides assumptions and clarifications to aid interpretation of the BOAMs.

G3 Assumptions / clarifications relevant to the Project BOAMs

- We have adjusted the impact model canopy cover measures to account for annual foliar cover of deciduous trees. We have assumed that willows have a three-month dormancy period where foliage is not present, which reduces the amount of shading. Consequently, the canopy foliar cover included in the model comprises the estimated foliar cover during the site assessment, multiplied by 9 (to account for the 9 months of the year when full, or nearly full foliar cover is present) then divided by 12 (to account for the three months of the year when no foliage is present). For example, for a site where the measured foliar cover was 60%, the foliar cover in the model was entered as 45% ((60% x 9 months) / 12 months = 45%).
- Where a measure prior to impact is higher than the benchmark value (e.g. Canopy 'Basal Area' WC_W6) this is due to comparison against benchmark values of a higher native biodiversity value ecosystem type. In this instance the difference between the impact value and the benchmark value is not accounted for in the offset model (i.e. the difference is not offset) due to large trees not being included in the proposed offset site. However, we consider that this loss of this value will be addressed by 'trading up' to a higher value ecosystem.
- Tī kōuka are considered emergent trees in the model when over 5 m tall as they would historically function as the emergent tree (succeeding above the main canopy) in the reference type wetland. At 5 m tall tī kōuka would be emergent above the tallest mature mānuka.

G4 Net biodiversity outcome component approach

To ensure no net loss of each biodiversity / habitat metric included in BOAMs the attribute net present biodiversity value (NPBV) for each metric should be at least 0.01. A value of 0.01 indicates a net gain scenario for that metric, where a value of 0.00 would indicate no net loss, and a negative value would indicate a net loss.

Whilst this approach was followed for most of the BOAM habitat metrics for the Project, a negative attribute NPBV was accepted for some of the canopy components in the models because the Project does not propose to replace willow wetland habitat with willow wetland habitat (like-for-like approach). Rather the reference wetland type has been chosen to reflect characteristic wetland habitat types within the Canterbury region, and which will ultimately result in substantially improved native biodiversity values at the offset site.

All other habitat metrics used for the models will result in NPBVs of at least 0.01. For some habitat metrics the NPBV is much higher than 0.01, which represents a highly positive net gain scenario. Additionally, to check that the NPBV for each impact wetland as a whole resulted in a net gain, the average NPBV across all eight metrics was calculated:

- For wetland CR_W2 the average combined NPBV was 0.07.
- For wetland WC_W1 the average combined NPBV was 0.10.
- For wetland WC_W6 the average combined NPBV was 0.07.

G5 No net loss biodiversity outcome component approach

To calculate the area of wetland offset required to achieve no net loss of each biodiversity / habitat metric included in BOAMs the NPBV for each metric would be 0.00.

However, because of the proposed offset habitat type differences between impact and proposed offset areas as described in Section G4 above, a negative attribute NPBV was accepted for some of the canopy components in the models. Consequently, to balance the accepted negative NPBVs and get as close as possible to a combined metric NPBV of 0.00 for each wetland as a whole, some

individual attribute values are positive. Reducing potential offset areas further than those presented in Section G8 below, would result in a negative NPBV for wetlands CR_W2 and WC_W1 which would represent a net loss; a very small positive combined NPBV was therefore accepted. The combined NPBV calculated for each impact wetland is as follows:

- For wetland CR_W2 the combined NPBV was 0.02.
- For wetland WC_W1 the combined NPBV was 0.01.
- For wetland WC_W6 the combined NPBV was 0.00.

G6 BOAM input and offset justifications and assumptions

Biodiversity component	Biodiversity attribute	Benchmark	Benchmark justification	Measure after offset (time until endpoint)	Measure after offset justification	Impact value	Management regime to achieve measure after offset	Overall Impact Area / Offset Area (ha)	Reference
Canopy	Percent (%) cover	70	A benchmark 70% canopy cover considers the presence of fast-growing mānuka to form a dense, low canopy within 10 years within areas in which it is planted.	70 (10)	10 years is considered an appropriate time to establish a closed canopy. Canopy closure typically occurs within 5 -10 years depending on species composition and spacing.	CR_W2: 45% WC_W1: 50% WC_W6: 45%	Wetland planting and maintenance	Net Gain: 0.6722 / 1.35 Replacement ratio (1:2.01) No Net Loss: 0.6722 / 0.74 Replacement ratio (1 : 1.10)	Tane's Tree Trust (2011).
	Height (m)	12	Average mature tī kōuka tree height.	6 (15)	Monitored planted cabbage tree seedlings achieved an average height of c.4.5 m after 10 years and 7 m after 20 years. Dividing the sum of these two heights by two gives a height of 5.75 m after 15 years.	CR_W2: 13 m WC_W1: 8 m WC_W6: 13 m	Wetland planting and maintenance		Tane's Tree trust (2012).
	Basal area (m^2 / ha)	40	Based on a planting density of one cabbage tree per 25 m^2 equating to 400 cabbage trees per hectare.	20 (20)	Monitored planted cabbage tree seedlings achieved a root collar diameter of 25 cm after 20 years. This equates to a root collar area of 0.049 m^2 per plant.	CR_W2: 70 m^2 WC_W1: 30 m^2 WC_W6: 61 m^2	Wetland planting and maintenance		Tane's Tree trust (2012).
Groundcover	Percent (%) cover	95	Based on observed density and cover of harakeke in naturally occurring harakeke wetlands.	90 (10)	Harakeke within restoration settings generally grow to full, mature width within 5 years post-planting where plantings are well-maintained.	CR_W2: 45% WC_W1: 10% WC_W6: 40%	Wetland planting and maintenance		
	Height (m)	3	Based on observed mature harakeke height in naturally occurring harakeke wetlands.	2 (10)	Harakeke within restoration settings generally grow to full, mature height within 5 years post-planting where plantings are well-maintained.	CR_W2: 1.5 m WC_W1: 0.5 m WC_W6: 1.3 m	Wetland planting and maintenance		
Diversity	Diversity of native species	35	Species lists for three natural wetland areas within the Canterbury Plains ED have total native species diversity ranging from 30-49 species. Average species diversity across the three sites	30 (10)	The restoration planting palette is likely to contain 15-20 native species. The additional 10-15 species will naturally self-seed into the	CR_W2: 17 WC_W1: 5	Restoration planting, maintenance		Brooklands Lagoon species list (1987). Wilson's Swamp species list (1993).

