Appendix C – Wetland Delineation Assessment

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From:	Alice Wheatley-Wilson (Graduate Environmental Scientist, BTW)				
Date:	29th June 2022	**BTW Job Number:**	211365	**Client Reference**	2025 Ohaupo Road, Te Awamutu

Subject: 2025 Ohaupo Road – Wetland Delineation Assessment

OVERVIEW

Ultimate Holdings Ltd (the client) has engaged BTW Company Limited (BTW) to assess the habitat within the subject site indicated in Figure 1, which has been identified as supporting potential wetland habitat. The subject site is positioned within the Waipa Stream catchment, North of Te Awamutu, Waikato. The total site area is approximately 25.78 Ha and is being investigated by the client for a proposed subdivision. Potential wetland habitats were identified in the western end of the site during a previous preliminary site assessment in December 2021, with further assessment and delineation required[1].

Earthworks are required to enable the proposed subdivision. These earthworks may include land contouring and development on or near the adjacent potential wetland areas. Additionally, these potential earthworks inform and facilitate the anticipated Private Plan Change. A wetland habitat assessment under the National Policy Statement for Freshwater Management 2020 (NPS-FM 2020) was therefore required. Earthworks within a natural wetland is a prohibited activity if it results, or is likely to result, in the complete or partial drainage of all or part of a natural wetland and does not have another status under any of regulations 38 to 51 (Clause 53(1), NES-FW). Further, earthworks within, or within a 10 m setback from, a natural wetland is a non-complying activity (Clause 51(b), NES-FW) and would require resource consent. The discharge of water within 100 m of any natural wetlands would also need to be considered in any stormwater design associated with the subdivision. The impacts and change in stormwater and overland flow that would result from the proposed subdivision have not been assessed in this memo and will require further assessment by a suitably qualified hydrologist or stormwater engineer.

[1] Preliminary Site Investigation (PSI) at 2025 Ohaupo, Te Awamutu (2021). BTW Company Ltd.

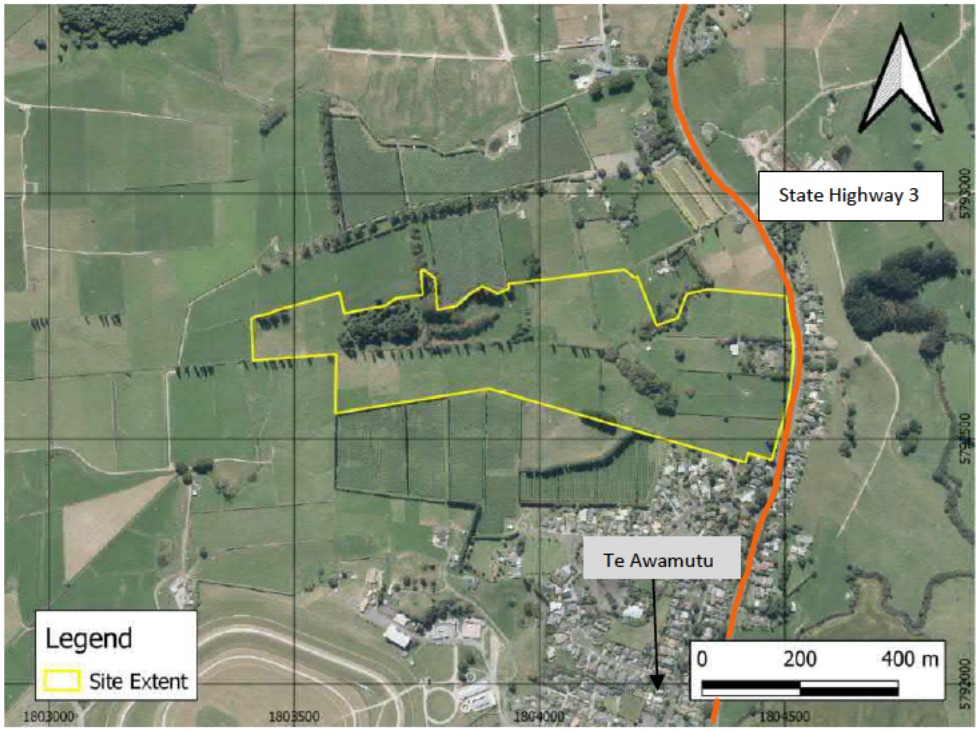

Figure 1: Site overview and extents

Scope of works

1. Identify and characterise wetlands in the context of the surrounding environment using national methods for delineating wetlands on site under the NPS-FM 2020 and undertake a risk assessment.

The scope of works included the following:

- Site visit, including vegetation identification within the subject site and soil assessment.
- Assessment of habitat within the subject site against wetland definitions set out in the following documents:
  - Resource Management Act 1991 (RMA)
  - NPS-FM 2020
- Wetland delineation assessment within the subject site in accordance with the following protocols:
  - Wetland delineation protocols 2020[2]
  - Wetland delineation hydrology tool for Aotearoa New Zealand[3]
  - Hydric soils[4] – field identification guide[5]

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[2] Ministry for the Environment (2020). ***Wetland delineation protocols.*** Published in August 2020 by the Ministry for the Environment. Publication number ME 1515. Wellington: Ministry for the Environment.

[3] Ministry for the Environment (2021). ***Wetland delineation hydrology tool for Aotearoa New Zealand.*** Published July 2021 by the Ministry for the Environment. Publication number ME 1575. Wellington: Ministry for the Environment.

[4] 'Hydric soils' is a general term for soils that are poorly or very poorly drained and have a water table above, at, or near the surface long enough during the growing season to develop anaerobic conditions in the upper layers.

[5] Fraser, S., Singleton, P., & Clarkson, B. (2018). ***Hydric soils – field identification guide***. Contract Report: LC3233. Prepared for Tasman District Council.

- A vegetation tool for wetland delineation in New Zealand[6]

Wetland Definitions

The following wetland definitions are currently used within New Zealand:

- The ***Resource Management Act 1991*** defines wetlands as including *"permanently or **intermittently wet areas, shallow water, and land water margins that support a natural** ecosystem of plants and animals that are adapted to wet conditions"*.
- The following, more rigorous, wetland definitions are provided in Section 3.21 of the NPS-FM 2020:

  Natural wetland means a wetland (as defined in the Act) that is not:

  (a) a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or

  (b) a geothermal wetland; or

  (c) any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain-derived water pooling

  Natural inland wetland means a natural wetland that is not in the coastal marine area.

- ***Hydrophytes (hydrophytic vegetation) are plant species capable of growing in soils that are permanently or intermittently saturated with water during the growing season. The hydrophyte categories (wetland indicator status ratings: Clarkson 2013 and subsequent updates) are:***
  - ***Obligate (OBL): occurs almost always in wetlands (estimated probability >99% in wetlands)***
  - ***Facultative Wetland (FACW): occurs usually in wetlands (67–99%)***
  - ***Facultative (FAC): equally likely to occur in wetlands or non-wetlands (34–66%)***
  - ***Facultative Upland (FACU): occurs occasionally in wetlands (1–33%)***
  - ***Upland (UPL): rarely occurs in wetlands (****<1%), almost always in 'uplands' (non-**wetlands)***

Proposed changes to definitions

An exposure draft of the proposed changes to the NPS-FM[7] and NES-F[8] (including wetland regulations) has been released to show the amendments to wetland provisions in response to feedback on the managing our wetlands consultation process (2021)[9]. The proposals consulted on were clarifications to the definition of a 'natural wetland', consent pathways for additional sectors, including subdivisions, refinements to the restoration policies, and recognition of maintenance and biosecurity activities.

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[6] Clarkson, B. (2013). ***A vegetation tool for wetland delineation in New Zealand***. Prepared by Landcare Research Contract for Meridian Energy Limited. Landcare Research Contract Report LC1793.

[7] Exposure draft of amendments to the National Policy Statement for Freshwater Management 2020. DOI: https://consult.environment.govt.nz/freshwater/npsfm-and-nesf-exposure-draft/user_uploads/exposure-draft-changes-to-npsfm-2020.pdf

[8] Exposure draft of changes to the National Environmental Standards for Freshwater 2020. DOI: https://consult.environment.govt.nz/freshwater/npsfm-and-nesf-exposure-draft/user_uploads/exposure-draft-changes-to-rm-nesf-regulations-2020.pdf

[9] For background and further detail refer to: Managing our Wetlands: Policy rationale for exposure draft amendments 2022. DOI: https://environment.govt.nz/assets/publications/managing-our-wetlands-policy-rationale-exposure-draft-amendments-31May2022.pdf

Part c of the proposed new wetland definition excludes:

(c) any area of pasture that has more than 50 percent ground cover comprising exotic pasture species or exotic species associated with pasture.

The intention of this change, which excludes the "and is subject to temporary rain derived water pooling" clause, is to better acknowledge the original intent that wet pasture areas, even if they were once 'natural wetlands', are now highly modified environments and should be able to continue their current use or be able to shift in land use.

SITE DESCRIPTION AND GENERAL OBSERVATIONS

A site visit was undertaken by a suitably qualified and experienced ecologist from BTW Company on 26th May 2022, under fine weather conditions. Vegetation, soil and hydrologic conditions appeared to be normal for this time of year.

The mean monthly rainfall between 1981 and 2010 for Hamilton for February, March and April are 68.7, 79.4, and 80.3 mm, respectively[10]. The total rainfall at the nearest WRC rainfall monitoring site (Bartons Corner Rd Bridge) for February, March, and April 2022 were 93, 57, and 10.5 mm[11]. Dry conditions preceded the site visit. The MfE (2021) guidelines recommend that site visits should not be undertaken within two weeks of an extreme weather event. Rainfall recorded at the WRC Barton's Corner Bridge rainfall monitoring stations within two weeks of the site visit were considered normal. The most recent rainfall event prior to the site visit was recorded at 3.5 mm (daily total) on 23rd May 2022, which is not considered to be an extreme weather event. Given that "normal conditions" were present at the time of the site visit, the MfE protocols and their assumptions can be applied to the subject site.

The potential wetland habitats are what remains of the historic marsh that once extended across the low elevation lowlands of Te Awamutu, bordering the Mangapiko stream.The subject site is situated in the middle of the Waipa catchment in Hamilton, Waikato. Thirteen putative wetland areas contained within the site (Ohaupo_WL1–13; Figure 2) were identified and assessed in the field. The marshlands are visible on-site in 1943 historic imagery[12]. The site's central drain discharges in the west of the property into a tributary of the Mangapiko Stream, which eventually discharges into the Waipa River at Pirongia (Figure 2). These wetlands are the main source feeders for the unknown tributary. The survey extent terminated at the property boundary; any wetland boundaries may therefore extend onto neighbouring properties.

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[10] NIWA (2022)/ Mean monthly rainfall (mm). Retrieved from: https://niwa.co.nz/education-and-training/schools/resoures/climate/meanrain on 3 June 2022.

[11] Waikato Regional Council (2022). Puniu River – Barton's Corner Road Bridge – Rainfall. Retrieved from: waikatoregion.govt.nz/environment/envirohub/environmental-maps-and-data/station/41893/RF?dt=Rainfall on 2 ne 2022.

