Before the Expert Consenting Panel

under: the Fast-track Approvals Act 2024 (*FTAA*)

in the matter of: notices of requirement and applications for resource consents, wildlife approvals and archaeological authorities by the NZ Transport Agency Waka Kotahi to develop the Brynderwyn Hills section of the Alternative to the Brynderwyn Hills Project, a state highway from the intersection of State Highway 1 and Baldrock Road in the south, through the Brynderwyn Hills to Waipū in the north.

applicant: **NZ Transport Agency**

Requiring Authority and Applicant

Statement of Evidence of Nicholas Singers for NZ Transport Agency Waka Kotahi

Dated: 28 October 2026

Reference: Paula Brosnahan (paula.brosnahan@chapmantripp.com)
Rebecca Tompkins (rebecca.tompkins@chapmantripp.com)

chapmantripp.com
T +64 9 357 9000
F +64 4 472 7111

PO Box 2206
Auckland 1140
New Zealand

Auckland
Wellington
Christchurch

chapman tripp

STATEMENT OF EVIDENCE OF NICHOLAS SINGERS

INTRODUCTION

1 My full name is Nicholas James Drysdale Singers.

2 I am an ecologist at my own ecology consultancy, Nicholas Singers Ecological Solutions Ltd. I hold a Bachelor of Science majoring in Plant Health and Ecology and a Master of Science in Ecology both gained at Massey University. I have 29 years' experience as an ecologist, specialising in plant ecology and conservation management. An overview of my relevant experience and qualifications is attached as **Appendix A** to this statement.

3 I have been engaged to assist the NZ Transport Agency Waka Kotahi *(NZTA)* as part of notices of requirement and applications for resource consents, wildlife approvals and archaeological authorities (together, the *Application*) to develop the Brynderwyn Hills section of the Alternative to the Brynderwyn Hills (*Project*), a state highway from the intersection of SH1 and Baldrock Road in the south, through the Brynderwyn Hills to Waipū in the north.

4 I was engaged by NZTA in April 2026 to provide my independent expert opinion of the Project's potential effects on, and recommended mitigation measures for indigenous vegetation and wetlands.

CODE OF CONDUCT

5 Although this matter is not before the Environment Court, I confirm that I have read the Environment Court's Code of Conduct for Expert Witnesses in its Environment Court Practice Note 2023. I agree to comply with that Code. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

6 My evidence will deal with the following matters:

6.1 Review of the:

(a) Assessment of Effects on Terrestrial Ecology prepared by Mr Simon Chapman (*Terrestrial Assessment*),[1] as relevant to indigenous vegetation; and

[1] Volume B – Appendix D06 – Assessment of Effects on Terrestrial Ecology (*Terrestrial Assessment*).

(b) Assessment of Effects on Freshwater Ecology prepared by Dr Vaughan Keesing (*Freshwater Assessment*),[2] as relevant to wetlands;

6.2 My assessment of the Project's potential effects on indigenous vegetation and wetlands;

6.3 Commentary on NZTA's proposed mitigation package, including amendments to reflect my own recommendations;

6.4 My overall conclusion as to the effects of the Project post-mitigation; and

6.5 My response to comments on the Terrestrial and Freshwater Assessments (as relevant to indigenous vegetation and wetlands).

7 In addition to the Terrestrial Assessment and Freshwater Assessment, I have reviewed the following documents in preparing this evidence:

7.1 Cultural Impact Assessments prepared by Te Pouwhenua o Tiakiriri Kūkupa Trust me Te Parawhau (*Te Parawhau*), Te Uri o Hau and Te Patuharakeke Te Iwi Trust Board (*Patuharakeke*), as these relate to indigenous vegetation and wetlands;[3] and

7.2 Comments received on the Application from the Department of Conservation on behalf of the Director General of Conservation (*DOC*), Te Parawhau, Patuharakeke, Te Uri o Hau and two private landowners.[4]

8 I visited the Project site during the period 7 to 9 July and 14 to 17 October 2026. The focus of the first visit was to survey terrestrial sites that had been assessed by Mr Chapman as having between very high to moderate ecological values including measuring tree metrics for Biodiversity Offset Accounting Model (*BOAM*) calculations. The second visit was to survey 15 wetlands which had not previously been surveyed by Dr Keesing.

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[2] Vol B – Appendix D07 – Assessment of Effects on Freshwater Ecology (*Freshwater Assessment*).

[3] Cultural Values and Impacts Assessment: Northern Corridor Section 2B prepared by Te Uri o Hau Environs Holdings Limited dated March 2026; Cultural Impact Assessment: Section 2B prepared by Te Pou Taiao o Patuharakeke Te Iwi Trust Board dated March 2026; and Aromatawai Ngā Uara Ahurea o Te Pouwhenua o Tiakiriri Kūkupa Trust me Te Parawhau Hapū prepared by Te Parawhau ki Tai dated July 2026.

[4] Heather J Bryham, Bryndham Farms Ltd and Karen Cave and Joshua Preece.

REVIEW OF TERRESTRIAL ASSESSMENT – INDIGENOUS VEGETATION

9 NZTA engaged me to review the Terrestrial Assessment, as it relates to indigenous vegetation. This section provides a summary of my review. At the outset, I note that throughout my evidence I make reference to numbered polygons for specific areas of indigenous vegetation found within the Proposed Designation. Where not otherwise reproduced in figures throughout my evidence, these polygons can be found in the indigenous vegetation maps in **Appendix B**.

10 I concluded that the Terrestrial Assessment was sufficiently comprehensive and thorough. I consider that the Terrestrial Assessment appropriately applies the industry best practice, Ecological Impact Assessment (*EcIA*) (EIANZ 2018), for the assessment of effects. I am in general agreement with the value assessment for the range of vegetation communities, threatened and at-risk plants, the magnitude of effects and conclusions for what effects and vegetation communities require effects management. I do note that while there are areas that would qualify as 'Significant Natural Areas' (*SNA*) referenced in the Terrestrial Assessment, these do not meet the actual definition of an SNA in the National Policy Statement for Indigenous Biodiversity 2023 (*NPS-IB*).[5]

11 I differed in opinion with respect to the application of the effects management hierarchy. Specifically, the process undertaken to determine what effects can be minimised, remedied, offset or require compensation.

12 Whilst a large area of habitat restoration had initially been proposed, I do not consider the Terrestrial Assessment adequately demonstrated this was comprehensive (or sufficient) to address effects to the full range of vegetation communities affected. For example, there was no specific consideration of threatened forest types associated with fertile soils. I address my assessment of effects and recommended effects management measures in the section below.

MY ASSESSMENT OF INDIGENOUS VEGETATION EFFECTS

13 The key effects of the Project are summarised in the Terrestrial Assessment and include habitat loss, loss of threatened or at-risk plants, habitat fragmentation including edge effects and reduced connectivity, and potential spread of biosecurity threats.[6] This

[5] Specifically, there have been no areas mapped as a Significant Natural Area in the Kaipara or Whangārei District Plans, and while there are significant natural area reports published by DOC, these have not been identified in a policy statement or plan as an area of significant indigenous vegetation or significant habitat of indigenous fauna (as per cl 1.6 of the NPS-IB).

[6] Vol B, Appendix D06 – Assessment of Effects on Terrestrial Ecology (*Terrestrial Assessment*) at section 4.3, pages 27-30.

section provides my expert opinion as to the overall unmitigated level of effect of the Project, based on my review of the Terrestrial Assessment and additional considerations.

Vegetation loss

14 The Project will result in the loss of large areas of indigenous vegetation, through complete habitat loss of approximately 30 hectares. I consider the overall unmitigated level of effect is very high when evaluated for the zone of influence (ie the Proposed Designation). My conclusion is primarily due to habitat loss of vegetation of very high to high ecological value.

15 This level reduces to a high effect at the Eastern Northland Ecological District scale (Table 10 of the Ecological Impact Assessment Guidelines for New Zealand (*EIANZ (2018)*)).[7] The landcover database (LCDB6) in the Eastern Northland Ecological District contains a total area of 112,101 hectares of indigenous 'forest and scrub'. This is made up of broadleaved indigenous hardwoods (6979 hectares), indigenous forest (71,876 hectares) and mānuka and / or kānuka types (33,247 hectares). My commentary on vegetation loss associated with the Project is outlined below.

16 At the outset, I consider it important to acknowledge the vegetation loss that NZTA has avoided through Project development. From my discussions with the Project team, I understand that avoiding significant vegetation was an important consideration in the development of the Indicative Alignment and Proposed Designation. In addition to other constraints within the broader landscape (including existing network utilities and geologically sensitive locations) through which NZTA has been required to 'thread the needle', there are ecologically valuable areas north of Pukekaroro and near the Brynderwyn Hills that were carefully considered in the development of the Proposed Designation.

17 While the Proposed Designation could not avoid all ecologically sensitive areas, it has in certain areas (including two QEII covenants near Brynderwyn).[8] Further, I understand the Proposed Designation has limited direct impacts on significant vegetation by dissecting ecological areas at the narrowest point possible (including north of Pukekaroro and through the Brynderwyn Ranges). Without excluding these areas from the Proposed Designation, greater effects would occur.

18 The Terrestrial Assessment identifies that the Indicative Alignment results in the loss of approximately 29 hectares of native forest of

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[7] Environment Institute of Australia and New Zealand Guidelines for use in *New Zealand: terrestrial and freshwater ecosystem*s (dated May 2018) *(EIANZ*) at Table 10.

[8] Brynderwyn is located at the junction of SH1 and SH12 (NZ Topo50).

moderate to very high value.[9] In my review, I identified some matters of relevance to the extent of vegetation loss from the Project, addressed in turn below.

19 Firstly, I observed that 2260m^2 of kohekohe, taraire, podocarp and broadleaf forest was heavily shaded in NZ aerial imagery and actually part of V2_39. This has been mistakenly mapped in the Terrestrial Assessment as radiata pine forest (V2_26, shown in Figure 1 below), so was not counted in the original 29 hectare total of vegetation loss.

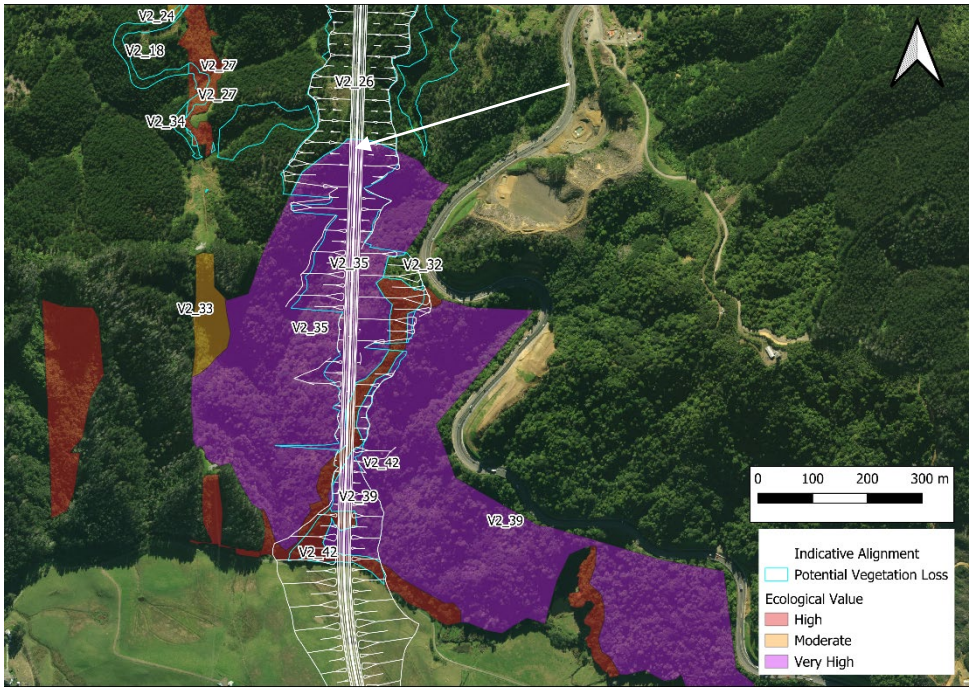

Figure 1 – Location of additional very high value kohekohe, taraire, podocarp and broadleaf forest. The arrow indicates where this error was.

20 Secondly, since lodgement I understand NZTA has committed to:

20.1 avoiding areas of kahikatea forest at Waipū, as shown in Appendix A of the Proposed Designation conditions;[10] and

20.2 reducing the extent of the Proposed Designation boundary, to remove one of the kahikatea stands on the eastern side of State Highway 1 (as discussed in the evidence of Mr Tony Innes).

21 I have reviewed the avoid area maps provided as part of NZTA's proposed designation conditions to the Panel on 13 July 2026 and recommended expanding the avoid area, 10m out from these trees in certain locations. The purpose of this buffer is to avoid potential effects on kahikatea trees and their roots from construction

[9] Terrestrial Assessment, section 5 at pages 27-29.

[10] Designation Conditions – Appendix A – Avoid Areas.

activities, including cumulative hydrological effects (above those already occurring from farm drainage). The amendments to these buffer areas are shown on Figure 2 below.



