



Land Exchange Assessment

Tukituki Water Security – Fast Track

Tukituki Water Security Limited

Waipukurau

Prepared by:

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Basis of Report

This report has been prepared by SLR Consulting New Zealand (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Tukituki Water Security Limited (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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Executive Summary

The Department of Conservation (DOC) is investigating the option of a land exchange under the Conservation Act 1987 (the Act) for 29.7 ha of DOC administered land which would be inundated by water as part of the proposed Tukituki Water Security Project (the Project). The area of land that may be available for exchange with the Department of Conservation is the “Smedley Exchange Block” (SEB). Pending conclusion of negotiations with the landowner and an evaluation of the ecological values, this area will also form part of a wider biodiversity offset package.

In order to enable a potential exchange of land, the test of ‘conservation enhancement’ under section 16A of the Act must be applied, such that there is a net enhancement of conservation values of land managed by DOC following the exchange with other land. In addition, a ‘current value’ approach to conservation values must be applied in determining whether this test is met. The purpose of this report is to assist a determination by DOC that this test is met relative to a proposed basis of exchange of part of the SEB land, as assessed and described in this report.

The proposed land exchange was assessed following the ‘External Guidance for conservation values assessments for land exchanges under the Fast-track Approvals Act 2024 – Current 18 August 2025’.

The ecological survey of the SEB found that there is a greater extent of indigenous vegetation cover within the block than within the affected DOC land. Of the indigenous vegetation mapped, 101.62 ha was deemed to be ecologically significant under the Central Hawke’s Bay District Plan and Hawke’s Bay Regional Council Regional Policy Statement criteria. The area of indigenous vegetation recommended for a land exchange with DOC is 125 ha, which equates to an exchange ratio of 1:4.2 for DOC land lost due to the Project to indigenous vegetation on the SEB, in order to meet the ‘current value’ requirement.

In addition, the proposed exchange land has a number of features not readily apparent. For example, it would form a buffer and corridor along the newly formed lake and create linkages of a range of representative vegetation types with the Gwavas Conservation Area to the east of the exchange land. If stock are excluded and pests controlled within the SEB, it would provide higher quality habitat than currently exists for virtually all of the At Risk and Threatened indigenous fauna species within this locality, as well as for a range of more widespread species, such as bellbird, tui and whitehead.

In addition, to ensure that the area of exchange land remains at least as ecologically diverse and functionally intact as that which is to be lost, a number of key management actions over the SEB are required (assuming that the Department will place some form of permanent legal protection over the land) including:

- Fencing to exclude all stock;
- Animal pest control (focussing on possums and deer, but also including other species such as ungulates, mustelids, rats and cats);
- Riparian planting of the Donovan Stream and adjacent wetlands, and
- Long term plant pest control, notably on-going monitoring and control of wildling pines.

How this land is fenced and surveyed from the existing farm operations will require further negotiations with the landowner, the Gwavas Crown Forest Licensor and Licensee and DOC.



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- Appendix D Vegetation Survey Plots**
- Appendix E Vegetation Maps**



Acronyms and Abbreviations

ABM	Automatic Bat Monitor
ACO	Artificial Cover Object
DOC	Department of Conservation
HBRIC	Hawke's Bay Regional Investment Company Limited
SEB	Smedley Exchange Block
TER	Terrestrial Ecology Report (Kessels & Associates Ltd 2013)



1.0 Introduction

In 2013-2015, the Department of Conservation (DOC) and Hawke's Bay Regional Investment Company Limited (HBRIC) investigated the option of a land exchange under the Conservation Act 1987 (the Act) for 29.7 ha of DOC-administered land which would be inundated by water as part of the proposed Ruataniwha Water Storage Scheme. However, the Supreme Court's decision to not allow the DOC land swap necessary for the construction of the scheme, resulted in HBRIC selling its intellectual property and assets to Water Holdings Hawkes Bay Limited (WHHB).

A successful application for the Tukituki Water Security Project (Figure 1), as it is now known, was made by WHHB and Tukituki Water Security Limited in 2024 for listing in Schedule 2 of the new Fast-Track Approvals Act 2024.

The DOC land that would be flooded by the Project (hereafter "DOC land") has been extensively surveyed and assessed for its terrestrial ecological values (Terrestrial Ecology Report (TER); Kessels Ecology 2013).

Kessels Ecology (2013) assessed the area of land proposed for exchange with DOC (the "Smedley Exchange Block" (SEB)). This area would form part of a wider biodiversity offset package to address adverse effects of the project on ecological values. Specifically, the land, if acquired, would form a habitat enhancement package to create higher quality, pest-free habitat for the range of nationally At Risk and Threatened flora and fauna species which would be inundated. Species and fauna groups, which would either be actively relocated or relocate on their own before the reservoir is created, include North Island fernbird (*Bowdleria punctata vealeae*), long-tailed bat (*Chalinolobus tuberculatus*), red mistletoe (*Peraxilla tetrapetala*), and a variety of lizard and invertebrate species.

This report describes the ecological values found within the DOC land that would be flooded and the SEB based on Kessels & Associates Ltd (2013) and Kessels Ecology (2013), and should be read in conjunction with these documents. It also assesses which areas and natural features would be most suitable for any exchange for the DOC land inundated by the Project. The report also incorporates the findings of fieldwork undertaken in September-October 2025, and addresses changes to the area of DOC land affected, due to one area of land that was assessed as a Hydro Parcel in the 2013 assessment now being identified as DOC land¹.

To enable a potential exchange of land, the test of 'conservation enhancement' under section 16A of the Act must be applied, such that there is a net enhancement of conservation values of land managed by DOC following the exchange with other land. In addition, a 'current value' approach to conservation values must be applied in determining whether this test is met. The purpose of this report is to assist a determination by DOC that this test is met relative to a proposed basis of exchange of part of the SEB land.

The proposed land exchange was assessed following the 'External Guidance for conservation values assessments for land exchanges under the Fast-track Approvals Act 2024 – Current 18 August 2025' (Appendix C).

¹ Part of riverbed parcel PID 4254214 (showing as a hydro parcel) is an island that was allocated to DOC in 1987.



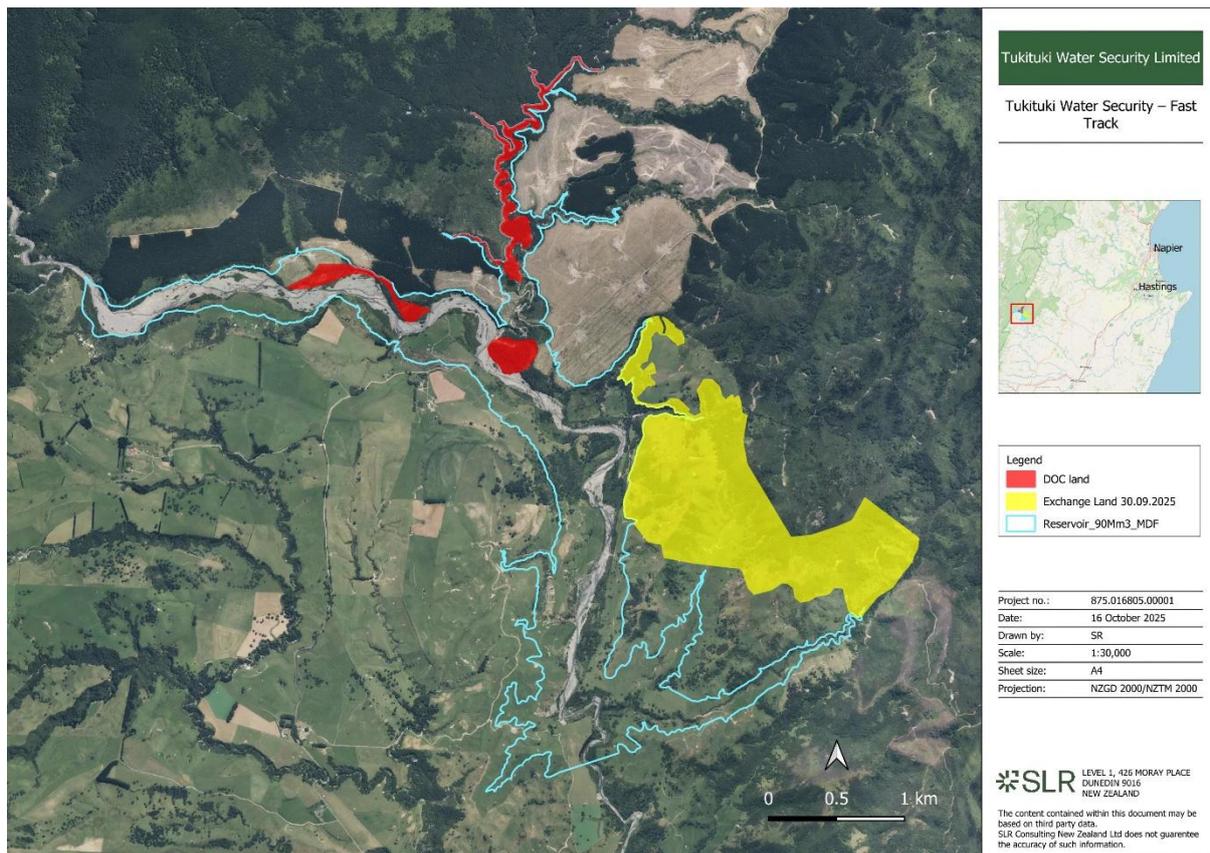


Figure 1: Location of the Tukituki Water Security Project, DOC land to be inundated, and proposed land exchange.

2.0 Ecological Context

The entire project area falls within the Ruahine Ecological District (ED) which covers more than 138,000 ha and most of the Ruahine Ranges. The ED covers a large altitudinal range and has a high proportion of indigenous vegetation remaining compared to other ecological districts in the region. The ED is characterised by a cool, humid and high-rainfall climate and steep topography. Vegetation pattern is driven by altitudinal change with snowgrass and red tussock in the alpine, mountain beech forest on the upper slopes of the ranges, and black beech and broadleaved species more common on the lower slopes (McEwen 1987). The lower parts of the ED include farmland and forestry. The project area immediately adjoins the Ruahine Forest Park in the northwest and the Gwavas Conservation Area in the northeast as well as production forestry in the north and pasture grassland in the west and south.

3.0 Methodology

3.1 Summary

The vegetation and fauna surveys undertaken to inform the assessment of effects and land exchange are summarised in Table 1 and described in more detail below. Monitoring locations are shown in Figure 2.



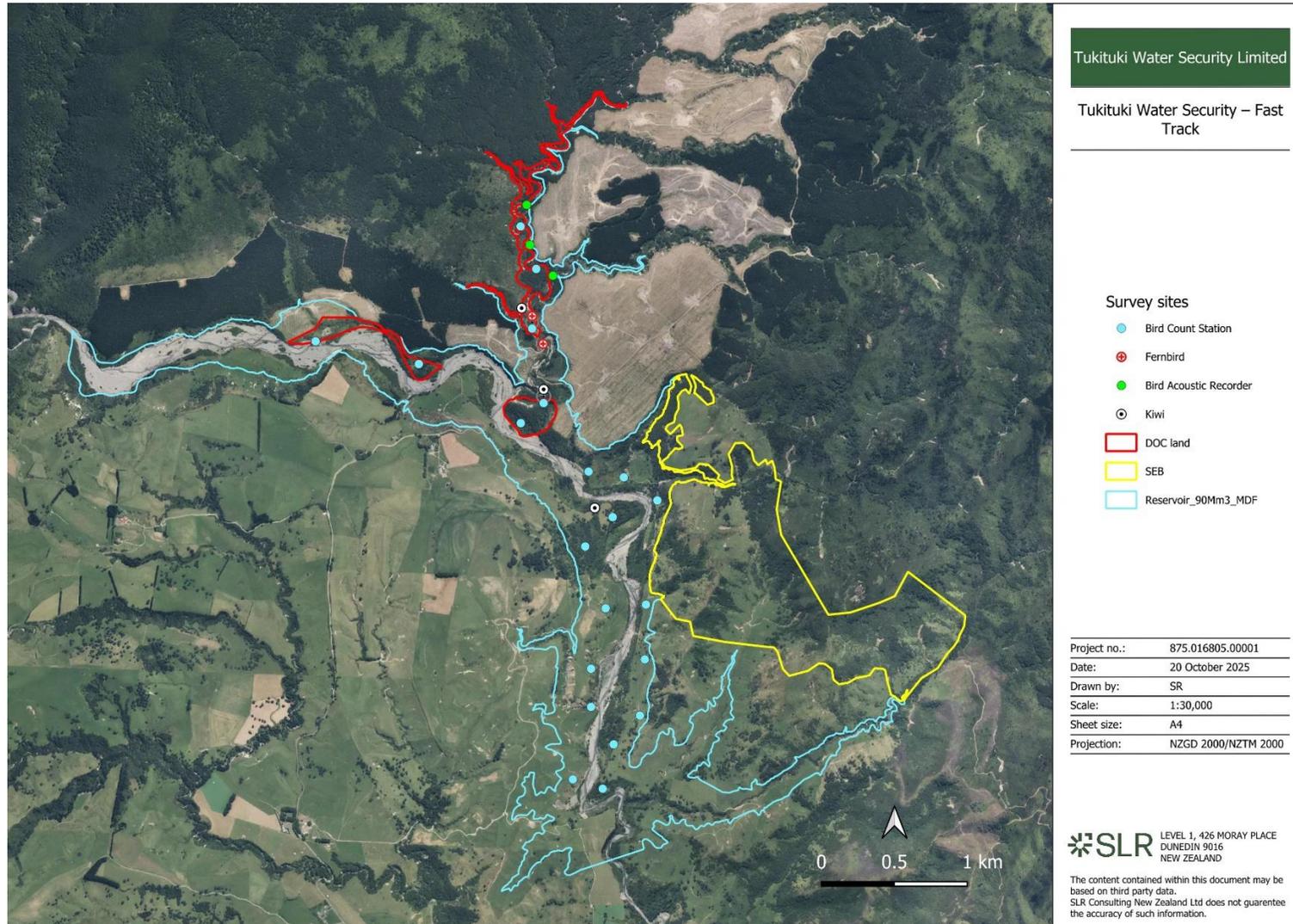


Figure 2: Bird survey sites conducted from 2010-2013 (Kessels Ecology 2011).



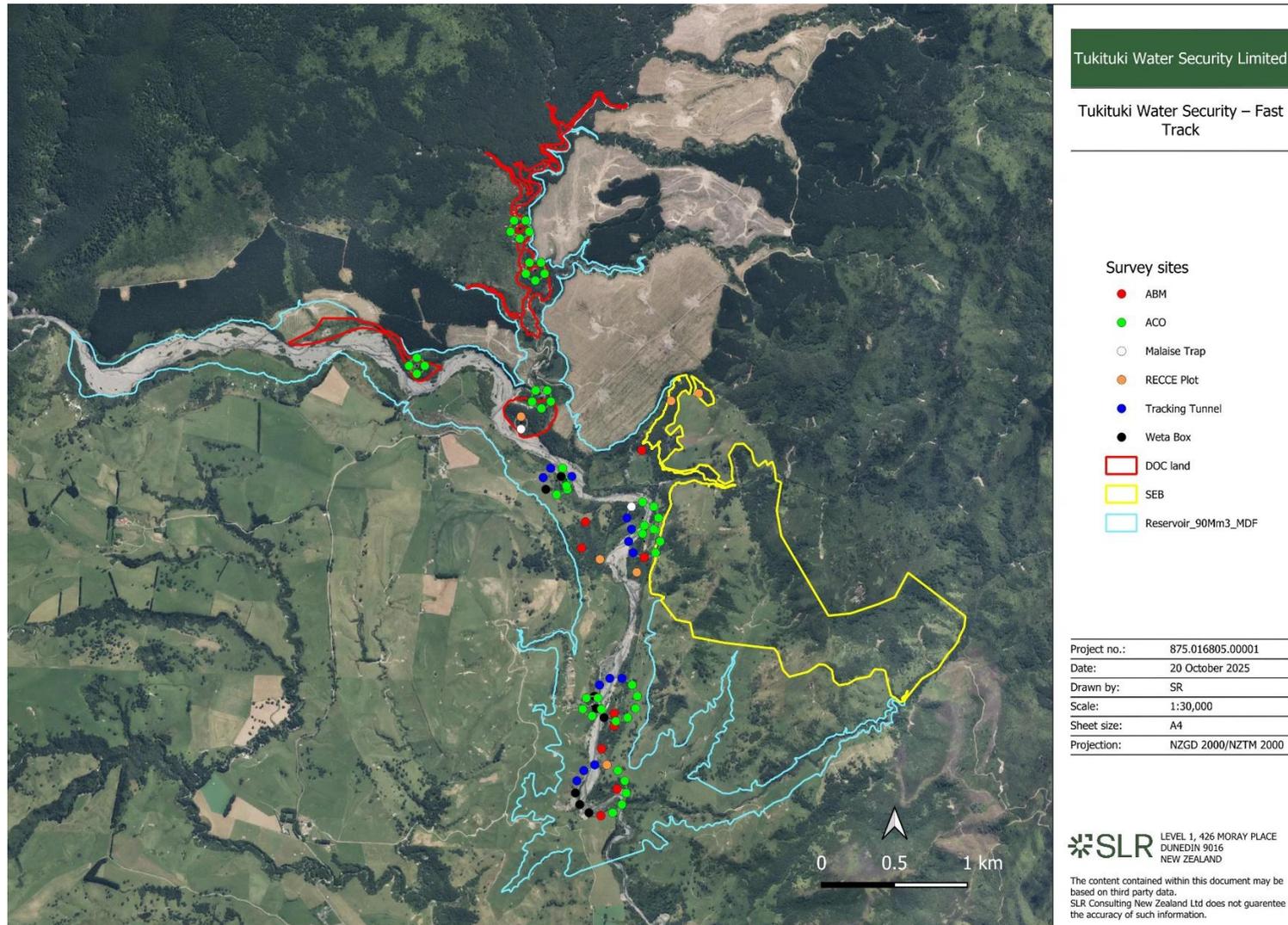


Figure 3: RECCE plot and fauna survey sites (excluding birds) conducted from 2010-2013 (Kessels Ecology 2013).



Table 1: Numbers of survey sites.

Survey type		On DOC land	Adjacent to DOC land ¹	On SEB	Adjacent to SEB ²	Entire TER Survey Area
Vegetation	Field surveys	Yes	Yes	Yes	Yes	Yes
	RECCE plots	1		2	2	6
Natural wetland delineation				Yes		
Bats	ABM				7	9
Birds	Bird Count Stations	5	2		8	21
	Fernbirds	1	1			2
	Kiwi	1	1			3
	Acoustic recorder		3			3
	Blue duck	Yes	Yes			
	Waders		Yes		Yes	
	Incidental observations			Yes		
Lizards	ACO	9	10		15	49
	Tracking Tunnel ³				10	13
Terrestrial invertebrates						
	Wetabox				6	8
	Malaise trap	1				2
Aquatic fauna						
	eDNA			3		
	Electrofishing ⁴	Yes	Yes		Yes	Yes

¹ Within 25 m of DOC land.
² On the true left of the Makaroro River, downstream of Dutch Creek.
³ Also used for terrestrial invertebrates.
⁴ Young et al. (2013).

3.2 Vegetation Field Surveys

3.2.1 2013 survey and assessment

For the DOC land, field surveys and mapping of vegetation types were conducted from September to December 2011. These surveys were undertaken to identify its ecological values and to assess the effects of the Project. The fieldwork included semi-quantitative surveys of all major indigenous vegetation community types and opportunistic searches for threatened plant species.

Field surveys of the SEB were conducted on 15-16 August 2013 to identify its ecological values and determine its potential for a land exchange. A general walkthrough survey was conducted to gain information on vegetation and habitat types present within the SEB, during which vegetation and habitat types were visually assessed from high vantage points or from transects. This assessment noted the main canopy and understory composition, as well as marked the extent of the vegetation/habitat encountered on recent aerial photographs supplied by Hawke's Bay Regional Council (HBRC). This information was then used for mapping the vegetation cover in GIS. Vegetation type descriptors as used in the TER report were adopted. The classifications generally followed Atkinson (1985) and were described as structural vegetation classes based on the dominant canopy species.



3.2.2 2025 survey and assessment

A visit to the DOC land and SEB was undertaken on 29 October 2025 to determine if any changes have occurred to the ecological values supported by these areas since the 2013 assessments. Particular attention was paid to the potential effects of Cyclone Gabrielle on indigenous habitats, and any early successional vegetation types that may have developed. Natural wetland delineation was undertaken in Donovan Gully following MfE (2022) protocols. Only the lower part of Dutch Creek could be accessed due to log jams and other difficulties getting up the stream, as well as time constraints. The effects of Cyclone Gabrielle could not be well assessed although the stream channel and banks were recovering well. The state of the cliff seepage wetlands was unable to be assessed.

Aerial imagery was also assessed to determine if any changes in vegetation cover were evident between 2013 and 2025. Where appropriate, vegetation and habitat types were remapped in a GIS based on recent aerial imagery and findings from the site visits. Updates to mapping included:

- changes to the extent of Makaroro gravel riverbed due to erosion of riparian vegetation.
- changes to the extent of treeland/shrubland which has colonised the riverbed.
- new mapping of the Dutch Creek streambed where visible in aerial imagery.
- remapping of boundaries of beech forest and broadleaved-small-leaved species tussock-shrubland alongside Dutch Creek.
- cropping SEB vegetation mapping to the reservoir 'Reservoir_90Mm3_MDF' layer.
- mapping wetlands in Donovan Gully in the SEB.
- Refining and improving vegetation type names based on field inspection and existing descriptions.
- Updating the vegetation maps for the SEB in response to vegetation growth and development.

Information from the 'Smedley Exchange Block Ecological Survey' report (Kessels Ecology 2013) and the TER (Kessels Ecology 2013) were reviewed and updated, including with information from the 2025 site visits, to provide a complete and up-to-date assessment of the land exchange.