[12] Appendix B. Preliminary Site Investigation (PSI) at 2025 Ohaupo, Te Awamutu (2021). BTW Company Ltd.

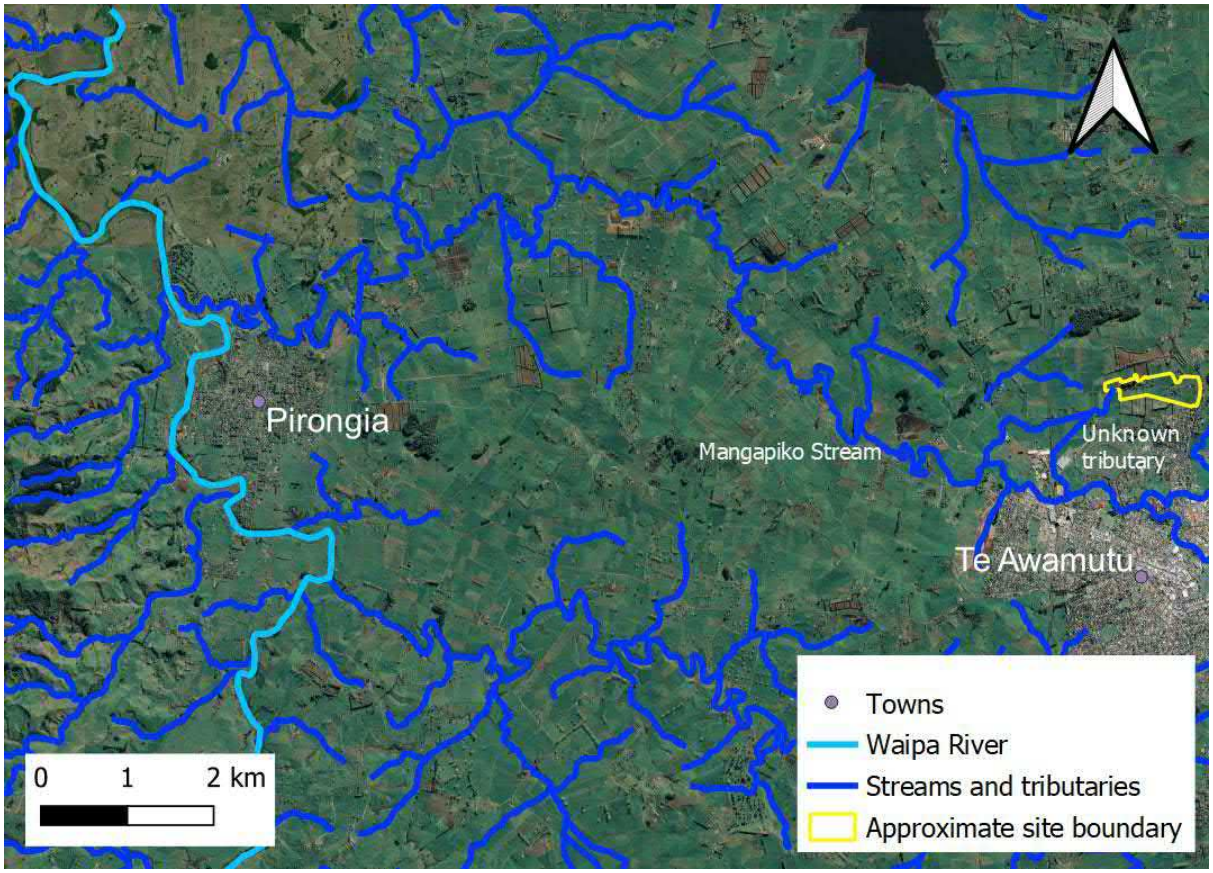

Figure 2: Map of river and stream centrelines within close proximity to the site (yellow outline)

The current land use at the site is pastoral agriculture[1]. Vegetation observed on-site include a kahikatea stand and three mature eucalyptus trees towards the western end of the site, poplars lining the central drain, and patches of exotic forest throughout the site. Pest vegetation species included woolly nightshade. Although the kahikatea stand is currently 1ha, the extent of this indigenous hardwood forest has decreased since 2002[13]. A significant area exists northwest of site in the catchment surrounding Lake Ngaroto.

WETLAND ASSESSMENT METHODOLOGY

The NPS-FM refers to the Ministry of the Environment (MfE) 2021 wetland delineation protocols in order to determine the status of wetlands. The delineation protocol set out in Figure 3 summarises the most recent wetland delineation guidance provided by MfE. This protocol builds on and integrates guidance included in preceding wetland delineation protocols[2]. This delineation protocol includes four key steps and uses the hydrophytic vegetation, hydric soils and wetland hydrology tools. The major vegetation type(s) at the site were mapped and assessed according to the methodology set out in Figure 3 to delineate the extent of any wetlands.

The protocol for determining the presence of hydrophytic vegetation is summarised in Figure 4[2]. The hydric soils and wetland hydrology tools referred to in Figure 3[5,3], respectively, are summarised in Figure 5 and Figure 6. Wetland hydrology (ponding and inundation) was determined using the Wetland Delineation Hydrology Tool which requires one primary indicator or two secondary indicators to be present to be considered consistent with wetland hydrology[14]. Representative vegetation plots were established within each major vegetation

[13] Waikato Reginal Council Intramaps. DOI: https://waikatomaps.waikatoregion.govt.nz/Gallery/

[14] Ministry for the Environment. (2021). ***Wetland Delineation Hydrology Tool for Aotearoa New Zealand.*** Wellington: Ministry for the Environment.

type and assessed in accordance with these protocols, which is the standard onsite method used for small potential wetland areas (≤2 ha)[2].

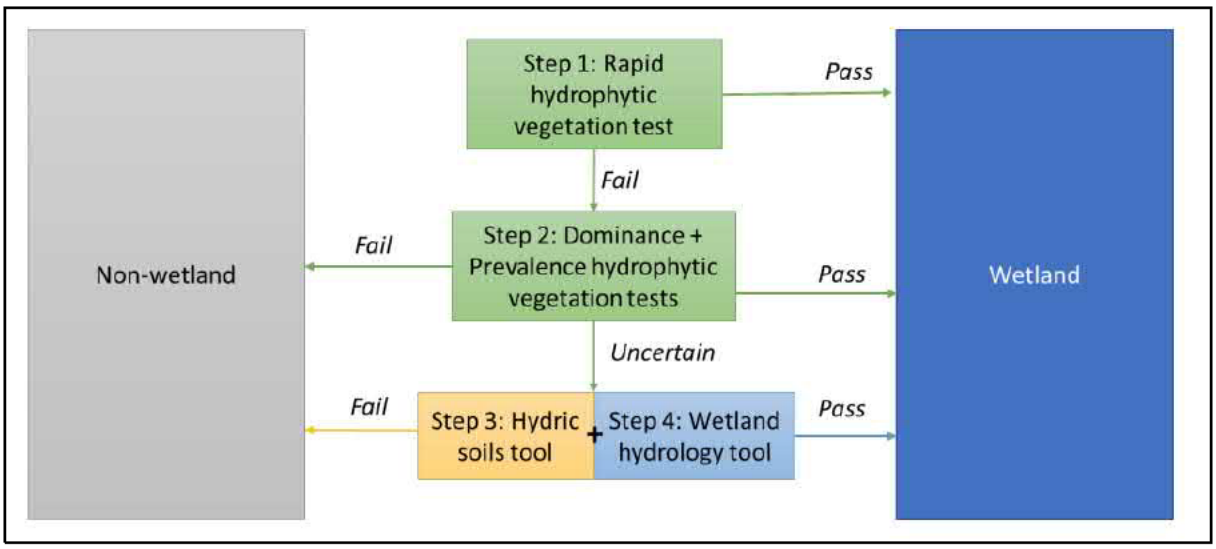

Figure 3: Four steps for delineating wetlands using the hydrophytic vegetation, hydric soils and wetland hydrology tools (retrieved from MfE, 2021).

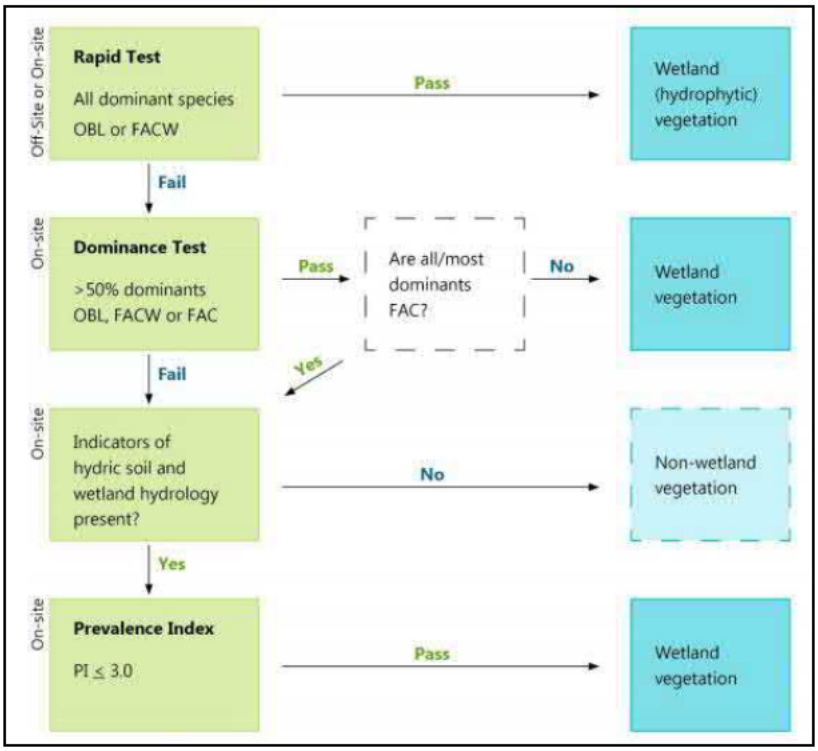

Figure 4: Flow chart of steps for hydrophytic (wetland) vegetation determination. Wetland indicator status abbreviations: FAC= facultative; FACW = facultative wetland; OBL = obligate wetland. Retrieved from the Wetland Delineation Protocols 2020 (MfE, 2020).