Figure 2: Recommended buffer to extend the avoid areas for the kahikatea stands that remain within the Proposed Designation

22 I support making this kahikatea forest + 10 m buffer as an avoid area, because it will reduce the potential loss of a critically threatened ecosystem that might otherwise occur. By incorporating this avoid area and removing stands from within the Proposed Designation, potential habitat loss of kahikatea forest will reduce by approximately 1.053 hectares.

23 Thirdly, my review reconsidered the potential effects of vegetation loss for secondary forest dominated by broadleaved trees and tree ferns occurring beneath the Transpower pylon corridor. These areas were assessed in the Terrestrial Assessment as of moderate (V2_9, V2_12, V2_19, V2_21, V2_22, V2_24, V2_33 and V2_34) and high (V2_27) ecological value (as shown on Figure 3 below). Of these areas, one polygon classified as broadleaved mixed forest/scrub was classified as high value (V2_27).

24 In October 2026, I visited this corridor and confirmed vegetation composition. All areas are variable mixes of early age māhoe, pigeonwood, patē and mamaku with secondary broadleaved shrubs such as kanono, hangehange, rangiora, which have regenerated through gorse over the last 20+ years. Parts still retain gorse and pampas and small areas of kikuyu grassland.

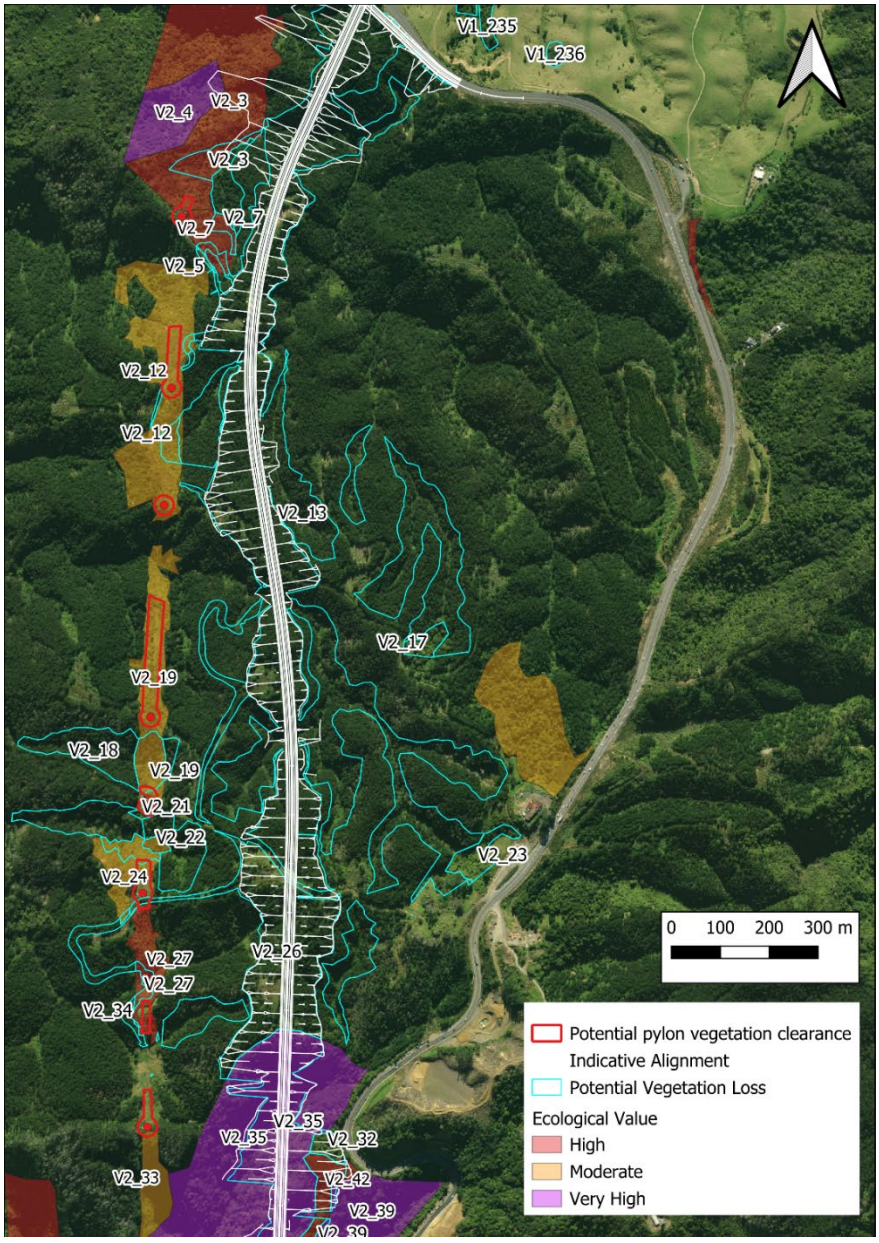

Figure 3 – Areas of likely vegetation clearance beneath Transpower pylons (red polygons), ecological value (as per the assessment), the Indicative Alignment (white) and associated extent of vegetation loss (light blue)

25 Based on the Indicative Alignment, haul roads and fill sites proposed in this corridor will result in habitat loss of 0.9 hectares. The current use of this area as a pylon corridor allows for routine vegetation trimming to maintain clearance for Transpower's transmission lines. This trimming maintains parts of these areas in a cycle of vegetation succession.

26 In previous work experience for DOC, and more recently for Transpower, I have assessed vegetation clearance within transmission line corridors, both prior to and post clearance. These routine vegetation operations occur around pylons and where lines

hang closer to vegetation. Typically felling to waste is undertaken in large sections in high-risk areas every 10-30 years.

27 From this experience, I have mapped the areas within the Proposed Designation in which I would expect cyclical felling would likely occur at some point in the future (shown in red outlines on Figure 3 above).

28 Whilst I acknowledge the Terrestrial Assessment was conservative by including these areas in the assessment of habitat loss, I do not agree that the parts that require routine vegetation clearance are of moderate or high ecological value. I consider that any areas which are routinely felled for maintaining electricity transmission are of low ecological value and should be excluded from effects management, as vegetation clearance is permitted. Routine vegetation clearance will also reduce the value of these areas as an ecological corridor.

29 Accordingly, I have discounted them as part of my assessment of effects.

30 In light of the changes above, I consider the total loss of native forest of moderate to very high value as a result of Project works is approximately 30 hectares. Overall, I consider that the unmitigated level of effect from vegetation loss is high to very high.

31 I did speak with the Project team about further opportunities I would recommend to reduce vegetation loss during Project construction. However, I understand that such avoidance could not be committed to at this stage, as there were questions as to whether avoidance was technically feasible. Specifically:

31.1 Kahikatea, pukatea, pūriri forest (V1_144) of very high ecological value (as shown on Figure 4). I understand that the extent of clearance required in this location could be minimised through movement of the alignment to the east. However, as outlined by Mr Ireland, the geometry of the alignment is very sensitive to changes, meaning an avoid area in this location would substantially limit flexibility to accommodate changes, particularly to interchange forms and connections during detailed design (including those necessary to avoid the kahikatea stands); and

31.2 Kohekohe, taraire, podocarp, broadleaf forest (V2_3, 4 & 7) of high to very high ecological value on the north side of the Brynderwyn Hills (as shown on Figure 5). I understand there is a section of this forest that could possibly be avoided or effects minimised. However, as outlined by Mr Ireland it would require substantial structural interventions to accommodate spoil deposition associated with cut and fill batters, and would have considerable implications for construction costs and programme.

32 In light of the above, I have not considered these as being avoided or minimised as part of my assessment at this stage. However, that does not preclude these from being considered as part of detailed design.



Figure 4 – Kahikatea, pukatea, pūriri forest avoidance opportunity

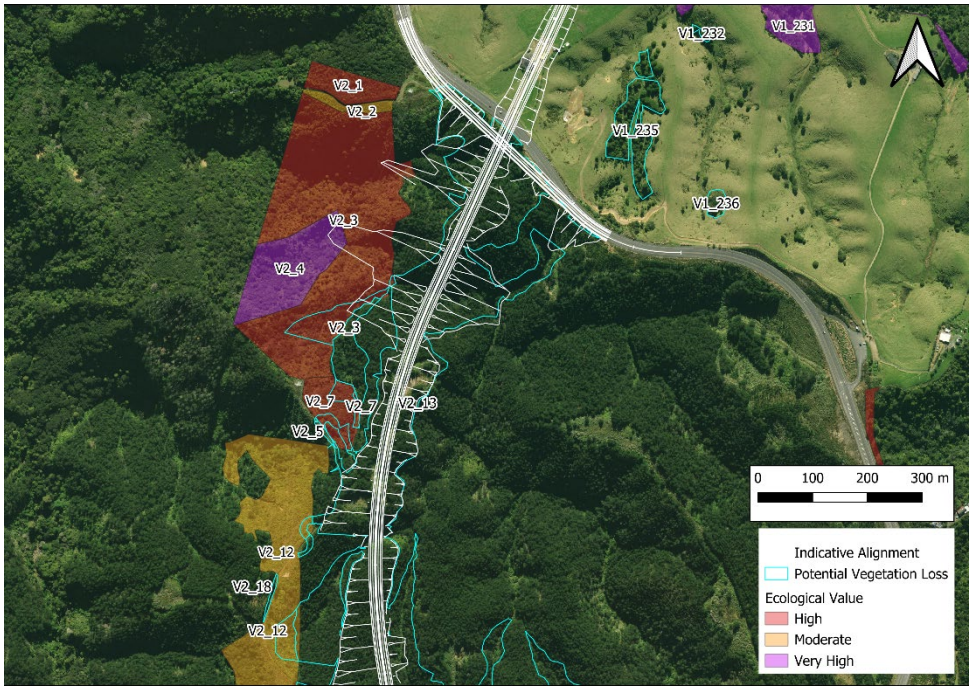

Figure 5 – Kohekohe, taraire, podocarp, broadleaf forest avoidance opportunity

33 Table 1 compares approximate vegetation loss from the Indicative Alignment (assuming the changes noted at paragraphs [31]-[32] above) against vegetation loss if further refinements are possible during detailed design.

Table 1 – Potential further reductions in vegetation loss

Ecological Value	Vegetation loss from Indicative Alignment (ha)	Potential vegetation loss (if identified areas are avoided) (ha)
Very High	18.226	16.136
High	7	4.978
Moderate	4	3.164
Total	29.226	24.277

34 If all changes noted above are adopted, the effects of vegetation loss will reduce by 4.723 hectares, which is a ~17% reduction compared to the Indicative Alignment. I support these changes to design, particularly for reducing effects to the kahikatea, pukatea and pūriri forest (V1_144), which is a critically threatened ecosystem. I note this remnant also contains several large pūriri trees and coastal milk tree (At risk – relict plant).

35 These design changes provide meaningful opportunities to reduce the loss of individual forest areas. However, I do not consider that their assumed avoidance would change the overall unmitigated level of effect of vegetation loss at the zone of influence or Ecological District scales, of very high and high from vegetation loss.

Loss of threatened or at-risk plant species

36 The Terrestrial Assessment identifies eleven threatened or at-risk plant species that were found within the Proposed Designation, six of which are found within the footprint of the Indicative Alignment.[11] Additionally, I found a single shrub of ewekuri (*Paratrophis banksii*) on one of my site visits, which is classified as "At risk – relict". This species was found within an area of kahikatea, pukatea, pūriri forest (V1_144, as shown on Figure 4 above). While this ewekuri is located within the Proposed Designation, it is located outside of the Indicative Alignment.

37 Seedlings of the endangered poroporo (*Solanum aviculare* var. *aviculare*), were seen on forest edges of radiata plantation forestry, though were later absent when these sites were revisited. As this is a pioneer species and demands light, it is likely present at other sites.

[11] Terrestrial Assessment, section 3.1.3 at page 13.

38 Most threatened plants occur in habitat where pressures are limited, or the plant is growing in a location that is removed from these pressures, such as on cliffs. Therefore, I consider it reasonable to expect that threatened plants have restricted distributions within the Proposed Designation and will typically occur in less modified habitat.

39 Having visited a variety of different forest communities and sites affected by the Indicative Alignment, I consider it is likely that threatened and at-risk plants are absent from the majority of the modified and secondary forests. This absence is because they were eliminated during early land clearance fires or by decades of stock grazing.

40 With the addition of the Waipū kahikatea remnants as an avoid area, a reduction of loss of *Muehlenbeckia complexa* var. *grandifolia* will occur. The Northland Region threatened plant list[12] ranked this as Regionally Naturally Uncommon (a considerable lowering compared to its 2023 ranking of Nationally Vulnerable).

41 For this reason, I support the conclusion in the Terrestrial Assessment that the potential effect of the Project on at-risk and threatened plant species (excluding kauri) is low.[13] Effects to kauri forest are addressed in the vegetation loss section above.

42 It is possible that some threatened plant species remain undetected within the Proposed Designation (including areas outside the Indicative Alignment), such as in the southern Brynderwyn forest which due to steepness has been surveyed less thoroughly. However, I do not expect that large undiscovered populations of threatened plants are likely to occur. Consequently, I have confidence that the assessment of effects for threatened plants is sufficiently robust and the effects (excluding kauri) are low.