Biodiversity component	Biodiversity attribute	Benchmark	Benchmark justification	Measure after offset (time until endpoint)	Measure after offset justification	Impact value	Management regime to achieve measure after offset	Overall Impact Area / Offset Area (ha)	Reference
			was 37 but included a range of different wetland types. 35 was chosen as a good representative species diversity for a harakeke-tī kōuka wetland system.		area as the plantings mature.	WC_W6: 14			Travis' Swamp species list (1988). All retrieved from: Plant lists: Canterbury region • New Zealand Plant Conservation Network
Fauna resources	Habitat richness for food provision	5	A 2.5 hectare wetland mosaic is of sufficient size to contain five different habitat types / broad vegetation types. These different habitat types will have different floral and faunal associations that will increase through time providing food for visiting or resident fauna species.	6 (10)	Through planting, five different broad vegetation types as well as areas of open water are considered to be achievable within the offset site.	CR_W2: 3 WC_W1: 2 WC_W6: 3	Restoration planting, maintenance		
Emergent trees	Number per ha	20	Count of tī kōuka per ha within a similar area of Ōtukaikino Wetland.	5 (30)	By 30 years post-planting tī kōuka have, on average, achieved c.8 m height which would result in at least some planted stems being tall enough to emerge above the surrounding shorter-stature canopy. If 20% of the planting comprises tī kōuka, then at least 20 trees should have reached maturity by 30 years post-planting.	CR_W2: 0 WC_W1: 0 WC_W6: 0	Restoration planting, maintenance		Tane's Tree trust (2012).

References

Tane's Tree Trust (2011). Technical Handbook Section 8: Planting and Maintenance of Natives. Planting Pattern and Density for Natives on Open Sites. Planting and Managing Native Trees. Technical Article No. 8.2.

Tane's Tree trust (2012). Technical Handbook Section 10: Native Tree Plantations. Performance of planted native shrubs. Technical Article No. 10.4.

G7 BOAM models – Net Gain

G7.1 Cam River / Ruataniwha – CR_W2_NPSFM

Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Offset area (ha)	Confidence in Offset Actions	Management timeframe	Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
Canopy	**0.1a**	Cover	Percent	70	0.6	Confident 75-90%	Finite end point	0	70	10	0.37	-0.21	0.16	**-0.07**
	0.1b	Height	m	12	0.6	Confident 75-90%	Finite end point	0	6	15	0.16	-0.33	**-0.17**	
	0.1c	Basal area	m2 / ha	40	0.6	Confident 75-90%	Finite end point	0	20	20	0.14	-0.33	**-0.19**	
Groundcover	**0.2a**	Cover	Percent	95	0.6	Confident 75-90%	Finite end point	0	90	10	0.35	-0.16	0.19	**0.14**
	0.2b	Height	m	3	0.6	Confident 75-90%	Finite end point	0	2	10	0.25	-0.17	0.08	
Diversity	**0.3a**	Diversity of native plants	Species richness	35	0.6	Low confidence >50% <75%	Finite end point	0	30	10	0.24	-0.16	0.08	**0.08**
Fauna habitat and food provision	**0.4a**	habitat richness	Count	5	0.6	Confident 75-90%	Finite end point	0	6	10	0.37	-0.20	0.17	**0.17**
Emergent trees	**0.6a**	Count per ha	Count / Ha	20	0.6	Confident 75-90%	Finite end point	0	5	30	0.05	0.00	0.05	**0.05**

G7.2 Waihora Creek – WC_W1

Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Offset area (ha)	Confidence in Offset Actions	Management timeframe	Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
Canopy	**2.1a**	Cover	Percent	70	0.4	Confident 75-90%	Finite end point	0	70	10	0.25	-0.14	0.10	**0.00**
	2.1b	Height	Metre	12	0.4	Confident 75-90%	Finite end point	0	6	15	0.12	-0.13	**-0.03**	
	2.1c	Basal area	m2 / ha	40	0.4	Confident 75-90%	Finite end point	0	20	20	0.09	-0.15	**-0.06**	
Groundcover	**2.2a**	Cover	Percent	95	0.4	Confident 75-90%	Finite end point	0	90	10	0.23	-0.02	0.21	**0.17**
	2.2b	Height	m	3	0.4	Confident 75-90%	Finite end point	0	2	10	0.16	-0.03	0.13	
Diversity	**2.3a**	Diversity of native plants	Species richness	35	0.4	Low confidence >50% <75%	Finite end point	0	30	10	0.16	-0.03	0.13	**0.13**
Fauna habitat and food provision	**2.4a**	Habitat richness	Count	5	0.4	Confident 75-90%	Finite end point	0	6	10	0.25	-0.08	0.16	**0.16**
Emergent trees	**2.6a**	Count per ha	Count / Ha	20	0.4	Confident 75-90%	Finite end point	0	5	30	0.03	0.00	0.03	**0.03**

G7.3 Waihora Creek – WC_W6

Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Offset area (ha)	Confidence in Offset Actions	Management timeframe	Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
Canopy	**1.1a**	Cover	Percent	70	0.35	Confident 75-90%	Finite end point	0	70	10	0.21	-0.09	0.12	**0.01**
	1.1b	Height	Metre	12	0.35	Confident 75-90%	Finite end point	0	6	15	0.09	-0.14	**-0.05**	
	1.1c	Basal area	m2 / ha	40	0.35	Confident 75-90%	Finite end point	0	20	20	0.08	-0.14	**-0.06**	
Groundcover / Understory	**1.2a**	Cover	Percent	95	0.35	Confident 75-90%	Finite end point	0	90	10	0.20	-0.06	0.14	**0.11**
	1.2b	Height	Metre	3	0.35	Confident 75-90%	Finite end point	0	2	10	0.14	-0.06	0.08	
Diversity	**1.3a**	Diversity of native plants	Species richness	35	0.35	Low confidence >50% <75%	Finite end point	0	30	10	0.14	-0.06	0.08	**0.08**
Fauna habitat and food provision	**1.4a**	Habitat richness	Count	5	0.35	Low confidence >50% <75%	Finite end point	0	6	10	0.21	-0.08	0.13	**0.13**
Emergent trees	**1.6a**	Count per ha	Count / Ha	20	0.35	Low confidence >50% <75%	Finite end point	0	5	30	0.03	0.00	0.03	**0.03**