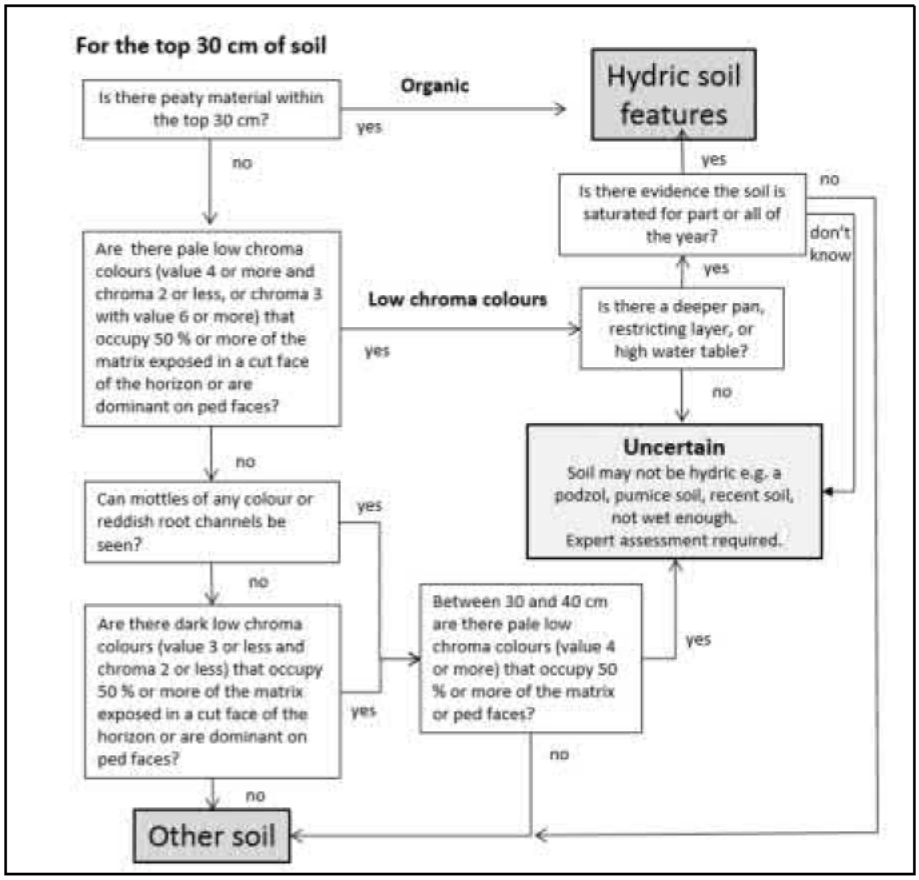

Figure 5: Simple key to identifying hydric soil features[5].

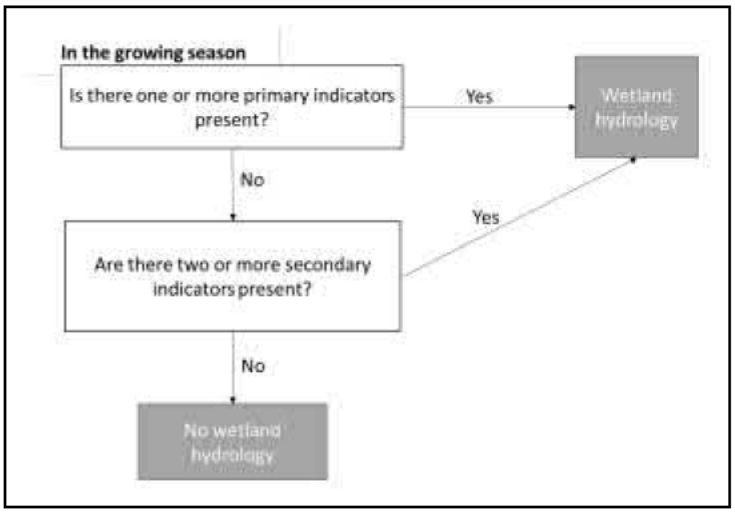

Figure 6: Simple key to describing wetland hydrology[3].

In accordance with the Wetland Delineation Protocols 2020[2], a conservative approach to delineation was taken. The in-field assessment involved a combination of observing obvious changes in vegetation (the first examples of wetland vegetation at the site), soil structure, and elevation/topography. The potential wetland habitats observed on site were divided into thirteen due to varying changes in these variables (e.g., hydrology, hydrophytic vegetation, hydric soils) within the assessment area. Each assessment was assigned a name (for example Ohaupo_WL1–13) and were grouped spatially for the wetland assessment (see below).

Vegetation on the boundary and 100 m downstream of the headwaters were not assessed under the Wetland Delineation Protocols (WDP's). This area is contained within the

transitioning riverine landscape of the unnamed tributary, with the hydrology, soil structure, elevation/topography, and observed fauna supporting this assessment.

UAV Data Capture and Aerial Imagery Outputs

The vegetation units were demarcated using a combination of infield 'boots on the ground' and aerial imagery. Using UAV[15] technology, aerial imagery was captured including false colour composites (FCC), colour infrared (CIR), RGB[16], digital terrain model indices, and topographic indices.

The BTW UAV set-up included a high resolution RGB camera, multispectral cameras, externally mounted downwelling light sensor (DLS), and GPS modules. Multispectral sensors are used for a range of applications, such as fertiliser management, crop health mapping, weed detection, and water management and leak scouting. These sensors simultaneously capture red, green, blue, red-edge, and near-infrared (NIR) bands. The captured bands can be used to create indices and colour composites imagery for the detection of potential wetland areas. Topographic wetness and digital terrain indices are used to illustrate topographic controls on hydrological processes, while colour composite imagery outputs are used to reveal and enhance visibility of water features that are not immediately visible to the human eye. These indices and composite images provide data that highlights variations in ground cover, surface darkening, and vegetation growth influenced by differences in water presence variations and surface water features.

RESULTS

The putative wetlands were a network of fragmented remnants of the historical marsh. The Digital Terrain Model (Appendix A) and Topographical Wetland Index (TWI) imagery were assessed and highlighted the likely locations of water pooling. Indices suggest the potential wetlands were located in low-lying areas on site and each remnant was no larger than 250 m^2.

There are clear indications of drainage across the entire site, including attempts near some of the potential wetlands outlined in this study. For example, in Figure WL12 f) underground drainage piping originating from upslope and discharging into a nearby downslope drain is visible.

General Site Assessment

Vegetation plots were set up at ten of thirteen sites, with the exception of Ohaupo_WL10 (assessed as not a wetland in field) & WL13 (discovered through aerial imagery after the site investigation). The key vegetation types were grassland/rush land dominated by the facultative wetland species giant rush (***Juncus pallidus***) and mercer grass (***Paspalum distichum***) and the facultative species creeping buttercup (***Ranunculus repens***) and Yorkshire fog (***Holcus lanatus***). Some sites had more than 50% cover with exotic pasture species. As part of the proposed changes to wetland definitions, a pasture species list is set to be collated for aiding in "pasture species" classification, and areas with over 50% cover with pasture species will not be classified as wetlands. The pasture exclusion list states that creeping buttercup is not included as a pasture species, but Yorkshire fog is.

One of nine plots set up for assessing hydrophytic vegetation passed the rapid test for wetland delineation, six passed the dominance test, and eight plots passed the prevalence test (<3) according to MfE protocols. This is an expected result considering the site was historically marshland but has been subject to intensive drainage and has had a pastoral land use since.

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[15] Unmanned Aerial Vehicle.

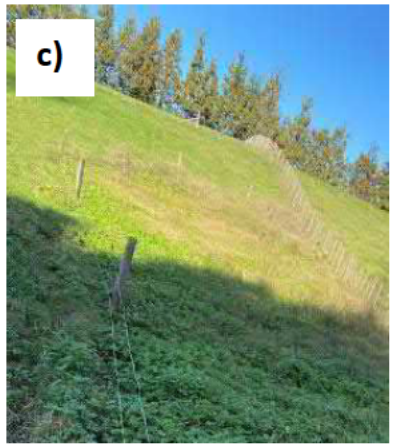
[16] RGB (red, green, blue) refers to imagery created with red, green, and blue primary colours of light added together to reproduce a broad array of colours.

The hydrophytic vegetation present at each of the putative wetlands meets the definition of a ‘natural wetland’ according to the NPS-FM. Despite a high percentage of pasture species in each plot and some areas subject to rain derived pooling during wet weather, pasture species were facultative (FAC) or facultative wetland (FACW) and wetland hydrology was present at the site. Wetland hydrology has been significantly altered by intensive drainage methods. Drainage methods visible on-site included channelisation of streams and visible drainage pipes throughout the property.

Soil at most putative wetland sites showed signs of hydric soil and wetland hydrology. Across the site, the soils appear to be Gley, identified by pale subsoils with reddish mottles. These colours are indicative of saturated low oxygen conditions and a high-water table. The potential wetlands were located in the lower reaches of gently sloping to sloping land. Drainage modification of the site has reduced the extent of the original marsh and altered the inherent properties that slow drainage and cause the soil to be wet. However, alongside hydric soils, most potential wetlands had saturated soil.

Underground drainage piping is present throughout the site. Piping visible in-field discharges into the central drain and was generally located close to the drain, within the surface soil layer. The wetland hydrology and flow pathways of some wetland sites (e.g., Ohaupo_WL9) were difficult to understand and could potentially be explained by the presence of underground drainage systems. Disturbance of these systems will likely result in a change in hydrology and flow pattern surrounding the highlighted putative wetlands.

Wetland Assessment 1: OHAUPO_WL1



Stratum	Species Name	% Cover	Indicator Status
Herb	*Holcus lanatus*	78	FAC
	Ranunculus repens	20	FAC
	Juncus pallidus	1	FACW
	Stellaria media	1	Unknown
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata: 2
- Percent of Dominant Species that are OBL, FACW and/or FAC: 100%
- Dominant species noted in blue

Rapid Test: Fail

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Dominance Test: Pass

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Hydric Soils Test: Fail

Hydrology Test: Fail

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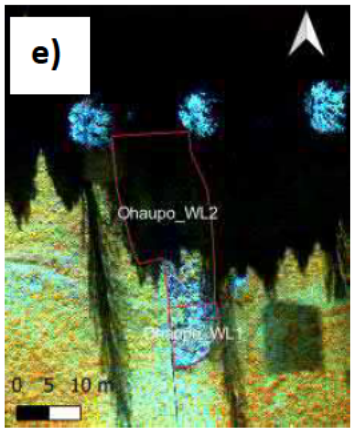
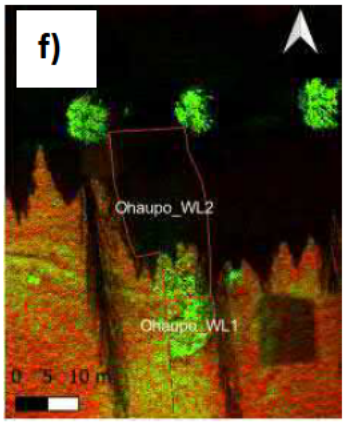
Prevalence Test: Fail



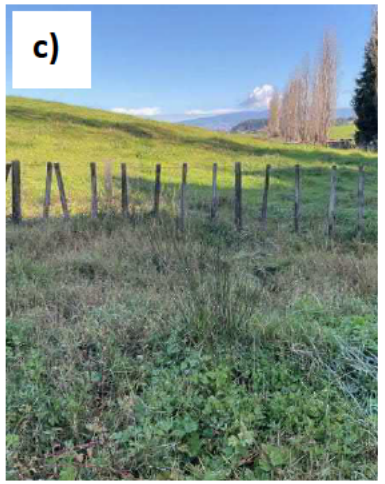


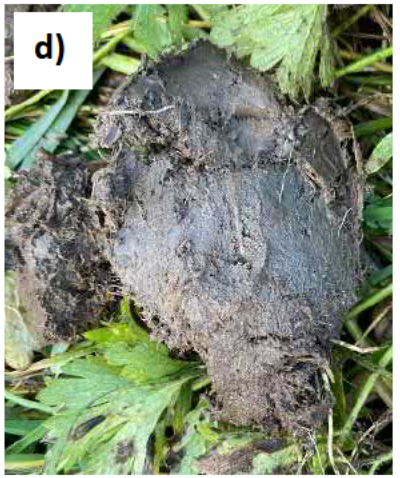
Notes/results: Fenced site upslope of Ohaupo_WL2. Distinct change in vegetation type and lack of saturated soil/surface pooling from WL2 to WL1. WL1 dominated by facultative species, hydric sandy-clay soils present with mottling and low chroma colours suggesting the site is subject to rising groundwater (seasonal affect), but significantly less saturated than WL2. The site marginally failed the hydric soils test as some mottling is present but the soil is unsaturated. The site failed the prevalence test given the result (2.99) was marginal (close to 3) and the site is dominated by facultative pasture species. Therefore, the site cannot be classed as a wetland.