43 I further note that the Terrestrial Assessment did not consider regionally threatened or at-risk species identified in Northland Regional Council's conservation status for indigenous vascular plant species. However, this list was not available during the survey period, having been published in June 2026 *after* lodgement of the application. I have retrospectively considered this list against species recorded in the Proposed Designation and Indicative Alignment (see Table 2 below).

44 Presence of these regionally threatened or at-risk plants does not change my overall conclusion that the effect of the Project is low (including if there were changes to the Indicative Alignment).

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[12] Ford, M., Cameron, E., Champion, P., de Lange, P., Townsend, A., & Forester, L. (2026). Conservation status of indigenous vascular plants in Taitokerau / Northland 2026. Northland Regional Council, available here.

[13] Terrestrial Assessment section 4.3.1, at Table 17.

Table 2 – Analysis of regionally at-risk or threatened plant species			
Species	**Regional rank**	**In Proposed Designation?**	**In Indicative Alignment?**
Alsophila cunninghamii (gully fern)	Regionally Naturally Uncommon	Yes	Unknown
Coprosma propinqua	Regionally at-risk declining	Yes	No
Coprosma rigida	Regionally at-risk declining	Yes	No
Coprosma tenuicaulis (hukihuki)	Regionally Naturally Uncommon	Yes	Yes (rare in V3_27)
Fuchsia excorticata	Regionally at risk declining	Yes	Yes (local in V4_64)
Libocedrus plumosa (kawaka)	Regionally Naturally Uncommon	Yes	Yes (six trees in V1_228)
Passiflora tetrandra (kohia)	Regionally at risk declining	Yes	Yes (locally common in V3_27)
Pennantia corymbosa (kaikomako)	Regionally at risk declining	Yes	Yes (rare in V3_27)
Plagianthus regius (mānatu)	Regionally at risk declining	Yes	No
Sophora microphylla (kōwhai)	Regionally at risk declining	Yes	No
Veronica macrocarpa var. *macrocarpa*	Regionally Naturally Uncommon	Yes	Yes (rare in V2_42 on ridge)

Fragmentation, edge effects and reduced connectivity

45 The Indicative Alignment will result in fragmentation, edge effects and reduced connectivity of very high to moderate ecological value forest habitat. The Terrestrial Assessment concluded that these effects would have a very high level of unmitigated effect.[14]

46 I consider this level to be a worst-case scenario and that fragmentation and edge effects for vegetation to be more nuanced than the Terrestrial Assessment presents. This distinction is

[14] Terrestrial Assessment, section 4.3.1 at pages 29-30, Table 17.

because severance affects forest remnants differently depending on their size, shape, forest structure and composition. For example, small forest remnants have more edge to interior habitat and will be less affected by increased light than areas where the alignment cuts into interior (cool and shady) forest habitat.

47 Edge effects are multifaceted and affect the edge of a forest in a variety of different ways and at varying distances. These effects include direct physical effects caused during construction, as well as indirect environmental effects, which are permanent changes.

48 During construction, direct effects are likely to occur to immediate edge areas, damaging tree roots and exposing vegetation to direct sunlight. This damage and exposure can cause localised plant death, windthrow, reduced growth and productivity. This would be more severe if clearance was followed by drought. Root damage can also cause tree death from plant pathogens. Edges are also particularly vulnerable to windthrow, colonisation by invasive weeds and ongoing changes in vegetation composition.

49 Abiotic factors such as light, temperature, moisture and wind flow change with fragmentation. These affect the edge of a forest at various distances from approximately 40 m for light and moisture to up to 200 m for wind disturbance.[15]

50 As the Proposed Designation is located within an area of reasonable average rainfall,[16] normal weather conditions should maintain sufficient soil moisture to plants with damaged root systems or more exposed.

51 Northland drought and severe storms are becoming more frequent and severe with climate change. Effects would be greater if an extreme event such as these followed the creation of new edges effect.

52 Within the context of the Project, large cuts into existing forest, such as the southern approach across the Brynderwyn Hills Range, are expected to cause wind tunnels and additional windiness to the adjoining forest remnants. This has the potential to change the abiotic environment and increase tree wind throw, particularly of tall trees and those on the edge with damaged roots. Tree windthrow can uproot tree root plates which could also increase the potential

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15 Davies-Colley, R. J., Payne, G. W., & Van Elswijk, M. (2000). Microclimate gradients across a forest edge. New Zealand Journal of Ecology, 111-121; Wilcox, F. (2010). Vegetation recovery and management of kahikatea *(Dacrycarpus dacrydioide*s) dominated forest remnants in the Waikato Region. Unpublished MSc Thesis, University of Waikato.

16 1100 – 1200 mm average rainfall. P.R. Chappell (2014). The Climate and Weather of Northland. 3rd Edition. NIWA Science and Technology Series, number 59.

for landslips and soil erosion to occur which may impact remnant forest areas.

53 For terrestrial vegetation, loss of connectivity from the creation of a four-lane expressway is less significant compared to other species such as land snails. Plants and their genes disperse in a variety of ways including via wind and native birds, during pollination and seed dispersal. These functions in this landscape are not limited by the width of a four-lane expressway.

54 Despite this general understanding of habitat fragmentation and edge effects, quantifying this effect and determining commensurate effects management measures is difficult using the EIANZ (2018). This is because wider scale effects, beyond the edge such as increased tree windthrow during future severe storms, are speculative and could also have happened if the road had not been built.

55 Assessed at the zone of influence scale, the level of habitat fragmentation ranges from negligible for small remnants, and low for larger remnants where the alignment dissects larger forest areas.

56 The level of effect however has the potential to be moderate in localised locations, where the road dissects steep land where trees are potentially more prone to wind throw, uprooting and associated land slips.

57 Overall, I consider the most probable unmitigated level of effect of fragmentation and edge effects within a 40 m edge under normal climatic conditions to be low. Within 5 to 10 m of the new forest edge where root damage is expected, this effect could be moderate to high, applying Table 10 of the EIANZ (2018) especially if followed by drought or a severe storm causing wind throw.

58 As a precautionary measure, I consider there is a need to remediate vegetation edges especially in steep land to protect both the expressway and adjoining natural values (discussed further below).

59 Past projects I have been involved in have managed edge effects by estimating an additional area around specific vegetation and counting that as a loss. I do not consider this to be necessary where consent conditions are written to require loss to be either offset or compensated and incentivise retaining as much vegetation as practicable. The Terrestrial Assessment has proposed effects management at the northern and southern mitigation sites to address edge effects. I discuss options for addressing fragmentation and edge effects in the recommendations section below.

Biosecurity risks - Kauri dieback

60 Kauri is present within the Proposed Designation and is abundant in V1_228, with regeneration also present in kānuka forest areas (as shown on Figure 6 below).

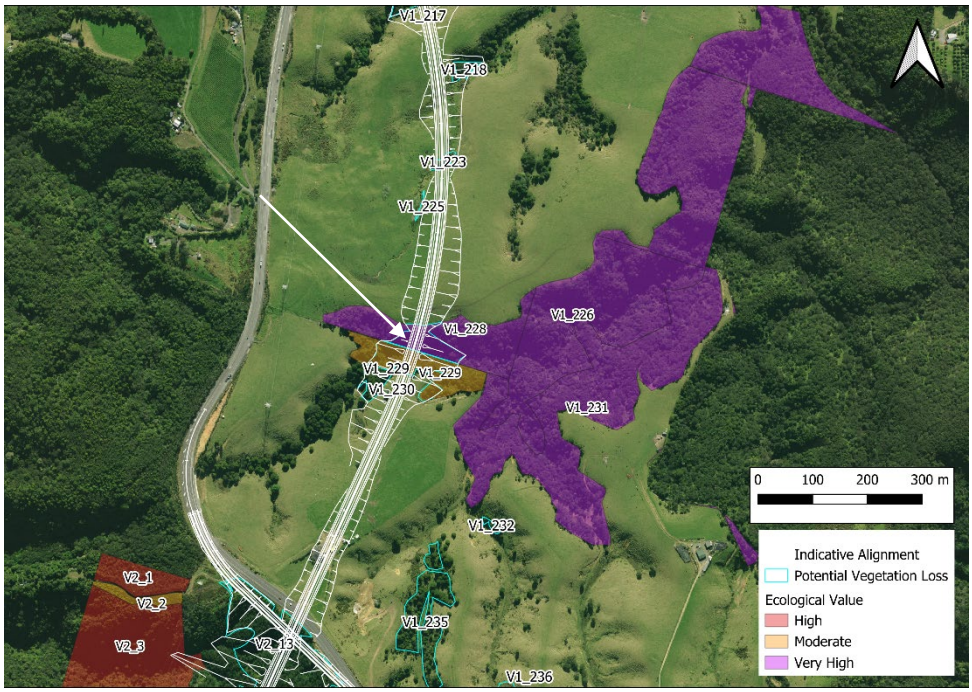

Figure 6 – Areas of kauri trees within V1_228 indicated by the arrow.

61 Kauri dieback fungus (*Phytophthora agathidicida*) is a soil borne plant pathogen that principally spreads via contaminated footwear, earthworks, vehicles, equipment and ungulates (ie hoofed animals). Once a kauri tree has been infected with the disease, it will eventually die. This threat is now the primary reason why kauri trees are classified as At Risk - Declining. It also causes similar mortality for other native trees such as rewarewa (*Knightia excelsa*).

62 If kauri dieback fungus was spread into the Proposed Designation, it would pose a significant long-term risk to the health of kauri trees present. This risk also applies to any areas where mitigation is proposed to occur, and kauri trees are present or would be planted.

63 No kauri with disease symptoms, or dead standing kauri, were observed within the Proposed Designation and the area is currently assumed to be free of disease. But kauri dieback has been confirmed nearby.[17] I observed dead standing kauri south of the Proposed Designation on the west side of Pukekaroro maunga which potentially have died from kauri dieback. Consequently, because

[17] Tiakina Kauri Kauri Protection, Kauri and disease distribution maps available here.

the disease occurs nearby, spread into the Proposed Designation is of moderate to high risk.

64 Applying Table 10 of EIANZ (2018), if kauri dieback were to spread into the Proposed Designation, the unmitigated level of effect is high to kauri (consistent with the conclusion in the Terrestrial Assessment).

Conclusion for overall unmitigated level of effects

65 I have reviewed Table 17 of the Terrestrial Assessment[18], reflecting the different types of effects and levels if they are not mitigated. I am in agreement with the majority of this table.

66 I differ only with respect to edge effects and fragmentation (within 40 m edge). For this effect, the level could range from low to high, depending on the location, the value of the remnant forest and whether an extreme weather event follows the vegetation clearance and creation of new edges.

RECOMMENDATIONS AND NZTA'S PROPOSED MITIGATIONS FOR INDIGENOUS VEGETATION

67 As part of my review of the Terrestrial Assessment, I have considered Mr Chapman's recommendations to manage effects on indigenous vegetation. I recommend refinements to those measures as outlined below.

Avoidance

68 As outlined at paragraphs [16]-[21] above, avoidance has been captured through development of the Proposed Designation boundary and within this, through conditions restricting works in areas of moderate to very high value indigenous vegetation. As outlined above, while I consider there are further opportunities for avoidance, I do not consider these are expressly necessary to manage effects from an ecological perspective.

69 Avoidance measures are also recommended to prevent the spread of biosecurity risks, particularly kauri dieback and invasive weeds. I understand NZTA is required to develop a plan to avoid effects from kauri dieback to comply with the Biosecurity (National PA[19] Pest Management Plan) Order 2022. I consider the measures required by these regulations will be appropriate to ensure the risk of spreading kauri dieback is appropriately managed.

Minimise

70 Habitat loss has been minimised through the design of steep cut batters where the Indicative Alignment dissects through hillslopes with indigenous vegetation. Cut batters are likely to be between 26 and 45 degrees. This significantly minimises the amount of habitat

[18] Terrestrial Assessment, section 4.3.1 at Table 17, at pages 29-30.

[19] PA is an abbreviation for the kauri dieback pathogen *Phytophthora agathidicida.*

loss of very high value indigenous vegetation, particularly when compared to shallower sloped cuts.

71 Much of the alignment has a low abundance of environmental weeds, and biosecurity measures to prevent weed spread are recommended.

Remediation

72 Loss of vegetation through areas of native forest will result in open habitat on the margins of the Indicative Alignment. This open habitat is likely to cause edge effects associated with fragmentation. I consider that weed invasion into edges poses the greatest threat to indigenous vegetation.

73 Where native forests are given suitable conditions, they have immense capacity to recover by natural regeneration (especially where ungulates are not present and weeds are controlled).