3.3 Vegetation Plots

More detailed surveys were undertaken in the project footprint using four 20 m × 20 m forest plots measured in accordance with standard protocols as described by Hurst & Allen (2007a and b). Note that in the 2013 survey these were erroneously termed RECCE (Reconnaissance) plots and for continuity that term has been retained here. For all species encountered within the two 20 × 20 m plots, the height tiers and cover classes for live vegetation were recorded. Seedling counts were conducted within a 1 × 1 m subplot extending from each of the four vegetation survey plot corners. A fifth 1 × 1 m subplot was put in the centre of the vegetation survey plot. The diameter at breast height (DBH) was recorded for all woody species taller than 135 cm and with a diameter ≥ 2 cm (plants with stem diameters of < 2 cm were counted as saplings) within the vegetation survey plot. Based on the walkthrough survey and the vegetation survey plots a vascular plant species list was also compiled.

The data collected can be used to assess the relative composition and abundance of each vegetation type within the surveyed sites. This interpretation would be based on an



assessment of vegetation diversity and abundance, as well as plant and animal pest influences. The RECCE data can provide useful baseline data for biodiversity off-set mitigation monitoring and allow meaningful comparisons with other similar habitat types in accordance with nationally accepted protocols.

For the TER, four plots were established within the three major indigenous forest types. One of the plots (Plot TER2) was located on DOC land.

In the SEB, beech forest was the main indigenous forest vegetation type encountered and it was found to be comparable to indigenous forest found in the affected (inundated) area of DOC land. Two 20 × 20 m vegetation survey plots were therefore established in beech forest: Plot SEB1 in an area where stock had been excluded and the forest's undergrowth had started to recover from grazing, and Plot SEB2 in unfenced beech forest that showed evidence of stock access and grazing.

Summary results are provided in Appendix D.

3.4 Wetland delineation

The National Policy Statement for Freshwater Management 2020 (MfE 2024) outlines the requirements for identifying and managing natural inland wetlands. Potential natural wetlands in Donovan Gully were assessed following the protocols outlined in MfE (2022), and identified wetlands were mapped in a GIS.

3.5 Indigenous Fauna Field Surveys

3.5.1 Birds

For the TER surveys, five-minute bird counts, line transects and placement of automated bio-acoustic recorders were considered the most appropriate methods to detect bird species composition due to the fragmented and varied nature of habitat in the survey area. In addition, walking surveys were undertaken for blue duck in Dutch Creek and for waders in the Makaroro River, and acoustic recorders were placed in Dutch Creek to survey for blue duck. Some of the survey sites were located on DOC land (Table 1).

Table 6 Summary of all avifauna survey effort at the Makaroro and Waipawa Sites, October 2011 – February 2013

Survey type	Period	Hours	Minutes
5-minute bird counts	October, November, December 2011 and February 2012	6	50
Makaroro River walkthrough	November and December, 2011 and again November 2012 and January/February 2013	17	0
Kiwi listening stations	November 2011, and February 2012	3	0
Whio walkthrough	October, November, December, 2011; February and November 2012; January, February 2013	27	49
Whio/kiwi bioacoustic recorders	November – December, 2011	144	0



Waipawa River wader walkthrough	November and December 2011	4	3
	Total survey effort	202	42

Findings of the TER surveys were applied to the SEB (e.g. eight bird count stations were located close to the SEB). In addition, specific eliciting calls for North Island fernbird within potentially suitable habitat were undertaken, and the locations of notable bird species observed during other surveys undertaken in the SEB were noted.

3.5.2 Bats, Lizards and Terrestrial Invertebrates

The TER provides details of the bat surveys conducted, some of which are within the SEB. The TER and pre-feasibility report also document a number of lizard and invertebrate surveys conducted in the locality, and in some cases also within the SEB. This information was summarised and interpreted in terms of the habitat present.

In summary:

- Bat surveys used Automatic Bat Monitors (ABM) in the reservoir area (including several sites adjacent to the SEB) and across the wider landscape between November 2011 and February 2013.
- Lizards surveys used Artificial Cover Objects (ACOs, 10 sites with 5 ACOs at each site), tracking tunnels (18 sites), hand searches, and canopy searches (night and day) in potential lizard habitat in the proposed reservoir area (including several sites adjacent to DOC land and the SEB) between December 2011 and February 2013.
- Terrestrial invertebrate surveys used hand searches in potential habitat, Weta Boxes, tracking tunnels, and two malaise traps between December 2011 and February 2013.

3.5.3 Freshwater Biota Habitats

An Aquatic Ecology Assessment was undertaken for the Ruataniwha Water Storage Scheme in 2013 (Young et al. 2013) which assessed waterways within and adjacent to the DOC land along Dutch Creek and the Makaroro River.

For the SEB, a review of existing literature and databases was conducted to assess the value and habitat for freshwater fish in any streams and wetland present. In addition, three environmental DNA (eDNA) samples were taken from waterways with potential fish habitat within the SEB in October 2025, and Rapid Habitat Assessments, following the standard Cawthron Institute protocols, were conducted. eDNA sampling involved three single-replicate samples taken at two stream locations (one in Donovan Creek, two in the stream which bisects the two parts of the SEB) each taken over an approximately 100 m reach. This method is not as robust as the recommended 6-replicate samples but time was extremely limited during the field survey, and some of the sensitivity of a multi-replicate sample is regained by taking the sample over a longer reach.

3.6 Ecological Significance Evaluation and Threatened Environments

The ecological significance of the TER area and SEB were assessed using the Central Hawke's Bay District Plan and Hawke's Bay Regional Council Regional Policy Statement criteria for identifying indigenous vegetation and habitats of indigenous fauna. All



ecologically significant vegetation types were mapped in a GIS, as well as quantified and compared to the DOC land within the inundation area. The vegetation types were also assessed against the nationally threatened environments classification as defined by Walker et al. (2007). The area of indigenous vegetation within each threatened environment category were mapped and quantified.

3.7 Conservation values assessment for land exchanges under the Fast-track Approvals Act 2024

The proposed land exchange was assessed following the 'External Guidance for conservation values assessments for land exchanges under the Fast-track Approvals Act 2024 – Current 18 August 2025'. Attachment 1 'Biodiversity assessment criteria' and Attachment 2 'Freshwater assessment' from the guidance document are provided in Appendix C.

Note that no shape files are available for the area of DOC land that was not included in the 2013 assessment as it was thought to be part of the 'hydro parcel'. In order to determine the effects of inundation on this land, we have demarcated its boundary as all of the area extending to the south and west of the Smedley Block property boundary that was mapped as indigenous and exotic vegetation for the TER.

4.0 Vegetation and Habitats

Based on the field survey and subsequent GIS mapping, 22 vegetation / habitat types were identified on DOC land that would be inundated and the SEB. The vegetation descriptions for below are from the TER report (Kessels & Associates Ltd 2013), and the SEB report (Kessels Ecology 2013) but the vegetation type numbers have been updated to run sequentially for the DOC and SEB land and names have been updated to better describe the vegetation. This was done based on the information in the descriptions, along with some field verification.

Vegetation maps are included as Figure 4 and Figure 5 and at a smaller scale in Appendix E.

1. Black beech forest

These areas were usually dominated by mature black beech (*Fuscospora solandri*) (i.e. >50% canopy cover). However, there were areas where large mataī (*Prumnopitys taxifolia*) (>25 m in height) and the occasional kahikatea (*Dacrycarpus dacrydioides*) emerged above the black beech canopy and where red beech (*Fuscospora fusca*) formed a small canopy component. The average canopy height within these areas was 20 m. The lower tiers of this vegetation type (i.e. between 0.3 and 12 m height) also predominantly consisted of black beech (up to 50% coverage), but also contained up to 25% cover of broadleaved species, such as kōhūhū (*Pittosporum tenuifolium*), lacebark (*Hoheria sexstylosa*), māpou (*Myrsine australis*), māhoe (*Melicytus ramiflorus*), lancewood (*Pseudopanax crassifolius*), white maire (*Notelaea neolanceolata*), hangehange (*Geniostoma ligustrifolium*), rangiora (*Brachyglottis repanda*), as well as small-leaved shrubs, such as *Coprosma* species and mingimingi (*Leucopogon fasciculatus*). Putaputawētā (*Carpodetus serratus*) were often noted in areas closer to the river, and the occasional whekī-ponga (*Dicksonia fibrosa*) was found within this vegetation type. Podocarps such as mataī, kahikatea, rimu (*Dacrydium cupressinum*), tōtara (*Podocarpus totara*) and miro (*Pectinopitys ferruginea*) were also frequently regenerating in the lower tiers of this forest type. Common lianes in this forest type were *Clematis* species, as well as bush lawyer (*Rubus* spp.). The groundcover usually comprised various ground ferns (e.g. *Asplenium*, *Parablechnum*, *Austroblechnum*, *Cranfillia*, and *Polystichum* species), a number of indigenous sedges and grasses (e.g. hook sedge (*Carex* sp.), *Luzula* species,



and bush rice grass (*Microlaena avenacea*)), as well as common herbs and seedlings of the tree and shrub species.

Some beech forest areas on the SEB were grazed and had a modified understorey, often comprising a low (1 - 4 m) tier of *Leucopogon fasciculatus*, *Coprosma rigida*, *Coprosma rhamnoides*, and *Helichrysum lanceolatum* (Photo 1).

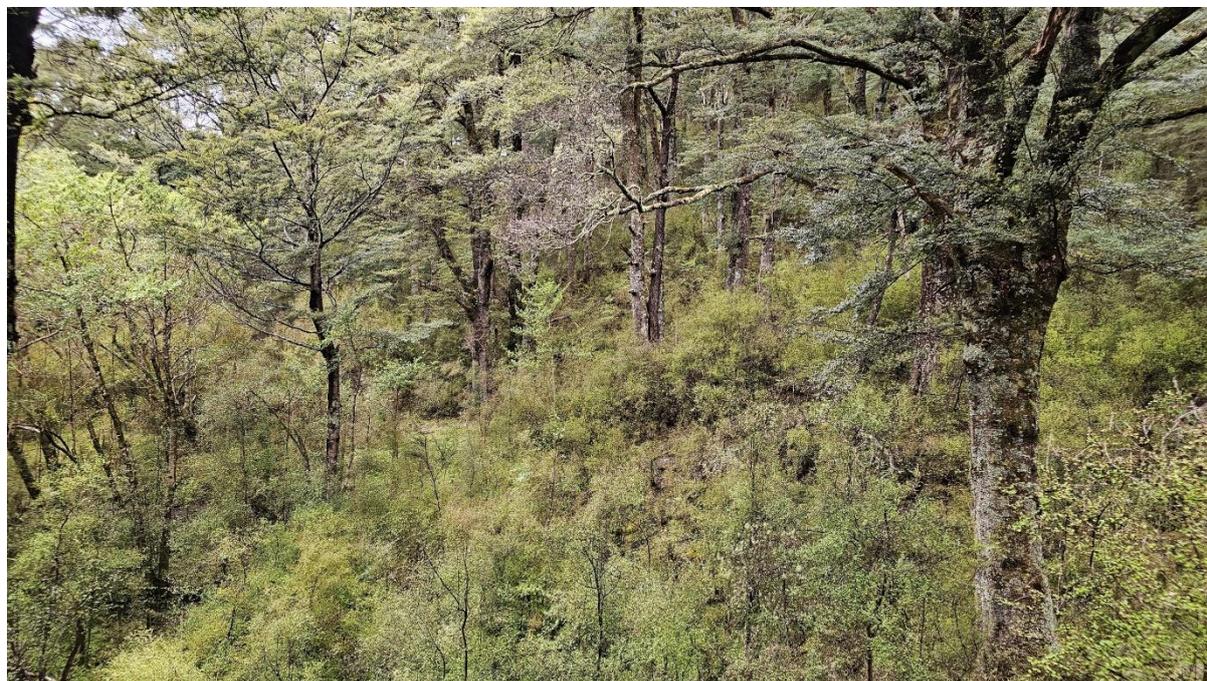


Photo 1: Modified black beech forest in the SEB.

2. Putaputawētā - lacebark – kaikomako forest

This canopy in this forest type contains only broadleaved tree species, with podocarps (i.e. mataī, tōtara and kahikatea) only present as saplings and seedlings. The most widespread species in this forest type are lacebark, kaikōmako (*Pennantia corymbosa*), lancewood, putaputawētā, kōhūhū, māhoe and māpou. Average canopy height is above 10 m. Smaller leaved species such as kōwhai (*Sophora microphylla*), poataniwha (*Melicope simplex*), rōhutu, and coprosma species are also present in reasonably low numbers. The understorey mainly contains young māhoe, as well as poataniwha and whekī-ponga with smaller amounts of horopito (*Pseudowintera axillaris*) (often showing severe deer damage), pate (*Schefflera digitata*) and round-leaved coprosma (*Coprosma rotundifolia*). The groundcover contains good densities of prickly shield fern (*Polystichum vestitum*), hen and chicken fern (*Asplenium bulbiferum*) and kiwikiwi (*Cranfillia fluviatilis*) with smaller amounts of lance fern (*Austroblechnum lanceolatum*) and round-leaved fern (*Pellaea rotundifolia*).

3. (Podocarp)/broadleaf-small-leaved scrub

These areas are regenerating secondary scrub with only the occasional podocarp (usually kahikatea or totara) emerging in some areas. Species common in this vegetation type include broadleaf species such as māhoe, hangehange, koromiko (*Veronica stricta*) and lancewood, as well as small-leaved species such as mānuka, poataniwha, rōhutu, and korokio (*Corokia cotoneaster*). The groundcover is usually dominated by pasture herbs and common exotic grasses.



4. Koromiko – putaputaweta – kāpuka shrubland

This vegetation type covers a reasonably large area within the wider study site but only a small area above the oxbow in the DOC land. It occurs on steep cliffs and river banks, and contains a various mixture of broadleaved and small-leaved shrub species (e.g. koromiko, hangehange, māhoe, putaputawētā, kaikōmako, broadleaf (*Griselinia littoralis*), cabbage tree (*Cordyline australis*)), as well as monocotyledonous species such as flax, *Machaerina*, *Astelia* and toetoe. Native broom (*Carmichaelia australis*) was also frequently encountered within this vegetation type in the Dutch Creek area, and tutu is common close to the river/stream banks.



Photo 2: Clockwise from top: Beech forest in the island parcel at the mouth of Dutch Creek (2025). Vegetation on the doc land adjacent to Dutch Creek (2025), and freshwater wetland in the oxbow in Dutch Creek (2013).



5. Black beech treeland

This vegetation type comprised remnant trees of the original black beech forest canopy mainly situated within grazed pasture with no or only little understorey remaining. Mature black beech was the main tree species, interspersed with occasional mataī, kahikatea or rimu. Some areas were only occasionally grazed and still contained a thin indigenous shrub layer underneath a line of black beech trees.

6. (Podocarp)/broadleaf-small-leaved treeland

These areas are regenerating secondary treeland and shrubland with less than 80% tree/shrub cover over significant amounts of pasture. There are occasional podocarps (usually kahikatea or totara) and broadleaved species such as māhoe, hangehange, koromiko and lancewood, as well as small-leaved species such as mānuka, poataniwha, rōhutu, and korokio.

7. Mānuka – poataniwha – *Coprosma rigida* - kaikomako shrubland

The vegetation type contains 80% tree/shrub cover over significant amounts of pasture. It includes groves of trees and shrubs in pasture or on bluffs. The canopy typically contains a mixture of mānuka with a smaller percentage of other small-leaved shrubs (e.g. korokio, poataniwha) and occasional broadleaf species, such as young māhoe, lancewood, koromiko and coprosma species, and the occasional young podocarp (kahikatea or tōtara).

8. Wetland

An oxbow wetland is present in the lower reach of Dutch Creek. Small ponds are present in this area, which are largely covered with *Azolla* fern and surrounded by rush/sedgeland grading into woody vegetation. Wetland species present include slender spike sedge, four *Carex* and a *Juncus* species, kiokio and swamp kiokio, toetoe, astelia, mountain flax, *Hydrocotyle*, *Sphagnum* moss and duck weed. Woody species present include three coprosma species, cabbage tree, mānuka and koromiko. Some whekī-ponga are also present. The slightly drier margins also have kahikatea, wineberry (*Aristotelia serrata*), broadleaf, kōwhai, lancewood, lacebark, kōhūhū, snowberry (*Gaultheria antipoda*), mingimingi, mataī and horopito.

9. Exotic forest and/or treeland

This type comprises plantations of pine and eucalyptus (*Eucalyptus* sp.).

10. Willow/lupin forest and/or scrub

A very small area on gravels near the bank of the Makaroro River dominated by willows (*Salix* sp.).

11. Pasture or rank grass

This vegetation type comprises areas of grazed pasture and areas that are fenced off or not accessible to stock for various reasons where a cover of rank grasses has become established.

12. Gravel riverbed and banks

The Makaroro riverbed (braided and single channel) including the open stream channel, mobile gravels, and stable gravel banks where vascular plants are starting to become established. Also includes the bed of Dutch Creek including the open stream channel and gravels.



13. Podocarp - black beech / putaputaweta – five-finger forest

This vegetation type comprised a mixture of podocarp species such as kahikatea, rimu and mataī emergent over a broadleaved species sub-/canopy. In parts, black beech trees also formed part of the canopy or were emergent. Broadleaved species commonly found amongst the canopy of this vegetation type were putaputawētā, five-finger (*Pseudopanax arboreus*), lancewood, white maire, lacebark, kōhūhū, pate and kaikōmako. Cabbage trees and tree ferns (i.e. whekī-ponga and whekī (*Dicksonia squarrosa*)) were also frequently present, and common lianes and climbers in this forest type were clematis and bush lawyer. The understorey of this vegetation type was typically comprised of karamū (*Coprosma robusta*), kanono (*C. grandifolia*), hangehange, young māhoe and koromiko. Of note were also three rimu and one kahikatea found in the north-eastern section of the SEB. These old-growth trees were emergent and reached heights of around 30 metres.



Photo 3: SEB vegetation, clockwise from left: Black beech forest, broadleaved species scrub along escarpment and stream with bracken fern and pasture grasses in foreground, and small-leaved-broadleaved scrub.



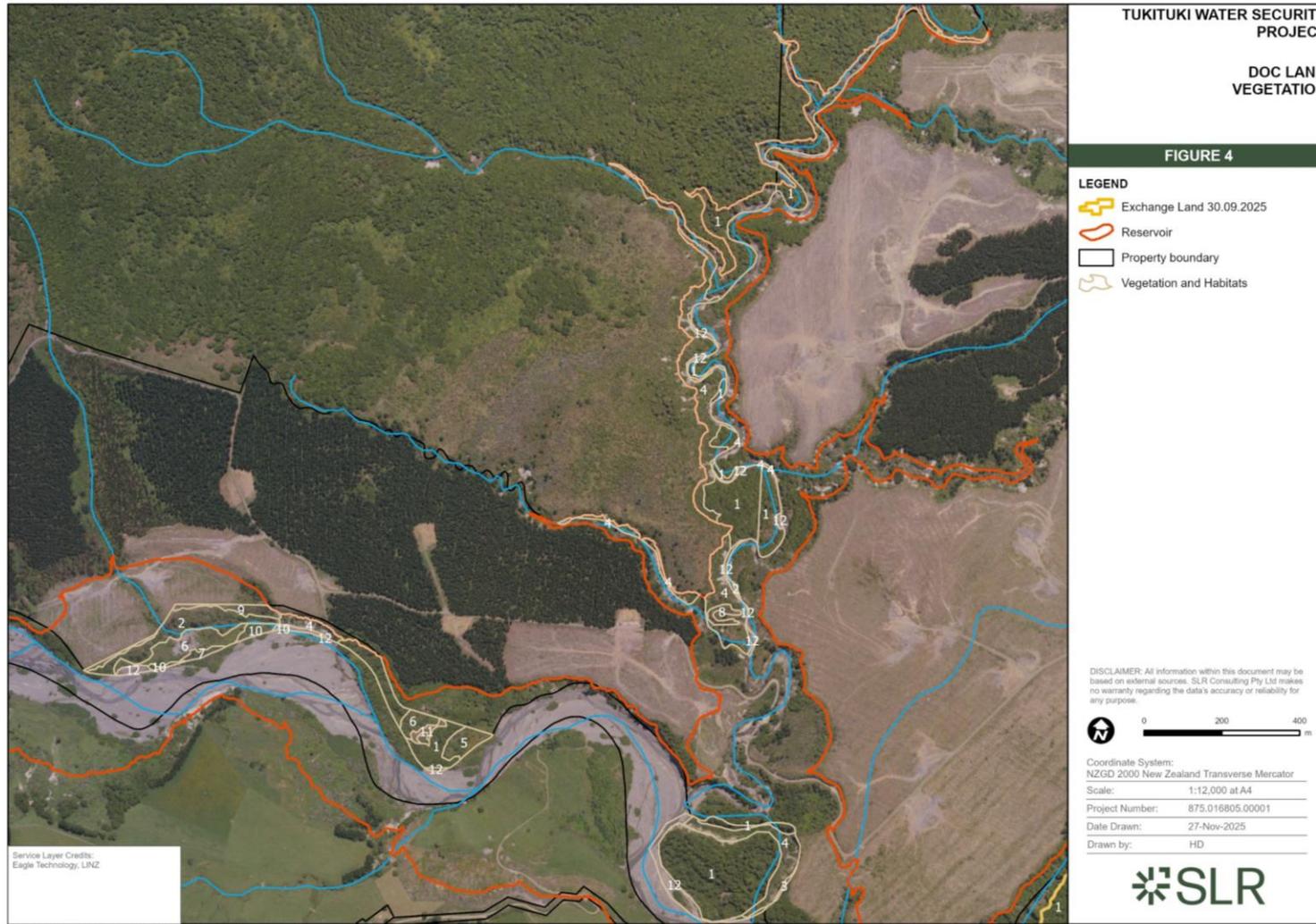


Figure 4: Vegetation and habitats, DOC land.