Figures of WL1: a) site map with WL1 highlighted in blue; b) aerial RGB image; c) photograph of hydric soil; d) landscape RGB photograph; e) CIR and; f) FCC colour composite imagery

Natural inland wetland: No

Wetland Assessment 2: OHAUPO_WL2





Stratum	Species Name	% Cover	Indicator Status
Herb	*Ranunculus repens*	60	FAC
	Holcus lanatus	20	FAC
	Paspalum distichum	10	FACW
	Juncus pallidus	8	FACW
	Stellaria media	1	Unknown
	Trifolium repens	1	FACU
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata: 2
- Percent of Dominant Species that are OBL, FACW and/or FAC: 100%
- Dominant species noted in blue

Rapid Test: Fail

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Dominance Test: Pass

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Hydric Soils Test: Pass

Hydrology Test: Pass

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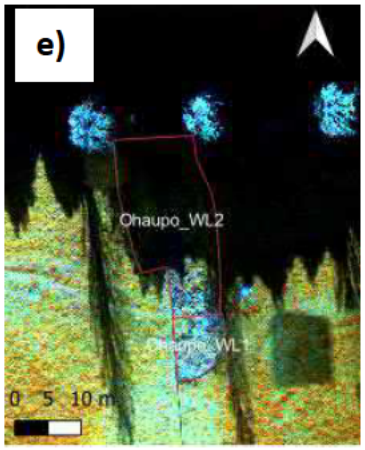
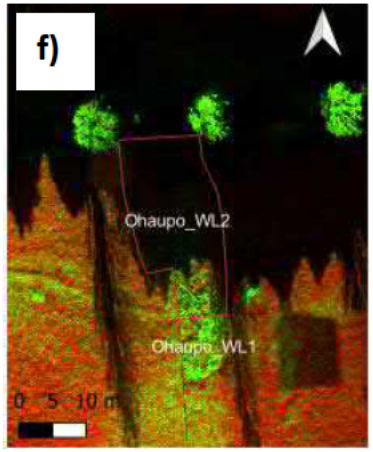
Prevalence Test: Pass





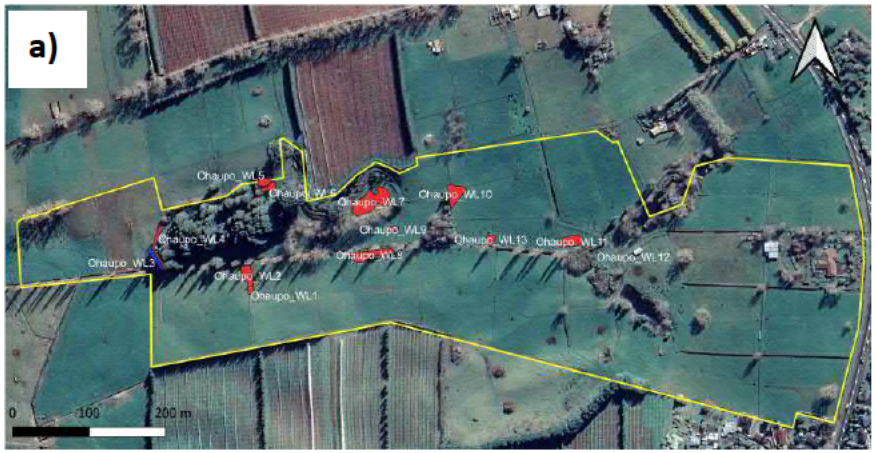
Notes/results: Fenced wetland on slope, downgradient of OhaupoWL_1, discharging into the central drain. Saturated soil with low chroma colours, minor mottling, and organic material at 10-15cm depth. Hydrophytic vegetation present, although facultative pasture species dominate. The site passed the Prevalence Test (2.83).

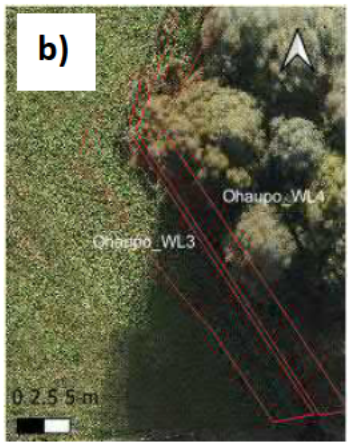
Multiple primary indicators of wetland hydrology were present, including surface water, soil saturation, and water marks on the fence line, therefore the wetland passed the hydrology test.

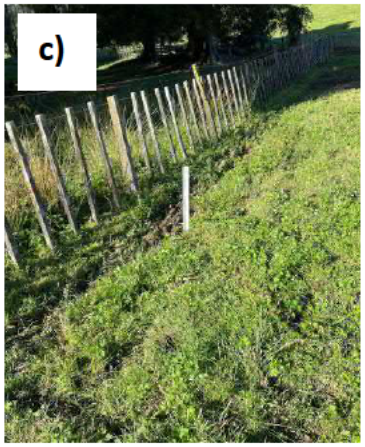
Figures of WL2: a) site map with WL2 highlighted in blue; b) aerial RGB image; c) photograph of hydric soil; d) landscape RGB photograph; e) CIR and; f) FCC colour composite imagery

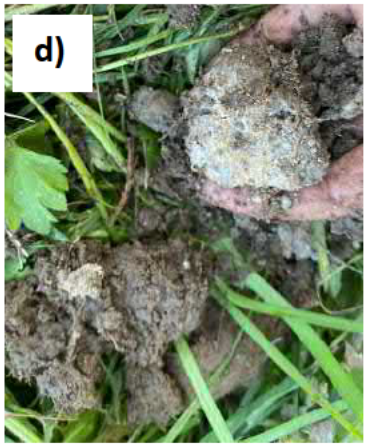
Natural inland wetland: Yes

Wetland Assessment 3: OHAUPO_WL3









Stratum	Species Name	% Cover	Indicator Status
Herb	*Ranunculus repens*	70	FAC
	Holcus lanatus	20	FAC
	Paspalum distichum	8	FACW
	Juncus pallidus	1	FACW
	Persicaria hydropiper	1	FACW
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata 2
- Percent of Dominant Species that are OBL, FACW and/or FAC 100%
- Dominant species noted in blue

Rapid Test: Fail

↓

Dominance Test: Pass

↓

Hydric Soils Test: Fail

Hydrology Test: Fail

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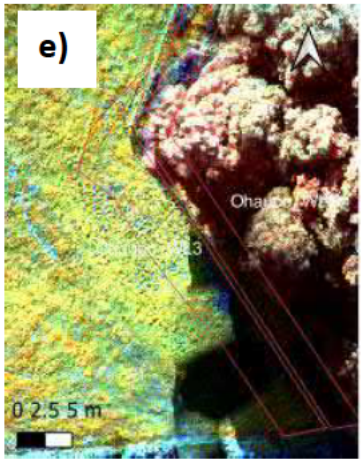
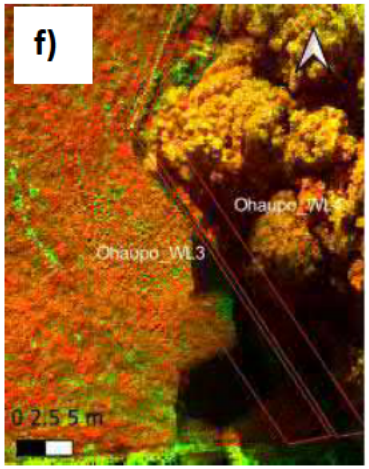
Prevalence Test: Fail



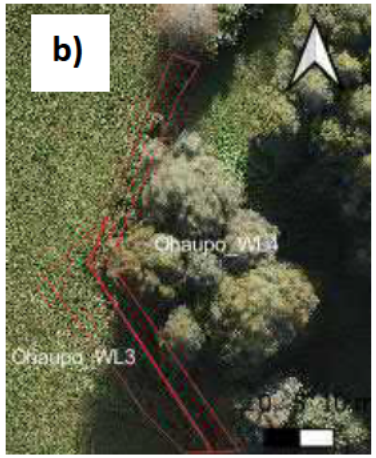


Notes/results: Unfenced section of paddock dominated by creeping buttercup (***Ranunculus repens***). Surface soil was unsaturated with mottling and low chroma colours and a significant amount of pugging existed due to stock access. Despite the presence of mottling, the soil was unsaturated, therefore the hydric soils test failed so this site cannot be considered a natural inland wetland. Area would benefit from restoration and with engineering design, could be integrated into the adjacent wetland.