74 To address edge effects, I recommend that weed management be undertaken adjacent to high value and very high value areas of indigenous vegetation that remain following Project clearance works. Most of these areas have few environmental weeds and so natural regeneration will occur. As stated above, I do not think all areas should require weed management, including areas which are currently grazed by stock and small areas that are largely edge. Priority areas (shown on Figures 4 to 7) are:

74.1 Kānuka, podocarp (tānekaha dominant) forest (V4_62, V4_64 & V4_66) (as shown on Figure 7 below);

74.2 Taraire, kohekohe, broadleaved podocarp forest (V2_35, V2_22, V2_7, V2_3) (as shown on Figure 5);

74.3 Kahikatea, pukatea, pūriri forest (V1_144) (as shown on Figure 4); and

74.4 Kauri (kawaka) forest (V1_228) (as shown on Figure 6) which is adjacent to the proposed northern mitigation area.

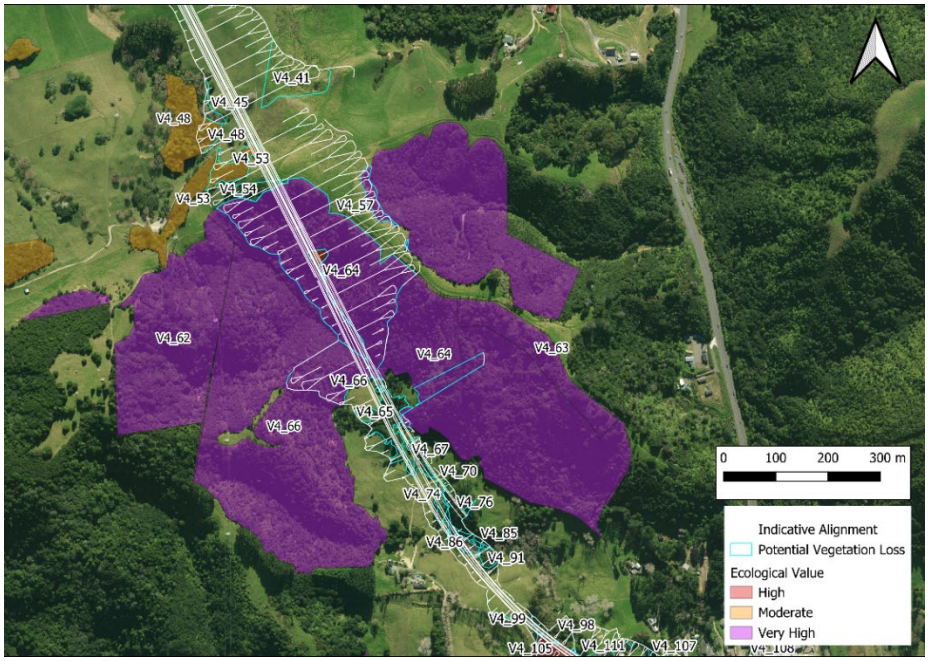

Figure 7 – Kānuka, podocarp (tānekaha dominant) forest (V4_62, V4_64 & V4_66) recommended weed management on forest edge.

75 Weed management should be undertaken up to 40 m into the forest from the created forest edge. Weed management should be undertaken until the edge has recovered with:

75.1 Dense cover (>80%) of shrubs, ferns and small trees greater than 2 m tall; and

75.2 A very low abundance (<1%) of environmental weeds.

76 If landslips occur within 40 m into the forest edge, appropriate remediation will be undertaken. Potentially including assisted remediation including hydroseeding of bare soil and weed management to facilitate natural regeneration. I understand that there may be some potential practicability issues with implementing certain types of remediation on certain slopes. As outlined in the evidence of Mr Ireland, cut batters for the Project will be steep and high in certain places and situated in a high rainfall environment. These gradients, along with local climatic conditions and the need for wide-spread retention of topsoil, mean that revegetation may not be practicable to establish or maintain dense vegetation cover. Other remediation techniques (such as hydro-seeding) would need to be used in those circumstances.

77 After application of the above mitigation measures, residual adverse effects remain, including habitat loss of approximately 29 hectares of indigenous vegetation and the loss of nationally and regionally at-risk or threatened plant species. The unmitigated level of effect of these is very high (for habitat loss) and low (for the loss of nationally at-risk plant species).

78 For sensitivity testing purposes, I consider that the unmitigated level of effects will be similar if there were changes to the alignment during detailed design. This is because there are no options to dissect through areas of very high ecological value south of the Brynderwyn Ranges which would result in less habitat loss.

79 Threatened and rare plants affected or within the Proposed Designation are mostly chronically (at-risk) threatened species. A single potential taxon, *Muehlenbeckia complexa* var. *grandifolia* which in 2023 was listed as acutely threatened (nationally vulnerable), though in the more recent 2026 Northland ranking is Regionally At-Risk – Regionally Naturally Uncommon. The downgrading of the threat status for Northland was made on the basis that it is now known to be more widespread.

80 Two *Muehlenbeckia complexa* var. *grandifolia* plants were seen within the Indicative Alignment in the initial survey. One of these is now avoided as it occurs in the Waipū kahikatea forest remnant. I found another two plants on the edge of wetland 25, growing through remnant tōtara trees. No consensus however exists in the botanical community whether this is a distinct species or of hybrid origin.

81 Poroporo (*Solanum aviculare* var. *aviculare*), Nationally endangered, has not been found within the Indicative Alignment. This species is a pioneer and establishes in recently disturbed habitat where herbivores are absent. For example, the only plants seen within the Proposed Designation were in plantation forest, and other plants could occur where recent windthrow has occurred.

82 Excluding kauri, I consider the magnitude of effect to these plants is low, given the limited numbers of individual plants found. The effects are low, and therefore I do not consider specific offsetting is necessary to manage effects to these plants.

83 Despite this, I consider there are opportunities to, and I recommend, remediating this small loss by including some suitable species within offset restoration planting or landscape planting treatments. For example:

83.1 Within what I refer to as the 'northern indigenous mitigation site' (Figure 8 below) area, *Libocedrus plumosa* could be included in the kauri, podocarp, broadleaved forest planting treatment to remediate for the loss of six trees.

83.2 Within what I refer to as the 'southern indigenous mitigation site' (Figure 9 below) area, *Metrosideros robusta*, *Fuchsia excorticata*, *Pennantia corymbosa* could be included on fertile melanic soils, the latter two in appropriate microsites. *Solanum aviculare* var. *aviculare* potentially could be used as a pioneer species in this area, at least on forest edges.

83.3 At the potential Waipū kahikatea treatment area, *Coprosma rigida*, *C. propinqua*, *C. tenuicaulis*, *Fuchsia excorticata*, *Pennantia corymbosa*, *Plagianthus regius*, *Solanum aviculare var. aviculare* and *Sophora microphylla* could be included.



Figure 8 – Northern Indigenous Mitigation Site and Indicative Alignment

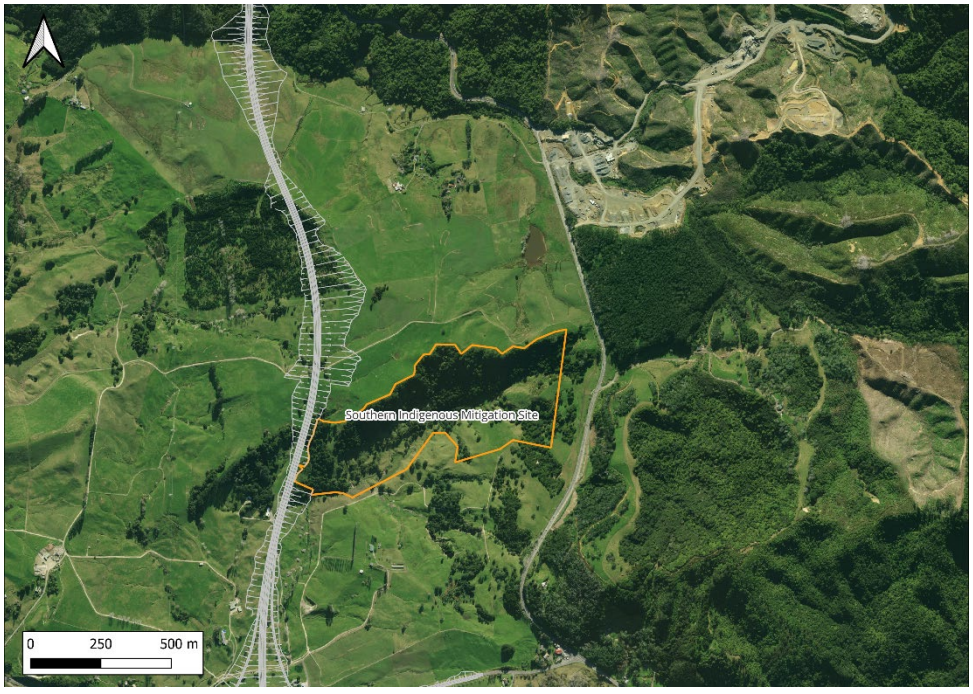

Figure 9 – Southern Indigenous Mitigation Site and Indicative Alignment

84 There is also potential to include *Veronica macrocarpa* var. *macrocarpa* within landscape planting areas, which would be more suitable than offset restoration planting areas. This species is also recommended to be used where scrub habitat for lizards is proposed.

85 I do not recommend that fixed percentages be assigned to these species within restoration treatments. Rather, the number included be determined by the suitability of planting sites to include these, considering the niche requirements of these species and the future restoration outcomes.

86 Other restoration actions, such as excluding stock from the northern indigenous mitigation site, could also remediate effects to some species, such as allowing maire (*Mida salicifolia*) seedlings to regenerate. Being a root parasite, translocation of this species is unlikely to be successful.

Offsetting

87 The Terrestrial Assessment recommended effects management for loss of native forest of moderate to very high ecological value.[20] These effects management measures include fencing to exclude stock, weed and animal pest management and restoration planting at three mitigation sites.

88 These mitigation sites are referred to as the 'southern', 'central' and 'northern' mitigation sites in the Terrestrial Assessment, each comprising approximately 54.5, 114 and 29 hectares respectively.[21] I understand that the central mitigation site was primarily included to address effects to Hochstetter's frogs, and therefore I do not consider that this is a priority for vegetation restoration. Further, I do not consider that it is required for offsetting terrestrial vegetation, particularly recommending that the land surrounding the Waipū kahikatea remnants are added as a new mitigation area.

89 The Terrestrial Assessment outlined that approximately 29.8 and 9 hectares of planting would be required at the northern and southern mitigation sites respectively to offset effects on indigenous vegetation.[22]

90 While I support these recommendations in principle, I consider further refinements are necessary to ensure effects on indigenous vegetation are appropriately managed. This section will address my opinion on:

90.1 Appropriate habitats for offsetting;

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[20] Terrestrial Assessment at section 5, Table 23.

[21] Terrestrial Assessment at sections 5.1.1 and 5.1.3.

[22] Terrestrial Assessment at sections 5.1.1 and 5.1.3.

90.2 Offsetting ratios;

90.3 Adequacy of the proposed mitigation sites; and

90.4 Overall conclusion on residual effects post-offsetting.

Offsetting is appropriate for some, but not all, native forests

91 Not all loss of vegetation is appropriate to offset. I undertook a site investigation using the criteria in Appendix 3 of the NPS-IB, to evaluate whether it was appropriate to offset high and very high habitat (and if so, which types).

92 I determined from field work which forest areas within the Proposed Designation were appropriate to offset. These included advanced secondary forests dominated by kānuka and gymnosperm trees such as tōtara, kahikatea and kauri. Whilst some of these trees may be up to 80 years old, the forests are comparatively simple in structure and composition, densely stocked with minimal understorey and ground cover tiers. Some areas are grazed whilst others have exotic species as the ground cover tier. These factors make them suitable for offsetting.

93 There are only two forest areas of very high ecological value within the Proposed Designation, which I consider inappropriate to offset:

93.1 kānuka, podocarp (tānekaha dominant) forest (V4_64 & V4_66), occupying 7.921 hectares and shown on Figure 7 above; and

93.2 taraire, kohekohe, broadleaved podocarp forest (V2_3, V2_7, V2_22 & V2_35), occupying 7.07 hectares and shown on Figure 5 above.

94 These areas are unsuitable for offsetting for three reasons:

94.1 They are mature, structurally and compositionally diverse forests that include components, such as long-lived emergent trees, epiphytes and vines, which do not occur in younger forests.

94.2 Offsetting has limits of what ecological outcomes will develop through a standard 35-year consent period. This is especially so for vegetation restoration planting.

94.3 Whilst restoration of an existing (degraded) forest could theoretically demonstrate no net loss (using the BOAM), there is a lack of data demonstrating improvement of forest health from management in Northland forests. This means robust BOAM calculations based on actual data would not be able to be performed to confidently demonstrate no net loss (or a lesser outcome). Using this approach would also require baseline data from suitable restoration site(s), that are

comparable and adequate with respect to the vegetation communities affected.

95 I recommend that these areas of very high ecological value (as shown on Figures 5 and 7) are compensated for if impacted (discussed further below).

96 In addition to the matters outlined above, I also note that in the absence of further information for areas under and adjacent to the Transpower corridor, I recommend the parts that are not cleared for electricity transmission are replaced at a ratio of 1 : 1 (ecological compensation ratio) using restoration planting.