G8 BOAM models – No Net Loss

G8.1 Cam River / Ruataniwha – CR_W2_NPSFM

Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Offset area (ha)	Confidence in Offset Actions	Management timeframe	Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
Canopy	**0.1a**	Cover	Percent	70	0.42	Confident 75-90%	Finite end point	0	70	10	0.37	-0.21	0.05	**-0.14**
	0.1b	Height	m	12	0.42	Confident 75-90%	Finite end point	0	6	15	0.16	-0.33	**-0.22**	
	0.1c	Basal area	m2 / ha	40	0.42	Confident 75-90%	Finite end point	0	20	20	0.14	-0.33	**-0.23**	
Groundcover	**0.2a**	Cover	Percent	95	0.42	Confident 75-90%	Finite end point	0	90	10	0.35	-0.16	0.09	**0.05**
	0.2b	Height	m	3	0.42	Confident 75-90%	Finite end point	0	2	10	0.25	-0.17	0.01	
Diversity	**0.3a**	Diversity of native plants	Species richness	35	0.42	Low confidence >50% <75%	Finite end point	0	30	10	0.24	-0.16	0.01	**0.01**
Fauna habitat and food provision	**0.4a**	habitat richness	Count	5	0.42	Confident 75-90%	Finite end point	0	6	10	0.37	-0.20	0.06	**0.06**
Emergent trees	**0.6a**	Count per ha	Count / Ha	20	0.42	Confident 75-90%	Finite end point	0	5	30	0.05	0.00	0.04	**0.04**

G8.2 Waihora Creek – WC_W1

Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Offset area (ha)	Confidence in Offset Actions	Management timeframe	Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
Canopy	**2.1a**	Cover	Percent	70	0.15	Confident 75-90%	Finite end point	0	70	10	0.25	-0.14	**-0.05**	**-0.09**
	2.1b	Height	Metre	12	0.15	Confident 75-90%	Finite end point	0	6	15	0.12	-0.13	**-0.10**	
	2.1c	Basal area	m2 / ha	40	0.15	Confident 75-90%	Finite end point	0	20	20	0.09	-0.15	**-0.12**	
Groundcover	**2.2a**	Cover	Percent	95	0.15	Confident 75-90%	Finite end point	0	90	10	0.23	-0.02	0.07	**0.05**
	2.2b	Height	m	3	0.15	Confident 75-90%	Finite end point	0	2	10	0.16	-0.03	0.03	
Diversity	**2.3a**	Diversity of native plants	Species richness	35	0.15	Low confidence >50% <75%	Finite end point	0	30	10	0.16	-0.03	0.03	**0.03**
Fauna habitat and food provision	**2.4a**	Habitat richness	Count	5	0.15	Confident 75-90%	Finite end point	0	6	10	0.25	-0.08	0.01	**0.01**
Emergent trees	**2.6a**	Count per ha	Count / Ha	20	0.15	Confident 75-90%	Finite end point	0	5	30	0.03	0.00	0.01	**0.01**

G8.3 Waihora Creek – WC_W6

Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Offset area (ha)	Confidence in Offset Actions	Management timeframe	Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
Canopy	**1.1a**	Cover	Percent	70	0.35	Confident 75-90%	Finite end point	0	70	10	0.21	-0.09	0.01	**-0.06**
	1.1b	Height	Metre	12	0.35	Confident 75-90%	Finite end point	0	6	15	0.09	-0.14	**-0.09**	
	1.1c	Basal area	m2 / ha	40	0.35	Confident 75-90%	Finite end point	0	20	20	0.08	-0.14	**-0.10**	
Groundcover / Understory	**1.2a**	Cover	Percent	95	0.35	Confident 75-90%	Finite end point	0	90	10	0.20	-0.06	0.04	**0.02**
	1.2b	Height	Metre	3	0.35	Confident 75-90%	Finite end point	0	2	10	0.14	-0.06	0.01	
Diversity	**1.3a**	Diversity of native plants	Species richness	35	0.35	Low confidence >50% <75%	Finite end point	0	30	10	0.14	-0.06	0.01	**0.01**
Fauna habitat and food provision	**1.4a**	Habitat richness	Count	5	0.35	Low confidence >50% <75%	Finite end point	0	6	10	0.21	-0.08	0.02	**0.02**
Emergent trees	**1.6a**	Count per ha	Count / Ha	20	0.35	Low confidence >50% <75%	Finite end point	0	5	30	0.03	0.00	0.01	**0.01**