Figures of WL3: a) site map with WL3 highlighted in blue; b) aerial RGB image; c) photograph of hydric soil; d) landscape RGB photograph; e) CIR and; f) FCC colour composite imagery

Natural inland wetland: No

Wetland Assessment 4 : OHAUPO_WL4



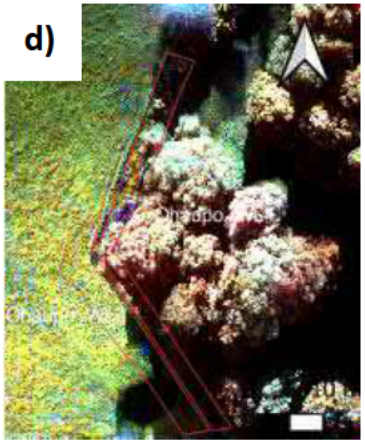
Stratum	Species Name	% Cover	Indicator Status
Herb	*Juncus pallidus* *Ranunculus repens* *Holcus lanatus*	50 30 20	FACW FAC FAC
Bare ground	Leaf litter, water, bare ground	0	N/A

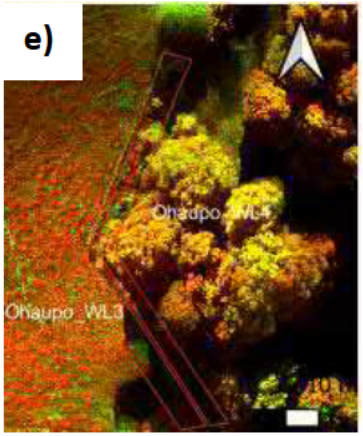
- Number of dominant species across all strata: 3
- Percent of Dominant Species that are OBL, FACW and/or FAC: 100%
- Dominant species noted in blue

Rapid Test: Fail

↓

Dominance Test: Pass





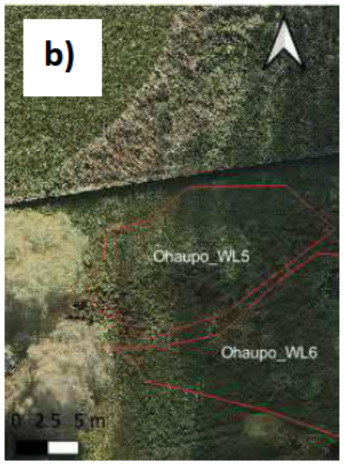
Notes/results: Fended riverine wetland/stream channel underneath Kahikatea stand, adjacent to Ohaupo_WL3. Stream appears to be channelised and flows adjacent to the Kahikatea stand, discharging into the site's central drain. Hydrophytic giant soft rush (***Juncus pallidus***) dominates the vegetation type, although 50% of dominants are FAC, therefore, a Hydric Soils Test was undertaken.

Multiple primary indicators of wetland hydrology were present. Soil was saturated and surface water was slowly flowing in the centre of the channel, therefore the wetland passed the hydrology test.

Figures of WL4: a) site map with WL4 highlighted in blue; b) aerial RGB image; c) landscape RGB photograph; d) CIR and; e) FCC colour composite imagery

Natural inland wetland: Yes

Wetland Assessment 5: OHAUPO_WL5



Stratum	Species Name	% Cover	Indicator Status
Herb	*Juncus pallidus*	60	FACW
	Holcus lanatus	20	FAC
	Paspalum distichum	15	FACW
	Ranunculus repens	5	FAC
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata: 2
- Percent of Dominant Species that are OBL, FACW and/or FAC: 100%
- Dominant species noted in blue

Rapid Test: Fail

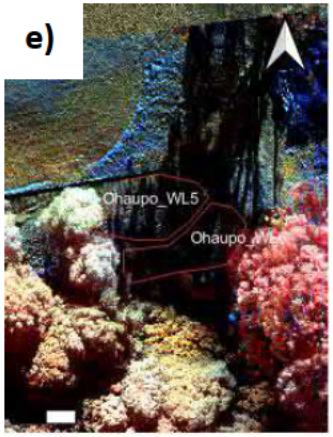
↓

Dominance Test: Pass

↓

Hydric Soils Test: Pass

Hydrology Test: Pass



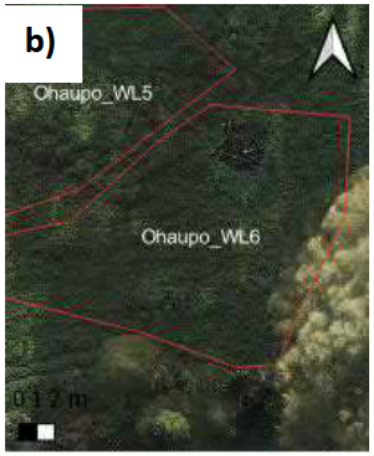
Notes/results: Hydrophytic vegetation dominant (60% giant soft rush), hydric soils with mottling and low chroma colours indicative of a Gley soil. Water pooling on surface, likely groundwater input based on sheens and obvious flow pathway towards channelised stream. Site in close proximity to drained Kahikatea stand.

Multiple primary indicators of wetland hydrology were present, including surface water, soil saturation, and groundwater sheens, therefore the wetland passed the hydrology test and the site is consistent with a natural inland wetland.

Figures of WL5: a) site map with WL5 highlighted in blue; b) aerial RGB image; c) photograph of hydric soil; d) landscape RGB photograph; e) CIR and; f) FCC colour composite imagery

Natural inland wetland: Yes

Wetland Assessment 6: OHAUPO_WL6



Stratum	Species Name	% Cover	Indicator Status
Herb	*Ranunculus repens* *Holcus lanatus* *Juncus pallidus*	70 28 2	FAC FAC FACW
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata: 2
- Percent of Dominant Species that are OBL, FACW and/or FAC: 100%
- Dominant species noted in blue

Rapid Test: Fail

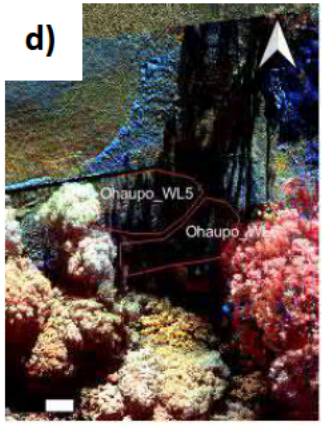
↓

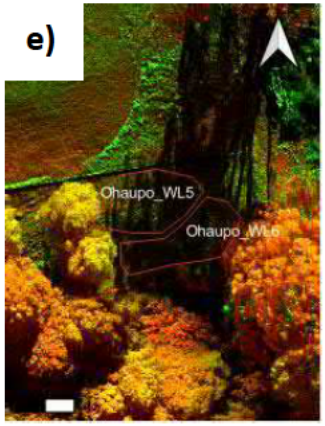
Dominance Test: Pass

↓

Hydric Soils Test: Pass

Hydrology Test: Pass





Notes/results: Site subject to surface pooling, dominated by facultative species, some hydrophytic rushes present (2%), hydric soils (partly saturated with some mottling). Downgradient from Ohaupo_WL5 in basin. Site in close proximity to drained Kahikatea stand. The soil was saturated in close proximity to the Kahikatea stand along with multiple primary indicators of wetland hydrology, including surface water, soil saturation, and sheens on pooled groundwater, therefore the wetland passed the hydrology test, and the site is consistent with a natural inland wetland.

Figures of WL6: a) site map with WL6 highlighted in blue; b) aerial RGB image; c) landscape RGB photograph; d) CIR and; e) FCC colour composite imagery

Natural inland wetland: Yes

Wetland Assessment 7: OHAUPO_WL7

Stratum	Species Name	% Cover	Indicator Status
Herb	*Paspalum distichum*	45	FACW
	Holcus lanatus	30	FAC
	Ranunculus repens	15	FAC
	Juncus pallidus	10	FACW
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata: 2
- Percent of Dominant Species that are OBL, FACW and/or FAC: 100%
- Dominant species noted in blue

Rapid Test: Fail

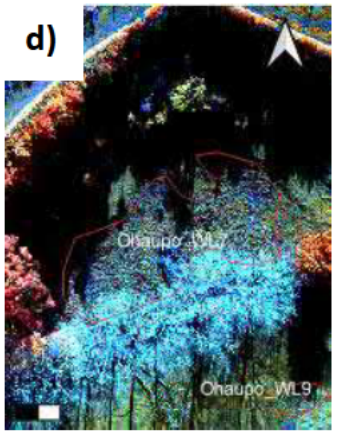
↓

Dominance Test: Pass

↓

Hydric Soils Test: Pass

Hydrology Test: Pass



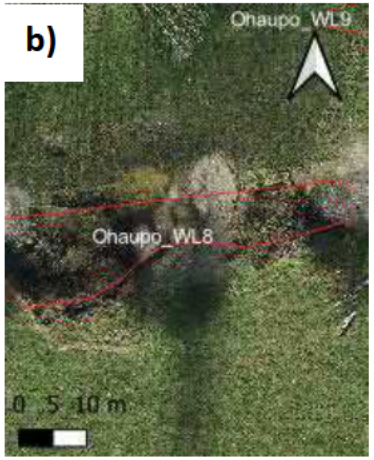
Notes/results: Hydrophytic vegetation present, surface water pooling and groundwater slowly flowing towards central drain. Hydric soils with distinct mottling, no odour, low chroma colours. Very wet site with sheens and iron staining.

Multiple primary indicators of wetland hydrology were present, including surface water, soil saturation, groundwater flow, and iron deposits therefore the wetland passed the hydrology test, and is consistent with a natural inland wetland.

Figures of WL7: a) site map with WL7 highlighted in blue; b) aerial RGB image; c) landscape RGB photograph; d) CIR and; e) FCC colour composite imagery

Natural inland wetland: Yes

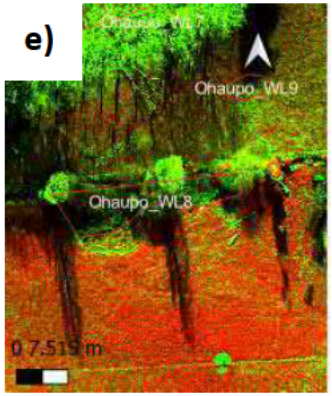
Wetland Assessment 8: OHAUPO_WL8



Stratum	Species Name	% Cover	Indicator Status
Herb	*Carex secta*	80	OBL
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata: 1
- Percent of Dominant Species that are OBL, FACW and/or FAC: 100%
- Dominant species noted in blue

Rapid Test: Pass



Notes/results: Extent of wetland not fully assessed due to accessibility. From viewpoint (through fence line, across stream) sedge (***Carex secta***) was the only plant species present. Aerial imagery revealed the extent of the wetland, running adjacent to the site's central drain.

Soil was saturated at this site (primary indicator of wetland hydrology), therefore the wetland passed the hydrology test, and is consistent with a natural inland wetland.

Figures of WL8: a) site map with WL8 highlighted in blue; b) aerial RGB image; c) landscape RGB photograph; d) CIR and; e) FCC colour composite imagery

Natural inland wetland: Yes

Wetland Assessment 9: OHAUPO_WL9

Stratum	Species Name	% Cover	Indicator Status
Herb	*Holcus lanatus*	40	FAC
	Ranunculus repens	40	FAC
	Juncus pallidus	20	FACW
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata: 3
- Percent of Dominant Species that are OBL, FACW and/or FAC: 100%
- Dominant species noted in blue

Rapid Test: Fail

↓

Dominance Test: Pass

↓

Hydric Soils Test: Pass

Hydrology Test: Pass

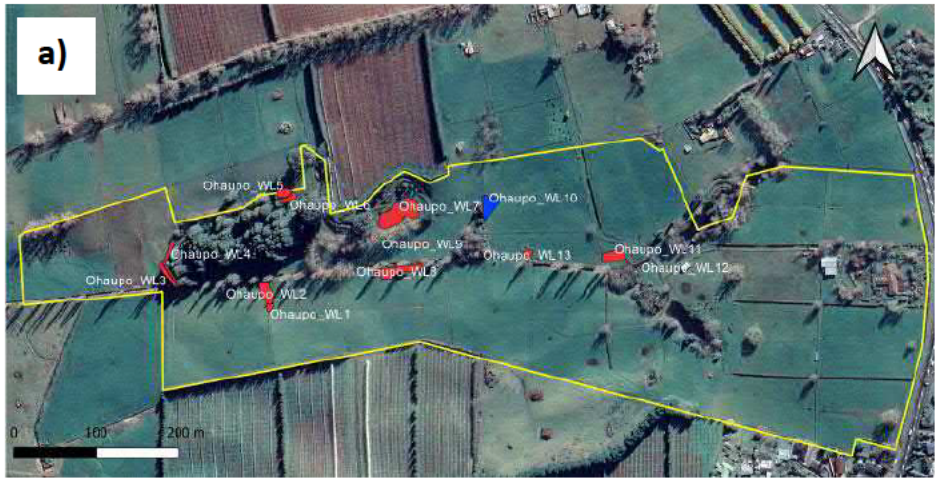
Notes/results: Small (~5m^2) area of hydrophytic vegetation with hydric soils. Wetland hydrology not immediately obvious, but multispectral aerial imagery reveals the flow pathway into the central drain. Site likely has underground drainage piping.