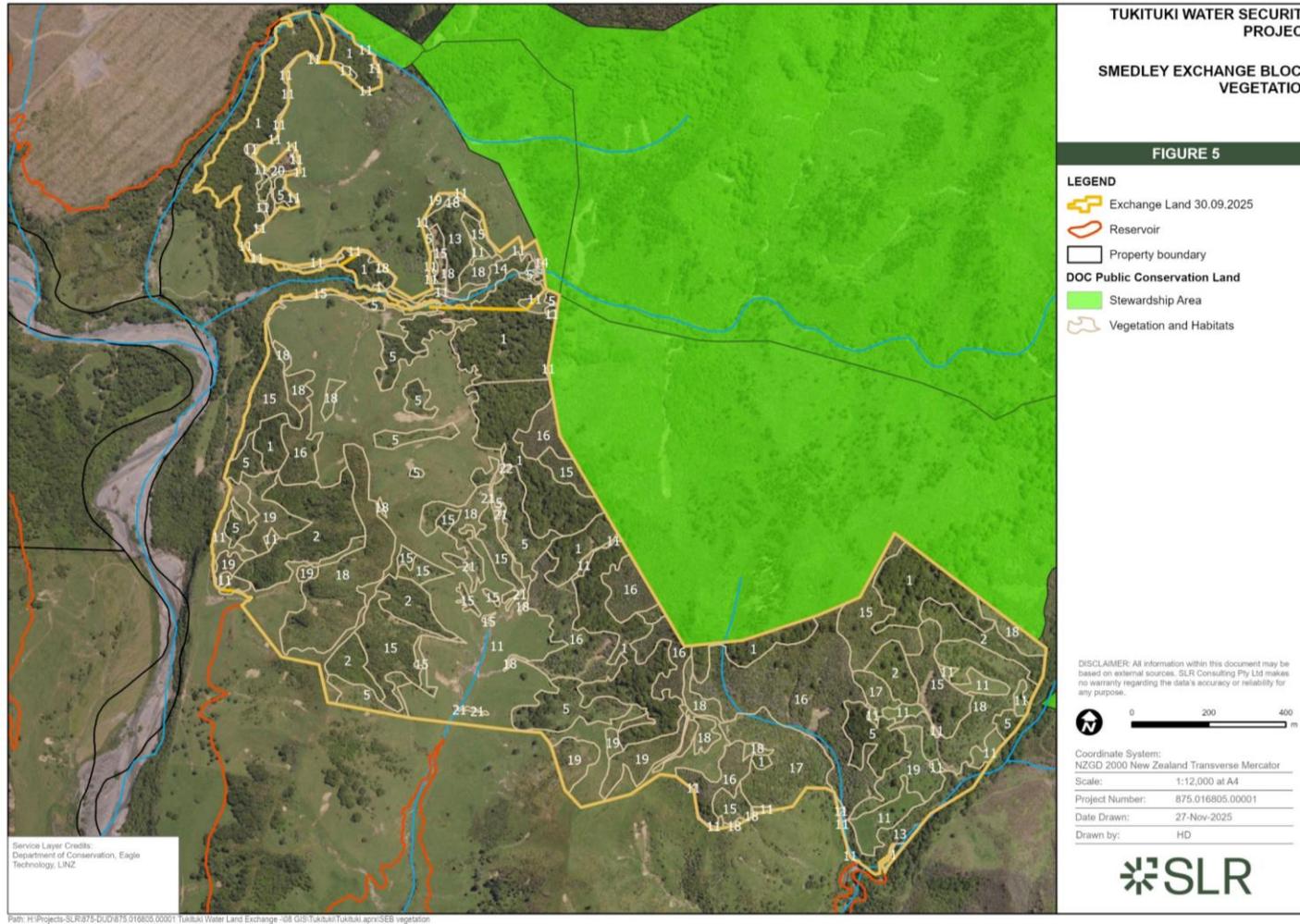


Figure 5: Vegetation and habitat types within the Smedley Exchange Block.



14. Broadleaved scrub

These areas were primarily secondary scrub comprising mainly broadleaved species on steep slopes and bluffs above two tributaries of the Makaroro River. Species common in this vegetation type included māhoe, hangehange, five-finger, koromiko, whekī, cabbage trees and lancewood. A combination of bracken fern (*Pteridium esculentum*) and pasture grasses, together with different small-leaved and broadleaved species (e.g. mānuka, māpou, *C. rhamnoides*) grew along the upper banks near the upstream parts of the escarpment. Fern species such as kiokio (*Parablechnum novae-zelandiae*) were also found in different parts along the steeper slopes of the escarpment. The majority of this vegetation type was found in the northern part of the SEB, and here the southern cliff top of the escarpment was lined with beech forest.

15. Putaputawētā – kaikomako – lacebark / *Coprosma rigida* – mānuka scrub

These areas were secondary scrub characterised by over 80% shrub/tree cover over small areas of pasture. Vegetation comprised broadleaved species such as putaputawētā, kaikōmako, lacebark, small-leaved *Coprosma* (particularly *C. rigida*), as well as small-leaved species such as mānuka. The occasional emergent black beech or rimu were also found within areas of this habitat type, but primarily along ridge tops, or near the edge of these areas.

16. Mānuka - Putaputawētā – kaikomako - *Coprosma rigida* scrub

This secondary vegetation type was characterised by over 80% shrub/tree cover over small areas of pasture. Vegetation comprised mainly small-leaved species such as mānuka, and to a lesser extent broadleaved species such as putaputawētā, and small-leaved *Coprosma*. The majority of this vegetation type was found along the eastern part of the SEB where it occasionally merged into/with beech forest.

17. Black beech / mānuka - *Coprosma* treeland

This vegetation type comprised remnant trees of the original black beech forest canopy mainly situated within grazed pasture with no or only little understorey remaining. Mature black beech was the main tree species, interspersed with occasional mataī, kahikatea or rimu. Some areas were only occasionally grazed and still contained a thin indigenous shrub layer underneath a line of black beech trees. Additionally, a higher number of small-leaved scrub species such as mānuka also grew in between beech trees, and therefore this type represented a slight modification to type 22 below.

18. Putaputawētā – kaikomako – (*Coprosma*) – (mānuka) shrubland

This vegetation type was characterised by less than 80% shrub/tree cover over significant amounts of pasture. Shrubs were usually less than 6m tall, and comprised broadleaved species such as putaputawētā, small-leaved *Coprosma* (primarily *C. rhamnoides* and *C. rigida*), and small-leaved species such as mānuka. Some areas previously mapped as this type were re-mapped as type 14 after the October 2025 site visit.





Photo 4: Broadleaved-small-leaved-shrubland and small-leaved-broadleaved-shrubland.

19. Coprosma – Mānuka – (putaputawētā) – (kaikomako) shrubland

This vegetation type was characterised by less than 80% shrub/tree cover with large areas of pasture. Vegetation comprised mainly small-leaved species such as *Coprosma rigida*, *C. rhamnoides*, mānuka, and to a lesser extent broadleaved species such as putaputawētā.



Photo 5: Black beech treeland (Veg type 5) on the opposite slope with Coprosma – Mānuka – (putaputawētā) – (kaikomako) shrubland (Veg type 19) beyond. September 2025.

20. Kahikatea treeland

This grazed mixed indigenous shrubland contained some large kahikatea, young podocarps (e.g. kahikatea and rimu), and various broadleaved and small-leaved species such as



lacebark, mānuka and cabbage tree, over a seep zone with remnant indigenous sedges and fern species. Blackberry (*Rubus fruticosus* agg.), pasture grasses and common pasture herbs dominate the margins and became less frequent towards the centre of these areas.



Photo 6: Left: Podocarp-broadleaved-small-leaved shrubland/seep zone. Right: Bracken-exotic grasses grassland.

21. *Juncus* – blue sweetgrass rush-grassland

This vegetation type includes most of the wetlands in Donovan Gully. Vegetation generally comprises scattered *Juncus* over a groundcover dominated by *Glyceria declinata*. More detailed descriptions of the wetlands are included in Section 5.0 below.

22. Rautahi sedgeland

This vegetation type occurred in one small seepage wetland on the edge of an area of beech forest. Vegetation comprised rautahi (*Carex geminata*) sedgeland with scattered exotic grasses.

5.0 SEB Wetlands

Five wetlands were identified during the October 2025 site visit in addition to the area already identified as Type 20. These wetlands are described below, and all are Natural Inland Wetlands as per the NPS-FM definition. All are relatively low quality wetlands and all except Wetland 5 are dominated by exotic species, typical of wetlands in grazed pasture. It is unlikely that these wetlands would have been present prior to the area being forested as a combination of deep shade preventing sward-forming species from dominating and holding sediment, smaller sediment load, and different gully morphology under forest cover would have resulted in channelised streams or ephemeral channels.



Table 2: Descriptions of wetlands in the SEB

Name	Vegetation	Type	Area
Wetland 1	<i>Juncus edgariae</i> / <i>J. articulatus</i> – <i>Glyceria declinata</i> . Mānuka and <i>Coprosma rigida</i> at upper end.	Seepage	478 m ²
Wetland 2	[<i>Carex secta</i>] – [<i>Juncus edgariae</i>] / <i>Juncus articulatus</i> – <i>Lotus pedunculatus</i> – <i>Glyceria declinata</i> – [<i>Myosotis laxa</i>]	Swamp	400 m ²
Wetland 3	[<i>Juncus edgariae</i>] / <i>Glyceria declinata</i> - <i>Juncus articulatus</i> – <i>Lotus pedunculatus</i>	Seepage	72 m ²
Wetland 4	[<i>Juncus edgariae</i>] / <i>Glyceria declinata</i> - <i>Juncus articulatus</i> – <i>Lotus pedunculatus</i>	Seepage	115 m ²
Wetland 5	<i>Carex geminata</i>	Seepage	234 m ²
Veg Type 20	(Kahikatea) / lacebark – mānuka – cabbage tree	Seepage	5,011 m ²





Photo 7: Wetlands in the SEB

The Donovan Gully wetlands present an opportunity for ecological enhancement through planting and pest animal control.



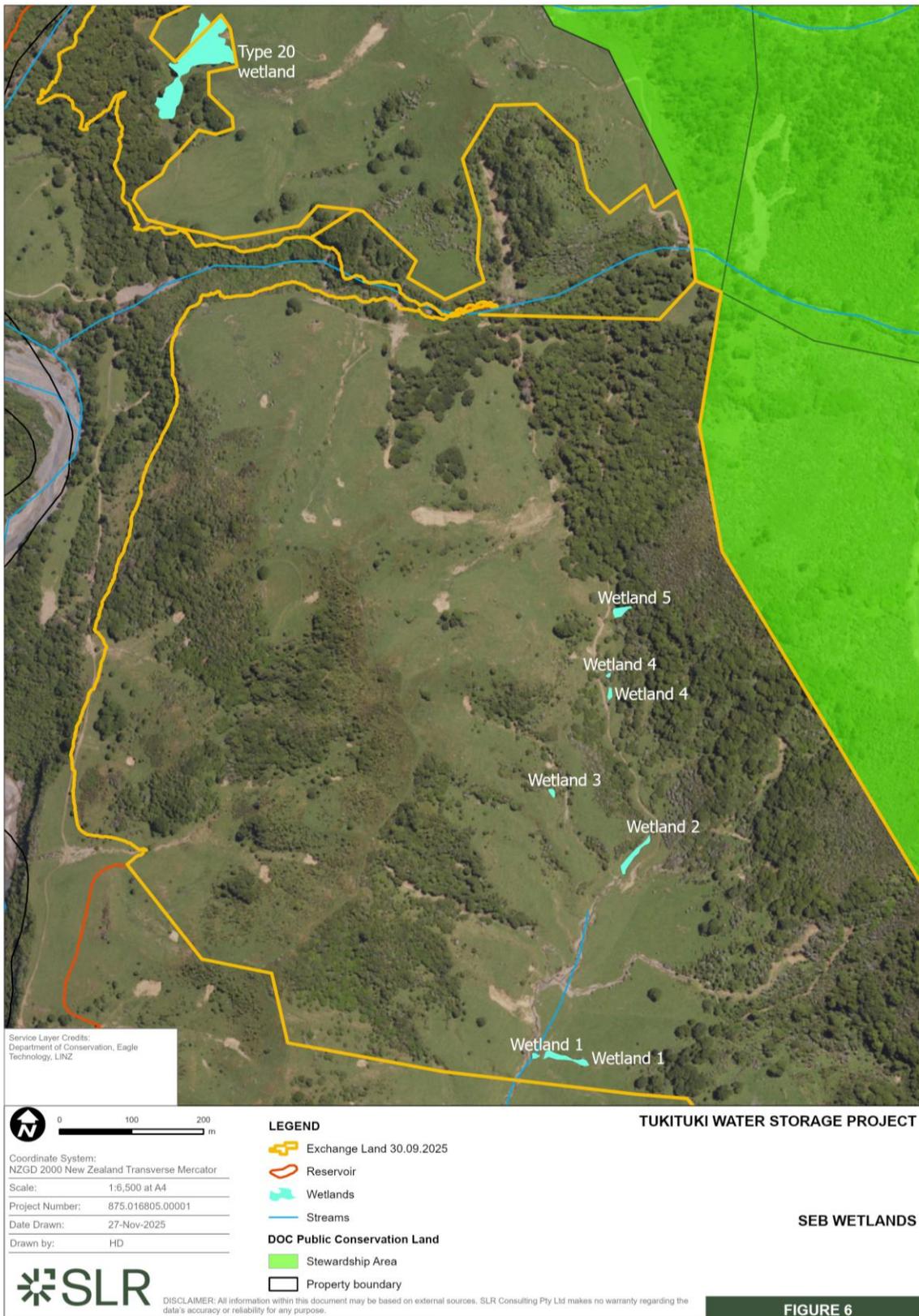


Figure 6: Wetlands in the SEB



6.0 Habitat Comparative Assessment

Table 3 provides a summary of the areas of each vegetation / habitat type found within the SEB, as well as a comparison to areas of vegetation / habitat types found within 30 ha of DOC land inundated by the reservoir. Approximately 36 ha was mapped as secondary indigenous scrub (i.e. greater than 80% vegetative cover), and 47 ha of indigenous forest were mapped on the SEB. This area was made up mainly by beech forest, with approximately 10 ha of Putaputawētā - lacebark – kaikomako forest and a small portion of podocarp - black beech / putaputaweta – five-finger forest . About 40 ha of shrubland and treeland (i.e. less than 80% woody cover over pasture or other non-woody species) was mapped. Wetlands made up about 0.6 ha and the remaining 45 ha comprised pasture and rank grass.

Table 3: Area (ha) of each vegetation / habitat type within the DOC land that will be inundated and the Smedley Exchange Block.

Veg Type No.	Vegetation / Habitat Type	DOC Land	SEB	Difference
	Indigenous Forest			
1	Black beech forest	16.0	33.033	
2	Putaputawētā - lacebark – kaikomako forest	1.959	10.497	
13	Podocarp - black beech / putaputaweta – five-finger forest		3.733	
	Indigenous forest total	17.931	47.263	29.332
	Indigenous treeland			
5	Black beech treeland	0.581	12.100	
6	(Podocarp)/broadleaf-small-leaved treeland	1.777		
17	Black beech / mānuka - Coprosma treeland		4.934	
	Indigenous treeland total	2.359	17.034	14.676
	Indigenous scrub			
3	(podocarp)/broadleaf-small-leaved scrub	0.052		
14	Broadleaved scrub		1.224	
15	Putaputawētā – kaikomako – lacebark / Coprosma rigida – mānuka scrub		15.011	
16	Mānuka - Putaputawētā – kaikomako - Coprosma rigida scrub		20.642	
	Indigenous scrub total	0.052	36.878	36.826
	Indigenous shrubland			
4	Koromiko – putaputaweta – kāpuka shrubland	6.734		
7	Mānuka – poataniwha – Coprosma rigida - kaikomako shrubland	0.170		
18	Putaputawētā – kaikomako – (Coprosma) – (mānuka) shrubland		15.803	
19	Coprosma – Mānuka – (putaputawētā) – (kaikomako) shrubland		7.778	
	Indigenous shrubland total	6.904	23.581	16.678
	Wetland			



Veg Type No.	Vegetation / Habitat Type	DOC Land	SEB	Difference
8	Wetland	0.236		
22	Rautahi sedgeland		0.023	
21	Juncus – blue sweetgrass rush-grassland		0.107	
20	Kahikatea treeland		0.453	
	Wetland total	0.236	0.583	0.347
	Exotic forest			
9	exotic forest and/or treeland	0.565		
10	Willow/lupin forest and/or scrub	0.469		
	Exotic forest total	0.905	0.000	-0.905
	Exotic grassland			
11	Pasture or rank grass	0.155	45.000	44.845
	Non-vegetated			
12	Gravel riverbed and banks	1.03		-1.615
	TOTAL	29.728	170.339	140.184

7.0 Flora

A list of vascular plant species recorded during the surveys can be found in Appendix A.

Red mistletoe (*Peraxilla tetrapetala*) is the only threatened flora species found within the reservoir footprint (on DOC land alongside Dutch Creek; Photo 8). This species has a national threat classification of At Risk-Declining in de Lange *et al.* (2024). The following description is sourced from the New Zealand Plant Conservation Network.

Red mistletoe occurs on both North and South Island but is less common in the North Island. It is distributed throughout the coastal to montane climatic zones. The plant is a hemiparasite whose main hosts are mountain beech (*Fuscospora cliffortioides*), black beech, red beech (*F. fusca*), and silver beech (*Lophozonia menziesii*). However, it has been recorded as a parasite on a further 17 species (2 exotic). Red mistletoe is a shrub that can grow up to 2 m across. It usually parasitises close to the trunk of its host (a feature that distinguishes it from other mistletoe species) and has bright red flowers that are up to 40 mm long. The primary threat to this species is browsing by possums.





Photo 8: Red mistletoe (*Peraxilla tetrapetala*) growing on a large black beech tree at Dutch Creek.

8.0 Fauna

8.1 Avifauna

For the TER, a total of 945² birds from 38³ bird species (11 endemic) were identified within the reservoir area (Table 4), with 55%⁴ of identified birds being native and 45% introduced. Threatened or At Risk species comprise 2.5% (23 birds) of all formal observations. Threatened and At Risk species observed were:

- Kārearea (New Zealand bush falcon) (Nationally Increasing), which was most likely nesting in the site during spring 2011 and summer 2011/12. This pair was not detected again during further surveys and site visits during 2012 and summer of 2012/13.
- Banded dotterel was not observed within the reservoir area during the extensive surveys in 2011/12 but one adult with a chick was observed in November 2012. The DOC portions of land within Dutch Creek or that found alongside the Makaroro River are not suitable habitat for this species.
- New Zealand pipit (Declining).
- Black shag (Naturally Uncommon).

² Total of all individuals observed within reservoir/dam footprint during formal avian survey and other fieldwork activities.

³ This number excludes morepork, which were heard during nighttime observation, but for which only presence has been noted.

⁴ These percentages exclude casual observations of birds made during other fieldwork activities.



- Mātātā (North Island fernbird) - (Declining).

Whio (Nationally Vulnerable) were not found in the 2011/12 surveys, despite extensive effort. However they have since been recorded within the Makaroro River⁵. No doubt this progression of whio downstream is due to ongoing mustelid trapping in the upper Makaroro catchment, where they have persisted. It is likely whio will also be utilising suitable feeding and nesting habitat within Dutch Creek.

In the SEB, no formal bird surveys were conducted, but 10 bird species were observed during vegetation surveys in 2013 and 2025 (Table 4). None of the species recorded are classified as Threatened or At Risk in Robertson et al. (2021), but three Threatened or At Risk species may utilise habitats within the Smedley Exchange Block:

- There is suitable habitat for New Zealand pipit due to the presence of open habitats, scrub, and shrubland.
- New Zealand bush falcon was observed during TER survey work and is likely to frequent the area.
- North Island fernbird was not found to be present in the SEB, although some areas of scrub and shrubland provide suitable habitat and fernbirds have been recorded nearby, at the confluence of Dutch Creek with the Makaroro River (TER).

There is the possibility that other threatened species are present in the locality including North Island brown kiwi, yellow-crowned parakeet and possibly red-crowned parakeet. However, there are no recent records for any of these species still being present in the locality of the TER or SEB and are now most likely locally extinct.

Common indigenous bird species found in the TER will also be present in the SEB, as it offers similarly suitable habitat. Kererū, tui, bellbird, silvereye, whitehead, long-tailed cuckoo, North Island robin, New Zealand pipit, rifleman, and tomtit will be able to utilise habitat within the SEB, if they already do not do so.

Less habitat will be available in the SEB area for shag and waterfowl species but the loss of habitat for these species is considered to be inconsequential and compensated for by the creation of the reservoir.

Kaka, if still present in this locality, will find suitable available foraging and nesting habitat within the mature beech forests of the SEB.

In terms of the at risk and threatened bird species found within the TER, aside from whio, the SEB is considered to provide higher quality habitat, and more of it, than that found within the TER.

Mātātā requires specific habitats with dense, low-lying vegetation in wetland areas, as they are poor fliers and prefer to creep and scramble through thick cover. Specific habitat requirements include wetlands and areas with ponds or high soil moisture. They also need thickets of native scrub that are generally less than 2 metres tall. Key plant species providing cover include: flax, manuka, sedges and reeds. They are insectivorous, foraging on the ground and in low vegetation for a variety of small invertebrates, including caterpillars, spiders, beetles, flies, and moths. While found primarily in wetlands, they can also inhabit other dense shrubby or tussock-covered areas, including dry mānuka forest or scrub lands, provided there is adequate, dense cover. The loss of habitat for fernbird in the TER will be

⁵ iNaturalist; 23 Dec, 2023, Accessed No 28 2025



compensated by suitable habitat with the SEB, which will only be enhanced over time by stock exclusion, restoration planting and animal pest control.

Kārearea is a highly adaptable species found across a wide variety of habitats, ranging from dense native forests to open high-country tussock and even exotic pine plantations and vineyard areas. Core requirements include sufficient prey availability and secure nesting sites. They require open or semi-open areas, such as forest edges, clearings, tussocklands, and plantation perimeters, to effectively hunt their prey (predominantly small-to-medium-sized birds). They utilise mature forest stands or rocky outcrops for shelter from wind and rain and as vantage points for hunting or territorial defense. A crucial requirement is a high abundance of prey, which includes native and introduced birds, insects, lizards, and small mammals like rabbits. Falcons do not build elaborate nests but make a simple scrape for their eggs. They are highly selective about these sites, which must offer some protection from aerial view and ground predators. In the North Island, the bush falcon often nests in large epiphytic plants (e.g., *Collospermum* or *Astelia*) high in emergent native trees. Ground nests are highly vulnerable to introduced mammalian predators like cats, stoats, and hedgehogs. Habitats that can be managed for predator control are vital for breeding success for kārearea. Without ongoing animal pest control this species usually becomes locally extinct. Available habitat for kārearea within the SEB is of higher quality and more abundant than that found within the TER. Combined with habitat enhancement for prey species and animal pest control, there will be an increase of higher quality habitat for kārearea with this proposal.