Appendix H Principles of Biodiversity Compensation – Lizards

Principles for Biodiversity Compensation (Appendix 4, NPS-IB)	Adherence to principles in modes described in Section 7
1. Adherence to effects management Hierarchy	The compensation measures have been proposed only after steps to avoid, minimise, remedy, and offset adverse effects. As described in Section 6, residual adverse effects remain after efforts to avoid, minimised, and remedy the permanent loss of up to 0.66 ha of moderate value habitat for indigenous lizards (Canterbury grass skinks).
2. When biodiversity compensation is not appropriate	As discussed in Section 3.3.1, biodiversity compensation has been selected as the preferred approach due to the relatively well understood effects to indigenous lizards (permanent loss of habitat) and the ecological values associated with the proposed compensation actions.
3. Scale of biodiversity compensation	The habitat values lost at the impact site have been adequately addressed acknowledging the expected loss of moderate value exotic grassland / scrub mosaic (0.66 ha) will be compensated for through the implementation of enrichment planting (with "lizard friendly" species and habitat enhancement across the low stature landscape planting across an available area of 6 ha.
4. Additionality	The compensation actions will be undertaken in addition to the planned landscape planting.
5. Leakage	The proposed compensation areas sit within New Zealand Transport Agency Waka Kotahi landholdings.
6. Long-term outcomes	The proposed compensation areas sit within New Zealand Transport Agency Waka Kotahi landholdings which allows the compensation outcomes to be secured for as long as the impact occurs.
7. Landscape context	Compensation areas are located near impact sites across the Project Site. It is expected the enhanced landscape plantings (with "lizard friendly" species) will provide linkages between existing population of skinks throughout the Project Site and immediate surrounds in the medium to long-term.
8. Time lags	It is expected that enrichment "lizard friendly" planting (alongside the landscape planting) will take up to 5 years to form a complete and reasonably complex habitat for Canterbury grass skink, with habitat enhancement measures accounted for 1 year bedding in time.
9. Trading up	Trading up is occurring through the replacement of exotic grassland / scrub communities with indigenous revegetation plantings of a variety of native grass and shrub species, which are expected to provide the complex habitat cover which will benefit Canterbury grass skinks.
10. Financial contributions	No financial contributions are proposed in this compensation approach.
11. Science and mātauranga Māori	Expert opinion, site survey data, and reference material have been used to support the proposed compensation approach. It is expected that through the commencement of construction and the preparation of a Residual Effects Management (REM) measures within the EMP, the approach will be refined and consultation with mana whenua will take place.

Principles for Biodiversity Compensation (Appendix 4, NPS-IB)	Adherence to principles in modes described in Section 7
12. Tangata whenua and stakeholder participation	See above.
13. Transparency	Details of the modelled approach are provided in Section 7.1.

Appendix I Full Project Site Terrestrial Ecology Values

I1 Ohoka Road overpass to Lineside Road (including the Kaiapoi River Bridge)

I1.1 Terrestrial ecological characteristics and values

Vegetation between the Ohoka Road overpass and the southern extent of the Kaiapoi River Bridge comprises managed exotic grassland that is regularly mown.

Managed exotic grassland may provide occasional foraging habitat for common 'Not Threatened' indigenous birds such as spur-winged plover (*Vanellus miles*) but is unlikely to provide nesting habitat due to high levels of disturbance. Warou (welcome swallow, *Hirundo neoxena*), feral pigeon (*Columba livia*), and kāruhiruhi (pied shag, *Phalacrocorax varius*) were observed during surveys of the Kaiapoi River; however, these species will not be impacted by SH1 widening works. The indigenous plantings include species such as harakeke, tī kōuka, and tarata that provide a good food source for indigenous birds, and the plantings are sufficiently well established to provide good nesting habitat. Managed exotic grassland has **negligible** ecological value botanically and from a fauna habitat provision perspective.

An area of indigenous vegetation is located at the Lineside Road interchange. It was not possible to access these areas without traffic management and therefore the vegetation was assessed using Google Street View and aerial images. The vegetation appears to comprise standard common species used in indigenous plantings including tarata (lemonwood, *Pittosporum eugenioides*), harakeke (flax, *Phormium tenax*), tī kōuka (cabbage tree, *Cordyline australis*), akeake (*Dodonea viscosa*), and kōhūhū (black matipo, *Pittosporum tenuifolium*). The plantings are around 2-3 m in height and are relatively dense.

The indigenous plantings are considered to have **low** ecological value botanically because the species present are widespread and all are 'Not Threatened' (de Lange et al. 2024). The area of indigenous planting provides potential foraging and nesting habitat for common indigenous birds; however, the vegetation is surrounded on all sides by roads leading to high levels of disturbance, which limits their attractiveness as bird habitat. The plantings provide marginal potential lizard habitat; however, it was concluded by Wildlands (2025) that lizards are not present due to lack of connectivity to existing lizard populations Samantha King, Wildland Consultants Ltd, pers. comm.).

The ecological value of the plantings from a habitat provision perspective is therefore considered **low**.

I2 Lineside Road to south of Cam River / Ruataniwha

I2.1 Terrestrial ecological characteristics and values

Terrestrial ecological values between Lineside Road and the Cam River / Ruataniwha were assessed using aerial images, Google Street View, photographs taken during site surveys and geotechnical investigations, and habitat descriptions provided by Wildlands (Wildlands 2025). No targeted surveys for threatened flora or birds were undertaken due to paucity of suitable habitat.

I2.1.1 Terrestrial vegetation and habitats

Vegetation within this section largely comprises managed exotic grassland either side of SH1, with areas of rank grass and scattered gorse (*Ulex europaeus*) along fence lines. The managed exotic grassland is unlikely to provide breeding habitat or important foraging habitat for any indigenous bird species due to regular disturbance. The ecological value of managed exotic grassland from both botanical and habitat provision perspectives is **negligible.**

Rank grass has an ecological value of **negligible**. However, areas of rank grass along both sides of the existing SH1 provide confirmed habitat for Canterbury grass skink (*Oligosoma* aff. *polychroma* Clade 4 At Risk – Declining; Hitchmough et al. 2021) (Wildlands, 2025). The ecological value of this vegetation type from a habitat provision perspective is therefore considered **low**.

I3 Cam River / Ruataniwha to Williams Street

I3.1 Terrestrial ecological characteristics and values

Site investigations to assess terrestrial and wetland ecological characteristics and values of this section was undertaken in May 2025.

I3.1.1 Flora

Seventeen indigenous and 30 exotic plant species were recorded in this section (Table Appendix C.1). No 'At Risk' or 'Threatened' plant species were observed and all indigenous plant species have been assigned an ecological value of **low**.

I3.1.2 Avifauna

Eight indigenous and three exotic bird species were recorded in this section. A single kāruhiruhi (pied shag, *Phalacrocorax varius*) was observed foraging in the Cam River / Ruataniwha on 6 March 2023. Willow trees within the riparian margin provide potential nesting habitat for kāruhiruhi; however, no sign of nesting was observed.