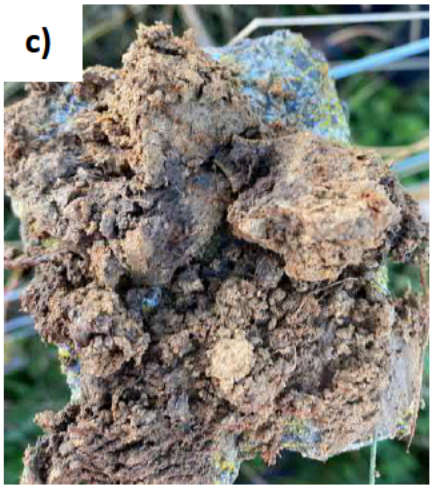
Soil was saturated and surface water pooling was present at this site (primary indicators of wetland hydrology), therefore the wetland passed the hydrology test, and is consistent with a natural inland wetland.

Figures of WL9: a) site map with WL9 highlighted in blue; b) aerial RGB image; c) landscape RGB photograph; d) CIR and; e) FCC colour composite imagery

Natural inland wetland: Yes

Wetland Assessment 10: OHAUPO_WL10





Stratum	Species Name	% Cover	Indicator Status
Herb	N/A	N/A	N/A
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata: N/A
- Percent of Dominant Species that are OBL, FACW and/or FAC: N/A
- Dominant species noted in blue

Rapid Test: Fail

↓

Dominance Test: N/A

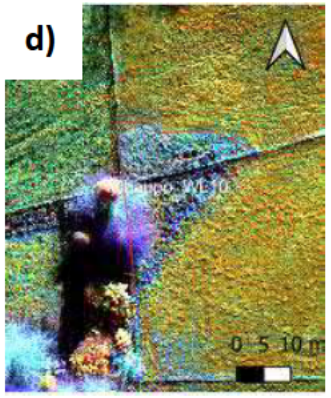
↓

Hydric Soils Test: Fail

Hydrology Test: Fail

↓

Prevalence Test: N/A

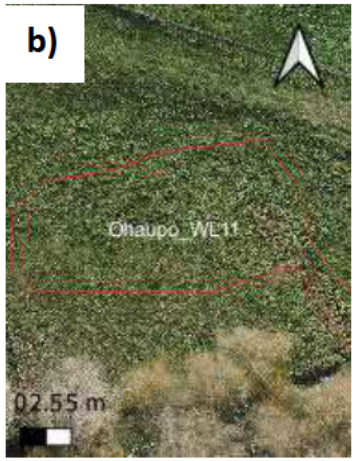


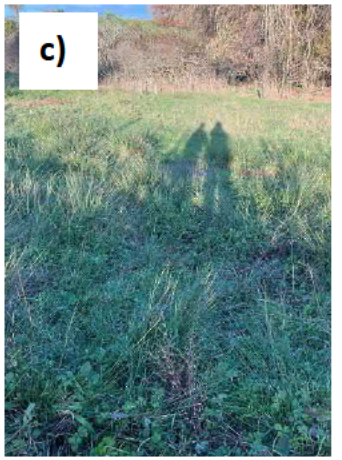
Notes/results: Not fully assessed in field. Hydrophytic vegetation (***Juncus pallidus***) and unsaturated partially hydric soils were present within the site. However, the absence of surface pooling or sheens, the position of the site at the lowest point of the sloping, basin-like paddock, and higher chroma soils with worms suggests this site is more affected by seasonal surface flooding than wetland hydrology. The area was also unfenced with a significant amount of pugging. The Prevalence Test was not applicable as vegetation was not fully assessed, although the site is assessed as highly unlikely to be a wetland.

Figures of WL10: a) site map with WL10 highlighted in blue; b) aerial RGB image; c) photograph of hydric soil; d) CIR and; e) FCC colour composite imagery

Natural inland wetland: No

Wetland Assessment 11: OHAUPO_WL11





Stratum	Species Name	% Cover	Indicator Status
Herb	*Juncus pallidus*	40	FACW
	Ranunculus repens	30	FAC
	Holcus lanatus	20	FAC
	Paspalum distichum	8	FACW
	Persicaria hydropiper	1	FACW
	Rumex obustifolius	1	FAC
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata: 3
- Percent of Dominant Species that are OBL, FACW and/or FAC: 100%
- Dominant species noted in blue

Rapid Test: Fail

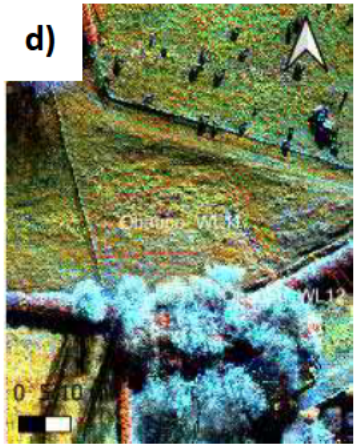
↓

Dominance Test: Pass

↓

Hydric Soils Test: Pass

Hydrology Test: Pass



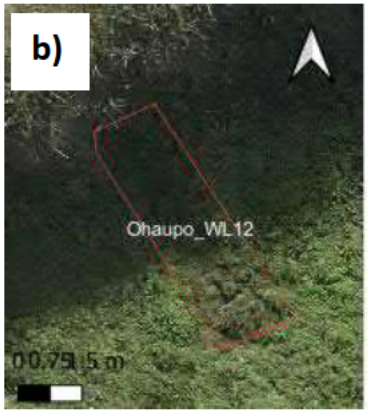
Notes/results: Hydrophytic vegetation, unsaturated hydric soils, lack of surface pooling. Drainage channel into site's central drain shows clear pathway of flow.

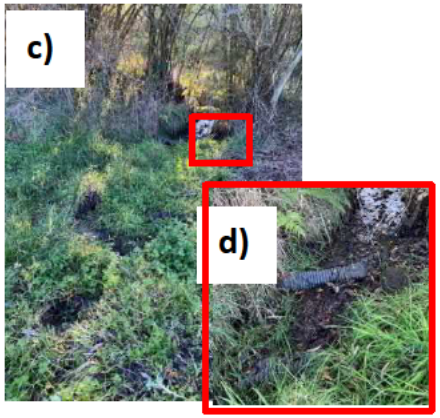
Multiple primary indicators of wetland hydrology were present, including surface water, soil saturation, groundwater flow, and iron deposits therefore the wetland passed the hydrology test, and is consistent with a natural inland wetland.

Figures of WL11: a) site map with WL11 highlighted in blue; b) aerial RGB image; c) landscape RGB photograph; d) CIR and; e) FCC colour composite imagery

Natural inland wetland: Yes

Wetland Assessment 12: OHAUPO_WL12





Stratum	Species Name	% Cover	Indicator Status
Herb	*Juncus pallidus*	50	FACW
	Ranunculus repens	25	FAC
	Holcus lanatus	15	FAC
	Paspalum distichum	8	FACW
	Juncus articulatus	1	FACW
	Trifolium repens	1	FACU
Bare ground	Leaf litter, water, bare ground	0	N/A

- Number of dominant species across all strata: 2
- Percent of Dominant Species that are OBL, FACW and/or FAC: 100%
- Dominant species noted in blue

Rapid Test: Fail

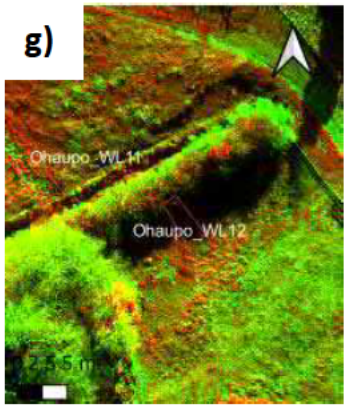
↓

Dominance Test: Pass

↓

Hydric Soils Test: Pass

Hydrology Test: Pass



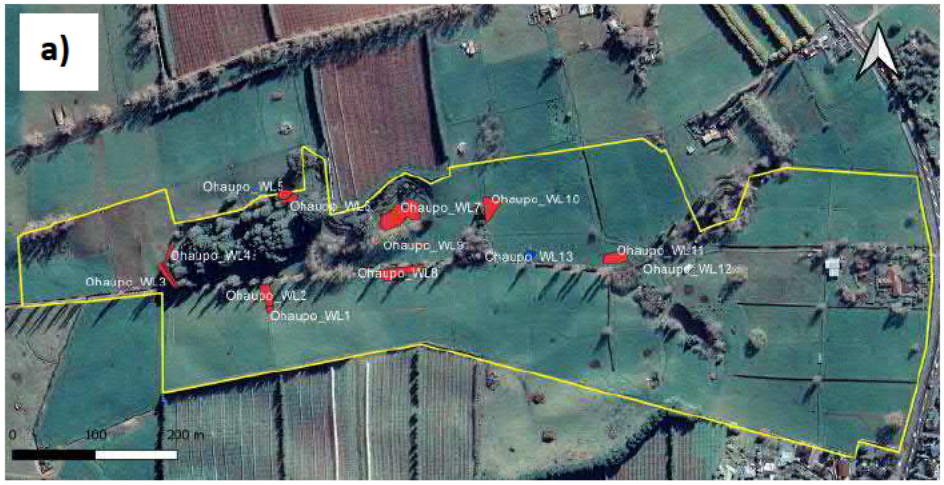
Notes/results: Small (2x1m) wetland upslope of central drain. Wetland hydrology, vegetation, and hydric soils present. Sheens in pooled surface water. Appears to be channelised with water source at the top of the slope. Drainage pipes directing water downslope into drain.

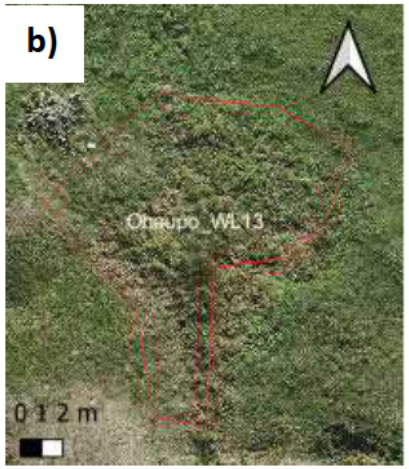
Site is consistent with a natural inland wetland.