Offsetting ratios

97 For the loss of approximately 29 hectares of moderate to very high ecological value indigenous forest, the Terrestrial Assessment proposed to undertake approximately 150 hectares of restoration planting along with conservation actions to restore existing forest habitat, across the three mitigation areas. This was an approximate offset ratio of five hectares restored for one hectare lost. In addition, a planting of 50 kauri trees for the loss of large kauri affected (greater than 50 cm diameter) was included in conditions.

98 I undertook a BOAM[23] to determine what would be an appropriate ratio to offset the loss of different forest habitat within the Proposed Designation. I consider the BOAM should be used as a decision support tool with a critical appraisal of the results provided. Particularly considering whether the amount of offset recommended is reasonable (c.f. loss), and whether the assumptions made hold true.

99 I collected data from representative forest areas, including tree height and diameter for the dominant canopy species. From this information, I calculated the average tree height and used this as the attribute of ecological value within the BOAM.

100 To support this calculation, I obtained tree growth data from published literature for the same species and developed growth models using average growth for these species over time. I used a discount rate of 4% and the benchmark values of the average tree height of mature trees. Confidence levels were set high (>95%) because restoration of these tall tree species is well proven, such as applying the Timata method.[24] Scenarios over 5 years and 35 years were run.

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[23] Maseyk, F.; Maron, M.; Seaton, R.; Dutson, G. (2014). A Biodiversity Offset Accounting Model for New Zealand. User Manual. The Catalyst Group Contract Report No. 2014-008 prepared for Department of Conservation.

[24] The Timata Method: A low-cost way to retire farmland into native forest - Our Land & Water - Toitū te Whenua, Toiora te Wai.

101 I also collected equivalent data from older growth, more structurally and compositionally complex forests that are inappropriate to offset (discussed above). The purpose of this data was to inform the development of a compensation package using the BOAM as a decision support tool (discussed further below).

102 I consider that the BOAM results are scientifically robust because they used actual tree height data measured from representative areas and tree growth data from published studies.

103 The BOAM is designed to disaggregate parts of a habitat model and is recommended to include other tiers, such as for the understorey and ground cover. I did not include these tiers and made the assumption, that using average tree height of tall canopy trees is sufficient because over time I expect these components to develop naturally.

104 I consider this assumption to be valid for three reasons:

104.1 The areas of habitat loss have very limited subcanopy and ground cover tiers, therefore loss of these components is comparatively insignificant compared to the canopy tier.

104.2 The proposed 'indigenous mitigation sites' include areas of indigenous forest that contain a wide range of native plant seed sources, which will spread into planted areas.

104.3 These 'indigenous mitigation sites' have few invasive weeds to derail natural vegetation succession. Therefore, I consider that it is reasonable to assume given the management proposed over the 35-year timeframe, natural regeneration of ground cover species such as ferns and tree seedlings will occur into planted forests.

105 For the offset forests, the BOAM calculations determined offsetting ratios of between 1 : 2 for kānuka forest to 1 : 3.79 for kauri forest, with an average of 1 : 2.91, when run over 35 years. Overall, I consider that a 1 : 3 ratio is appropriate for all forest types. Considering impacts from the Indicative Alignment, this would require restoration planting of ≥11 hectares managed over 35 years to address approximately 3.67 hectares of indigenous forest habitat.

106 The proposed conditions also proposed planting 50 kauri for the loss of kauri trees ≥50 cm diameter at breast height. Most of these are situated within V1_228 which is already included within the BOAM calculations. Approximately 15-20 large kauri trees also occur elsewhere, mostly within V1_214 (Appendix B, Figure B2), V4_64 and V4_66 (north of Pukekaroro, shown on Figure 7). I recommend that where kauri trees over 50 cm in diameter at breast height are located outside of kauri dominant forests, they should be offset at the 1 : 50 ratio.

107 In addition to kauri, several large pūriri trees occur in V1_144 which I recommend also be replaced at a 1 : 50 ratio (where over 50cm in diameter at breast height). Similarly, this offsetting would only be required where these individual tree species are located outside of areas of pūriri dominant forest.

108 Areas of secondary broadleaved treefern forest within the Transpower Corridor not expected to be routinely cleared for power transmission purposes, I recommend be offset at 1 : 1 ratio.

Assessing the adequacy of mitigation areas

109 I undertook a desktop spatial evaluation of the adequacy of the northern and southern mitigation areas for restoration planting to offset the loss of habitat. This evaluation considered the size of the vegetation communities anticipated to be planted and the potential for restoration based on the land systems (soil types and landforms) present.

110 I used the potential ecosystem classification system[25] as the restoration planting goal, not a like-for-like replacement. I used this approach because restoration treatments, which aim to restore near equivalent potential ecosystems, are more meaningful than like-for-like treatments such as planting kānuka forest. This approach is known as 'trading up' which is defined as '*demonstrably of higher conservation value, quality, and importance than the one lost*'.[26] In the future, I anticipate trading up will result in a net gain (though beyond a 35-year timeframe).

111 The northern indigenous site and southern indigenous site include land systems currently that have pasture suitable for restoring the following potential ecosystems:

111.1 Approximately 1.87 hectares of WF8 kahikatea, pukatea forest within gullies with poor draining gley soils;

111.2 Approximately 3.85 hectares of WF7.2 pūriri, taraire, kohekohe, podocarp forest on shallow to steep hillslopes with melanic (fertile) soils; and

111.3 Approximately 34.7 hectares of WF11: Kauri, podocarp, broadleaved forest on shallow to steep hillslopes with ultic and brown soils.

112 In addition to the above, the land surrounding the Waipū kahikatea forest remnants included within the avoidance area is very suitable

[25] Singers, N.J.D.; Rogers, G.M. (2014) A classification of New Zealand's terrestrial ecosystems. Science for Conservation 325, Department of Conservation.

[26] Singers, N.J.D.; Rogers, G.M. (2014) A classification of New Zealand's terrestrial ecosystems. Science for Conservation 325, Department of Conservation.

as a potential mitigation area. This was not identified in the Terrestrial Assessment.

113 The Waipū land could be used for offsetting the loss of all kahikatea forest types and would also be a preferable option for trading up for the loss of secondary kānuka and tōtara forest. Restoring approximately 5.5 hectares of farmland here would join up all remnants into a cohesive single natural area.

114 Collectively, these three mitigation sites contain more land and the variety of soil types required to restore the variety of ecosystems described at paragraphs [111]-[113] above. This therefore creates options to trade up restoration planting preferentially to threatened forest types. They are also very feasible areas to manage because they contain limited invasive weeds, feral ungulates are absent and stock can be excluded.

115 There are other suitable land systems and areas within the Proposed Designation, including:

115.1 Kahikatea, pukatea, pūriri forest could be restored on land adjoining remnant V1_144, which some loss of is expected;

115.2 Pūriri dominant forest could be restored on land adjoining V4_38; and

115.3 Kauri, podocarp forest could be restored on land adjoining V4_64 and V4_66 and the Indicative Alignment, north of Pukekaroro.

116 These three options occur in close proximity to the point of impact.

117 As outlined above, I consider a 1 : 3 offsetting ratio is appropriate for kauri forest. Based on the impacts of the Indicative Alignment in V2_38 where the kauri forest is located, a minimum of 1.3437 hectares would be restored using a kauri, podocarp, broadleaved forest restoration treatment (likely containing kauri at least 400 trees per hectare). For the loss of approximately 15 scattered large kauri trees[27] outside these areas, a 50 : 1 ratio this will add approximately 750 kauri trees. These areas could be planted as small groves of trees in ecologically suitable locations at the northern indigenous site. Combined, these measures would result in a minimum area of 2 hectares of kauri, podocarp, broadleaved forest, more than currently occurs in the Proposed Designation.

118 Where there is suitable land for the critically threatened pūriri forest (such as in the southern indigenous site) and kahikatea forest, I consider these two forest types should preferentially be restored as

[27] Kauri trees identified within the Indicative Alignment are outlined in Appendix O of the Terrestrial Assessment.

part of offset planting, trading up the loss of secondary kānuka and tōtara forest.

119 This is because these forest types are threatened forest types of higher potential conservation value. If either or both options were implemented, less kauri, podocarp, broadleaved forest would be restored compared to proposed in the assessment but would result in higher ecological value.

Conclusion post-implementation of offsetting

120 The BOAM calculations determined no net loss when run over a 35-year timeframe. Implementing a 1 to 3 mitigation ratio further increased the total amount of planting by 3%. Whilst not accounted for in the model, I consider that this will result in a small net gain.

121 Net gain will also occur in three other ways. Trading up for the loss of secondary forests by restoring critically threatened ecosystems. Planting around the margins of existing remnants buffering and increasing their size. Restoration actions undertaken, such as stock exclusion at the northern indigenous site will result in additional biodiversity gain within existing forest areas currently grazed by cattle. These biodiversity gains are meaningful though none have been accounted for in the BOAM calculations for vegetation.

122 Measured over a 35-year timeframe, I am confident that collectively these actions will result in net biodiversity gain for the 3.67 hectares of habitat loss I have determined is appropriate to offset.

123 For sensitivity testing purposes, with respect to the forests which I consider can be offset, my recommendations and conclusions would be generally consistent if a design change occurred.

124 The only exception is if the extent of habitat loss of remnant (V1_144) was to increase. The Indicative Alignment currently removes the eastern edge of this remnant which is predominately densely stocked secondary kahikatea trees. If the alignment was to be moved further west it would impact mature forest including very large pūriri trees. This would shift this habitat loss into ecological compensation.

125 With respect to long term persistence, I recommend that all offset areas are legally protected (for example by QEII, through an appropriate conservation covenant).

Compensation

126 To address the residual adverse effects arising from the loss of very high value forest, I recommend that compensation is provided. Based on the Indicative Alignment, this would be for the loss of 14.361 hectares of very high value forest. This is different to the Terrestrial Assessment which proposed restoration planting and conservation management actions such as stock exclusion, animal and weed control to address all effects.

127 I consider compensation should be used primarily for averting loss of unprotected forests, where priority areas occur in the Proposed Designation, or within the main catchments affected and lastly in the wider Eastern Northland Ecological District.

128 The focus should be prioritised to firstly threatened forest types, such as those dominated by pūriri, tōtara and kahikatea on fertile melanic and alluvial soils and secondly habitat of threatened species affected by the Project.

129 In my opinion, compensation for loss of indigenous forest should be consistent with broader principles that apply to protection of land for ecological purposes. While not specifically required, I consider that my proposed approach is consistent with section 3(b) of the Reserves Act 1977 and the purpose of the protected natural areas surveys undertaken across Northland to identify priorities for the preservation of high value ecosystems, habitats and communities. Of note, section 3(b) says:

> *Ensuring, as far as possible, the survival of all indigenous species of flora and fauna, both rare and commonplace, in their natural communities and habitats, and the preservation of representative examples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character.*

130 I consider my approach is consistent with these outcomes because it will ensure protection of forest areas that would not otherwise be protected, contributing to the survival of such species and preservation of representative examples of forest types.

131 Within and in close proximity to the Proposed Designation there are priority areas where compensation could occur. Examples include the Waipū kahikatea remnants, which occupy 4.59 hectares and would complement the proposed offset planting by joining these areas together. Other potentially suitable examples include the kahikatea, pukatea, pūriri forest in V1_144 (Figure 4) and V4_63 & V4_64 (Figure 7) of approximately 11 hectares, which contain secondary kauri, podocarp forest. Combined, at least 17 hectares of priority forest habitat exists in the Proposed Designation, which exceeds the area of loss on the Indicative Alignment.

132 Other priorities outside the Proposed Designation could include the forest margins of the Ahuroa and Waihoihoi rivers and the pūriri forests in the wider Wairau River catchment. Many of these areas were identified as recommended protected areas as part of the New Zealand Natural Areas Programme.[28]

[28] Natural areas of Waipū Ecological District: reconnaissance survey report for the Protected Natural Areas Programme Jenny Lux, Tim Martin and Sarah Beadel, 2007. New Zealand Protected Natural Areas Programme.

133 Actions to avert loss could include:

133.1 Land surveying and legal protection, such as a QEII covenant;

133.2 Providing an ecological value assessment report, biodiversity action plan and associated information to enable obtaining third party revenue, such as transferable environmental benefit lots or biodiversity credits;

133.3 Excluding stock and feral ungulates; and

133.4 Initial weed and animal pest control to low levels and infrastructure such as traps to support ongoing control.

134 While I do not think active maintenance of protected areas is required, initial protection and actions to facilitate regeneration would ensure that compensation was meaningful and commensurate to the loss.

135 Whilst the areas identified for compensation are of very high ecological value, I do not consider it necessary to specifically target aversion of the exact same forest types. This is because hill country forests of similar composition are already well represented in the broader reserves network, and therefore other high value forest types could also be protected and achieve a similar outcome.

136 I used an objective method to quantify the amount of compensation (ie ~$300,000 per hectare lost). This used the anticipated loss of approximately 15 hectares and multiplied it by the 1 : 3 ratio as determined using BOAM calculations (for offsetting) to calculate an appropriate area that would be necessary to compensate for such loss (45 hectares). The BOAM provides rigour to this because it applies the precautionary principle.