Table 10.3: Native birds recorded at the Cam River / Ruataniwha and Williams Street

Common name	Scientific name	Conservation status	Nesting habitat
Kāhu / Australasian harrier	*Circus approximans*	Not Threatened	Nests can be on the ground, on low bushes, or in long grass, scrub or wetlands.
Kāruhiruhi / pied shag	*Phalacrocorax varius*	'At Risk-Recovering	Colonies in trees overhanging water. No nests observed.
Pīwakawaka / fantail	*Rhipidura fuliginosa*	Not Threatened	Nests built in trees or shrubs.
Pūkeko	*Porphyrio melanotus*	Not Threatened	Often nest near or over water with surrounding vegetation to hide nest.
Pūtangitangi / paradise shelduck	*Tadorna variegata*	'Not Threatened'	Nest in holes (trees, rock crevices, under buildings or debris piles) with overhead cover and a single entrance.

Common name	Scientific name	Conservation status	Nesting habitat
Riroriro / grey warbler	*Gerygone Igata*	Not Threatened	Nest built in trees or shrubs, often in small-leaved species.
Tauhou / silvereye	*Zosterops lateralis*	Not Threatened	Nest built in trees, shrubs or tree ferns.
Spur-winged plover	Vanellus miles	Not Threatened	Nest on the ground in open habitat with good line of sight.

Willows and shrubs provide foraging and potential nesting habitat for common forest birds such as pīwakawaka (*Rhipidura fuliginosa*), riroriro (*Gerygone igata*), and tauhou (silvereye, *Zosterops lateralis*), all of which were observed at the site. Pūkeko (*Porphyrio melanotus*) footprints were observed underneath the existing Cam River Bridge and this species may use rank grass and wetland vegetation habitats for foraging and nesting. Other than kāruhiruhi ('At Risk – Recovering', Robertson et al. (2021)), all indigenous species observed or likely to use habitats in this section have a conservation status of 'Not Threatened'.

Kāruhiruhi have been assigned an ecological value of **high** due to their conservation status. All other 'Not Threatened' bird species have been assigned an ecological value of **low**.

I3.1.3 Herpetofauna

Canterbury grass skinks were detected in rank grassland, exotic scrub / grassland mosaic and beneath exotic shelterbelts in this section (Wildlands, 2025). Canterbury grass skink are considered to be of **high** ecological value due to their conservation status ('At Risk – Declining, Hitchmough et al. 2021).

I3.1.4 Terrestrial vegetation and habitats

Five primary habitat types have been identified between the between Cam River / Ruataniwha and Williams Street. The identified terrestrial habitat types are described in more detail below.

Exotic treeland

Areas of exotic treeland are present in various locations throughout this section of the Project Site, dominated by mature crack willow. Ground cover vegetation beneath the tree canopy is varied and includes rank grass, exotic herbfield, leaf litter, blackberry (*Rubus fruticosus agg.*), and wetland vegetation (see below). Hawthorn (*Crataegus monogyna*), spindle (*Euonymus europaeus*), gorse, broom (*Cytisus scoparius*), and karamū (*Coprosma robusta*) are scattered through the understorey, particularly on edges.

Exotic treeland extends to the true left bank of the Cam River / Ruataniwha. The groundcover on the bank, including within the inundation zone, comprises rank grass and blackberry with scattered indigenous ferns including rereti (*Blechnum chambersii*) and little hard fern (*Austroblechnum penna-marina*). Further areas of treeland comprising large radiata pines (*Pinus radiata*) and macrocarpa (*Hesperocyparis macrocarpa*) are present within the property at 567 Williams Street.

Exotic treeland has a **negligible** ecological value from a botanical perspective. This vegetation type provides potential foraging and nesting habitat for 'Not Threatened' indigenous birds; however, similar habitat is well represented in the surrounding area and the treeland is not considered to provide significant habitat for indigenous birds. Canterbury grass skink were recorded within some of the areas of treeland. Low stature vegetation found within this vegetation class is understood to provide lesser quality habitat for Canterbury grass skinks. As such this vegetation type has been assigned a **low** ecological value for fauna habitat provision.

Grassland

Grassland habitats are present throughout this section. Managed grassland is present on the berms either side of SH1 and around the 567 Williams Street driveway. Grazed pasture is also present. Rank grassland is present along fence lines on both sides of SH1, beneath shelterbelts, and on the true right bank of the Cam River / Ruataniwha. The ecological value of pasture and managed grassland is **negligible.** Rank grassland provides confirmed habitat for Canterbury grass skink. Although frequently utilised, Rank grassland is not considered a preferred habitat for Canterbury grass skink because they prefer greater habitat complexity that provides a greater range of shelter, foraging and basking opportunities. As such, rank grassland has been assigned an ecological value of **low** for habitat provision.

Exotic shelterbelts

The exotic shelterbelts present along Williams Street mostly comprise well-maintained macrocarpa trees with minimal ground cover. Other shelterbelts within the property at 567 Williams Street are less-well maintained and have a rank grass ground cover tier that provides confirmed habitat for Canterbury grass skink (Wildlands 2025). Exotic shelterbelts have an ecological value from a botanical perspective of **negligible**; however, they provide potential foraging and nesting habitat for 'Not Threatened' indigenous birds. Rank grass beneath the shelterbelts provides low-quality habitat for Canterbury grass skinks. Shelterbelts are well-represented in the surrounding area and this vegetation type is not considered to provide significant habitat for indigenous fauna. As such, it has been assigned an ecological value of **low**.