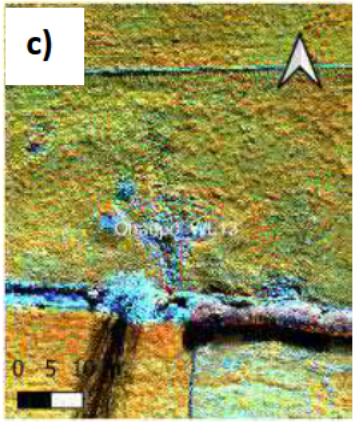
Figures of WL12: a) site map with WL12 highlighted in blue; b) aerial RGB image; c) landscape RGB photograph; d) inset image from photograph c) of drainage piping; e) photograph of hydric soil; f) CIR and; g) FCC colour composite imagery

Natural inland wetland: Yes

Wetland Assessment 13: OHAUPO_WL13







Stratum	Species Name	% Cover	Indicator Status
Herb	N/A	N/A	N/A
Bare ground	Leaf litter, water, bare ground	0	N/A

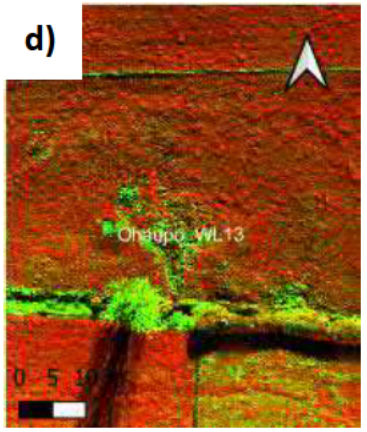
- Number of dominant species across all strata: N/A
- Percent of Dominant Species that are OBL, FACW and/or FAC N/A
- Dominant species noted in blue

Rapid Test: N/A

Dominance Test: N/A

Hydric Soils Test: N/A

Prevalence Test: N/A



Notes/results: Detected after initial wetland delineation visit using CIR and FCC imagery and unable to get in-field photographs or hydrophytic vegetation identification. Therefore, hydric soils were unable to be assessed and the Prevalence Test was unable to be calculated.

Figures of WL13: a) site map with WL13 highlighted in blue; b) aerial RGB image; c) CIR and; e) FCC colour composite imagery

Natural inland wetland: Undetermined

SUMMARY

Wetland Assessment

The subject site was found to support nine natural inland wetland units within the identified area as the following criteria were met:

- Ten of the thirteen sites were assessed for hydrophytic vegetation using Wetland Delineation Protocols[2].
- One of the vegetation units Passed the Rapid Test and ten passed the Dominance Test, with plant species composition typical of wetlands.
- Four putative wetland sites Passed the Hydric Soils Test and Hydrology Test indicative of wetland hydrology.
- Three units were not considered natural inland wetlands (Ohaupo WL1,3 & 10) due to >50%exotic pasture species, and failed the hydric soil and wetland hydrology tests.
- One of the thirteen sites (Ohaupo_WL13) was identified after the field-visit using aerial imagery, proving this to be a useful tool in wetland delineation assessments. However, further in-field is required to fully characterise this potential wetland.
- These permanently and intermittently wet areas support plants that are adapted to wet conditions, which aligns with the ***Resource Management Act 1991*** definition of a wetland.
- Evidence of hydric soils[2] and wetland hydrology during the applicable hydrophytic vegetation growing season[3].
- The site has been subject to intensive drainage, as indicated by the fragmentation of wetland units, channelisation of streams including the site's central drain, visible drainage piping across the site, and the extent of unsaturated soil relative to the extent of the historic marshland[13]. This has largely changed wetland hydrology and dominance of wetland species.

Recommendations

This Wetland Delineation Report will influence the subdivision master design, so the following recommendations have been made with respect to the wetland areas:

- A site Groundwater assessment is recommended to be undertaken, to determine and monitor existing groundwater levels (considering seasonal fluctuation over a 12-month period), and also to assess existing groundwater quantity and quality aspects.
- On collection and assessment of the site groundwater, a water budget is recommended to be prepared for the site by a suitability qualified wetland hydrologist to determine present and future yield from site development and assess hydraulic neutrality. Maintaining water inputs through hydraulic neutrality should preserve existing wetland character.
- Ensure stock access is excluded from the identified wetland areas[17] and undertake enhancement planting within the wetlands. With the proposed change in land use, ongoing plantings in close proximity should be compatible, indigenous species that are already present shall be used to ensure no invasion of prevailing pest species.

[17] Methodology for deriving stock exclusion low-slope land extent for the Resource Management (Stock Exclusion) Regulations 2020 (Stock Exclusion Regulations in place by July 2025).

- Undergo an EcIA to determine if the site is host to significant indigenous flora and fauna (e.g., wetlands can provide important fish spawning habitats) and detail any specific impacts due to the private plan change. Additionally, undergo herpetofauna surveys as part of the EcIA to identify if the site is a possible habitat for bats and lizards. Furthermore, an EcIA would provide the opportunity to delineate and characterise wetlands (Ohaupo_WL13) captured by aerial imagery after the initial site investigations.
- Undertake ongoing weed and mammalian pest control within the wetlands, to enhance ecological values.
- Protect the Kahikatea stand and the fragmented wetlands within the site (perhaps listing as a Significant Natural Area (SNA)).
- Buffer the wetlands with a riparian margin of terrestrial species if practicable within spatial constraints, to provide refuge for biota (avifauna and potentially herpetofauna) and a naturalised vegetation sequence.
- Consider also treating the three wet areas that were not classified as natural inland wetlands (OhaupoWL1,3 & 10) in the same manner required for those with the classification (e.g., wetland planting, fencing and managing stock access, excluding from development area).This would allow for more ecological connectivity, create carbon sinks, and increase visual amenity of the site.
- This document is recommended to be a working document, which is subject to changes in wetland regulations (NPS-FM and NES-F changes) and shall be updated on the findings after the EcIA.

Please do not hesitate to contact me with any questions regarding the information contained in this memo.

Regards,

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APPENDIX A DIGITAL TERRAIN MODEL IMAGERY

Figure A 1: Figure 1: Digital Terrain Model (DTM) Index Imagery illustrating the terrain of the landscape and the likely position of surface water pooling with potential wetland polygons. Index colour scheme ranges from deep blue (indicating lower elevation) to bright yellow (indicating higher elevation

APPENDIX B TABLES AND CALCULATIONS

Table B 1: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL1

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	N/A	0	N/A	N/A
Herb	Holcus lanatus	78	Yes	FAC
	Ranunculus repens	20	Yes	FAC
	Juncus Pallidus	1	No	FACW
	Stellaria media	1	No	Unknown
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 99%				

Table B 2: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL2

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	N/A	0	N/A	N/A
Herb	Ranunculus repens	60	Yes	FAC
	Holcus lanatus	20	Yes	FAC
	Paspalum distichum	10	No	FACW
	Juncus Pallidus	8	No	FACW
	Stellaria media	1	No	Unknown
	Trifolium repens	1	No	FACU
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 98%				

Table B 3: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL3

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	N/A	0	N/A	N/A
Herb	Ranunculus repens	70	Yes	FAC
	Holcus lanatus	20	No	FAC
	Paspalum distichum	8	No	FACW
	Juncus Pallidus	1	No	FACW
	Persicaria hydropiper	1	No	FACW
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A

Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 100%

Table B 4: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL4

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	Rubus spp.	1	No	FACU
Herb	Juncus Pallidus Ranunculus repens Holcus lanatus	50 30 19	Yes Yes No	FACW FAC FAC
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 99%				

Table B 5: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL5

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	N/A	0 0	N/A N/A	N/A N/A
Herb	Juncus Pallidus Holcus lanatus Paspalum distichum Ranunculus repens	60 20 15 5	Yes Yes No No	FACW FAC FACW FAC
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 100%				

Table B 6: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL6

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	N/A	0 0	N/A N/A	N/A N/A
Herb	Ranunculus repens Holcus lanatus Juncus Pallidus	70 28 2	Yes Yes No	FAC FAC FACW
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 100%				

Table B 7: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL7

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	N/A	0 0	N/A N/A	N/A N/A
Herb	Paspalum distichum Holcus lanatus Ranunculus repens Juncus Pallidus	45 30 15 10	Yes Yes No No	FACW FAC FAC FACW
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 100%				

Table B 8: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL8

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	N/A	0 0	N/A N/A	N/A N/A
Herb	Carex secta	80	Yes	OBL
Bare ground	Leaf litter, water, bare ground	20	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 100%				

Table B 9: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL9

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	N/A	0 0	N/A N/A	N/A N/A
Herb	Holcus lanatus Ranunculus repens Juncus Pallidus	40 40 20	Yes Yes Yes	FAC FAC FACW
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 100%				

Table B 10: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL10

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A

Sapling/shrub	N/A	0 0	N/A N/A	N/A N/A
Herb		35 2.5 2.5 0.5 2 10.5	Yes No No No No No	OBL FACU FACW Undefined OBL FAC
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 100%				

Table B 11: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL11

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	N/A	0 0	N/A N/A	N/A N/A
Herb	Juncus pallidus Ranunculus repens Holcus lanatus Paspalum distichum Persicaria hydropiper Rumex obustifolius	40 30 20 8 1 1	Yes Yes Yes No No No	FACW FAC FAC FACW FACW FAC
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC 100%				

Table B 12: Percentage cover of plant species within the vegetation types assessed within Ohaupo_WL12

Stratum	Species Name	% Cover	Dominant Species?	Indicator Status
Tree	N/A	0	N/A	N/A
Sapling/shrub	N/A	0 0	N/A N/A	N/A N/A
Herb	Juncus Pallidus Ranunculus repens Holcus lanatus Paspalum distichum Juncus articulatus Trifolium repens	50 25 15 8 1 1	Yes Yes No No No No	FACW FAC FAC FACW FACW FACU
Bare ground	Leaf litter, water, bare ground	0	N/A	N/A
Number of dominant species across all strata: 2 Percent of Dominant Species that are OBL, FACW and/or FAC: 99%				

APPENDIX C NZ WETLAND DETERMINATION DATA FORM

Appendix 1 – NZ Wetland Determination Data Form

WETLAND DETERMINATION DATA FORM – NEW ZEALAND

Project/Site: Ohaupo Region: Waikato Sampling Date: ______

Applicant/Owner: Levin DeCosta Altitude: ______ Sampling Point No: 1

Investigator(s): AS / AW Nearby town/city: ______

Landform (hillslope, terrace, etc.): Hillslope/basin Local relief (concave, convex, none): concave Slope (%): ______

Latitude: ______ Longitude: ______ Datum: WGS 84

Soil Map Unit Name: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ______	**Is the Sampled Area within a Wetland?** Yes ______ No ______
Hydric Soil Present?	Yes ✓ No ______	
Wetland Hydrology Present?	Yes ~~✓~~ No ✓	

Remarks: Ohaupo – WL1 (upland) Barn lane ; Ohaupo – WL2 (downgradient) after 4th fence post down stream

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	______ = Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	______ = Total Cover		
Herb Stratum (Plot size: 2x2m)			
Ohaupo-WL1 1. Upland grass	~~75~~ 80		
2. Ranunculus repens	20		
3. Giant soft rush	1		
4. Chickweed ?			
5. (obvious mottling, dry)			
6.			
Ohaupo-WL2 7. Ranunculus repens ~~60%~~	60		
8. Tussock grass (mercer)	40		
9. Sedge	5		
10. chickweed	1%		
11. Clover	1		
12.			
	______ = Total Cover		

Low chroma, saturated soil. No odour. Mottling (minor). Organic material @ 10-15 cm depth.