Whio has highly specialised habitat requirements, focusing exclusively on clean, fast-flowing rivers and streams in forested, upper catchments. They live year-round on turbulent white-water rivers. Their diet consists almost entirely of aquatic invertebrate larvae (such as caddisfly, mayfly, and stonefly larvae) which they scrape off submerged rocks using their specialized fleshy-lipped bill. For whio river margins must have standing native scrub or woodland, providing overhead canopy cover and stable, undercut banks. These features are essential for nesting sites which are typically well-hidden along the river edge in sites like riverside caves, holes in banks, under fallen trees, or at the base of fern clumps. They also require overhanging and lateral cover from vegetation and woody debris which is used for roosting during the day and for protection from predators. While the upper reaches of Dutch Creek provides suitable whio habitat (as well as the Makaroro River itself), there are only small reaches of optimal whio habitat within the TER portion of Dutch Creek. The streams within the SEB provide little, if any optimal whio foraging habitat, but the upper reaches of the Middle Stream provides some lesser quality habitat for both feeding and nesting. This habitat will improve with exclusion of stock, riparian planting and animal pest control. Widespread and ongoing animal pest control, particularly trapping targeting stoats, greatly benefit whio breeding success. The proposed animal pest control programme will thus compensate to some degree, for the loss of whio habitat to be flooded within the TER.



Table 4: Bird species recorded in and near the reservoir area (TER) and Smedley Exchange Block (SEB).

Scientific Name	Common Name	Threat Classification ⁶	TER	SEB
<i>Falco novaeseelandiae ferox</i>	Bush falcon	Nationally Increasing	X	X
<i>Anthus novaeseelandiae</i>	New Zealand pipit	Declining	X	X
<i>Bowdleria punctata vealeae</i>	North Island fernbird	Declining	X	X
<i>Charadrius bicinctus</i>	Banded dotterel	Declining	X	
<i>Phalacrocorax carbo</i>	Black shag	Naturally Uncommon	X	
<i>Anthornis melanura</i>	Bellbird	Not Threatened	X	
<i>Chrysococcyx lucidus</i>	Shining cuckoo	Not Threatened	X	
<i>Circus approximans</i>	Swamp harrier	Not Threatened	X	
<i>Gerygone igata</i>	Grey warbler	Not Threatened	X	X
<i>Hemiphaga novaeseelandiae</i>	Kererū	Not Threatened	X	X
<i>Himantopus himantopus</i>	Pied stilt	Not Threatened	X	
<i>Hirundo neoxena</i>	Welcome swallow	Not Threatened	X	
<i>Hymenolaimus malacorhynchus</i>	Whio	Nationally Vulnerable	X	
<i>Larus dominicanus dominicanus</i>	Southern black-backed gull	Not Threatened	X	
<i>Mohoua albicilla</i>	Whitehead	Not Threatened	X	X
<i>Petroica macrocephala toitoi</i>	North Island tomtit	Not Threatened	X	
<i>Prothemadera novaeseelandiae</i>	Tūī	Not Threatened	X	X
<i>Rhipidura fuliginosa placabilis</i>	North Island fantail	Not Threatened	X	
<i>Tadorna variegata</i>	Paradise shelduck	Not Threatened	X	X
<i>Todiramphus sanctus</i>	Sacred kingfisher	Not Threatened	X	X
<i>Vanellus miles</i>	Spur-winged plover	Not Threatened	X	
<i>Zosterops lateralis*</i>	Silveryeye	Not Threatened	X	X
<i>Acridotheres tristis</i>	Common myna	Introduced and Naturalised	X	
<i>Alauda arvensis</i>	Eurasian skylark	Introduced and Naturalised	X	
<i>Anas platyrhynchos</i>	Mallard duck	Introduced and Naturalised	X	
<i>Callipepla californica</i>	California quail	Introduced and Naturalised	X	
<i>Carduelis carduelis</i>	European goldfinch	Introduced and Naturalised	X	
<i>Carduelis chloris</i>	European greenfinch	Introduced and Naturalised	X	
<i>Carduelis flammea cabaret</i>	Common redpoll	Introduced and Naturalised	X	
<i>Emberiza citrinella</i>	Yellowhammer	Introduced and Naturalised	X	
<i>Fringilla coelebs</i>	Chaffinch	Introduced and Naturalised	X	
<i>Gymnorhina tibicen</i>	Australian magpie	Introduced and Naturalised	X	X
<i>Meleagris gallopavo</i>	Wild turkey	Introduced and Naturalised	X	
<i>Passer domesticus</i>	House sparrow	Introduced and Naturalised	X	
<i>Phasianus colchicus</i>	Common pheasant	Introduced and Naturalised	X	
<i>Platycercus eximius</i>	Eastern rosella	Introduced and Naturalised	X	X
<i>Sturnus vulgaris</i>	Common starling	Introduced and Naturalised	X	
<i>Turdus merula</i>	Blackbird	Introduced and Naturalised	X	X

⁶ Robertson et al. (2021).

Scientific Name	Common Name	Threat Classification ⁶	TER	SEB
<i>Turdus philomelos</i>	Song thrush	Introduced and Naturalised	X	

8.2 Bats

Pekapeka-tou-roa (long-tailed bats) (*Chalinolobus tuberculatus*), were recorded at all survey sites within the proposed reservoir (inundation) area and are therefore highly likely to utilise habitats within DOC land.

Bat activity was detected at seven of the nine ABMs that were set up on the edges of clearings within beech forest adjacent to the SEB, suggesting that the population detected extends into suitable habitat within that found on the SEB.

Long-tailed bats are highly social and require secure, dry cavities for daytime rest, breeding (maternity roosts), and protection from predators. They frequently change roosts, often moving nightly, so a network of available sites within their large home range (up to 100 km²) is essential. Their primary natural roosts are in the hollows of large, old native trees such as tōtara, rimu, and beech species. They can also use natural tree ferns, splits in trees, under peeling bark, caves, rock crevices, buildings, and bridges. In modified landscapes, they readily use large exotic trees, including mature pine species, willows, poplars, and eucalypts. They are aerial insectivores and require open or semi-open spaces to hunt on the wing for small moths, midges, and beetles. Long-tailed bats prefer foraging along habitat edges, such as treelines, forest margins, forest roads, and tracks, where insect concentrations may be higher. They are often found foraging over, or drinking from, streams, rivers, and ponds, preferring deeper, less turbulent water to avoid obstacles while in flight. As fast-flying bats, they prefer areas with less dense understory vegetation, which allows for easier navigation via echolocation and reduced risk of physical collision. A lack of ground and aerial predators (especially stoats, rats, and cats) in their habitat is critical for breeding success and survival, as bats can be slow to wake from torpor (a state of inactivity during cold weather) and thus vulnerable to predation while roosting.

Potential bat roosting habitat (i.e. old trees with cavities, hollows, cracks, and/or peeling or flaking bark) is present in both the SEB and DOC land. The SEB also contains streams and scrub habitat suitable for foraging and an abundance of large beech trees with cavity bearing properties for roosting.

Overall, the SEB land, especially combined with animal pest control and restoration planting, will provide high quality habitat over a larger area than that found within the TER area.

Table 5: Bat species recorded in the proposed reservoir area and likely occurring within DOC land and the Smedley Exchange Block.

Scientific Name	Common Name	Threat Classification ⁷
<i>Chalinolobus tuberculatus</i>	Long-tailed bat	Nationally Critical

8.3 Lizards

A desktop assessment as part of the TER determined that of the 11 lizard species present in southern Hawke's Bay region or neighbouring areas of the southern North Island

⁷ O'Donnell et al. (2022).



(Jewell 2008), four are likely to be present within the footprint of the proposed reservoir (Table 6).

The gecko species listed they generally live on tree trunks, larger branches, and in the canopy. In the North Island, they frequently use the slender branches of mānuka and kānuka trees. Suitable retreat sites are crucial for shelter and protection from predators. They often utilize natural cavities in trees. Although largely nocturnal, they are heliothermic and require areas to sun-bask near their retreat or among vegetation during the day.

Northern grass skink prefer open habitats over dense forests. Common environments include: Grasslands, especially tall or rank grass; shrublands; scree slopes and rock piles; and rough pasture. While they bask in the open, they require immediate access to safe hiding spots to escape predators and avoid overheating. Key refuge elements include: dense ground cover, such as thick grass, flax, and low shrubs and natural crevices under rocks, logs, and coastal debris. Their habitat needs to support a wide range of invertebrates (beetles, spiders, caterpillars) for their diet. The presence of native plants that produce berries and nectar also provides a food source for the skinks.

Maintaining wide and interconnected zones of suitable habitat is important for population health for both skinks and geckos as they exhibit strong site fidelity.

During herpetological fauna searches as part of the TER, a ngahere gecko (*Mokopirirakau* 'southern North Island') was discovered in a rock pile within grassland. This discovery was made in close proximity to the SEB, and it matches a desktop study by Forbes et al. (2011) that identified small leaved scrub / shrubland, podocarp-broadleaved species forest and some parts of the pastureland on the SEB as potential habitat for eight indigenous gecko and skink species. They are found in a range of forested environments, including mature forests (beech, podocarp, and broadleaf), scrubland, and swampy bush. A subsequent field survey of kānuka scrub and native broadleaved species forest bordering pasture on the SEB by Forbes et al. (2011) also discovered five raukawa geckos and 11 northern grass skinks.

The SEB provides a wider and larger variety of favourable habitat types for both skink and gecko species likely to be present.



Table 6: Lizard species recorded in and potentially occurring within DOC land and the Smedley Exchange Block.

Scientific Name	Common Name	Threat Classification ⁸	Presence
<i>Oligosoma microlepis</i>	Small-scaled skink	Nationally Vulnerable	Unlikely (known records distant)
<i>Mokopirirakau</i> "southern North Island"	Ngahere gecko	Declining	Present (TER, near SEB)
<i>Naultinus punctatus</i>	Barking gecko	Declining	Likely (Widespread in south-eastern North Island)
<i>Oligosoma aeneum</i>	Copper skink	Declining	Unlikely (not known from Hawke's Bay)
<i>Oligosoma ornatum</i>	Ornate skink	Declining	Unlikely (largely absent from Hawke's Bay)
<i>Dactylocnemis pacificus</i>	Pacific gecko	Not Threatened	Unlikely (not known from mainland Hawke's Bay)
<i>Oligosoma polychroma</i>	Northern grass skink	Not Threatened	Present (SEB)
<i>Oligosoma auroraense</i>	Hawke's Bay skink	Nationally Endangered	Unlikely (mostly coastal)
<i>Woodworthia maculata</i>	Raukawa gecko	Not Threatened	Present (SEB)
<i>Oligosoma</i> aff. <i>infrapunctatum</i> 'Southern North Island'	Kupe skink	Nationally Critical	Unlikely (western side of Ruahine Range)
<i>Oligosoma kokowai</i>	Northern spotted skink	Relict	Unlikely (not known from the area)
<i>Oligosoma zelandicum</i>	Glossy brown skink	Declining	Unlikely (western side of Ruahine Range)

8.4 Terrestrial Invertebrates

Terrestrial invertebrate surveys as part of the TER noted a rich diversity of invertebrate species within the surveyed habitats. Similar habitat is found in the SEB.

Of particular note was the Hawke's Bay tree wētā (*Hemideina trewicki*) that was discovered during one of the wētā box checks (Table 8). It is expected that this species would also be found within the SEB, as the exchange area contains suitable habitat for this wētā species. The Hawke's Bay tree wētā is an arboreal and nocturnal insect that requires specific types of forested habitats with suitable daytime refuge cavities. They are found in natural forests and even suburban gardens across the Hawke's Bay region. They inhabit a variety of native New Zealand forests, including kamahi, mixed broadleaf, kānuka, and beech forests. They can be found from lower altitudes up 720m above sea level, such as in the Boundary Stream Scenic Reserve area. The most critical habitat requirement is the presence of secure, dark, and confined spaces to hide during the day, safe from predators. Natural holes are typically found in living or dead trees, formed by the exit holes of beetle or moth larvae, or where rot has set in after a twig breaks off. Wētā maintain these holes, known as galleries, by

⁸ Hitchmough et al. (2021).



chewing away any new bark growth around the entrance. They exhibit social behaviour, with adult wētā often sharing large tree cavities in groups. These groups typically consist of one or two large-jawed males and several females. At night, they emerge from their galleries to forage. Their habitat must provide access to a variety of food sources within the trees and surrounding bush, including leaves, flowers, fruits, and small insects.

Table 7: At Risk terrestrial invertebrate species observed in the reservoir area and potentially occurring within the Smedley Exchange Block.

Scientific Name	Common Name	Threat Classification ⁹
<i>Hemideina trewicki</i>	Hawke's Bay tree wētā	Relict

8.5 Aquatic fauna

The ecological effects of the Project on the aquatic ecology of the Makaroro and Tukituki catchments were assessed by Young et al. (2013) who detected 11 freshwater fish species and kōura (*Paranephrops planifrons*) within the Makaroro catchment (Table 8). Four of the nine indigenous fish species are classified as “Declining” in Dunn et al. (2018). The majority of fish and macroinvertebrate species recorded by Young et al. (2013) were migratory species, which would be adversely affected by the dam unless a trap and release regime or fish passage were provided.

Four larger streams run through the SEB, although none are as large as Dutch Creek. Aquatic fauna in the SEB block was surveyed using environmental DNA (eDNA) which detects fragments of DNA in the water. Five fish species were identified in the two streams that were sampled in the SEB, including three At Risk – Declining indigenous species, one not-threatened indigenous species, and one introduced species (Table 9).

Table 8: Freshwater fish and macroinvertebrate species recorded from Makaroro catchment, and their threat classification and migratory status (from Young et al. 2013).

Scientific Name	Common Name	Threat Classification ¹⁰	Migratory	Number of Records
<i>Anguilla australis</i>	Shortfin eel	Not Threatened	Yes	3
<i>Anguilla dieffenbachii</i>	Longfin eel	Declining	Yes	19
<i>Cheimarrichthys fosteri</i>	Torrentfish	Declining	Yes	22
<i>Galaxias divergens</i>	Dwarf galaxias	Declining	No	24
<i>Gobiomorphus basalis</i>	Cran's bully	Not Threatened	No	4
<i>Gobiomorphus cotidianus</i>	Common bully	Not Threatened	Yes	2
<i>Gobiomorphus hubbsi</i>	Bluegill bully	Declining	Yes	3
<i>Gobiomorphus huttoni</i>	Redfin bully	Not Threatened	Yes	2

⁹ Trewick et al. (2022).

¹⁰ Dunn et al. (2018).



Scientific Name	Common Name	Threat Classification ¹⁰	Migratory	Number of Records
<i>Oncorhynchus mykiss</i>	Rainbow trout	Introduced and Naturalised	Yes	25
<i>Paranephrops planifrons</i>	Kōura	Not Threatened	No	4
<i>Retropinna retropinna</i>	Common smelt	Not Threatened	Yes	5
<i>Salmo trutta</i>	Brown trout	Introduced and Naturalised	Yes	1

Table 9: Fish species of the SEB identified through eDNA

Scientific Name	Common Name	Threat Classification ¹¹	Locality
<i>Anguilla australis</i>	Shortfin eel	Not Threatened	Donovan Stream
<i>Anguilla dieffenbachii</i>	Longfin eel	Declining	Donovan Stream, Middle Stream
<i>Galaxias brevipinnis</i>	Kōaro	Declining	Middle Stream
<i>Galaxias divergens</i>	Dwarf galaxias	Declining	Middle Stream
<i>Oncorhynchus mykiss</i>	Rainbow trout	Introduced and Naturalised	Middle Stream

9.0 Stream habitat values

Only three of the four streams in the SEB block were viewed in 2025, and Rapid Habitat Assessments were carried out for two of them (Appendix C). None of the four streams have official names in the New Zealand topographical database so these have been labelled with contextual names for ease of reading (Figure 7).

9.1 Donovan Stream

Donovan Stream within the SEB is a very small 2nd order stream with a wetted width of 1 – 2 m at time of survey, and a bank width of 7 – 12 m. The wetted channel was only 5 - 15 cm deep in most places and the substrate was a mix of fine sediments, gravels and cobbles. The channel was heavily vegetated in primarily *Juncus articulatus*. Riparian cover was pasture and rushes for the majority of the stream’s length but some of the tributaries were well shaded by indigenous tree and shrub cover.

9.1.1 Rapid Habitat Assessment

Donovan Stream had around 50% fine sediment in the surveyed reach. Invertebrate habitat was of moderate value, with a range of habitat types and relatively high abundance of habitat. Fish cover was also good with a range of cover including vegetation mats, cobbles, undercut banks and woody debris. The depth of the water may be a limiting factor however.

¹¹ Dunn et al. (2018).



The surveyed reach had limited hydraulic heterogeneity with only small riffles and run habitat. The stream has recovered well from the effects of Cyclone Gabriel and active bank erosion was very limited. Riparian vegetation was limited to grazed pasture and rushes and is providing no shade and very little habitat for fauna or protection from contaminant runoff.

Overall the Rapid Habitat Assessment yielded a score of 45.5 which is considered 'Fair' (Clapcott *et. al.* 202).



Photo 9: Donovan Stream within the SEB

9.1.2 Taxon-Independent Community Index

Taxon-Independent Community Index (TICI) is a biotic index of riverine community health developed by eDNA-provider Wilderlab (Wilkinson *et. al.* 2024). It uses data on the sensitivity of a range of taxa to assess the ecological health of a waterway in a similar way to the Macroinvertebrate Community Index (Stark 1985). Although the scoring system of the two indexes is not directly comparable, the TICI quality bands align with those used by the Macroinvertebrate Community Index (MCI). The calculated TICI for Donovan Stream was 109.54 which places the stream in the 'Good' band for ecological health. This result should be read with caution, given only one eDNA replicate was collected.



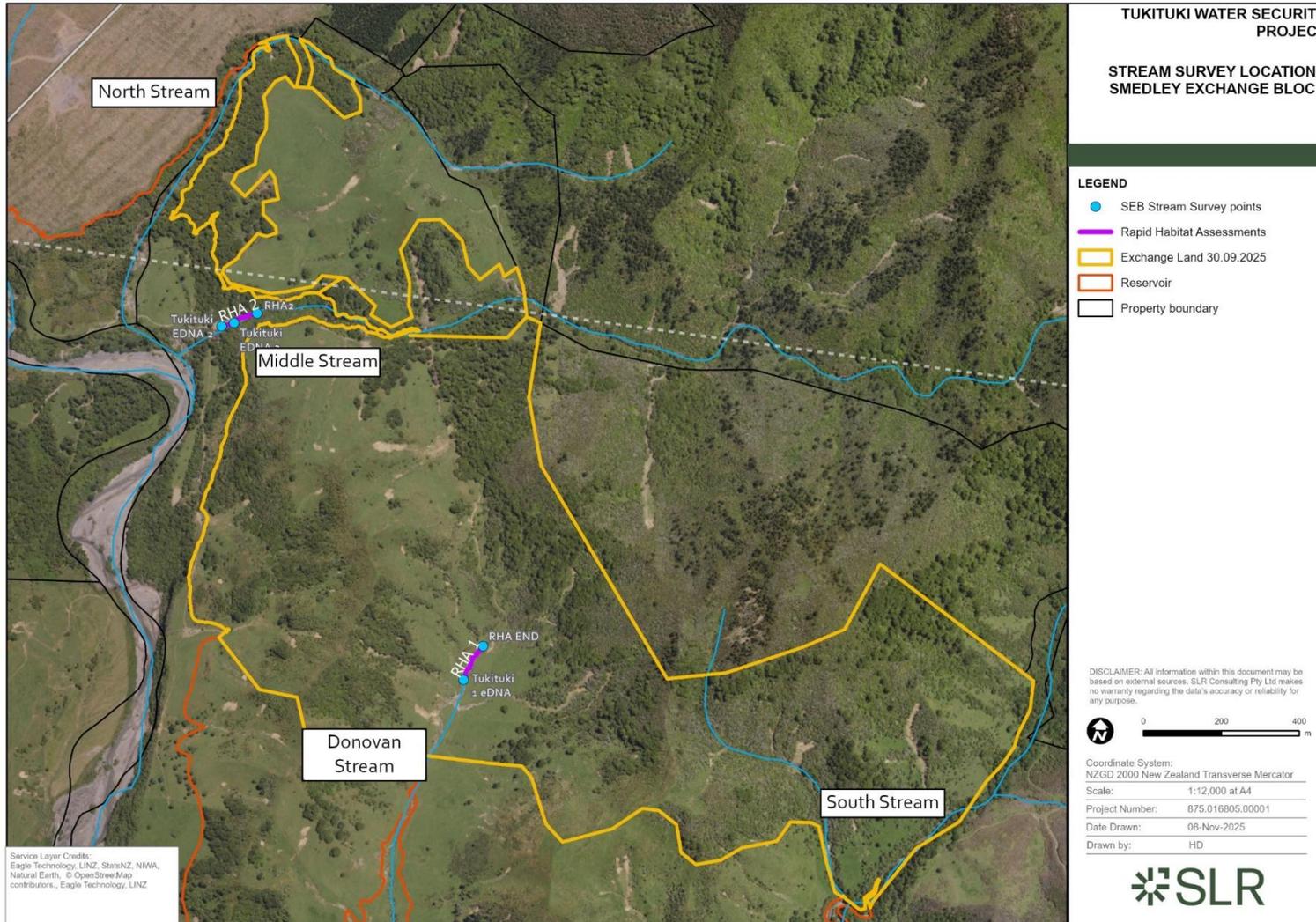


Figure 7: Stream survey sites in the SEB



9.2 Middle Stream

This stream is the largest of the four flowing through the SEB and has a large catchment area in the adjacent Gwavas Conservation Area. Because of time constraints and access issues the area surveyed for the Rapid Habitat Assessment was actually outside the SEB and within the area to be flooded but a description of the whole reach is also provided. The stream flows into the SEB at the upstream end as a low-gradient stream with a wide gravel beds (20 m) and some riparian cover provided by large black beech. After only 40 or 50 m it drops into a steep-sided gorge and loses around 15 m in elevation before entering the area that will be inundated by the reservoir. This part of the stream is constrained by mudstone banks and the substrate could not be viewed due to access. There is very good riparian cover provided by indigenous scrub. This gorge area is around 650 m long and below this it widens out to low-gradient stream with wide gravel beds similar to the upstream end.