Indigenous planting

A small area of indigenous planting is present at the apex of the shelterbelt where Williams Street and SH1 intersect, comprising numerous semi-mature native tree species including tōtara (*Podocarpus totara* var*. totara*), mānatu (*Plagianthus regius* subsp. *regius*), small-leaved kōwhai (*Sophora microphylla*), and tī kōuka. This canopy sits approximately 4-6 m in height with a mostly bare ground / grass understorey and occasional seedlings / saplings of the canopy species. Kōhūhū was present in the understorey as two small shrubs. The native vegetation present in this area has **low** ecological value from a botanical perspective as these species have a conservation status of 'Not Threatened'. Lizards were not detected in this habitat and the sparse ground cover is unlikely to provide habitat. These indigenous plantings, primarily tī kōuka and tōtara, provide a good food source for indigenous birds, while all the vegetation in the area provides potential nesting habitat. From a habitat provision perspective, the vegetation has been assessed as a having a **low** ecological value**.**

I4 Quarry Lakes to Woodend Beach Road

I4.1 Terrestrial ecological characteristics and values

Terrestrial and wetland ecological characteristics and values were assessed during site visits in April, May, and July 2025. Aerial images, Google Street View, photographs undertaken during site surveys and geotechnical assessments, and habitat descriptions provided by Wildland Consultants Ltd were also relied upon for the assessment.

I4.1.1 Flora

Eleven indigenous and 35 exotic plant species were recorded in this section of the Project Site. All the indigenous species observed have a conservation status of 'Not Threatened' and have therefore been assigned an ecological value of **low**.

I4.1.2 Avifauna

Eight indigenous bird species were recorded on the South and East Lakes during the site visit, including four with a conservation status of 'At Risk' or higher (Table Appendix I.4). The baseline for this assessment assumes that all habitat within the early works footprint has been removed. The Southern Lake remnant and its margins provide foraging for all the species listed in Table 5.3 and potential nesting habitat for pāpango (New Zealand scaup, *Aythya novaeseelandiae*) and pūtangitangi (paradise shelduck, *Tadorna variegata*).

Rank grass and exotic scrub / grassland mosaic may provide breeding habitat for pīhoihoi (New Zealand pipit, *Anthus novaeseelandiae*, 'At Risk – Declining) and kahu (Australasian harrier, *Circus approximans*) and rank grass associated with the McIntosh Drain may provide occasional low-quality foraging habitat for matuku-hūrepo (Australasian bittern, *Botaurus poiciloptilus*; 'Threatened-Nationally Critical'). Other than pīhoihoi and matuku-hūrepo, it is unlikely that any 'At Risk' or 'Threatened' native species use habitats outside of the Quarry Lakes area.

In accordance with EcIA guidelines, 'Not Threatened' indigenous species have been assigned an ecological value of **low**, 'At Risk' species an ecological value of **high**, and 'Threatened' species an ecological value of **very high**.

Table Appendix I.4: Indigenous bird species observed on and around the Quarry Lakes

Common name	Scientific name	Conservation status	Nesting habitat
Pūteketeke / great crested grebe	*Podiceps cristatus*	Threatened-Nationally Vulnerable	Floating nest of sticks and water weeds often attached to willow branches or reeds. No nests found during a survey of the South Lake in July 2025.
Australasian coot	*Fulica atra*	At Risk-Naturally Uncommon	Vegetated lake margins. No nests found during a survey of the South Lake in July 2025.
Kawaupaka / little shag	*Microcarbo melanoleucos*)	At Risk-Relict	Colonies in trees overhanging water. No nests observed.
Kāruhiruhi / pied shag	*Phalacrocorax varius*	At Risk-Recovering	Colonies in trees overhanging water. No nests observed.
Pāpango / New Zealand scaup	*Aythya novaeseelandiae*	Not Threatened	Lake margin vegetation. Suitable habitat present around both South and East Lakes.
Pūtangitangi / paradise shelduck	*Tadorna variegata*	Not Threatened	Nest in holes (trees, rock crevices, under buildings or debris piles) with overhead cover and a single entrance. Suitable habitat present around both South and East Lakes.

Common name	Scientific name	Conservation status	Nesting habitat
Pūteketeke / great crested grebe	*Podiceps cristatus*	Threatened-Nationally Vulnerable	Floating nest of sticks and water weeds often attached to willow branches or reeds. No nests found during a survey of the South Lake in July 2025.
Australasian coot	*Fulica atra*	At Risk-Naturally Uncommon	Vegetated lake margins. No nests found during a survey of the South Lake in July 2025.
Kawaupaka / little shag	*Microcarbo melanoleucos*)	At Risk-Relict	Colonies in trees overhanging water. No nests observed.
Spur-winged plover	*Vanellus miles*	Not Threatened	Ground nests in open habitat. Suitable habitat present around both South and East Lakes.
Warou / welcome swallow	*Hirundo neoxena*	Not Threatened	Cup nests on artificial structures. Sheds may provide nest habitat.

I4.1.3 Herpetofauna

Canterbury grass skink were detected in rank grass, exotic scrub, and debris piles in this section (Wildlands, 2025). Canterbury grass skink are assigned an ecological value of **high** due to their At Risk conservation status (Hitchmough et al. 2021).

I4.1.4 Terrestrial vegetation and habitats

Four main terrestrial vegetation types were identified within this section of the Project Site.

Grassland

Most of the vegetation within this section comprises pasture which is regularly grazed and / or mown. Rank grassland is present around McIntosh Drain.

No lizards were detected within pasture or rank grass within this section. Grazed / mown pasture provides foraging habitat for indigenous birds but is unlikely to provide breeding habitat due to regular disturbance.

McIntosh Drain provides potential low-quality habitat for matuku-hūrepo. Matuku-hūrepo have been recorded at the Pegasus Lakes (roughly 5 km north east of the Quarry Lakes) and are known to use drains in farmland as foraging habitat. The rank grass surrounding the drain does not provide nesting habitat for matuku-hūrepo; however, it does provide potential nesting habitat for pūkeko.

Grazed / mown pasture is considered to have **negligible** ecological value from both a botanical and from a habitat provision perspective. Rank grassland also has an ecological value of **negligible** from a botanical perspective. However, rank grass provides potential habitat for indigenous bird species, the ecological value is considered **low**.