Remarks:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ______ No ______

Adapted from US Army Corps of Engineers New Zealand – Version 1.0

Fenced
Sandy clay
Iron mottles

Appendix 1 – NZ Wetland Determination Data Form

WETLAND DETERMINATION DATA FORM – NEW ZEALAND

Project/Site: Ohaupo Region: Waikato Sampling Date: 26/5/22

Applicant/Owner: Lawn Designs Altitude: _____ Sampling Point No: _____

Investigator(s): AS, JNW Nearby town/city: Ohaupo / TA

Landform (hillslope, terrace, etc.): Slight hillslope Local relief (concave, convex, none): concave Slope (%): _____

Latitude: _____ Longitude: _____ Datum: WGS 84

Soil Map Unit Name: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes _____ No _____	
Wetland Hydrology Present?	Yes _____ No _____	

Remarks:

OhaupoWL3

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 2x2m)			
1. Ranunculus repens	70%		
2. Poa spp.	30%		
3. Sedge	1%		
4. ~~Water weed~~	1%		
5. NOT wetland mint			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks:

Adapted from US Army Corps of Engineers

New Zealand – Version 1.0

Appendix 1 – NZ Wetland Determination Data Form

WETLAND DETERMINATION DATA FORM – NEW ZEALAND

Project/Site: 2025 Otaipo road Region: Otaipo Sampling Date: _____

Applicant/Owner: Leon Vegosla Altitude: _____ Sampling Point No: _____

Investigator(s): AS / ANW Nearby town/city: TA

Landform (hillslope, terrace, etc.): channel Local relief (concave, convex, none): concave Slope (%): _____

Latitude: _____ Longitude: _____ Datum: WGS 84

Soil Map Unit Name: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:
Otaipo-WL4 Fenced wetland/stream channel underneath Kahikatea stand remnt wetland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 2x2m)			
1. Sedge	50		
2. Rethycidus rapens	30		
3. Blackberry			
4. Pasture	20		
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks:

Adapted from US Army Corps of Engineers New Zealand – Version 1.0

Appendix 1 – NZ Wetland Determination Data Form

WL5 + WL6

WETLAND DETERMINATION DATA FORM – NEW ZEALAND

Project/Site: Ohaupo 2025 Region: Ohaupo Sampling Date: 26/5

Applicant/Owner: Lewis Decosta Altitude: _____ Sampling Point No: _____

Investigator(s): AS / AWW Nearby town/city: _____

Landform (hillslope, terrace, etc.): hillslope (basin) Local relief (concave, convex, none): concave Slope (%): _____

Latitude: _____ Longitude: _____ Datum: WGS 84

Soil Map Unit Name: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes _____ No _____	
Wetland Hydrology Present?	Yes _____ No _____	

Remarks: WL5 WL6 sheen on surface WL6

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: _____)			
WL5 1. Sedge	60		
2. pasture	40		
3.			
4.			
5.			
6.			
7.			
8. Ranunculus	5		
WL6 9. pasture	2		
10. sedge			
11.			
12.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: Peaking for WL6

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WL1

Appendix 1 – NZ Wetland Determination Data Form

WETLAND DETERMINATION DATA FORM – NEW ZEALAND

Project/Site: 2025 ohaupo Region: Ohaupo/Hamilton Sampling Date: _____

Applicant/Owner: Leun Decosta Altitude: _____ Sampling Point No: _____

Investigator(s): AS/AWW Nearby town/city: TA/Hamilton

Landform (hillslope, terrace, etc.): ~~terrace~~ basin Local relief (concave, convex, none): concave Slope (%): _____

Latitude: _____ Longitude: _____ Datum: WGS 84

Soil Map Unit Name: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes _____	No _____	

Remarks: Distinct mottling. No odour. Low chroma. Wet veg / grazing. Flowing GW. Very wet.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: _____)			
1. Knot grass	75		
2. ranunculus	5		
3. Sedge	10		
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks:

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Appendix 1 – NZ Wetland Determination Data Form

WETLAND DETERMINATION DATA FORM – NEW ZEALAND

2025

Project/Site: Ohaupo rd. Region: Ohaupo/Waiabo Sampling Date: 26/5

Applicant/Owner: Levin Acosta Altitude: _____ Sampling Point No: _____

Investigator(s): AS/AWW Nearby town/city: Hamilton

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): _____

Latitude: _____ Longitude: _____ Datum: WGS 84

Soil Map Unit Name: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Soily grass – WL8 on other side of stream

WL9 – small spot with sedges (unsure of headwater location)

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: _____)			
1. Rabbit grass	100%		
2.			
3.	NOT		
4.	FULLY ASSESSED		
5.			
6.			
7. ~~Pasture~~			
8. Ranunculus	30		
9. Sedge	20		
10. Kmf	10		
11. Upland grass	40		
12.			
	= Total Cover		

WL8

WL9

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks:

WL9 = nothing, low chroma colours

Adapted from US Army Corps of Engineers

New Zealand – Version 1.0

* Interesting to see w/ Multispec ~5m² of hydric soils

Appendix 1 – NZ Wetland Determination Data Form

WETLAND DETERMINATION DATA FORM – NEW ZEALAND

Project/Site: 2025 Ohaupo Rd Region: Waikato Sampling Date: 26/5/22

Applicant/Owner: Lewis Roche Altitude: _____ Sampling Point No: _____

Investigator(s): AS/AWW Nearby town/city: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Latitude: _____ Longitude: _____ Datum: WGS 84

Soil Map Unit Name: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes _____ No _____	
Wetland Hydrology Present?	Yes _____ No _____	

Remarks: wet channel, aerial imagery shows dk. colour, often wet sheens, pipes at hedge line creating wl drain

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Ranunculus			
2. Sedge			
3. Jointed rush			
4. Tufted species			
5. Soft rush			
6. knot grass			
7. pasture			
8.			
9.			
10.			
11.			
12.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: 1 1/2 – 2m ship very small area

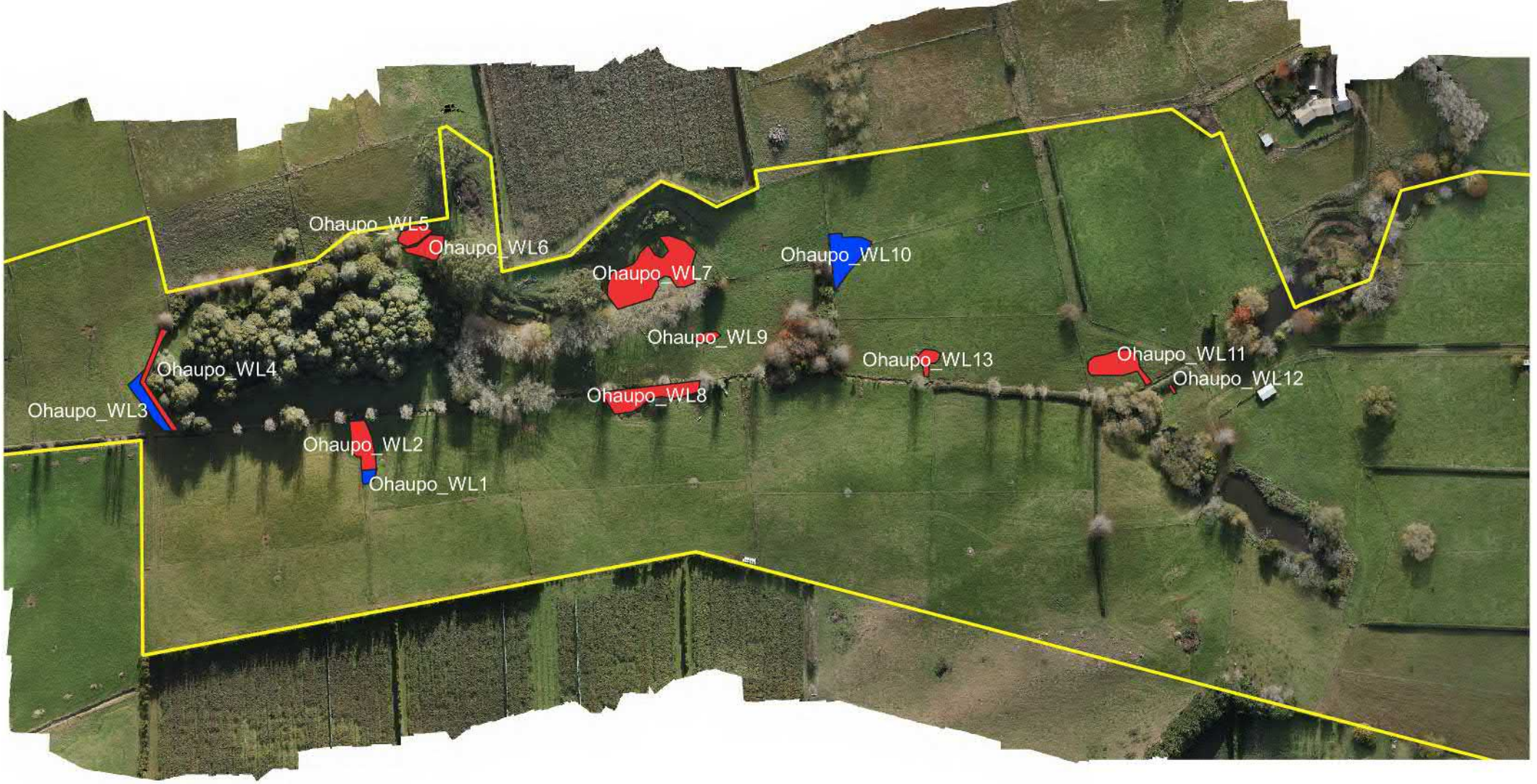
Ohaupo_WL12

Adapted from US Army Corps of Engineers

Low chroma soil.

New Zealand – Version 1.0

APPENDIX D SITE MAP WITH WETLAND POLYGONS



Approximate boundary: 2025 Ohaupo Road

Wetland polygons:

Not a wetland

Wetland

BTW COMPANY

2021 Orthomosaic Aerial Imagery, 2025 Ohaupo Road

Project: 211365
Scale: 1:2486
Coordinate system: WSG84
Disclaimer: Areas and dimensions may be subject to scale error. Scaling from this drawing is at the user's risk

0 75 150 m