9.2.1 Rapid Habitat Assessment

The RHA was conducted at this lower end. Below the gorge, the wetted width was around 2 – 2.5 m with a bank width of up to 20 m. There was very little deposited sediment and the substrate was predominantly gravel and cobbles with a few boulders. Invertebrate habitat was good, with a range of habitat types including woody debris, leaves, and vegetation. EPT habitat quality was high. Fish habitat quality was also relatively good although fish passage through the gorge was not assessed. The hydraulic heterogeneity for the assessed reach was only moderate, but when the whole reach within the SEB is considered this would be high. Riparian vegetation was limited in the assessed reach but again, the reach within the SEB was much better, being almost entirely vegetated and well shaded (Photo 9).

Overall the RHA yielded a score of 68 which is considered 'Good' quality (Clapcott *et. al.* 2020).

9.2.2 Taxon-Independent Community Index

The two eDNA samples taken in Middle Stream yielded a mean TICl score of 116.09, placing it in the 'Excellent' band for stream ecological health, but again, this result should be read with caution because the recommended six replicates were not able to be collected.

9.3 North Stream

The North Stream also flows out of the Gwavas Conservation Area but has a much smaller catchment than Middle Stream and only flows through the SEB for around 60 m before entering the future reservoir. This stream was only viewed towards the lower end, around 200 m upstream of where it meets the Makaroro. Here it was a small, shallow stream with a channel width of only 1 – 1.5 m and the margins of the channel were densely vegetated in mats of *Juncus articulatus*, *Nasturtium officinale*, and *Glyceria declinata* (Photo 10). However, from this point up to where it enters the Gwavas Conservation Area the riparian zone is densely vegetated in beech forest. This stream is of at least moderate quality.





Photo 10: Middle Stream looking upstream from the upper end of the RHA reach into the gorge section.



Photo 11: North Stream



9.4 Dutch Creek

No formal assessments of the aquatic values of Dutch Creek were carried out in 2025 and Dutch Creek is not specifically reported on for many aquatic values in the 2013 report, despite sampling occurring there. The stream drains a large catchment which includes the foothills of the Ruahine range to the northwest as well as a large part of the Gwavas production forest to the northeast. The wetted channel width is generally around 3 – 6 m and full bank width is 15 m or more. The stream is shallow, low gradient and sinuous and is dominated by riffles and runs with occasional pools. The substrate is dominated by gravel and cobbles with areas of boulders and sand. Dutch Creek was heavily scoured during Cyclone Gabrielle and although streamside vegetation is recovering, in October 2025 it was dominated by exotic grasses with areas of toetoe (*Austroderia fulvida*), tree lupin (*Lupinus arboreus*) and tutu (*Coriaria arborea*). Shading is limited but instream habitat for fish and invertebrates is of reasonable diversity and quality.

The closest MCI reported in the 2013 assessment (Young *et. al.* 2013) was from the Makaroro River at Burnt Bridge which is located a considerable distance downstream of Dutch Creek, just above the confluence with the Tukituki. There, the MCI showed an ecological health in the Good to Excellent range but the applicability of this data to Dutch Creek is low. Nevertheless, based on a visual inspection and the data from the main stem of the Tukituki it is expected that the ecological health of Dutch Creek is at least 'Good'.

Five native fish (Longfin eel, torrentfish, bluegill bully, redfin bully, dwarf galaxias) were recorded by Young *et. al.* (2013) in Dutch Creek and nine were recorded in the wider area. Koaro have only been recorded at two locations in the catchment, although they are predicted to occur in the small headwater streams draining the Ruahine Ranges. Cran's bully was the most widespread and commonly recorded in the catchment and also likely present in Dutch Creek and the streams of the SEB land.

Young *et. al.* (2013) attest that: "*while any loss of habitat is not desirable, the length of flowing water habitat inundated by the proposed reservoir with the TER is relatively small compared with the length of flowing water habitat throughout the Tukituki Catchment*". The loss of this habitat is not expected to result in a significant increase to the threat of localised extinction for any species, but it is noted that access to these habitat for migratory species will be severed with dam. The negative effect of this loss of habitat will be the same for the Dutch Creek as for the SEB streams. It is understood that active translocations of eels are proposed as part of the substantive application to partially address this loss of habitat.

Of note however, is that dwarf galaxias are non-diadromous, meaning they spend their entire life cycle in freshwater, without a marine phase. Thus the dam may not adversely affect this species utilisation of habitat once the dam is constructed. This fish is typically found in shallow, riffley margins of larger rivers and the gravel/cobble riffles of smaller streams. The fish require instream cover, such as logs and/or boulders, and gravel/cobble substrates. Good riparian cover and shade are essential. It is expected that the streams within the SEB land will therefore continue to provide viable habitat for dwarf galaxias, and with stock exclusion and restoration planting, this habitat is expected to improve in quality.

Kōaro is a migratory galaxiid with specific requirements for cool, fast-flowing, and well-shaded stream habitats. Notably, they are also capable of forming land-locked populations in lakes. Thus the discovery of kōaro in the SEB streams by eDNA sampling suggests this species can persist in the catchment above the dam. Kōaro are excellent climbers, which allows them to penetrate further inland and higher into catchments than other whitebait species, often past significant natural barriers like waterfalls. Their preferred stream environment includes velocity rapids and swift-flowing mountain streams. They are typically found in areas with boulder and cobble substrates, where they hide under and amongst



large rocks. They almost always require streams with native bush or dense, quality riparian cover to provide shade and large woody debris for instream cover. Spawning occurs in autumn, with eggs laid in damp areas along the stream edges, often within the bankside vegetation. The protection the streams with the SEB land, alongside stock exclusion and restoration planting, is expected to suitably compensate for the loss of similar habitat found within Dutch Creek for this species.



Photo 12: Dutch Creek

10.0 Comparison of Stream Habitat

Approximately 1.2 km of Dutch Creek is within the DOC land and approximately 2.03 km of stream within the SEB. The SEB streams are all considerably smaller than Dutch Creek but eDNA results indicate that they still provide good habitat for indigenous fish and sensitive invertebrates. With exclusion of livestock, planting of Donovan Stream and recovery of the riparian vegetation along the other streams, it is expected that the SEB streams will continue to improve in quality and ecological value.

11.0 Threatened Environments Classification

The distribution of the different LENZ Threatened Environment Classifications (TEC) for areas of indigenous vegetation in inundated DOC land and the SEB is shown in Figure 7. The map has been prepared at LENZ Level 4 and shows land environments with 30% or less remaining indigenous vegetation cover at a national scale.

A summary of the TEC for areas of indigenous vegetation within the inundated DOC land and SEB is provided in Table 9. Priority 1 of the 'Statement of National Priorities for Protecting Rare and Threatened Indigenous Biodiversity of Private Land' (MfE 2007) is to protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV) that have 20% or less remaining indigenous cover.



Compared to the DOC land, the SEB has a smaller extent of indigenous vegetation on ‘Acutely Threatened’ land environments (<10% indigenous cover left), and a similar extent of indigenous vegetation on ‘Chronically Threatened’ land environments (10–20% indigenous vegetation cover left), although there is a greater overall extent of indigenous vegetation on the SEB (Table 9).

Table 10: LENZ Threatened Environment Classification (TEC) for indigenous vegetation on DOC land that will be inundated and the Smedley Exchange Block.

TEC	Inundated DOC land		Smedley Exchange Block	
	Area (ha)	% of total	Area (ha)	% of total
Acutely Threatened (<10% indigenous cover left)	9.2	31.5	0.0	0.0
Chronically Threatened (10-20% indigenous cover left)	18.5	63.1	21.6	16.8
Underprotected (>30% left and 10-20% protected)	0.1	0.3	0.0	0.0
Less reduced and better protected (>30% left and >20% protected)	0.1	0.4	107.1	83.2

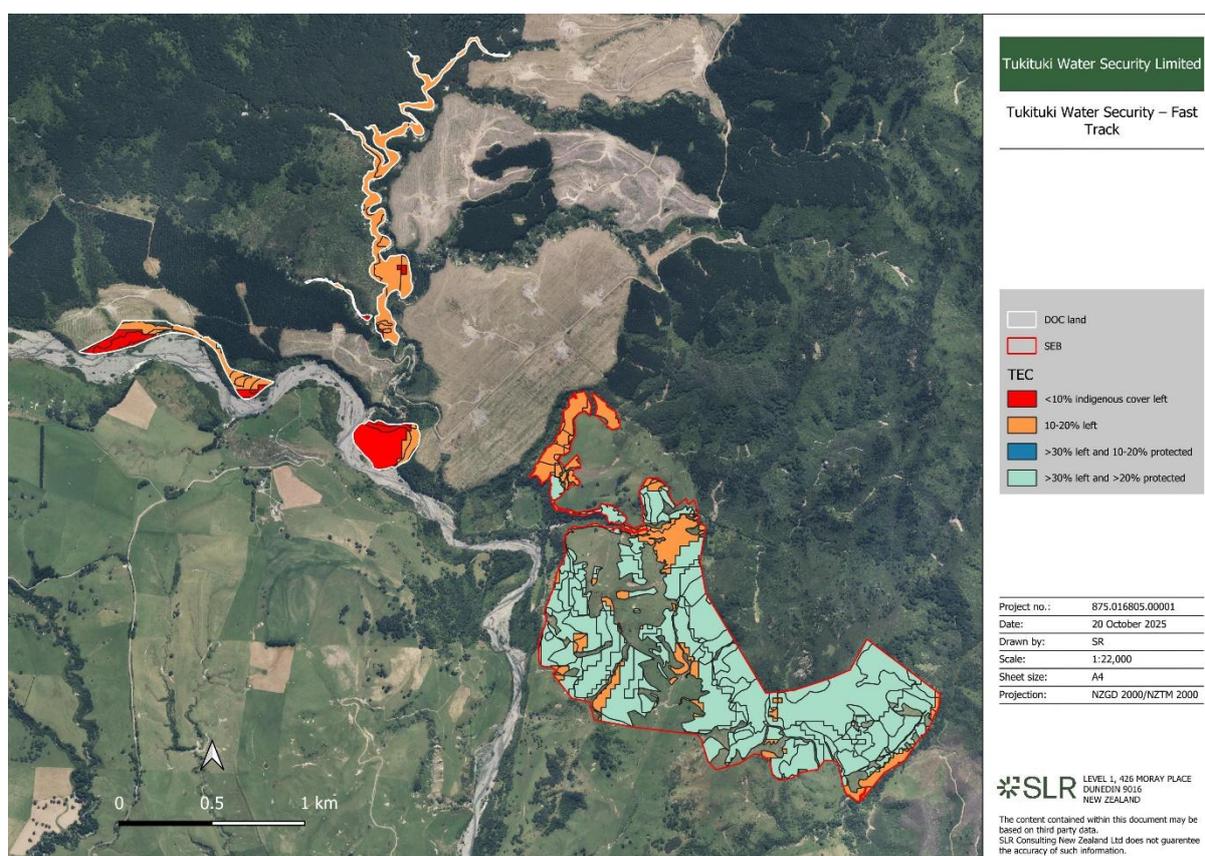


Figure 8: LENZ Threatened Environments Classification for indigenous vegetation within DOC land and the SEB.



12.0 Ecological Significance Assessment

The indigenous vegetation cover in the DOC land and SEB was assessed against the Ecological Significance Determination Criteria for the Central Hawke's Bay District (ECO-P1 in the Central Hawke's Bay District Plan 2024).

Indigenous vegetation and habitat types present within the DOC land and SEB, which were ecologically functional, and were shown to provide habitat for Threatened and At Risk species, were considered to be ecologically significant under the relevant criteria of the District Plan and RPS.

The indigenous vegetation cover within the DOC land that was considered to be ecologically significant under both assessment criteria (meeting one or more of the indigenous vegetation extent, maturity or rarity criteria) was:

- Black beech forest, Putaputawētā - lacebark – kaikomako forest (17.93 ha)
- (podocarp)/broadleaved-small-leaved species treeland/shrubland, black beech treeland, Koromiko – putaputaweta – kāpuka shrubland, and Mānuka – poataniwha – Coprosma rigida - kaikomako shrubland (9.26 ha)
- Wetland vegetation (0.24 ha)

The indigenous vegetation cover within the SEB that was considered to be ecologically significant under both assessment criteria (meeting one or more of the indigenous vegetation extent, maturity or rarity criteria) was:

- Black beech forest, Podocarp - black beech / putaputaweta – five-finger forest, putaputawētā - lacebark – kaikomako forest (47.26 ha);
- broadleaved species scrub, Putaputawētā – kaikomako – lacebark / Coprosma rigida – mānuka scrub, Mānuka - Putaputawētā – kaikomako - Coprosma rigida scrub (36.88 ha);
- Black beech / mānuka - Coprosma treeland, black beech treeland (17.03 ha); and
- Kahikatea treeland (a seepage wetland) (0.45 ha).

The total area of ecologically significant vegetation within the SEB was found to be 101.62 ha. Beyond this core area of ecologically significant vegetation, other indigenous shrubland types may also provide habitat for native fauna, including Threatened and At Risk species that may frequent the area.

Aside from 4.4 ha of beech in the north-west corner of the SEB (refer to the description of Plot SEB1 in section 5.0) and some tributary escarpments (Type 10 in particular), most of these indigenous vegetation remnants are grazed by stock so that regeneration is hindered. It is noted that wilding conifers are present on the adjacent Gwavas Conservation Area. Wilding conifers could become a threat to some of the more open and seral habitats within the SEB once stock are excluded. Also, animal pests are widespread, although controlled to some extent by the regional council and the landowner. While these threats lower the quality and sustainability of the affected habitats, they do not change the ecological significance evaluation for the affected habitats. Rather, by legal protection and fencing from stock, in combination with a number of habitat enhancement, translocation, animal and plant pest control measures associated with the Project (refer to Section 13 of the TER), this proposal presents opportunities to legally protect and enhance these significant ecological values.



No specific surveys for terrestrial At Risk or Threatened species have been conducted on the proposed SEB exchange land. It is highly likely that as well as long-tailed bats, several other Threatened or At Risk species will be currently utilising suitable habitats within the SEB, such as bush falcon, North Island fernbird and red mistletoe, as well as species such as Hawke's Bay tree wētā and ngahere gecko, which have all been previously found in this locality (refer to Section 4 in the TER). Evidence of regular utilisation by any of these species would extend and/or elevate the significance of habitats identified within the SEB.

In terms of native fishes longfin eel (Declining), kōaro (Declining), and dwarf galaxias (Declining) are present within the SEB stream, which elevates the ecological significance of the SEB, as these species were not known to be present in the 2013 or 2015 assessment reports. Wetland Values

Department of Conservation staff undertook a survey and assessment of the SEB in 2015 (La Cock et al. 2015) and assessed the wetlands in Donovan Gully as being ecologically significant. This is no longer the case as the wetlands are grazed, dominated by exotic species, have low diversity and have low representativeness. However, although they are not ecologically significant under Section 6c of the RMA, wetlands play an important role in waterway health by providing services such as water filtration, storage and attenuation, and nutrient removal. Wetlands have been significantly reduced from their historic extent, making even degraded ones valuable.

13.0 Comparative conservation values assessment under the Fast-track Approvals Act 2024

13.1 Biodiversity Assessment

The proposed land exchange was assessed following the 'External Guidance for conservation values assessments for land exchanges under the Fast-track Approvals Act 2024 – Current 18 August 2025' (Table 10; see Appendix C for the full assessment criteria).



Table 11: Comparative conservation values assessment for the DOC land that will be inundated and the Smedley Exchange Block. Each criterion is scored High (H), Moderate (M), or Low (L) and a justification provided.

Criterion	Definition	DOC land that would be inundated	Smedley Exchange Block
Representativeness	The extent to which indigenous biodiversity is typical or characteristic of the natural diversity of the relevant Ecological District	M – Beech forest with most podocarps logged (15.97 ha), Putaputawētā - lacebark – kaikomako forest and derivatives (1.9 ha), black beech treeland (0.6 ha), mixed broadleaved and small-leaved species treeland and shrubland (9.26 ha), ‘oxbow’ wetland (0.236 ha). Moderately representative of vegetation in the Ruahine ED which features large areas of similar or better quality black beech forest.	M – Representative beech forest and podocarp-beech forest (36.8 ha), black beech treeland (17 ha), mixed broadleaved and small-leaved species scrub (36.9 ha), kahikatea treeland seepage (0.45 ha), and modified wetlands in Donovan Gully (0.13 ha). Black beech forest is of very good quality in some areas.
Diversity & Pattern	The extent to which the expected range of diversity and pattern of biological and physical components within the relevant ecological district is present	M – Beech forest, broadleaved species forest, and modified and regenerating indigenous treeland and shrubland, one wetland. Remnant lizard and bird fauna. Freshwater fish community in Dutch Creek. Underlying geology similar to that found in nearby conservation estate.	H – Beech forest, podocarp-beech forest, and extensive modified and regenerating indigenous treeland, scrub and shrubland. Several small wetlands. Supports ecosystems that are not present in DOC land that will be inundated. Potential habitat for several indigenous lizard species. Different underlying geology and greater altitudinal range (> 300 m) than conservation estate.
Rarity & Distinctiveness	The presence of rare or distinctive indigenous taxa, habitats of indigenous fauna, indigenous vegetation or ecosystems	M – Red mistletoe (Declining), North Island fernbird (Declining), and potentially long-tailed bat (Nationally Critical) and blue duck (Nationally Vulnerable). Indigenous vegetation on land environments with <20% indigenous cover left (22 ha). Freshwater wetlands (0.29 ha) are rare at a national scale Bluegill bully (Declining), dwarf galaxias (Declining), torrentfish (Declining), longfin eel (Declining) in Dutch Creek. Ngahere gecko (Declining).	M – Potentially long-tailed bat (Nationally Critical), and several other Threatened or At Risk species such as bush falcon (Nationally Increasing), NI fernbird (Declining), New Zealand pipit (Declining), red mistletoe (Declining), Hawke’s Bay tree wētā (Relict), ngahere gecko (Declining), and other At Risk lizard species. Indigenous vegetation on land environments with <20% indigenous cover left (29.95 ha). Freshwater wetlands are rare at a national scale (0.6 ha).
Ecological Context	The extent to which the size, shape, and configuration of an area within the wider surrounding landscape contributes to its ability to maintain indigenous biodiversity or affects the ability of the surrounding landscape to maintain its indigenous biodiversity	M/H – Relatively small area of indigenous vegetation (20.9 ha). The Makaroro block provides limited buffering to the river while the Dutch Creek block is contiguous with the wider Forest Park and provides a valuable linkage between the upland areas and the river downstream, as well as buffering the creek itself.	M/H – Relatively large area of indigenous vegetation (122.2 ha). Indigenous vegetation partly buffers the Makaroro River (following inundation the vegetation will buffer the newly formed lake). Also buffers and adds to a range of indigenous vegetation types with the adjacent Gwavas Conservation Area. Riparian area and wetlands in Donovan Gully will be planted and restored. Extension of the altitudinal range of Gwavas Conservation Area and connection of the CA to the river / lake.

Overall the Smedley Exchange Block is of comparable value to the DOC land being lost.



13.2 Freshwater Assessment

The freshwater assessment compares the loss of freshwater habitats within DOC land to those in the proposed Smedley Exchange Block (Table 11). Only parts of Dutch Creek (around 1.2 km) are within DOC land according to the aerial photos. These areas have been given appropriate weight in the following assessment. A very small part of the Makaroro River bed is within DOC land and accordingly the value of the river has been given a low weight in the assessment below. The adverse effects on the Makaroro and Dutch Creek (along with other freshwater values) has been considered and addressed through the consenting process and is not part of this land exchange.

Table 12: Comparative freshwater assessment for the DOC land that will be inundated and the Smedley Exchange Block. Each criterion is scored High (H), Moderate (M), or Low (L) and a justification provided.