Exotic scrub and grassland mosaic

This vegetation type is present on the eastern side of the Quarry Lakes. It comprises a mosaic of exotic scrub and grassland habitat with rank grass present between this vegetation type and adjoining pasture. Key species and vegetation types noted within this area include:

- Broom and lupin (*Lupinus arboreus*) shrubland with local blackberry and gorse and dense exotic grass cover beneath the shrub canopy. Pōhuehue (*Muehlenbeckia australis*) is locally common on shrubs within these areas.
- Cocksfoot (*Dactylis glomerata*), browntop (*Agrostis capillaris*) and tall fescue grassland.
- Marram (*Calamagrostis arenaria*) grassland.
- Patchy exotic herbfield with highly variable composition. Species noted include sheep's sorrel (*Rumex acetosella*), cutleaf burnweed (*Senecio glomeratus*), broad-leaved fleabane (*Erigeron bonariensis*), fireweed (*Senecio hispidulus*), yarrow (*Achillea millefolium*), and musky storksbill (*Erodium moschatum*).

Canterbury grass skink were detected in this vegetation type, particularly in the northeastern parts of the Project Site (Wildlands 2025). Scrub habitats provide moderate quality habitat for this species.

Exotic scrub and grassland mosaic also provides foraging habitat for common indigenous birds such as riroriro and pīwakawaka and may provide nesting habitat for pīhoihoi. Pīhoihoi were not observed during site assessments; however, they have been recorded close by and open areas within the scrub habitat provide moderate-quality nesting habitat.

As with other vegetation types, the ecological value of this vegetation from a botanical perspective is **negligible** due to it being dominated by exotic species. However, the vegetation provides confirmed habitat for indigenous skinks and likely foraging and nesting habitat for indigenous birds and as such the ecological value is considered **moderate**.

Lake margin

The vegetated margins of the South Lake remnant comprise a patchy mosaic of vegetation types including native-dominated rushland, emergent willows, and exotic herbfield. The southern shore of the South Lake remnant contains small areas of rushland dominated by giant rush (*Juncus pallidus*) with occasional emergent grey willow (*Salix cinerea*). Further east, the margin comprises gravelfield with scattered exotic herbs and small shrubs. Gravelfield habitats have negligible ecological value botanically and do not provide habitat for indigenous fauna species and are therefore not considered further.

Rushland provides potential nesting habitat for a range of 'Not Threatened' indigenous bird species including pāpango, pūtangitangi, and pūkeko. The vegetation forms a narrow margin at the base of steep banks and is therefore considered to provide only low-quality habitat. Lake margins do not provide habitat for native lizard species.

The lake margin has **low** ecological value from a botanical perspective as the indigenous plant species recorded are all 'Not Threatened' and are common within in the surrounding area. The lake margin has an ecological value of **low** for habitat provision due to it providing potential low-quality nesting habitat for 'Not Threatened' indigenous bird species.

Exotic shelterbelts

Exotic shelterbelts are scattered throughout this section. Most are poplar (*Populus* sp.), with some pine (*Pinus* sp.). In general, the shelterbelts are well-maintained through pruning and most lack significant groundcover due to grazing and / or mowing. The ecological value of the shelterbelts is considered to be the same regardless of species composition. Shelterbelts provide foraging and

nesting habitat for common forest birds such as riroriro and pīwakawaka, and a small poplar shelterbelt on Woodend Beach Road has been identified as lizard habitat (Wildlands 2025).

Exotic shelterbelts have a **negligible** ecological value from a botanical perspective; however, they provide potential foraging and nesting habitat for 'Not Threatened' indigenous birds; and ground cover beneath shelterbelts can support Canterbury grass skinks. Shelterbelts are well-represented in the surrounding area and this vegetation type is not considered to provide significant habitat for indigenous fauna. As such, it has been assigned an ecological value of **low**.

Buildings and gardens

There are two houses with outbuildings and gardens within this section of the Project Site. The properties were not visited and values were assessed from photographs taken during geotechnical assessments. No indigenous plants appear to be present at either property, and lizards were not detected during surveys (Wildlands 2025). The ecological value of the houses, gardens, and outbuildings are considered **negligible**.

I5 Woodend Beach Road to Gladstone Road

I5.1 Terrestrial ecological characteristics and values

Vegetation at the proposed Gladstone Road and Woodend Beach Road interchanges were assessed during ecological surveys in May 2025. Vegetation between Gladstone Road and Woodend Beach Road was also assessed using aerial images, Google Street View, photographs taken during site surveys and geotechnical investigations, and habitat descriptions provided by Wildlands (2025).

I5.1.1 Flora

Three indigenous and six exotic plant species were recorded in this section. All the indigenous species observed have a conservation status of 'Not Threatened' and have therefore been assigned an ecological value of **low**.

I5.1.2 Avifauna

No bird species were recorded in this section during assessments of the proposed Gladstone Road and Woodend Beach Road interchanges.

I5.1.3 Herpetofauna

Canterbury grass skinks were detected in rank grass, debris piles, and beneath exotic shelterbelts in this section (Wildlands, 2025). Canterbury grass skink are assigned an ecological value of **high** due to their 'At Risk-Declining' conservation status.

I5.1.4 Terrestrial vegetation and habitats

The dominant habitat type within this section is pasture. Other habitat types include exotic shelterbelts, exotic treeland, and rank grass. Most shelterbelts are poplar, with a conifer shelterbelt running north to south along the driveway to 171 Gladstone Road. Shelterbelts are well-maintained with varying levels of groundcover depending on grazing and / or mowing regimes. Rank grass is present along the edge of Woodend Beach Road and at 167 Gladstone Road. Sparse native amenity planting is present along the road frontage of 179 Gladstone Road and piles of debris within pasture provide potential lizard habitat.

All habitats within this section, including sparse native amenity planting, have an ecological value of **negligible** from a botanical perspective. Exotic shelterbelts, exotic treeland, and rank grass habitats

in this section have been assigned an ecological value of **low** due to providing confirmed or potential habitat for indigenous bird species and Canterbury grass skink.

I6 Gladstone Road to SH1

I6.1 Terrestrial ecological characteristics and values

I6.1.1 Flora

Eleven indigenous and 35 exotic plant species were recorded in this section. No 'At Risk' or 'Threatened' plant species were observed.

I6.1.2 Avifauna

Four indigenous and two exotic bird species were recorded in this section of the project. All bird species have a conservation status of 'Not Threatened'.