137 Using this area, I calculated what it would cost to manage forest restoration from scratch over 35 years, with the objective being to restore kohekohe, taraire, podocarp, broadleaved forest (similar to loss within the southern Brynderwyn Range). Comparatively, purchasing land and restoring forest is a higher cost activity, so the approach recommended should provide sufficient resources to protect a meaningful area of unprotected land.

138 The overall effect post effects management measures therefore is dependent on implementing the compensation package. The primary objective of my proposed compensation mechanism is to avert future loss of indigenous forest, prioritising threatened forest types and habitat for threatened species affected by the Project. These objectives provide the opportunity for meaningful ecological outcomes where the outcomes are delivered.

139 Successful compensation outcomes, however, require understanding and acknowledging two assumptions. These are:

139.1 Legal protection will avert habitat loss. This assumes that areas which are currently unprotected will not be protected by any other means in the future. Therefore, without legal and physical protection, the biodiversity contained will degrade and eventually be lost. Despite most forest on private land remaining unprotected, this assumption at times will be false. Landowners may choose to protect biodiversity, but not legally protect a natural area. Landowners also are continuing to protect areas (for example the total area of QEII covenants increases annually). Given this, the compensation package needs to protect more biodiversity than will be lost.

139.2 Legal and physical protection of remnants averts future loss. This assumption is generally true. Legal protection and exclusion of stock is usually sufficient to promote rapid vegetation recovery and arrest future habitat loss. The exceptions being due to stochastic events and severe impacts from animal pests and weeds.

140 Given the recommendations and assumptions discussed above, I consider that the compensation mechanism needs to aim to protect more land than is lost.

141 I am confident that the method proposed to determine the amount of compensation, based on costs for restoration planting and protection of 45 hectares over 35 years, will provide sufficient funding to legally protect more land than is lost.

142 Given the compensation package proposed will result in biodiversity gains over decades through implementation of initial protection and maintenance measures, success needs to be measured over a long period (35 years +) of time. By design, this approach has inherent winners and losers:

142.1 The winners are intended to be threatened alluvial and fertile soil forest types and habitat for some threatened species such as kauri snails.

142.2 The losers will be the more common hill country forest of:

(a) Kānuka, podocarp (tānekaha dominant) forest (V4_62, V4_64 & V4_66) (as shown on Figure 7), which is in a process of ecological succession towards kauri, podocarp, broadleaved forest; and

(b) Taraire, kohekohe, broadleaved podocarp forest (V2_35, V2_22, V2_7, V2_3) (as shown on Figure 5).

143 The winners currently have a very low representation in the reserves network whereas the losers are common.

144 This approach cannot achieve no net loss, nor is it intended to do so, because loss and gain components are different.

145 Assuming compensation will avert the loss of threatened forest types and habitat for threatened species, this will be a positive effect and overall likely net gain, if two to three times the loss is protected. This positive ratio is needed to address 'additionality', because some of this habitat would probably have been protected in the future.

146 In my opinion, following application of successful compensation, I consider the Project may have an overall low to moderate level of effect.

OVERALL EFFECTS POST-IMPLEMENTATION OF RECOMMENDATIONS – INDIGENOUS VEGETATION

147 I am confident that the measures proposed to avoid, minimise, remedy and offset effects will ensure effects of the Project are adequately managed.

148 Suitable land systems have been identified as restoration planting sites for the range of forest types affected, including for alluvial forest types which the lodged mitigation package did not demonstrate. I have however recommended that some secondary and more common forest types not be restored as like for like and are instead trading up to threatened forest types. The approach recommended therefore deviates from the equivalence principle, though for good reasons.

149 Where areas cannot be offset, I consider that the compensation approach outlined above will ensure that residual adverse effects are appropriately managed.

RESPONSE TO COMMENTS IN RELATION TO INDIGENOUS VEGETATION

150 In this section, I provide my responses to comments from DOC, Patuharakeke and Te Parawhau on the Application in relation to indigenous vegetation. I note that many elements of their comments have already been responded to, as part of my own review of the assessment and NZTA's proposed effects management measures. I offer some additional responses to some specific elements of these comments, in particular, those relating to:

150.1 Assessment methodology;

150.2 Transparency when applying the ecological significance criteria;

150.3 Approach to determining magnitude and level of effects;

150.4 Adequacy of surveys for nationally threatened or regionally critical at-risk plant species;

150.5 Necessity of a BOAM to demonstrate suitability of recommended mitigation measures, and consistency of offsetting and compensation with the principles of the NPS-IB;

150.6 Suitability of compensation planting ratios;

150.7 Avoidance and proposed restrictions on habitat clearance;

150.8 Need for a buffer area around the kahikatea avoid areas;

150.9 Ecological value and mitigation measures for trees on a specific property;

150.10 Effects management for alluvial forest types; and

150.11 Restrictions on the extent of indigenous vegetation clearance.

Assessment methodology

Ecological significance

151 The DOC reviewer raised concerns about the need for greater transparency when applying the ecological significance criteria for all sites assessed (eg Representativeness, Diversity and pattern, Rarity and distinctiveness, Ecological context). The EcIA recommends full discussion of the rationale behind rankings be provided in a report. In my own review, I identified that the Terrestrial Assessment provided the overall ecological value for sites, but not the individual scores for the ecological significance criteria. Further, there was somewhat limited discussion for the rationale of why these were applied to the various vegetation communities and sites.

152 Further reviewers have stated that previous information for significant natural area assessment was ignored.

153 The Terrestrial Assessment used the significance criteria of the EIANZ (2018) to create an overall ecological value for vegetation communities mapped and described at a fine scale. Component parts, such as the representativeness criterion, are not presented for vegetation communities or individual sites such as in Appendix F. This omission has been criticised by external reviewers.

154 Reviewers have expressed the opinion that past reports on ecological significance were not used as supporting information for determining significance. However, I understand that whilst significant natural area reports were published by DOC, there are no Significant Natural Areas, as that term is defined in the NPS-IB.

155 These reports provide useful background but have limitations, particularly the age of the information and how significance was determined for use for these. The information collected for these DOC PNAP reports dates back to 1994-1996 (Waipū Ecological District) and 2010-12 (Northland part of Rodney Ecological District).

156 Further, the PNAP significance criteria (Myers et al. 1987) being representativeness, diversity, special features, naturalness, viability, size and shape, buffering and fragility and threat were not uniformly and consistently evaluated.

157 Whilst I understand that relevant site information was read when undertaking the assessment report, I consider that it would have been inappropriate, given the distance of time, to have relied on this information when determining ecological value. Further the significance determination within this report was not undertaken in the same way as the EIANZ (2018).

158 The Whangārei District Plan (WDP) (ECO Appendix 1 – 6) contains criteria for determining significance, but the plan does not contain a map or list of significant sites.

159 I do not consider that inclusion of the WDP criteria would have modified the ecological value assessments undertaken, because values are adequately assessed using the four EIANZ (2018) criteria.

160 In my experience, having undertaken multiple assessments of effects surveys and ecological surveys for determining significance, the former are more thorough and comprehensive, at least in areas directly affected by the proposal's footprint.

161 Initially, I and one reviewer thought that ecosystem rarity for threatened ecosystems may have been undervalued when giving sites an overall ecological value, based on insufficient discussion of ecosystem context. Whilst initially I had concerns, my opinion was agnostic because I was data deficient to confidently take a position either way. Following my site visit and also considering Table 2 of Leathwick (2018), I formed a firm position on this.

162 I consider that all vegetation types and sites which have been assigned an overall high to very high ecological value are accurate and fair. Potentially some instances are conservative and arguably could have been valued marginally lower.

163 I consider that these areas and the vegetation types present qualify as being overall high or very high ecological value, principally for their high representativeness, ecosystem rarity and ecological context. The following is a generalisation across these vegetation communities and sites.

164 With regard to the representativeness criterion:

164.1 Vegetation composition and structure is diverse in very high areas, with layered structural tiers occur, including some old trees with epiphytes and habitat features, vines, subcanopy and ground cover tiers. Emergent trees are largely absent.

164.2 Vegetation is dominated by indigenous species with a very low diversity and abundance of invasive weeds in all high and very high areas.

164.3 Low animal pest pressures are present and palatable indicator species of high forest health are common in all very high areas and most high areas. For example, understories contain an abundance of palatable shrub and fern species, in the absence of ungulates. The southern Brynderwyn forest (V2_35 & V2_39) is structurally and compositionally complex, with numerous kohekohe in the subcanopy indicating minimal historical compositional change due to possum browse effects. Possum browse effects were seen including severe browse on mangeao.

165 With regard to the ecological context criterion:

165.1 Vegetation succession is occurring with few limitations and sites are developing towards potential older vegetation communities. They contain numerous long lived trees such as podocarps, locally kauri and broadleaved canopy trees.

165.2 The Brynderwyn forest (V2_35 & V2_39) and sites V4_64 & V4_66 have a high degree of connectivity to larger forest areas within the wider Brynderwyn Range.

165.3 These two areas (above) are ecologically compact occurring with defined gully and hillslope landform boundaries and are buffered from surrounding land use effects.

166 The difference of opinion or doubt largely sits with areas which have been given moderate or low overall ecological value, such as the pūriri remnant (V4_38), anthropogenic tōtara forest and exotic riparian forest habitat.

167 Overall, I am comfortable that ecological significance criteria have been appropritately considered.

Ecosystem context

168 I have used the following sources of information to provide the best context for ecosystem diversity and remaining extent.

169 Potential ecosystems describe a full range of ecosystem types at a variety of scales in an approximation of the natural or potential state, as they would have been observed if people arrived today in

New Zealand, utilising the classification system of Singers and Rogers (2014) and the Northland potential ecosystems GIS layer and summary information (Singers & Lawrence 2018) which maps that classification system across Northland.

170 I have also mapped this classification system for all of the North Island and the top of the South Island. For Northland ecosystems especially, I gained a national understanding of their distribution and human induced rarity.

171 Data within Table 2 of Leathwick (2018) which summarises the historic and current ecosystem representation.

172 The Indicative Alignment dissects three potential ecosystems as mapped in the Northland Potential Ecosystems Map (PE Map) (Singers & Lawrence 2018).

173 The PE Map provides a broad scale depiction of ecosystem diversity and pattern, having been developed primarily using historic NZ Forest Service forest class map data (Nicholls 1976), and where native forest no longer occurs, abiotic factors that influence ecosystem diversity, such as soil types. These data sources are low resolution broad scale mapping, for example at 1:63,000 scale.

174 Along the Indicative Alignment potential ecosystem units mapped in Singers and Lawrence (2018) include:

174.1 WF7-2, Pūriri, taraire forest which was mapped on the highly fertile (melanic) soils near Brynderwyn. Being highly fertile most of the original forest on this land was cleared and is now dairy farms, though a few small indigenous forest fragments occur, including some that are pūriri dominant.

174.2 WF11, Kauri, podocarp, broadleaved forest which was mapped on ultic and brown soils on the Brynderwyn Hills. Today this land includes areas of remnant (modified) indigenous forest, plantation pine forest and pasture used for grazing cattle. Areas of indigenous forest have lost the emergent forest tier, presumably through historic logging.

174.3 WF8 Kahikatea, pukatea forest which was mapped on the flat river terrace land with gley soils of the Ahuroa River. Being flat and fertile most of the original forest of this land was cleared and is now dairy farms. Today most of this land is dairy farming land, though several fragments of indigenous forest occur, such as near Waipū town.

175 At a finer scale (1: 1000), applying the vegetation survey results and the abiotic framework of Singers & Rogers (2014) with further learnings from Singers & Lawrence (2018), greater ecosystem diversity was identified including:

175.1 WF7-3, Kahikatea, Pūriri forest, which the forest remnant V1_144 is representative of. This type probably dominated much of the Ahuroa River flats instead of WF8, where it occupied imperfectly drained fertile silt loam soils. WF8 was restricted to the poor draining old river channels and depressions.

175.2 WF7-1, Pūriri, tōtara forest. This type is mapped (outside of the Indicative Alignment) close to the Ahuroa River on moderately well drained soils, though likely was more extensive. Several areas of secondary and highly fragmented forest and tree land occur dominated by tōtara such as V1_152.

176 On the south side of the Brynderwyn Hills, forest within the main gully and hillslope areas are now representative of WF9, Taraire, tawa podocarp forest having no obvious kauri and few podocarp trees. These areas were however mapped by Nicholls (1976) as Kauri, podocarp broadleaved forest. Outside of the Indicative Alignment kauri remains on ridges. Within the Indicative Alignment cut stumps and logs were found downslope of advanced kānuka, broadleaved forest on ridges, indicative of forest damage and vegetation succession following historic logging. At a larger scale the Brynderwyn forests would have been Kauri, podocarp broadleaved forest, though with multiple vegetation communities, similar to those described by Burns and Leathwick (1996) at Waipoua Forest.

177 All vegetation communities and sites described within the Terrestrial Assessment, on the Indicative Alignment, are modified to some degree, though are recovering. They range from exotic dominant habitat of negligible ecological value to areas of modified primary forest of very high value. Most native forests are advanced secondary forests dominated by either kānuka and/or gymnosperm trees, which regenerated following early European native tree logging and land clearance fires.