Ecological significance criteria	DOC land that would be inundated	Smedley Exchange Block
Representativeness	<p>H. Dutch Creek (3rd Order waterway) (1.2 km) and tributaries (2nd order waterway) (700 m). Makaroro River (4th Order)</p> <p>Similar to other waterways in the area although catchment is modified and waterway is at least partially affected by sediment from the adjacent forestry land. Oxbow wetland in Dutch Creek is significant for representativeness, rarity, distinctiveness and ecological context (La Cock et al. 2015).</p> <p>Makaroro River is not identified as significant for its ecological values by HBRC (Harper 2018).</p> <p>Hughey et al. (2012) assessed the Makaroro River as being of Local significance for native birdlife.</p> <p>Makaroro floodplain contains Willow/lupin forest and/or scrub, with buddleia, mānuka, and other native species. The gravel riverbed contains open stream channels and mobile gravels.</p> <p>Makaroro MCI 5 year rolling average of 122 (Excellent) (https://www.hbrc.govt.nz).</p>	<p>M. Donovan Gully (1st Order waterway), parts of 1st and 3rd Order waterway to the south, and 2nd Order waterway to north.</p> <p>Waterways in the SEB are modified and not particularly representative of streams in the ED which has a high proportion of unmodified catchments.</p>
Diversity and Pattern	<p>H. Fish data from the Makaroro which is somewhat applicable to Dutch Creek shows 9 indigenous fish species: shortfin eel, longfin eel, torrentfish, dwarf galaxias, Cran's bully, common bully, bluegill bully, redfin bully, and common smelt.</p> <p>Eight bird species associated with aquatic habitats recorded in TER: North Island fernbird, banded dotterel, black shag, pied stilt, welcome swallow, southern black-backed gull, paradise shelduck, and sacred kingfisher.</p> <p>The gravel riverbed contains open stream channels and mobile gravels.</p>	<p>M. A range of stream morphologies and habitat types are present within the SEB, providing moderately good-quality and reasonably diverse habitat for indigenous fauna. Although only five fish species were recorded from the two surveyed streams, more may be present. TIC1 showed good to excellent ecological health.</p>
Rarity and distinctiveness	<p>H. Freshwater wetlands are rare at a national scale (Cromarty and Scott 1985).</p> <p>Braided riverbeds are a Naturally Rare/Uncommon ecosystem type (Williams et al 2007) classified as Endangered (Holdaway et al. 2012)</p> <p>Four At Risk fish species in Makaroro River which are expected to also inhabit Dutch Creek.</p> <p>Three At Risk bird species in river/wetland habitats.</p>	<p>M. Three At Risk fish species were recorded in the two surveyed streams within the SEB. Although the wetlands in the SEB are degraded, Freshwater wetlands are rare at a national scale (Cromarty and Scott 1985).</p>



Ecological significance criteria	DOC land that would be inundated	Smedley Exchange Block
Ecological context (size, shape, connectivity, buffering)	<p>M/H. Only a very small part of the Makaroro riverbed, but a larger part of Dutch Creek, is located on DOC land. Dutch Creek is moderately well buffered by indigenous vegetation.</p> <p>Makaroro River and Dutch Creek are part of large interconnected river system.</p> <p>Not a DOC Ngā Awa site, community restoration site, or Ngā Whenua Rāhui.</p>	<p>M. The waterways are small, and their lower reaches are located in exotic grassland, but they provide a valuable linkage between the Gwavas Conservation Area and what will be the new reservoir.</p> <p>Wetlands are small.</p> <p>Not a DOC Ngā Awa site, community restoration site, or Ngā Whenua Rāhui.</p>

Aquatic values in the SEB are lower than those that will be lost in the DOC land, however they are still considered to be of moderate to high ecological value because of the presence of three At Risk fish species. In addition, with restoration work in Donovan Gully the Donovan Stream and the wetlands there will improve. Exclusion of livestock from all waterways on the SEB will also significantly improve aquatic values.

14.0 Issues raised by Submitters in 2013

Loss of kōwhai as a food source

La Cock et al. (2015) in their assessment of the proposed land exchange, did not consider the loss of kōwhai as a food source for birds to be a potential adverse effect, because “there is a large amount of kōwhai in the district that will not be inundated should the Ruataniwha Water Storage Scheme go ahead”.

This conclusion was based on an aerial assessment which revealed “kōwhai to be present on the banks of the Makaroro River well into Ruahine Forest Park, with a kōwhai-dominated face on the bank opposite the western end of the Makaroro River parcel of Ruahine Forest Park revocation land. This face will be above the footprint of the dam, should the Ruataniwha Water Storage Scheme proceed”.

The presence of kōwhai at these sites was confirmed during the 2025 site visits.

Dutch Creek cliff seepages

Concern was raised by Lloyd (2013) that seepages on cliffs along Dutch Creek may contain threatened plant species. These seepages were surveyed by La Cock et al. (2015), but no threatened plant species were observed. It is recognised that these wetlands are difficult to map due to their location on steep topography (Lloyd 2013).

These seepages could not be viewed during the October 2025 site visit, but similar seepages at the lower end of Dutch Creek, outside the DOC land, had been damaged by Cyclone Gabriel but were recovering, with species such as *Machaerina sinclairii* and *Coriaria arborea* regenerating well and *Carex geminata* common at the toe of the slopes.

Potential for Kupe skink

See Section 7.3. Kupe skinks (*Oligosoma aff. infrapunctatum* "southern North Island") are generally restricted to the western side of the Tararua and Ruahine ranges mountain ranges (<https://www.reptiles.org.nz>), so are unlikely to be present in the Project area.

Freshwater habitats and fish

An assessment of freshwater habitats and fish values has been undertaken as part of this report.



15.0 Forestry access to the northern end of the SEB

Gwavas Forestry requires access to the area in the northern end of the SEB to secure access to an area of land that they will be taking over. This will cut through an area of high value black beech forest which is unfortunate and will adversely affect the surrounding forest due to increased edge effects and potential for sediment runoff and disturbance. The location of this track is constrained by topography but alternatives to the north should be considered. The proposed track has been considered in the habitat area calculations in Section 6.0.

16.0 Summary & Recommendations

The ecological survey of the SEB found that there is a greater extent of indigenous vegetation cover within the block than within the DOC land that will be inundated. While some vegetation types could not be matched against the same vegetation type within the vegetation found within Dutch Creek and the other DOC land, other similar vegetation types were found that could provide an equivalent habitat type or structure, e.g. broadleaved species forest in the DOC land (1.96 ha) vs. podocarp-black beech/ putaputaweta – five-finger forest in the SEB land (3.73 ha).

The current use of the SEB as farm for pastoral farming purposes (cattle and sheep grazing) has led to modification of the indigenous vegetation within the block (aside from the black beech forest at the northern end currently fenced to exclude stock). Continued grazing pressure would require management to improve ecological sustainability in the future. That said, the ecologically highly valuable area of beech forest, currently fenced from stock (some 4.4 ha excluding the portion flooded by the Project) is considered to be at least as diverse as similar forest types found within Dutch Creek. This indicates that when fenced from stock grazing the indigenous areas presently grazed within the SEB will regenerate well (refer to differences in vegetation structure and density between ungrazed Plot SEB1 and grazed Plot SEB2). The black beech forest/podocarp-black beech/ putaputaweta – five-finger forest species forest and black beech / mānuka - *Coprosma* treeland/black beech treeland would improve relatively rapidly once seedling and sapling recruitment advances in the absence of grazing (we estimate that with stock exclusion and animal pest control, seedling densities would be similar to that found within Plot SEB1). Besides stock exclusion, pest plant and animal control would be required in order to improve and maintain indigenous habitat values for the long term.

Red mistletoe, which is a nationally At Risk species, was found within the DOC land. Growing new plants from seed collected from the impacted specimen may be the only option to address the loss of the red mistletoe within Dutch Creek. However, while growing mistletoe from seed is difficult, suitable beech forest habitat is present within the SEB block for this to occur.

From a fauna perspective, previous surveys have found that twelve nationally Threatened and At Risk species frequent the area close to or within the SEB, including NZ bush falcon, long tailed bats and fernbird. In particular, long-tailed bats were found to utilize the margins of old growth beech forest within the SEB and it is considered likely that bats are roosting in the 53.8 ha of beech forest and beech treeland. Once suitable wetland vegetation along the lake margin has been restored, North Island fernbird, a nationally At Risk – Declining species, could also utilize parts of the SEB as habitat. The 36.88 ha of broadleaved species scrub, putaputawētā – kaikomako – lacebark / *Coprosma rigida* – mānuka scrub, and mānuka - putaputawētā – kaikomako - *Coprosma rigida* scrub will provide suitable habitat for



many indigenous species, including fernbird and lizards, as well as common insectivorous and fructivorous bird species and will continue to develop into beech forest as it matures.

In total, 101.62 ha of indigenous vegetation was found to be ecological significant within the SEB, and an additional 1 ha of indigenous vegetation is on 'Chronically threatened' land environments within the SEB.

16.1 Potential Exchange Areas

Following the design of an indicative fence line, an area of 170 ha containing 125 ha of indigenous vegetation has been proposed for the land exchange (refer Figure 5 & Table 3). In comparison, the DOC land being inundated is

Given that the areas of vegetation on the DOC land are largely within Acutely or Chronically Threatened environments (16.6% and 82.5% respectively) and for the most part, in a less modified ecological state than those habitats within the SEB land, and applying a 'current values' approach to conservation values, it is considered appropriate that the exchange land offered should be a larger area than that lost to achieve the enhancement test. In this case the area of land proposed for the exchange is indicatively 5.6 times larger than the area which would be flooded (subject to survey and fencing arrangements) while the area of indigenous vegetation in the exchange area is 4.5 times larger than the area of indigenous vegetation in the DOC land being inundated. In 2013, the ratio of exchange was calculated using the area of indigenous vegetation in the exchange block and the total area of DOC land being inundated. For comparison, the current proposal yields a ratio of 4.2 using those measurements. This is a slightly reduced exchange ratio to that provided in the 2013 reports (5.5 x) due to an increase in the extent of DOC land loss following identification of additional DOC land near the confluence of the Makaroro River and Dutch Creek in 2025. While the "current value" of the DOC land has changed compared to the 2013 assessment (a greater extent of indigenous vegetation, predominantly beech forest, will be lost), more than two times the extent of beech forest that will be lost is present in the SEB (see Table 3 in Section 6) and therefore this change does not materially affect the assessment of the proposed land exchange.

The exchange land also has a number of features not readily apparent. For example, it would form a buffer and corridor along the newly formed lake and create linkages of a range of representative vegetation types with the Gwavas Conservation Area to the east. If stock are excluded and pests controlled within the SEB land, it would provide higher quality habitat than currently exists for virtually all of the At Risk and Threatened indigenous fauna species within this locality, as well as for a range of more widespread species, such as bellbird, tui and whitehead.

In addition, to ensure that the area of exchange land remains at least as ecologically diverse and functionally intact as that which is to be lost, a number of key management actions over the SEB land are required (assuming that the Department will place some form of permanent legal protection over the land). Key timing for these actions is provided in Table 13. The management actions will be guided by a Management Plan, which will be prepared within 1 year of granting of consent. Management actions to be included in the plan include:

- Fencing to exclude all stock to prevent browsing of indigenous vegetation, pugging, and soil compaction, allow natural regeneration of indigenous species, and improve water quality.
- Long term pest animal control (focussing on possums, but also including other species such as ungulates (particularly deer), mustelids, rats and feral cats) to



improve the quality of indigenous vegetation and indigenous fauna habitats by reducing browsing and predation by exotic mammals.

- Long term pest plant control, notably on-going monitoring and control of wildling pines, to prevent spread of weeds and displacement of indigenous vegetation.
- Indigenous planting in Donovans Gully to increase the extent of indigenous riparian vegetation, shade the waterway, reduce erosion of stream banks, and link existing areas of indigenous vegetation.

These management actions are part of the land exchange and are additional to any works undertaken to mitigate the adverse effects of the proposed dam and reservoir.

Table 13: Timing of proposed key management actions for the Smedley Exchange Block.

Action	Timing
Preparation of SEB Management Plan	Within 1 year of construction commencing on the dam.
Land exchange	Within two years of construction commencing on the dam
Fencing, pest plant and animal pest control, indigenous planting	Starting within one year of construction commencing on the dam, Undertaken for a minimum of 2 years or until land transfer to DOC (whichever is longer).
Transition of management responsibility to DOC	2 years following commencement of SEB management actions

How the SEB is fenced and surveyed from the existing farm operations will require further negotiations with the landowner, the Gwavas Crown Forest Licensor and Licensee and DOC. For example, part of the northern portion of the land which is currently in pasture (c. 24.7 ha refer to Figure 5), will be used as an exchange with Gwavas Crown Forest Licence, so access to this area through the beech forest separating the existing plantation forest and the exchange area would be required. The proposed corridor crosses a small stream gully and covers an area of c. 0.41 ha. Its construction would require the clearing of 0.39 ha of SEB black beech forest, of which 0.13 ha would be beech forest found to be of high ecological value. The clearing of this beech forest area, especially clearing of the ecologically highly valuable component, is not a preferred option due to the associated ecological impact on the valuable indigenous vegetation in this area, but would be required under the current Gwavas Forest Exchange Land negotiations. In order for the access corridor to connect up to existing forestry roads, additional clearing of indigenous forest vegetation outside the SEB property boundary would also be necessary. The area of indigenous vegetation that would be cleared for the accessway has been retained in the comparison between DOC land and the SEB as the comparison is based on 'current values' and any adverse effects associated with creation of the accessway are not associated with the land exchange.

Fence lines will have to follow most practical routes, meaning that some areas of pasture would be included in any exchange, and some areas of indigenous vegetation may be left



out. The fence line will also be extended to the south along the newly formed lake to include the nominal 20 m buffer area as part of the Project's offset package, and this may also be suitable for inclusion in the exchange. Figure 5 also shows the indicative fence line route. Thought should also be given to creating public access to the block, particularly from the newly formed lake, as there are a number of opportunities for public access, with many flat areas and glades found in the beech treeland habitats adjacent to streams in the northern portion, as well as viewpoints along the western ridge.

The Management Plan for the SEB will include, but not be limited to, details on the species to be planted, planting zones, eco-sourcing of plant stock, planting guidelines such as plant sizes, plant spacings, and timing of planting, site preparation, maintenance guidelines, and monitoring to ensure planting success. Planting of indigenous species in Donovan Gully will comprise riparian species already present in the SEB that are fast-growing such as mānuka, as well as climax species such as black beech, podocarps (matai, rimu and miro), and broadleaved tree species. Kōwhai is a feature of the scrub and treeland vegetation found on the banks of the Makaroro River and Dutch Creek. Kōwhai, podocarps and Coprosma species provide important seasonal food supplies for lizards and many indigenous bird species in this locality. Plantings shall also include of high densities of Kōwhai, fruiting Coprosma species and podocarps.

A map of indicative riparian planting areas is provided in Figure 9 based on a 10 m-wide strip on each side of the stream/flow path centreline and around the adjacent wetlands. The area shown on the map covers approximately 3.5 ha, with the available planting area slightly less than this due to existing indigenous trees and shrubs and the width of the stream channel. The planting sites link several areas of existing indigenous vegetation. Planted areas will act as a source for further natural spread of indigenous vegetation in the SEB over time. Planting areas will be refined when the Management Plan is prepared.

Weed control in the SEB will focus on wilding conifers but will include any exotic tree species that could threaten ecological values, including buddleia, Scotch broom, and grey willow which have been recorded in the Smedley Block. Weed monitoring and control will be undertaken annually.



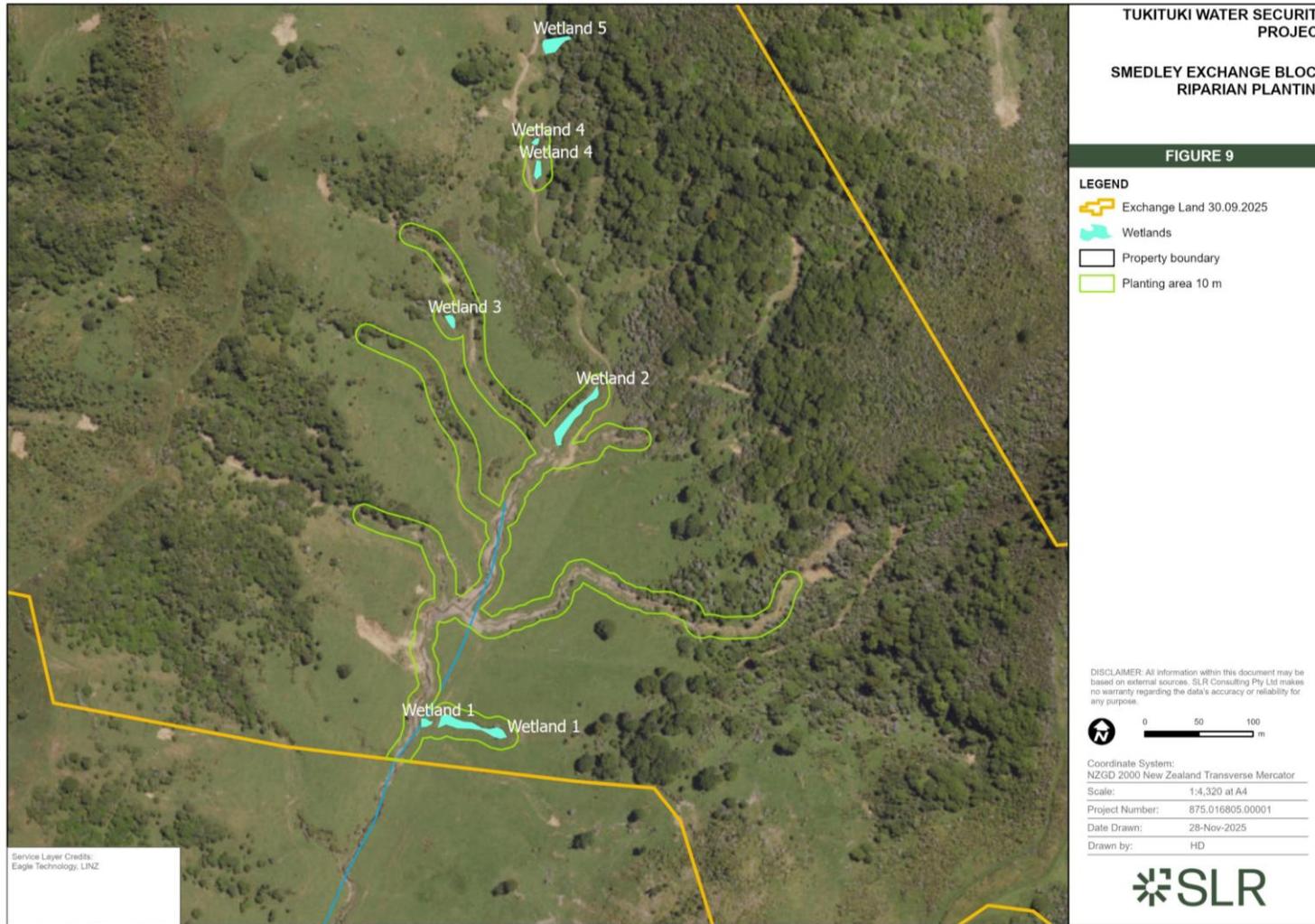


Figure 9: Indicative available riparian planting areas in Donovan Gully



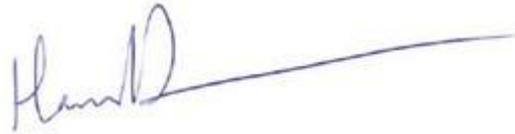
17.0 Closure

Sincerely,

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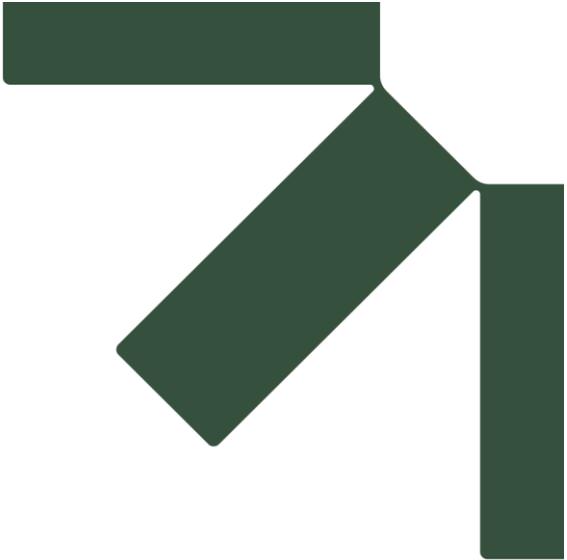
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Appendix A Vascular Plant Species List

Land Exchange Assessment

Tukituki Water Security – Fast Track

Tukituki Water Security Limited

SLR Project No.: 875.016805.00001

28 November 2025

Indigenous Species	Common Name	Growth Form	Makaroro	SEB
<i>Acaena anserinifolia</i>	Bidibid	Dicot herb	X	
<i>Acaena microphylla</i>	Bidibid	Dicot herb		X
<i>Adiantum cunninghamii</i>	Maiden hair fern	Fern	X	
<i>Aristolelia serrata</i>	Makomako, wineberry	Tree	X	X
<i>Asplenium bulbiferum</i>	Hen and chickens fern	Fern	X	X
<i>Asplenium bulbiferum</i> × <i>flaccidum</i>		Fern	X	
<i>Asplenium flaccidum</i>	Hanging spleenwort	Fern	X	X
<i>Asplenium gracillimum</i>	Hen and chickens fern	Fern	X	
<i>Asplenium oblongifolium</i>	Shining spleenwort	Fern	X	
<i>Asplenium polyodon</i>	Sickle spleenwort	Fern	X	X
<i>Astelia fragrans</i>	Bush flax, kakaha	Monocot herb	X	
<i>Astelia solandri</i>	Kōwharawhara	Monocot herb	X	
<i>Astelia</i> species		Monocot herb		X
<i>Austroblechnum lanceolatum</i>	Lance fern, Nini, Rereti	Fern	X	X
<i>Austroblechnum penna-marina</i>	Little hard fern	Fern	X	X
<i>Austroderia fulvida</i>	Kakaho, toetoe	Grass	X	
<i>Baumea tenax</i>	Baumea	Sedge	X	
<i>Brachyglottis repanda</i>	Rangiora	Tree	X	X
<i>Cardamine debilis</i>	New Zealand bitter cress	Dicot herb	X	
<i>Carex geminata</i>	Rautahi	Sedge	X	X
<i>Carex maorica</i>	Māori sedge	Sedge	X	
<i>Carex secta</i>	Pukio	Sedge	X	X
<i>Carex</i> species	Hooked sedge	Sedge	X	X
<i>Carex virgata</i>	Swamp sedge	Sedge	X	
<i>Carmichaelia australis</i>	Native broom, maukoro	Shrub	X	
<i>Carpodetus serratus</i>	Marble leaf, putaputawētā	Tree	X	X
<i>Centella uniflora</i>	Centella	Dicot herb	X	
<i>Cirsium palustre</i>	Marsh thistle	Dicot herb	X	
<i>Clematis forsteri</i>	Small white coprosma	Liane	X	
<i>Clematis paniculata</i>	Clematis, puawānanga	Liane	X	
<i>Clematis</i> species	Clematis	Liane		X
<i>Corybas</i> species		Orchid	X	X
<i>Cranfillia fluviatilis</i>	Kiwakiwa, kiwikiwi	Fern	X	X
<i>Dacrydium cupressinum</i>	Rimu	Tree	X	X
<i>Dianella</i> species		Monocot herb		X
<i>Earina mucronata</i>	Spring orchid, peka a waka	Orchid	X	
<i>Coprosma dumosa</i>		Shrub	X	
<i>Coprosma grandifolia</i>	Kanono	Tree	X	X
<i>Coprosma lucida</i>	Shining karamū	Tree	X	X
<i>Coprosma propinqua</i>	Mingimingi	Tree	X	X
<i>Coprosma rhamnoides</i>		Shrub	X	X