I6.1.3 Herpetofauna

Canterbury grass skinks were detected in rank grass, exotic scrub / grassland mosaic, and beneath exotic shelterbelts in this section of the Project Site (Wildlands, 2025). Canterbury grass skink are assigned an ecological value of **high** due to their conservation status.

I6.1.4 Terrestrial vegetation and habitats

Three habitat types were identified in this section.

Exotic grassland habitats

The bulk of the vegetation in this section is grazed pasture, some areas of which are also used seasonally for growing crops. Pasture has a **negligible** ecological value from both botanical and habitat provision perspectives because pasture is dominated by exotic plant species and high levels of disturbance mean it is unlikely to provide significant habitat for any indigenous fauna species.

Within this section, rank grass is present along fences, beneath shelterbelts, and around buildings. Rank grass in this section is unlikely to provide nesting habitat for indigenous birds; however, it provides confirmed habitat for Canterbury grass skink. Rank grassland has an ecological value of **negligible** from a botanical perspective and **low** from a habitat provision perspective.

Exotic scrub / grassland mosaic

Two main areas of exotic scrub / grassland mosaic are present in this section with localised patches along fences. The first area is at the Gladstone Road Landfill at 162 Gladstone Road. Scrub comprising gorse and broom over rank grass is present on bunds with weedy grassland elsewhere. A range of other exotic species including fennel (*Foeniculum vulgare*), dock (*Rumex* sp.), white clover, yarrow, and poison hemlock (*Conium maculatum*). The second area is at 130B Main North Road. The southeastern section of this property comprises broom with a dense infestation of old man's beard (*Clematis vitalba*) forming a canopy over the broom. The remainder of the property largely comprises rank grassland with broom, gorse, rose (*Rosa* sp.), clumps of pampas and scattered silver birch (*Betula pendula*). Both locations have debris piles and bare earth present.

Vegetation and debris piles within both these areas provide confirmed habitat for Canterbury grass skink (Wildlands 2025). Both areas also provide potential foraging and breeding habitat for common indigenous birds including pīwakawaka, kahu, and riroriro.

The ecological value of this vegetation from a botanical perspective is **negligible** due to it being dominated by exotic species. However, the vegetation provides confirmed habitat for indigenous

skinks and likely foraging and nesting habitat for indigenous birds and as such the ecological value is considered **moderate**.

Exotic treeland and exotic shelterbelts

Well-maintained conifer shelterbelts are present in the south of this section at 160 Gladstone Road. Discrete areas of treeland are present throughout, with a relatively large area at the northern extent of this section around the Waihora Stream. A range of exotic species are present including willows (*Salix* spp.), radiata pine, macrocarpa, and gum (*Eucalyptus* sp.).

Exotic treeland and exotic shelterbelts provide potential foraging and breeding habitat for indigenous birds. Canterbury grass skink have been confirmed as present in several areas of exotic treeland and exotic shelterbelts, including in debris piles associated with treeland at 138 Main North Road (Wildlands 2025).

Exotic treeland has a **negligible** ecological value from a botanical perspective. This vegetation type provides potential foraging and nesting habitat for 'Not Threatened' indigenous birds and confirmed habitat for 'At Risk' indigenous lizards; however, similar habitat is well represented in the surrounding area and the treeland is not considered to provide significant habitat for indigenous fauna. As such it been assigned a **low** ecological value.

Amenity plantings

The property at 1188 Main North Road, close to where the designation meets existing SH1, has been planted with specimen trees including Japanese red cedar (*Cryptomeria japonica*), Douglas fir (*Pseudotsuga menziesii*), English oak (*Quercus robur*), southern magnolia (*Magnolia grandiflora*), Lawsons cypress (*Chamaecyparis lawsoniana*), and coast redwood (*Sequoia sempervirens*). There is no understory vegetation present beneath these specimen trees, with grass actively managed to maintain aesthetic appearance of the collection. These areas have an ecological value of **negligible** from a botanical perspective. The trees provide potential foraging and nesting habitat for indigenous birds, but this vegetation type does not provide habitat for Canterbury grass skinks (Wildlands 2025). The ecological value of this vegetation from a habitat provision perspective is **low**.

I7 Pegasus interchange

I7.1 Terrestrial ecological characteristics and values

I7.1.1 Flora

Seventeen indigenous and two exotic plant species were recorded in this section, primarily located within the indigenous plantings around the Taranaki Stream. All but one indigenous plant species observed at the site have a national conservation status of 'Not Threatened' (de Lange et al 2024). These species therefore have an ecological value of **low**.

Coprosma virescens has been planted with other indigenous species adjacent to Taranaki Stream near Bob Robertson Drive. This species has a national conservation status of 'At Risk – Declining' (de Lange et al 2024), and is considered to have an ecological value of high under the EcIAG framework. However, as this species is planted in amenity plantings it is considered to have an ecological value of **low**.

I7.1.2 Avifauna

Seven indigenous and three exotic bird species were recorded in this section. All indigenous bird species recorded have a conservation status of 'Not Threatened' and have been assigned an ecological value of **low**.

I7.1.3 Herpetofauna

It is likely that Canterbury grass skink are present in planted indigenous vegetation; however, potential lizard habitat within this section was not surveyed in the 2024 / 2025 lizard survey (Wildlands 2025). Lizards have been assumed present for the purpose of this effects assessment.

I7.1.4 Terrestrial vegetation and habitats

Most of the vegetation within this section comprises managed grassland and isolated plantings of indigenous vegetation. The riparian margins of the Taranaki and Waihora Streams have been planted with various indigenous species, largely comprising *Carex* sp., *Juncus* sp. and tī kōuka. Additional indigenous species are present in small numbers within the riparian margins of these streams, and include kōhūhū and mānuka. The ecological value of the indigenous plantings is from a botanical perspective is considered **low**. The plantings do not provide habitat for indigenous bird species; however, Canterbury grass skink may be present. The plantings are considered to have an ecological value of **low** from a habitat provision perspective.

www.tonkintaylor.com