Ecosystem rarity

178 I would like to provide some further commentary on how ecosystem rarity has informed my consideration of vegetation values within the Proposed Designation, the level of effect based on the impacts of the Indicative Alignment, and my recommendations as to appropriate effects management measures.

179 Leathwick (2018) in Table 2 provides the estimated historic and current extents of potential ecosystems in the Northland Region. This data was calculated by undertaking a GIS intersect between the

Northland Potential Ecosystem Map (Singers & Lawrence 2018) and current vegetation (LCDB4).

180 This process determined that the percentage remaining of potential ecosystems (for the Northland Region), which remain or historically were present along the Indicative Alignment today are:

180.1 WF7-1, Pūriri, tōtara forest = 11.2%

180.2 WF7-2, Pūriri, taraire forest = 12.5%

180.3 WF7-3, Kahikatea, Pūriri forest = 10.3%

180.4 WF8, Kahikatea, pukatea forest = 10.2%

180.5 WF9, Taraire, tawa podocarp forest = 61.4%

180.6 WF11, Kauri, podocarp, broadleaved forest = 35.1%

181 Ecosystem rarity is a component of the distinctiveness criterion. Considering the data above, representative examples of all WF7 Pūriri forest variants and WF8 Kahikatea, pukatea forest should be given a score of 'high' for distinctiveness based on their ecosystem rarity. With less than 20% remaining this is considered to be 'endangered' applying the ecosystem threat assessment methodology of Bland et al. (2017).

182 The above percentage remaining figures however include both primary and secondary landcover types. When considering only primary landcover types which are the most representative, WF7 and WF8 fall to less than 10% extent, which is critically threatened. It is my opinion that critically threatened is a more accurate threat determination for these types.

183 For reference the Threatened Land Environment classification is often used for assessing habitat or ecosystem rarity. I do not use this method because it is a surrogate for assessing ecosystem rarity, having no direct context for what ecosystems actually occur in these environments. If this data source had been used instead, a similar result would have occurred to using Leathwick (2018) data. But this method generalises that all indigenous vegetation within threatened land environments are of equal threat, which with secondary ecosystems especially, is not accurate.

184 WF9 and WF11 do not trigger the ecosystem rarity criterion as the percentage remaining are 61.4% and 35.1% respectively.

Pūriri forest

185 There are several small pūriri forest remnants within the Proposed Designation of which a single area (V4_38) is affected, with c. 60m^2 loss from a total area of 9820m^2. I consider this area to be

representative of WF7-2, Pūriri, taraire forest, therefore it meets the 'high' definition for ecosystem rarity.

186 Whether this area should be considered greater than a moderate overall ecological value requires consideration of the other three criteria (Representativeness, Diversity and Pattern and Ecological Context).

187 In my review of overall ecological value, I have considered the following EIANZ (2018) guidance for representativeness (Table 4) '*Thresholds may need to be lowered where all examples of a type are strongly modified*'. This is particularly relevant guidance for critically threatened ecosystems because most examples are small, fragmented and modified.

188 V4_38 is small (<1ha), surrounded by pasture, modified compositionally and structurally and grazed by cattle. Canopy trees are dying with no replacement. The understorey is dominated by exotic grassland. I do not consider that any other significance criteria meet the definition of 'high'. With a single 'high' value for ecosystem rarity, the overall ecological value is moderate (applying Table 6 of the EcIA). As such I agree with the determination within the Terrestrial Assessment.

189 North east 370m of V4_38 is a 1.6 ha remnant of Pūriri forest, which is outside of the Proposed Designation which is legally protected by a conservation covenant and stock are excluded. Whilst I only observed this from a vantage point, I would be confident to give this site at least an overall high ecological value for its rarity, representativeness and ecological condition.

190 There are also at least three very large pūriri trees in V1_144 which could well be over 1000 years old. They are high value trees because they contain an abundance of epiphytes and cavities used by hole nesting fauna, and are expected to persist for centuries. Kākā were seen in this area and may well use these trees for nesting.

Tōtara forest

191 The assessment includes a variety of tōtara dominant vegetation types including anthropogenic tōtara, based on the description in Singers et al. (2017)[29] and Tōtara / broadleaf scrub.

192 Small areas and fragments of secondary tōtara tree land and forest occur on the Ahuroa River flats (including V1_86, 89, 91, 92, 99, 111, 144, 152, 153 & V1_175) and historically suitable moderately

[29] Singers, N. et al. (2017). Indigenous terrestrial and wetland ecosystems of Auckland.

well drained and fertile soils likely had vegetation representative of WF7-1, Pūriri, tōtara forest.

193 These occur within an acutely threatened land environment though are of considerable variability with respect to ecological value. One reviewer has recommended that any tōtara forest or treeland on alluvial soils (threatened land environment) should have a high ecological value.

194 These areas are all young, the better examples being densely stocked tōtara with occasional kahikatea. They have all developed in the presence of stock grazing, agricultural soil drainage, mostly have a ground cover of exotic grassland, or minimal understory vegetation. V1_175 has an understorey dominated by Chinese privet, an invasive weed. Some appear to have established along fencelines and or amongst former stock exclusion hedges.

195 Whilst some of these may occur on pockets of moderately well drained soils, that historically may have supported WF7-1, Pūriri, tōtara forest, they lack the broadleaved canopy component, which is characteristic of WF7-1, Pūriri, tōtara forest. In composition and structure they are very similar to tōtara on hillslopes, because composition has been strongly influenced by grazing stock. For these reasons, I consider they are most appropriately classified as anthropogenic tōtara (Singers et al. 2017).

196 I do acknowledge that areas where tōtara occurs next to the Ahuroa River, are more diverse and representative of WF7-1, Pūriri, tōtara. These are however not on the Indicative Alignment.

197 Regenerating tōtara is common on farmland in Northland (Bergin & Kimberley 2014). Steward and Quinlan (2019) estimated that approximately 200,000 hectares of tōtara forest and scrub cover freehold land throughout Northland. Kennedy (2007) estimated that 344,000 ha of private land in Northland currently contains tōtara at various stockings and is increasing. Whatever the amount is, it is large. Regenerating tōtara is not rare or threatened in Northland. For comparison there is approximately 106,000 hectares of public conservation land in Northland.

198 In summary, whilst some tōtara occurs on alluvial terrace landforms on the Indicative Alignment, I consider these are better classified as the novel ecosystem 'Anthropogenic tōtara' and overall agree with their value assessments of low for treeland areas to moderate value for small areas of forest.

Riparian vegetation

199 Riparian vegetation, irrespective of whether it is native dominant, a mosaic of native and exotics or entirely exotic provides ecosystem services and value for wildlife such as, stabilising riverbanks, shading water and providing habitat for fish and riverine wildlife.

200 One reviewer considered that riparian vegetation dominated by crack willow with occasional understorey of native species should be considered more highly (than low).

201 The Indicative Alignment would result in the loss of 2440 m^2 of riparian vegetation described as crack willow forest (V1_195), which occurs adjacent to the Waihoihoi River. Construction will require realignment of the Waihoihoi River in this location.

202 Whilst the ecological value of crack willow forest can be assessed, it is incumbent on the relevant ecologist to consider that, which primarily sits with the fauna and freshwater assessments. Whether crack willow forest is of moderate ecological value rests entirely upon the importance placed on these areas for instream and riparian wildlife. I consider that a 'moderate' score is appropriate for ecosystem context because willow forest does provide habitat for native fauna. With very low or low scores for the other three criteria, an overall ecological value of low is obtained (Table 6).

203 From an ecosystem functioning perspective willows provide both positive and negative effects to river function, improving bank stability though they can also result in restricting flow and the seasonal deciduous leaf fall causes instream oxygen depletion.

204 The EIANZ (2018) discusses ecosystem services (section 5.5) but purposefully excludes these components from the EIANZ (2018).

205 I however consider that the Project should remedy the loss of this, to replace the instream value and as 'green infrastructure' to better protect the Indicative Alignment.

Transparency when applying the ecological significance criteria

206 While I appreciate the concern raised by reviewers that without all significance criteria presented in a single table and acknowledge there is a lack of transparency, I do not consider that this undermines the integrity of the assessment.

207 This is because I consider that the ecological scoring is accurate and fair. Consequently, I do not consider including this data will provide a meaningful difference to the assessment.

208 Further, whilst I had some initial concerns with some evaluations (described above), with knowledge gained from the field assessment and additional desktop information, these concerns were resolved.

Approach to determining the magnitude and level of effects was appropriate

209 The DOC reviewer has raised the point that the assessment does not evaluate separately the magnitude of effect and level for the loss of every discrete vegetation community or site. Instead, it groups loss into ecological value rankings from very high to moderate. The

criticism speculates that this potentially masks the magnitude of effect for some types.

210 I disagree that this is the outcome of this approach. In reality, aggregating vegetation types lifts the bar of magnitude and level particularly for small areas of habitat loss of moderate and high value.

211 The primary purpose of this approach was to better assess cumulative effects. EIANZ discusses cumulative effects in section 6.5 and this approach is consistent with guidance 'Consider effects on valued ecological features or attributes due to interactions with other actions, and not just the effects of the single action under review'.

212 With a linear development which results in small effects to multiple sites, this approach enables these parts to be grouped and assessed collectively. The below illustrates this point.

213 Pūriri forest is a critically threatened habitat. The area affected is of moderate value and loss is approximately 60 m^2 across the entire Indicative Alignment, whilst within the Proposed Designation there is 1.6945 hectares. This loss represents 0.35% of the available resource within the Zone of Influence and a minuscule effect at the ecological district scale. The magnitude is therefore negligible and the level is very low. A very low effect does not require remediation or offsetting.

214 I support aggregating magnitude of effects especially for threatened ecosystems because it is more conservative.

Surveys undertaken for the Project were appropriate to inform development of the mitigation package

215 I note that DOC has postulated that possum palatable threatened plants such as kohurangi (*Brachyglottis kirkii*) and *Pittosporum kirkii* may be present within the Proposed Designation and should have been specifically surveyed for.[30]

216 I understand that small to moderately sized remnants were surveyed very thoroughly, whilst less habitat was physically surveyed within the larger areas such as north of Pukekaroro and the southern Brynderwyn range, due to the very steep land and associated Health and Safety constraints.

217 Ramarama (*Lophomyrtus bullata*), critically threatened, was specifically surveyed for in the southern Brynderwyn forest in optimal habitat, though was not found. This species was targeted

[30] Comments from the Department of Conservation on behalf of the Director-General of Conservation *(DOC Comment*s) at Appendix B – Vegetation, page 10 at paragraphs [32]-[33].

here because it had been found previously on adjoining land during the Brynderwyn emergency works.

218 From direct experience surveying for these epiphytic shrubs elsewhere, they are most common on large emergent trees with an abundance of epiphytes. Large trees are limited within the Proposed Designation, having been harvested many decades ago. Further, kohurangi requires very low possum abundances to persist and I consider from experience of managing possum palatable threatened plants, possum numbers are generally too high for this species to persist.

219 In conclusion I do not consider that additional threatened plant surveys are required.

Mitigation package is consistent with the principles of offsetting and compensation

220 DOC states that the lodged 'mitigation' package, which did not use a BOAM, did not demonstrate the offset principles of additionality, equivalence, and permanence.[31] These principles require specific comment, as they relate to my recommended mitigation package.

221 I consider the areas identified for offsetting are consistent with the guidelines of Appendix 3 of the NPS-IB as to what biodiversity types can be offset. As outlined above, using the BOAM, I calculated ratios for the various types based on average tree height data and published growth rates over a 35-year time period. From this, I have recommended a 1 : 3 ratio for kauri, podocarp and mature kānuka types, which is 3% higher than the model outputs. Secondary broadleaved treefern forest occurring under the pylon corridor I have recommended be replaced at a 1 : 1 ratio.

222 Further, I have evaluated where the range of forest types can be restored by planting on appropriate land systems.

223 Compensation of very high value forest is proposed which has been purposefully designed to avert the loss of threatened forest types and habitat for threatened species affected by the Project, and openly acknowledging the tradeoff of more common types.

Compensation ratios proposed are appropriate

224 Patuharakeke have recommended a minimum ratio of 1 : 5 (loss versus gain) for compensation. I oppose this proposition because, as I discuss above, I consider my compensation proposal is more appropriate than offsetting as it is outcome focused, not output focused. My proposal is to prioritise averting loss of threatened forest types to increase representation of these in the protected area network and secondly habitat of threatened species affected by the Project. Threatened forest types occur in small parcels, and

[31] DOC Comments – Appendix G.

protecting five times loss would be unachievable within the Proposed Designation and potentially also in the catchments affected.

225 Achieving a compensation a minimum of 1 : 5 ratio, would comparatively be easier by protecting larger blocks of more common hill country forest. These are already well represented in the reserves network and would offer limited gain compared to protecting threatened forest types. Consequently, having a ratio set by a consent condition could be counterproductive to the compensation objectives that are consistent with section 3(b) of the Reserves Act 1977 to preserve representative examples of all classes of natural ecosystems.