<i>Coprosma rigida</i>		Shrub	X	X
<i>Coprosma robusta</i>	Karamū	Tree	X	X
<i>Coprosma rotundifolia</i>	Round-leaved coprosma	Shrub	X	X
<i>Coprosma tenuifolia</i>	Wavy-leaved coprosma	Tree	X	X
<i>Coprosma × cunninghamii</i>		Tree	X	
<i>Cordyline australis</i>	Cabbage tree, tī kōuka	Monocot tree	X	X
<i>Cordyline banksii</i>	Forest cabbage tree, tī ngahere	Monocot tree	X	
<i>Coriaria arborea</i> var. <i>arborea</i>	Tree tutu	Tree	X	
<i>Corokia cotoneaster</i>	Korokio	Shrub	X	
<i>Cotoneaster</i> sp.	Cotoneaster	Tree	X	
<i>Cyathea dealbata</i>	Ponga, silver fern	Fern	X	
<i>Cyathea smithii</i>	Soft leaved tree fern, kātote	Fern	X	
<i>Dacrycarpus dacrydioides</i>	Kahikatea	Tree	X	X
<i>Dactylis glomerata</i>	Cocksfoot	Grass		X
<i>Dianella nigra</i>	Blueberry, tūrutu	Monocot herb	X	
<i>Dicksonia fibrosa</i>	Whekī-ponga	Fern	X	X
<i>Dicksonia squarrosa</i>	Whekī	Fern	X	X
<i>Doodia australis</i>	Rasp fern	Fern	X	
<i>Elaeocarpus dentatus</i>	Hīnau	Tree		X
<i>Elaeocarpus hookerianus</i>	Pōkākā	Tree	X	
<i>Eleocharis gracilis</i>	Slender spike sedge	Sedge	X	
<i>Ficinia nodosa</i>	Knobby clubrush	Sedge		X
<i>Fuchsia excorticata</i>	Fuchsia, kōtukutuku	Tree	X	X
<i>Fuscospora cliffortioides</i>	Mountain beech	Tree	X	
<i>Fuscospora fusca</i>	Red beech	Tree	X	X
<i>Fuscospora solandri</i>	Black beech	Tree	X	X
<i>Gaultheria antipoda</i>	Snowberry, tāwiniwini	Tree	X	
<i>Geniostoma ligustrifolium</i>	Hangehange	Shrub	X	2
<i>Griselinia littoralis</i>	Broadleaf, kāpuka	Tree	X	
<i>Griselinia</i> species		Tree		X
<i>Haloragis erecta</i>	Shrubby haloragis	Dicot herb	X	
<i>Hedycarya arborea</i>	Porokaiwhiri, pigeonwood	Tree	X	
<i>Helichrysum lanceolatum</i>	Hells bells, Niniao	Shrub	X	X
<i>Histiopteris incisa</i>	Water fern	Fern	X	
<i>Hoheria sexstylosa</i>	Houhere, lacebark	Tree	X	X
<i>Holcus lanatus</i>	Yorkshire fog	Grass	X	X
<i>Huperzia varia</i>	Hanging clubmoss, iwituna	Fern ally	X	
<i>Hydrocotyle</i> species		Dicot herb		X
<i>Hymenophyllum sanguinolentum</i>	Piripiri	Fern		X
<i>Hypolepis ambigua</i>		Fern	X	
<i>Icarus filiformis</i>	Climbing hard fern	Fern	X	
<i>Isolepis reticularis</i>		Sedge	X	
<i>Juncus edgariae</i>	Edgar's rush	Rush		X



<i>Juncus sarophorus</i>	Fan-flowered rush	Sedge	X	
<i>Kunzea robusta</i>	Kānuka	Tree	X	X
<i>Lemna disperma</i>	Common duckweed	Dicot herb	X	
<i>Leptecophylla juniperina</i>		Shrub		X
<i>Leptecophylla juniperina</i> ssp. <i>juniperina</i>		Tree	X	
<i>Leptopteris hymenophylloides</i>	Crepe fern, heruheru	Fern	X	X
<i>Leptospermum scoparium</i> var. <i>scoparium</i>	Mānuka	Tree	X	X
<i>Leucopogon fasciculatus</i>	Mingimingi	Shrub	X	X
<i>Lobelia angulata</i>	Pratia	Dicot herb	X	X
<i>Lomaria discolor</i>	Piupiu, crown fern	Fern	X	
<i>Lophomyrtus obcordata</i>	Rōhutu	Tree	X	
<i>Lotus pedunculatus</i>	Lotus	Dicot herb	X	
<i>Ludwigia palustris</i>	Water purslane	Dicot herb	X	
<i>Luzula</i> sp.		Sedge	X	
<i>Lycopodium volubile</i>	Climbing clubmoss	Fern ally	X	
<i>Machaerina sinclairii</i>	Machaerina	Sedge	X	
<i>Melicope simplex</i>	Poataniwha	Tree	X	X
<i>Melicytus ramiflorus</i>	Māhoe	Tree	X	X
<i>Metrosideros colensoi</i>	Climbing rātā	Liane	X	X
<i>Metrosideros diffusa</i>	Climbing rātā	Liane	X	
<i>Metrosideros perforata</i>	Climbing rātā	Liane	X	
<i>Microlaena avenacea</i>	Bush rice grass	Grass	X	
<i>Muehlenbeckia australis</i>	Pōhuehue	Liane	X	
<i>Myrsine australis</i>	Māpou	Tree	X	X
<i>Myrsine salicina</i>	Toro	Tree	X	
<i>Nertera depressa</i>	Common nertera	Dicot herb	X	
<i>Notelaea cunninghamii</i>	Black maire	Tree	X	
<i>Notelaea neolanceolata</i>	White maire	Tree	X	
<i>Notelaea</i> species	Maire	Tree		X
<i>Notogrammitis heterophylla</i>		Fern		X
<i>Olearia rani</i>	Heketara	Tree		X
<i>Paesia scaberula</i>	Matata, ring fern	Fern	X	
<i>Parablechnum minus</i>	Swamp kiokio	Fern	X	
<i>Parablechnum novae-zelandiae</i>	Kiokio	Fern	X	X
<i>Parsonsia capsularis</i> var. <i>capsularis</i>	Small flowered jasmine	Liane	X	
<i>Parsonsia heterophylla</i>	New Zealand jasmine, kaihua	Liane	X	
<i>Passiflora tetrandra</i>	Kōhia, New Zealand passion flower	Liane		X
<i>Pectinopitys ferruginea</i>	Miro	Tree	X	X
<i>Pellaea rotundifolia</i>	Round-leaved fern	Fern	X	
<i>Pennantia corymbosa</i>	Kaikōmako	Tree	X	X
<i>Peraxilla tetrapetala</i>	Red mistletoe	Tree	X	
<i>Phormium cookianum</i> ssp. <i>cookianum</i>	Mountain flax, wharariki	Monocot herb	X	



<i>Phormium tenax</i>	Flax, harakeke	Monocot herb	X	X
<i>Pittosporum eugenioides</i>	Lemonwood, tarata	Tree	X	
<i>Pittosporum tenuifolium</i>	Köhühū	Tree	X	X
<i>Pneumatopteris pennigera</i>	Gully fern	Fern	X	X
<i>Podocarpus cunninghamii</i>	Hall's tōtara	Tree	X	
<i>Podocarpus totara</i> var. <i>totara</i>	Tōtara	Tree	X	X
<i>Polystichum neozelandicum</i> ssp. <i>zerophyllum</i>		Fern	X	
<i>Polystichum vestitum</i>	Prickly shield fern, pūniu, pūnui	Fern	X	X
<i>Polystichum wawranum</i>		Fern		X
<i>Prumnopitys taxifolia</i>	Mataī	Tree	X	X
<i>Pseudopanax arboreus</i>	Five-finger, whauwhaupaku	Tree	X	X
<i>Pseudopanax crassifolius</i>	Horoeka, lancewood	Tree	X	X
<i>Pseudowintera axillaris</i>	Lowland horopito	Tree		X
<i>Pseudowintera colorata</i>	Mountain horopito	Tree	X	
<i>Pteridium esculentum</i>	Bracken, rārahu	Fern	X	X
<i>Pterostylis graminea</i>	Grass-leaved greenhood	Orchid	X	
<i>Pyrosia eleagnifolia</i>	Leather leaf fern	Fern	X	X
<i>Raukaua anomalus</i>		Shrub		X
<i>Rubus cissoides</i>	Bush lawyer, tātarāmoa	Liane		X
<i>Rubus schmidelioides</i>	Bush lawyer, tātarāmoa	Liane	X	X
<i>Schefflera digitata</i>	Patē	Tree	X	X
<i>Sophora microphylla</i>	Small-leaved kōwhai	Tree	X	X
<i>Sophora tetraptera</i>	Large-leaved kōwhai	Tree	X	
<i>Thelymitra longifolia</i>	White sun orchid	Orchid		X
<i>Tmesipteris elongata</i>	Fork fern	Fern ally	X	
<i>Uncinia</i> sp.	Hook sedge	Sedge	X	
<i>Uncinia uncinata</i>	Hook sedge	Sedge	X	
<i>Veronica</i> sp.		Tree	X	
<i>Veronica stricta</i>	Koromiko	Tree	X	X
<i>Zealandia pustulata</i>	Hound's tongue fern	Fern	X	X
Exotic Species	Common name	Growth Form	Makaroro	SEB
<i>Anthoxanthum odoratum</i>	Sweet vernal	Grass	X	
<i>Berberis glaucocarpa</i>	Barberry	Tree	X	
<i>Bromus hordeaceus</i>	Soft brome	Grass	X	
<i>Buddleja davidii</i>	Buddleia	Tree	X	X
<i>Cirsium vulgare</i>	Scotch thistle	Dicot herb	X	
<i>Cortaderia selloana</i>	Pampas grass	Grass	X	
<i>Cortaderia</i> species		Grass		X
<i>Cytisus scoparius</i>	Scotch broom	Shrub		X
<i>Digitalis purpurea</i>	Foxglove	Dicot herb		X
<i>Glyceria declinata</i>	Blue sweetgrass	Grass		X
<i>Hydrocotyle elongata</i>		Dicot herb	X	
<i>Jacobaea vulgaris</i>	Ragwort	Dicot herb	X	



<i>Juncus articulatus</i>	Jointed rush	Sedge	X	X
<i>Juncus conglomeratus</i>	Soft rush	Sedge	X	
<i>Juncus effusus</i>	Leafless rush	Sedge	X	X
<i>Juncus</i> species	Rush	Rush		X
<i>Ligustrum sinense</i>	Chinese privet	Tree	X	
<i>Lotus pedunculatus</i>	Lotus	Dicot herb		X
<i>Lupinus arboreus</i>	Tree lupin	Tree	X	X
<i>Mycelis muralis</i>	Wall lettuce	Dicot herb	X	X
<i>Myosotis laxa</i> subsp. <i>caespitosa</i>	Water forget-me-not	Dicot herb		X
<i>Myriophyllum aquaticum</i>	Parrot's feather	Dicot herb	X	
<i>Oxalis</i> sp.	Oxalis	Dicot herb	X	
<i>Pinus radiata</i>	Radiata pine	Tree	X	
<i>Plantago lanceolata</i>	Narrow leaved plantain	Dicot herb	X	
<i>Poa annua</i>	Annual poa	Grass	X	
<i>Prunella vulgaris</i>	Self-heal	Dicot herb	X	X
<i>Ranunculus flammula</i>	Spearwort	Dicot herb	X	
<i>Ranunculus repens</i>	Creeping buttercup	Dicot herb	X	X
<i>Rubus fruticosus</i>	Blackberry	Liane	X	X
<i>Rumex</i> sp.	Dock	Dicot herb	X	
<i>Salix cinerea</i>	Grey willow	Tree	X	X
<i>Salix elaeagnos</i>	Bitter willow	Tree	X	
<i>Salix fragilis</i>	Crack willow	Tree	X	
<i>Trifolium repens</i>	White clover	Dicot herb	X	X
<i>Ulex europaeus</i>	Gorse	Tree	X	
<i>Urtica incisa</i>	Stinging nettle	Dicot herb	X	X



Appendix B Guidance for conservation values assessments for land exchanges under the Fast- track Approvals Act 2024

Land Exchange Assessment

Tukituki Water Security – Fast Track

Tukituki Water Security Limited

SLR Project No.: 875.016805.00001

28 November 2025



Attachment 1 – Biodiversity Assessment

Criterion	Definition	Key assessment principles	Assessment Attributes
Representativeness	The extent to which indigenous biodiversity is typical or characteristic of the natural diversity of the relevant Ecological District	<ul style="list-style-type: none"> includes seral (regenerating) indigenous vegetation that is recovering following natural or induced disturbance, provided species composition is typical of that type of indigenous vegetation. Fauna habitat should be considered in terms of how well it supports the typical suite of indigenous animals that would occur in the present-day environment. Habitat of indigenous fauna may be indigenous or exotic. May include commonplace indigenous vegetation and the habitats of indigenous fauna, which is where most indigenous biodiversity is present. It may also include degraded indigenous vegetation, ecosystems and habitats that are typical of what remains in depleted ecological districts. It is not restricted to the best or most representative examples, and it is not a measure of how well that indigenous vegetation or habitat is protected elsewhere in the ecological district. When considering the typical character of an ecological district, any highly developed land or built-up areas should be excluded. Needs to consider indigenous vegetation and habitats that are representative of the full range and extent of ecological diversity across all environmental gradients in an ecological district, such as climate, altitude, landform, and soil sequences. The ecological character and pattern of the indigenous vegetation in the ecological district should be described by reference to the types of indigenous vegetation and the landforms on which it occurs. 	<ol style="list-style-type: none"> The degree to which indigenous vegetation has ecological integrity that is typical of the character of the ecological district. The degree to which habitat that supports a typical suite of indigenous fauna is characteristic of the habitat type in the ecological district and the species expected for that habitat type in the ecological district.
Diversity & Pattern	The extent to which the expected range of diversity and pattern of biological and physical components within the relevant ecological district is present	<ul style="list-style-type: none"> Diversity of biological components is expressed in the variation of species, communities, and ecosystems. Biological diversity is associated with variation in physical components, such as geology, soils/substrate, aspect/exposure, altitude/depth, temperature, and salinity. Pattern includes changes along environmental and landform gradients, such as ecotones and sequences. Natural areas that have a wider range of species, habitats or communities or wider environmental variation due to ecotones, gradients, and sequences in the context of the ecological district, rate more highly under this criterion. 	<ol style="list-style-type: none"> The degree of diversity of indigenous species, vegetation, habitats of indigenous fauna or communities in the context of the ecological district. The quality of indigenous ecotones, complete or partial gradients or sequences.
Rarity & Distinctiveness	The presence of rare or distinctive indigenous taxa, habitats of indigenous fauna, indigenous vegetation or ecosystems	<ul style="list-style-type: none"> Rarity is the scarcity (natural or induced) of indigenous elements: species, habitats, vegetation, or ecosystems. Rarity includes elements that are uncommon or threatened. The list of Threatened and At Risk species is regularly updated by the Department of Conservation. Rarity at a regional or ecological district scale is defined by regional or district lists or determined by expert ecological advice. The significance of nationally listed Threatened and At Risk species should not be downgraded just because they are common within a region or ecological district. Depletion of indigenous vegetation or ecosystems is assessed using ecological districts and land environments. Distinctiveness includes distribution limits, type localities, local endemism, relict distributions, and special ecological or scientific features. 	<p>The degree to which:</p> <ol style="list-style-type: none"> an area provides for habitat of an indigenous species that is listed as Threatened or At Risk (declining) in the New Zealand Threat Classification System lists. an indigenous vegetation type or an indigenous species occurs that is uncommon within the region or ecological district.



Criterion	Definition	Key assessment principles	Assessment Attributes
			<ol style="list-style-type: none"> 3. an indigenous species or plant community at or near its natural distributional limit occurs. 4. indigenous vegetation is present that has been reduced to less than 20 per cent of its pre-human extent in the ecological district, region, or land environment. 5. indigenous vegetation or habitat of indigenous fauna occurs in naturally uncommon ecosystems. 6. the type locality of an indigenous species occurs. 7. a distinctive assemblage or community of indigenous species occurs. 8. a special ecological or scientific feature occurs.
Ecological Context	The extent to which the size, shape, and configuration of an area within the wider surrounding landscape contributes to its ability to maintain indigenous biodiversity or affects the ability of the surrounding landscape to maintain its indigenous biodiversity	<ul style="list-style-type: none"> • Includes the characteristics that help maintain indigenous biodiversity (such as size, shape, and configuration) in the area <p>Includes the contribution the area makes to protecting indigenous biodiversity in the wider landscape (such as by linking, connecting to or buffering other natural areas, providing 'stepping stones' of habitat or maintaining ecological integrity)</p>	<p>The degree to which an area:</p> <ol style="list-style-type: none"> 1. has a robust size and a compact shape 2. is well-buffered 3. provides an important full or partial buffer to, or link between, one or more important habitats of indigenous fauna or significant natural areas 4. is important for the natural functioning of an ecosystem relative to remaining habitats in the ecological district.



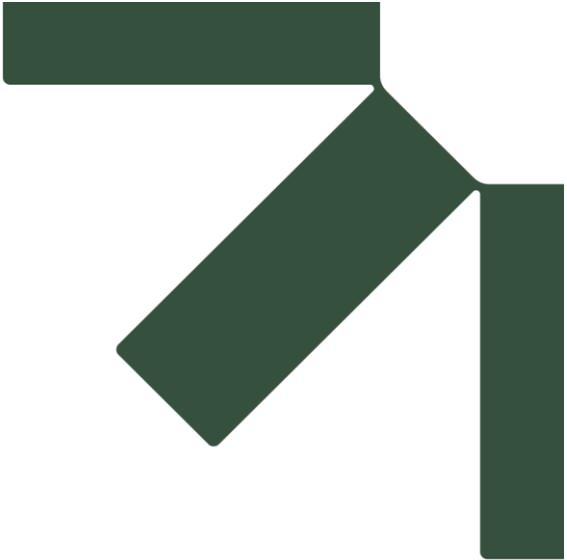
Attachment 2 – Freshwater Assessment

Ecological significance criteria	Data/Resources to assess	ArcReader layers to open	What to look for
Representativeness	1. Check for wetland, lake, river or estuary presence	<ul style="list-style-type: none"> Aerial imagery Topo50_SI REC1 ->RC_Classification FENZv1 wetlands current typology Estuaries -> NZ coastal hydrosystems classification 	Are any freshwater systems present that need to be evaluated, and if so, what type?
	2. Check for wetland, lake, river or estuary significance in Ecological District	<ul style="list-style-type: none"> Management ->Boundaries ->Ecological districts 	Are the FW systems a good example of 'natural state' environment for that region? Are there many others like it in that region? Natural wetlands are rare (nationally)so if they are present they are significant.
	3. Check for wetland, lake or river naturalness	<ul style="list-style-type: none"> Aerial imagery Species ->Macroinvertebrates-> Predicted Invertebrate MCI ->Contemporary Invertebrate MCI 	Are the FW systems in their natural state or are they modified based on aerial photography? Are the FW systems in their natural state based on predicted MCI score = higher MCI = high naturalness for streams.
Diversity and Pattern	4. Check for ecosystem/habitat diversity and pattern	<ul style="list-style-type: none"> Aerial imagery Do the FW ecosystems in the land parcel support a range of habitat types? 	
	5. Check for species diversity	<ul style="list-style-type: none"> Fish -> NZFFD Fish -> spawning sites Threatened invertebrates Species -> Waterbirds 	Would you expect the FW ecosystem to support relatively good species diversity? If no species records in the parcel, look in similar habitats nearby, and upstream and downstream in the catchment and similar catchments for migratory species. Supply species list here (diversity)
Rarity and distinctiveness	6. Check for threatened freshwater/land environments and rare ecosystems	<ul style="list-style-type: none"> Terrestrial -> LENZ Threatened environments classification Naturally Uncommon Ecosystems 	Are the FW ecosystems situated in a region of highly threatened habitat? Are any of the FW ecosystems a Naturally Rare/Uncommon ecosystem type in NZ?
	7. Check for actual or predicted threatened species presence	<ul style="list-style-type: none"> NZFFD Threatened invertebrates 	Threatened species present = high ranking. High proportion of known distribution of At Risk species in parcel or several At Risk species present = high ranking.



Ecological significance criteria	Data/Resources to assess	ArcReader layers to open	What to look for
Ecological context (size, shape, connectivity, buffering)	8. Evaluate ecological context	<ul style="list-style-type: none"> • Aerial imagery • Other public conservation land • Nga Awa -> DOC Nga Awa sites • EMUs • Wetland, River, Lake, Estuary mapping • Community restoration • Nga Whenua (Māori covenant/protected areas) 	<p>Look at the catchment and management context. Does the area provide an important ecological buffer, or connectivity, that supports the ecological health of adjacent or downstream FW ecosystems?</p> <p>E.g. If within a Nga Awa catchment, supports connectivity for fish passage, or has important role in buffering downstream wetlands, lakes or estuary =high ranking.</p>





Appendix C Stream Rapid Habitat Assessments

Land Exchange Assessment

Tukituki Water Security – Fast Track

Tukituki Water Security Limited

SLR Project No.: 875.016805.00001

28 November 2025

From Tukituki eDNA 100m upstream
ends at RHAaul

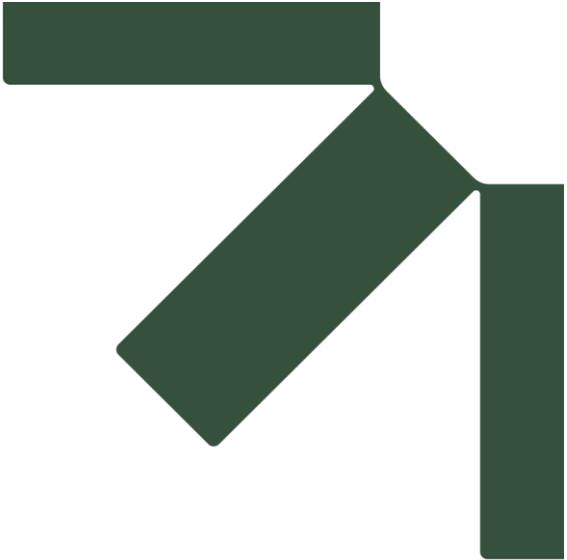
River Habitat Assessment (RHA) Field Recording Sheet

Habitat parameter	Condition category										SCORE
1. Deposited sediment	The percentage of the stream bed covered by fine sediment.										3
SCORE	0	5	10	15	20	30	40	50	60	≥ 75	
SCORE	10	9	8	7	6	5	4	3	2	1	
2. Invertebrate habitat diversity	The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.										5
SCORE	≥ 5	5	4	4	3	3	2	2	1		
SCORE	10	9	8	7	6	5	4	3	2	1	
3. Invertebrate habitat abundance	The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.										8
SCORE	95	75	70	60	50	40	30	25	15	5	
SCORE	10	9	8	7	6	5	4	3	2	1	
4. Fish cover diversity	The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.										8
SCORE	≥ 5	5	4	4	3	3	2	2	1		
SCORE	10	9	8	7	6	5	4	3	2	1	
5. Fish cover abundance	The percentage of fish cover available.										8
SCORE	95	75	60	50	40	30	20	10	5	0	
SCORE	10	9	8	7	6	5	4	3	2	1	
6. Hydraulic heterogeneity	The number of of hydraulic components such as pool, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater. Presence of deep pools score higher.										2
SCORE	≥ 5	5	4	4	3	3	2	2	1		
SCORE	10	9	8	7	6	5	4	3	2	1	
7. Bank erosion	The percentage of the stream bank recently/actively eroding due to scouring at the water line, stumping of the bank or stock pugging.										7.5
Left bank	0	≤ 5	5	15	25	35	50	65	75	> 75	
Right bank	0	≤ 5	5	15	25	35	50	65	75	> 75	
SCORE	10	9	8	7	6	5	4	3	2	1	
8. Bank vegetation	The maturity, diversity and naturalness of bank vegetation.										2
Left bank AND Right bank	Mature native trees with diverse and intact understorey	Regenerating native or flaxes/sedges/tussock > dense exotic	Mature shrubs, sparse tree cover > young exotic, long grass	Heavily grazed or mown grass > bare/impervious ground.							
SCORE	10	9	8	7	6	5	4	3	2	1	
9. Riparian width	The width (m) of the riparian buffer constrained by vegetation, fence or other structure(s).										9.1
Left bank	≥ 30	15	10	7	5	4	3	2	1	0	
Right bank	≥ 30	15	10	7	5	4	3	2	1	0	
SCORE	10	9	8	7	6	5	4	3	2	1	
10. Riparian shade	The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).										1
SCORE	≥ 90	80	70	60	50	40	25	15	10	≤ 5	
SCORE	10	9	8	7	6	5	4	3	2	1	
TOTAL	(Sum of parameters 1-10)										45.5

B = DNA 2 u/s 100m to RHA 2

River Habitat Assessment (RHA) Field Recording Sheet

Habitat parameter	Condition category										SCORE
1. Deposited sediment	The percentage of the stream bed covered by fine sediment.										9
SCORE	0	5	10	15	20	30	40	50	60	≥ 75	
2. Invertebrate habitat diversity	The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.										10
SCORE	≤ 2	3	4	5	6	7	8	9	10	11	
3. Invertebrate habitat abundance	The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.										9
SCORE	95	75	60	50	40	30	25	15	5	0	
4. Fish cover diversity	The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.										8
SCORE	≥ 5	5	4	4	3	3	2	2	1	0	
5. Fish cover abundance	The percentage of fish cover available.										7
SCORE	95	75	60	50	40	30	20	10	5	0	
6. Hydraulic heterogeneity	The number of hydraulic components such as pool, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater. Presence of deep pools score higher.										6
SCORE	≥ 5	5	4	4	3	3	2	2	2	1	
7. Bank erosion	The percentage of the stream bank recently/actively eroding due to scouring at the water line, stumping of the bank or stock pugging.										9
Left bank	0	5	5	15	25	35	50	65	75	> 75	
Right bank	0	5	5	15	25	35	50	65	75	> 75	
8. Bank vegetation	The maturity, diversity and naturalness of bank vegetation.										4
Left bank AND Right bank	Mature native trees with diverse and intact understory	Regenerating native or flaxes/sedges/tussock > dense exotic	Mature shrubs, sparse tree cover > young exotic, long grass	Heavily grazed or mown grass > bare/impervious ground.							
SCORE	10	9	8	7	6	5	4	3	2	1	
9. Riparian width	The width (m) of the riparian buffer constrained by vegetation, fence or other structure(s).										1
Left bank	≥ 30	15	10	7	5	4	3	2	1	0	
Right bank	≥ 30	15	10	7	5	4	3	2	1	0	
SCORE	10	9	8	7	6	5	4	3	2	1	
10. Riparian shade	The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).										5
SCORE	≥ 90	80	70	60	50	40	25	15	10	≤ 5	
TOTAL	(Sum of parameters 1-10)										68



Appendix D Vegetation Survey Plots

Land Exchange Assessment

Tukituki Water Security – Fast Track

Tukituki Water Security Limited

SLR Project No.: 875.016805.00001

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DOC land

One 20 × 20 m vegetation survey plot (TER2) was established in black beech forest habitat in DOC land that will be inundated.

This site, at the confluence of Dutch Creek and the Makaroro River, has large matai (>25 m in height) and the occasional kahikatea emerge above the black beech canopy, with red beech and rimu forming a small canopy component (Photo 13). The sub-canopy was dominated by black beech, maire, lancewood, and māpou. The shrub layer was diverse, with māpou and kanono common. The ground was covered in ferns (the commonest being hen and chicken fern and kiwikiwi), and a diverse range of tree seedlings.

The average canopy height is about 20 m (compared to 12 m in RECCE Plot 1 in beech forest near the dam site, outside DOC land). Diameter at breast height (DBH) measurements for black beech trees within RECCE Plot TER2 ranged from 9 to 95 cm (compared to between 53 and 78 cm DBH in Plot TER1). Matai was measured in Plot TER2 between 48 and 70 cm DBH, and red beech and kahikatea in Plot TER2 were measured at 75 and 95 cm DBH, respectively. The total sapling count was 53, with the majority (~ 70%) of these being kanono and māhoe.



Photo 13: RECCE Plot 2 is located in this area of black beech forest containing large podocarps at the confluence of Dutch Creek (at left) and Makaroro River.

SEB

Two 20 × 20 m vegetation survey plots were established in black beech forest habitat within the SEB. Plot SEB1 was set in an area from which stock had been excluded, while Plot SEB2 was placed in an area where stock had unrestricted access.



In both cases, black beech was the dominant canopy species, with an average height of 20 m (Figure 10). The canopy in Plot SEB1 also contained small amounts of tōtara and rimu, while rimu was only recorded in the sub-canopy of Plot SEB2. The main difference between the two plots was the reduced understory in Plot SEB2. Notably, Plot SEB1 exhibited a richer diversity of small to medium sized shrubs such as different *Coprosma* species, prickly mingimingi (*Leptecophylla juniperina*), mingimingi, and māpou. The average DBH of black beech in Plots SEB1 and SEB2 was 21.9 cm and 45.9 cm respectively. The average DBH of rimu in plots 1 and 2 was 5.9 cm and 8.6 cm respectively. Sapling counts conducted within each plot found a total of 38 saplings in Plot SEB1 and none in Plot SEB2. The majority of these saplings (~ 58%) were mingimingi, māpou and mānuka (*Leptospermum scoparium*) in approximately equal amounts. In contrast, seedling counts for both plots showed a larger number of seedlings in the more open Plot SEB2, the majority of which were *Coprosma rhamnoides*.



Photo 14: Left: Black beech forest at vegetation survey Plot SEB1. Right: Black beech forest at vegetation survey Plot SEB2.



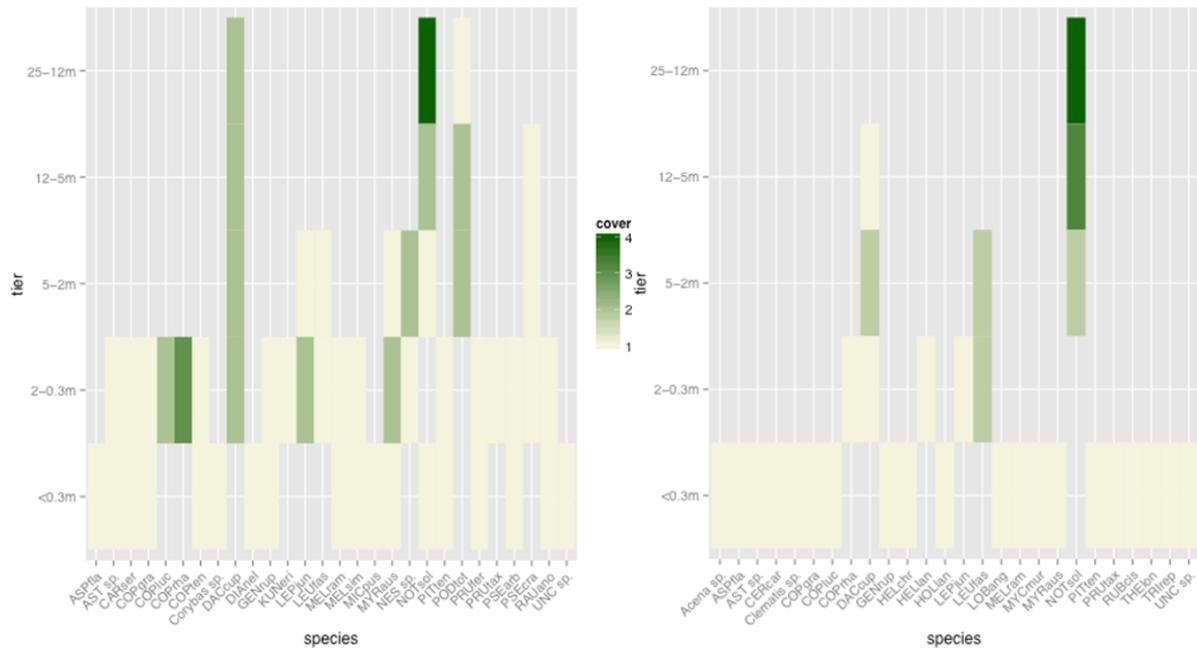


Figure 10: Foliage cover scores for live vegetation in each height tier for vegetation in RECCE Plot 1 (stock excluded; left) and RECCE Plot 2 (unfenced; right) in the SEB; cover classes: 1 = <1%; 2 = 1-5%; 3 = 6-25%, 4 = 26-50%, 5 = 51-75% (Kessels Ecology 2013)



Appendix E Vegetation Maps

Land Exchange Assessment

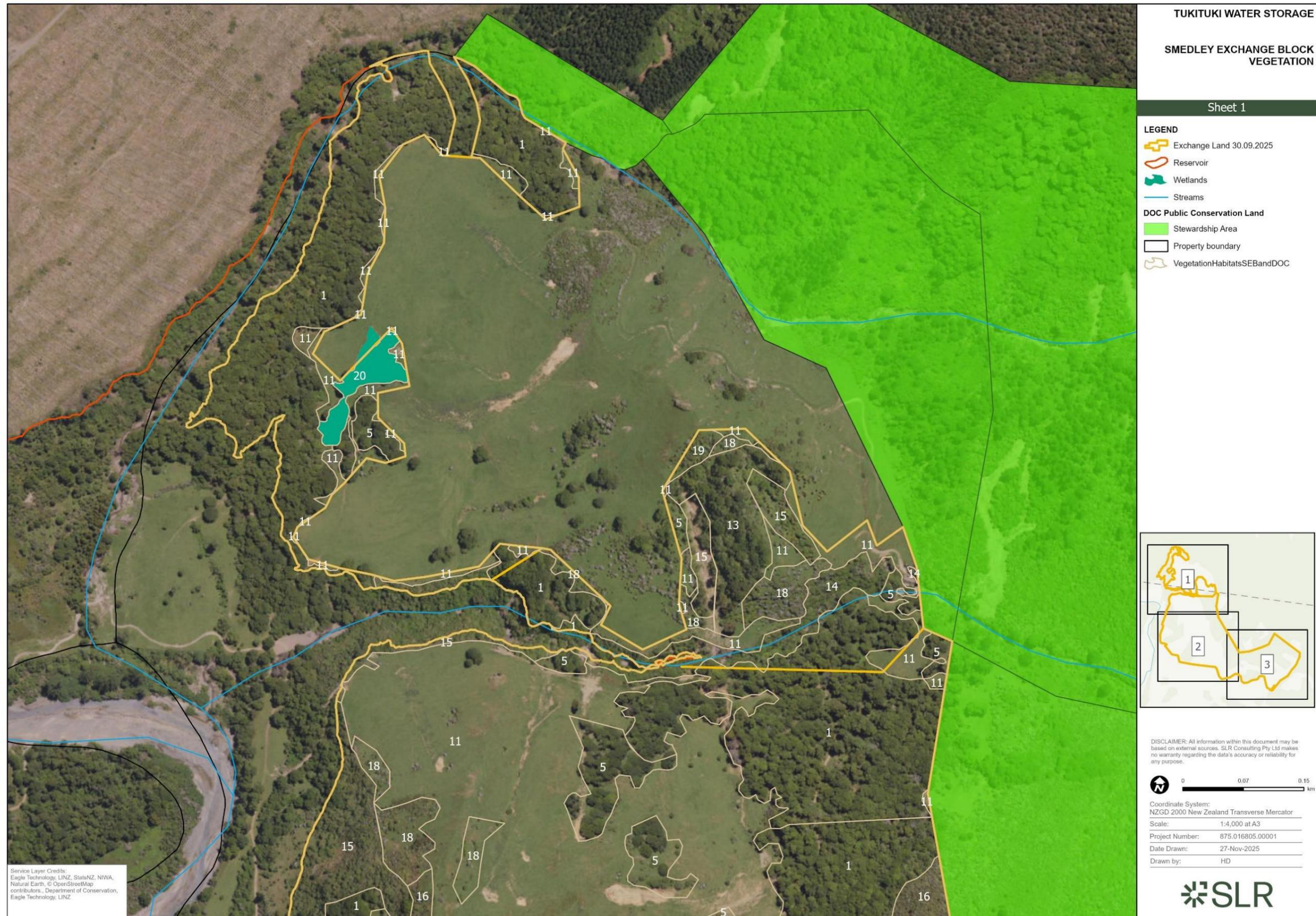
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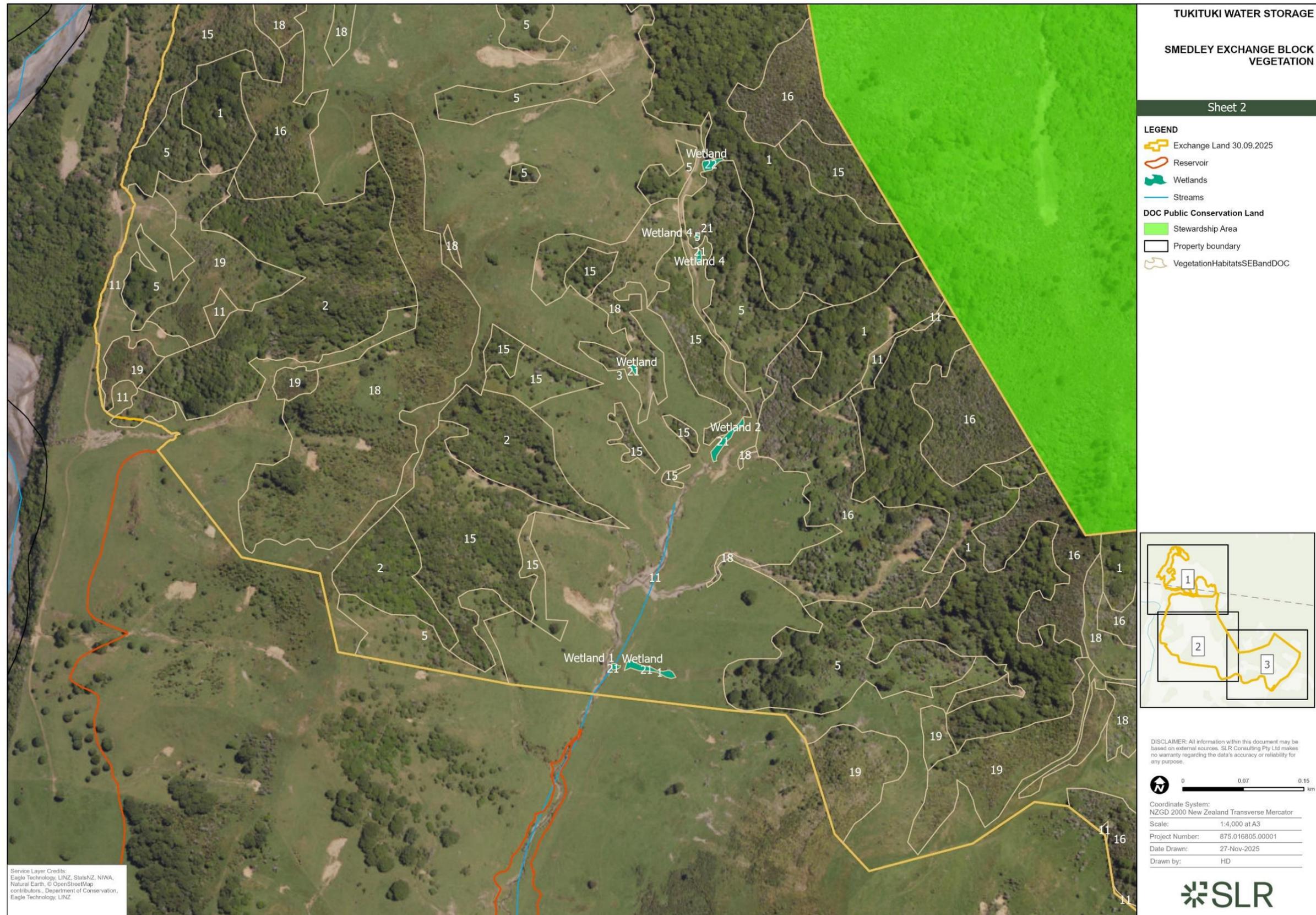
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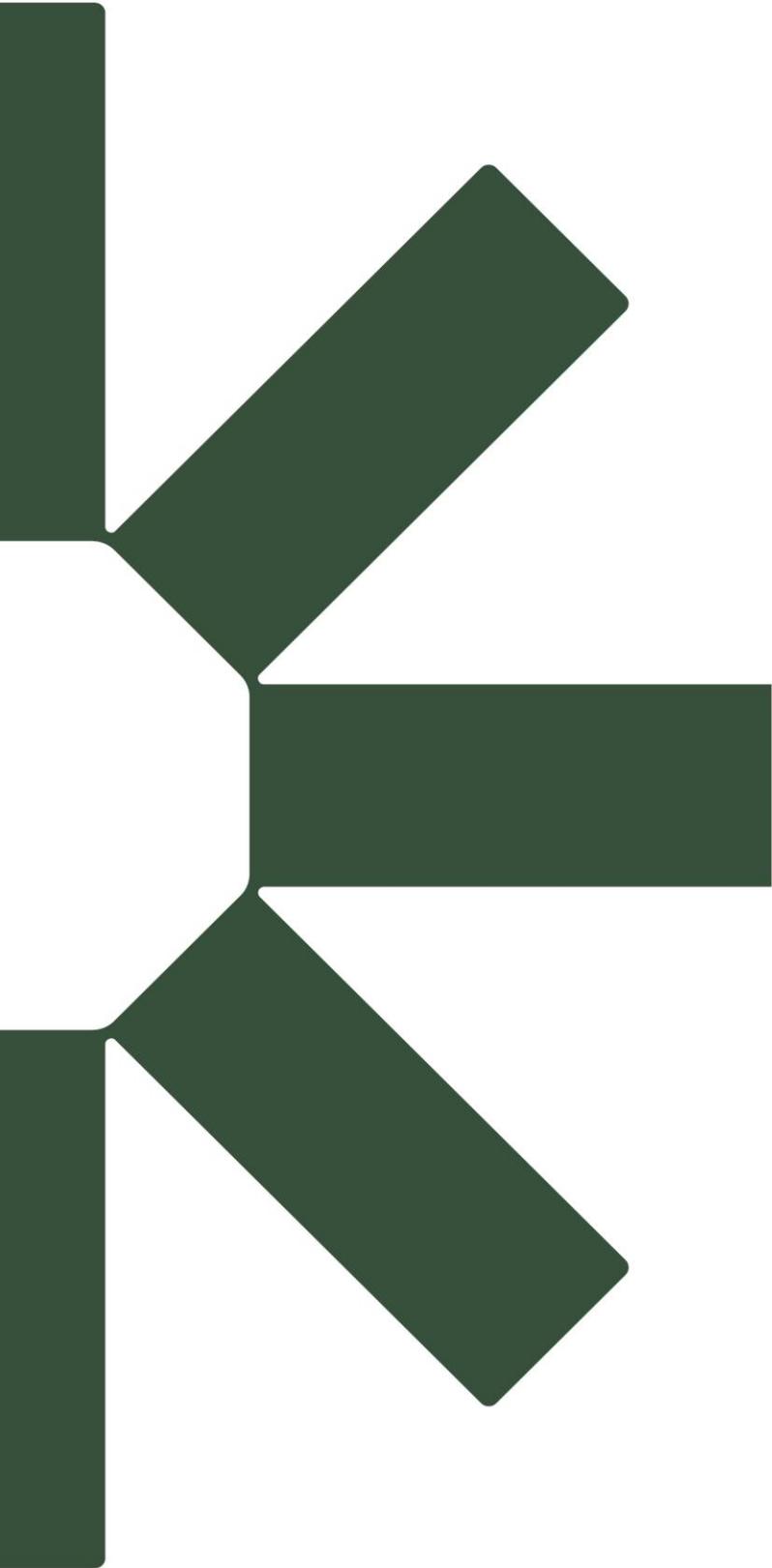
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