Need for buffer areas around kahikatea stand avoid areas

226 I note that Heather J Bryham and Bryham Farms Ltd (owners of the property where the Waipū kahikatea remnants are located) have sought that the buffer areas around these trees are expanded to manage adverse effects from construction. As outlined above, NZTA has expanded the avoid buffer areas on the basis of my expert opinion, and I consider these will ensure effects on these trees are appropriately avoided. Further, I note that I have recommended that surrounding these remnants is a priority for offset planting to connect these fragments together, and could be an opportunity for compensation.

Ecological value and effects management

227 I note that Karen Creeve and Joshua Precee have made comments about the ecological value of trees on their property that might be impacted by the Project, and how to appropriately manage effects on these.

228 I note that this property contains mature kānuka with tōtara and other podocarp trees, as shown on V1_229.

229 Data that these landowners have provided appears to have been collected from their property (V1_229), as well as the adjoining neighbouring property (kauri forest V1_228 as shown on Figures 2 and 10 in their comments).

230 I visited V1_228 and measured the diameters of kauri trees which were used in the offset calculations. I concluded that this kauri forest grove was advanced secondary, which developed following historic land clearance activities.

231 From V1_228, I was able to look across to V1_229 and determined this was also advanced secondary forest dominated by mature kānuka, and secondary tōtara and some other podocarp trees, but likely younger than V1_228.

232 I do not agree with the proposition presented that there are trees on their property or the neighbouring property that are kauri, rimu or tōtara exceeding 120 years old, at least within the Indicative

Alignment. I suspect the conclusions they have made were taken by measuring tree diameters at base height, not 1.35m at breast height (which is the standard for measuring trees and estimating ages).

233 In terms of effects management, I note that both V1_228 and V1_229 (if impacted) would need to be offset. Based on the Indicative Alignment, that would result in the potential loss of 0.4419 and 0.6354 hectares. NZTA's mitigation package would require habitat loss of these trees to be offset, including planting at a three to one ratio and fencing. For these trees, I consider they could be suitably planted in the northern indigenous site (which is located on this property). This would increase the size of indigenous forest (in this vicinity) and the ecological condition through stock exclusion and other management.

234 In my opinion, at this location, implementing offsetting proposed, would result in a net biodiversity gain.

Restrictions on extent of indigenous vegetation clearance

235 Patuharakeke has proposed various restrictions on the total extent of vegetation clearance that can occur within the Proposed Designation. I do not consider these are necessary given the effects management proposed, including avoidance, remediation, offsetting and compensation measures proposed.

REVIEW OF FRESHWATER ASSESSMENT - WETLAND ECOLOGY

236 I have reviewed the Freshwater Assessment prepared by Dr Keesing, and his statement of evidence prepared in response to comments on the Application, as relevant to wetland ecology. I note that throughout the remainder of this section where I reference 'wetlands', I am referring to natural inland wetlands (as defined in the National Policy Statement for Freshwater Management 2020 (NPS-FM)).[32]

237 As part of my review, I undertook my own visit to areas within the Proposed Designation to survey additional wetlands that were identified following lodgement of the Application (discussed further below). While I acknowledge there are some wetlands that were not considered as part of the Freshwater Assessment, these do not change my opinion in relation to the ability to develop an appropriate effects management package.

238 In terms of the wetlands that Dr Keesing identified, I note that most were exotic dominant of low to negligible ecological value, which is

[32] National Policy Statement for Freshwater Management 2020 (consolidated with December 2025 amendments). I note the Regional Plan for Northland also adopts the same definition for natural inland wetlands (Regional Plan for Northland, Part B – Definitions at page 22).

consistent with my own findings of 97% exotic wetlands within the Indicative Alignment.

239 If I had undertaken the assessment of all wetlands applying the EIANZ (2018) included within Dr Keesing's assessment, I would have made near identical conclusions:

239.1 For the loss of exotic dominant wetlands, low and very Low level of effects. No effects management is required for this level of effect.

239.2 For the loss of moderate value native: exotic mosaic wetlands, high and moderate level of effects. Offsetting to achieve no net loss is recommended for this level of effect.

239.3 For the loss of native dominant wetlands, very high level of effects. Offsetting to achieve a net biodiversity gain is recommended for this level of effect. As I understand, only wetland 24 has this level of effect.

240 I support Dr Keesing's recommendation to undertake either wetland creation or restoration as a means of offsetting the loss of moderate and high value wetlands (discussed further below). I consider either method will adequately address effects from the Project.

241 Whilst I acknowledge that a BOAM was not used, I consider these ratios are appropriate because:

241.1 The wetlands impacted are types associated with high fertility, such as raupō reedlands. These types are dominated by fast growing species which rapidly colonise and grow when planted into offset wetlands.

241.2 Offsetting wetland loss through construction and restoration planting undertaken by NZTA, such as on the Mackays to Peka Peka expressway, has proven that ≥80% cover of indigenous wetland vegetation can be achieved within 3 years, consistent with the outcomes anticipated by NZTA's current effects management measures.

241.3 Consequently, I consider this to be the loss of wetland habitat compared to replacement to be a 'short term (up to 5 years)' effect (as defined by Table 9 of the EIANZ).

242 The only area where I differ from Dr Keesing is with respect to maintaining the hydrology of the residual (downstream) part of wetland 24. In this location, depending on the location of the final alignment, I consider that remediation actions could be implemented to avoid downstream channel scouring, which has the potential to negatively impact the hydrology of this wetland. Channel scouring would lower the water table within the adjoining raupō reedland habitat vegetation change. This effect would be

most impactful during severe weather events especially if treated stormwater entered the wetland at this location.

243 Remediation actions could potentially include the construction of an upstream flood water wetland to collect then gradually release flow downstream, and a downstream fan below the culvert exit to dissipate flow broadly (as compared to at a point discharge a culvert).

244 Subject to my remediation commentary, I consider that, irrespective of changes to the final alignment, NZTA's proposed conditions will enable responses to changes in the values and potential effects on these through scalable application of mitigation. I offer my own refinements to these effects management measures below.

245 In the following sections, I will:

245.1 Outline my approach to, and results of, the additional wetland surveys;

245.2 Provide an assessment of effects of the Project on wetland ecology (as it relates to the additional wetlands identified as part of my survey);

245.3 Outline my own recommendations for refinements to NZTA's mitigation package to manage effects on wetlands;

245.4 Provide my conclusion as to the Project's effects on wetlands; and

245.5 Respond to comments relating to wetlands.

ADDITIONAL WETLAND SURVEYS

246 Following lodgement, I understand that an additional 15 wetlands were identified by Dr Tim Martin, which had not been identified and assessed as part of the Freshwater Assessment.

247 I was asked by NZTA to survey these features, to document their composition, determine wetland status, boundaries and evaluate their ecological value to inform my own recommendations for amendments to NZTA's effects management package. I was able to make observations about the identification and values assessments for wetlands that were included in the Freshwater Assessment. My survey approach, results and values classifications are outlined below, with a full list of the additional wetlands within the Proposed Designation and their associated values included as Appendix C of my evidence.

Wetland survey methodology

248 Prior to undertaking field work, I mapped these wetlands using GIS. Then using the Indicative Alignment, I segregated these areas by, those that would be impacted by the Indicative Alignment, within

100 m of the Indicative Alignment and areas beyond this. These polygons were then displayed digitally when undertaking the field surveys (as shown on the maps in **Appendix D**). The numbered wetland references I make throughout my evidence can be found on the maps in Appendix B of Dr Keesing's brief of evidence.

249 Between 14 and 16 October 2026, I undertook an ecological assessment at all but four of these wetlands. Access was not granted to access these wetlands, though I surveyed two using binoculars.

250 The survey method used the unbounded recce plot method[33] recording all plant species present and their approximate abundance (as percentage cover) within distinct vegetation communities, which I spatially delineated.

251 Using this data, I confirmed the features were wetlands using their wetland plant indicator status ratings[34] and applying the wetland delineation method rapid test.[35] This requires facultative wetland (FACW) or obligate (OBLW) wetland species to exceed 50% cover.

252 I confirmed the boundaries of these wetlands based on the physical edge between upland (non-wetland) species (such as rye grass (*Lolium perenne*) and white clover (*Trifolium repens*)) and facultative wetland species. I did not apply the pasture exclusion clause within the NPS-FM wetland definition. Typically, this edge was by saturated (spongy) soil and pugging, as most wetlands were within paddocks and grazed by cattle.

253 Most features exceeded 50% cover of FACW or OBLW species, and so I determined were wetlands using the rapid test.

254 For wetland 30, I was less certain where the wetland boundary was. Accordingly, I measured plant species and cover within two (2 x 2m) plots. I then used the rapid test to confirm wetland status of these plots and confirm the boundary.

255 I did not undertake soil pit assessments to confirm hydric soils, though did investigate soil profiles where they were exposed in drainage channels. Several wetlands on podzol soils were emitting hydrogen-sulphide (rotten egg smell) which is indicative of anoxic soil conditions.

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[33] Hurst, J.M., Allen, R.B., & Fergus, A.J. (2022). The Recce method for describing New Zealand vegetation – Field Manual. Manaaki Whenua Press, Lincoln, New Zealand.

[34] Clarkson BR, Fitzgerald NB, Champion PD, Forester L, Rance BD 2021. New Zealand wetland plant list 2021. Manaaki Whenua - Landcare Research contract report LC3975 for Hawke's Bay Regional Council.

[35] Ministry for the Environment. 2020. Wetland delineation protocols. Wellington: Ministry for the Environment.

256 I took representative photos of the wetlands I surveyed (as shown in Appendix E).

Wetland survey results

257 In total, an additional 13.547 hectares of wetland were delineated across 15 wetlands (included as wetlands 25-39 in Appendix C, Table 1). This assumes that the four wetlands I was not able to survey are exotic dominant, based on my binocular assessment of wetlands 34 and 37. A full assessment of the species composition and percentage cover for each additional wetland surveyed is outlined in Appendix C, Table 2.

258 Most wetlands were overwhelmingly dominated by exotic plant communities which occupied 97.5% of those surveyed (13.2 hectares). Soft rush (*Juncus effusus*) was ubiquitous and often dominant typically with a ground cover of wetland grasses such as creeping bent (*Agrostis stolonifera*) and herbaceous species such as creeping buttercup (*Ranunculus repens*). I refer to these herbaceous wetland communities as 'water meadows', following the use of this term in Great Britain where these species are native to. Almost all wetlands were grazed by cattle and impacted also by pugging and nutrient enrichment.

259 Native species were uncommon except for small defined areas where native:mixed ecotic communities occurred. These occupied 2.5% (0.346 hectares) of the wetlands.

260 The most common native species was broom rush (*Juncus sarophorus*). Broom rush is common on farms with clay based soils, which readily are pugged by cattle and seasonally wet throughout the North and South Islands. It is also present on Stewart Island/Rakiura, Chatham Islands and Campbell Island/Motu Ihupuku and also in Australia (Ref NZPCN factsheet).

261 Small areas of the following native species were found; raupō (*Typha orientalis*) and lake clubrush (*Schoenoplectus tabernaemontani*) both present at wetland 25. Sharp spike sedge (*Eleocharis acuta*) and *Isolepis prolifera* rare in many wetlands and swamp millet (*Isachne globosa*) and *Machaerina rubiginosa* in wetland 38. These species are typically more resilient to browsing by cattle and are fairly widespread on farms in similar types of wetlands across the North Island and parts of the South Island. They are also common wetland plants within more intact indigenous dominant higher fertility wetlands.

262 Two of the four wetlands (wetlands 34 and 37) where access was not granted were inspected with binoculars from the edge of SH1. These appear to be small ribbons with gully floors of soft rush and water meadows dominated by exotic species. The other two appear to be of similar composition based on the appearance on aerial images.

263 Many of the additional wetlands were hydrologically modified, with one or more drainage channels lowering water tables and soils are pugged due to cattle grazing.

264 Species composition and abundance has largely been determined as a result of the land use being cattle grazing, and fertilising irrespective of the underlying differences in soil type (for example podzols or gley), landforms and different hydrological sources.

265 No threatened plants species were found in any of these additional wetlands, and in my opinion it is highly unlikely that any will occur in these areas given their existing composition.

266 Except for wetland 39, there is insufficient ponded water adjoining dense wetland cover to provide habitat for cryptic wetland birds within these wetlands. Wetland 39 is also connected to the Waihoihoi River (during high flows), so is likely to be unsuitable as habitat for mudfish, because eels are likely present in the ponded areas (which are predatory of mudfish).

267 I also identified one feature (wetland 19) which is not a wetland (as per the NPS-FM definition). Within this feature, there is a constructed pond which may have historically been used for stock water. Surrounding this is a tall exotic grassland of kikuyu and creeping buttercup.

Wetland ecological values

268 In the following section, I consider the four significance criteria from the EIANZ (representativeness, rarity/distinctiveness, diversity and pattern, and ecological context) and four ecologically relevant values from the NPS-FM (indigenous biodiversity, hydrological, Māori freshwater and ecosystem health). My full assessment of the values of each additional wetland are outlined in Appendix C, Table 1.

269 Most wetlands have an overall ecological value of low to negligible based on a dominance of exotic plants, low representativeness, diversity and pattern and ecological context.

270 I score the rarity criterion low because I do not consider exotic dominant wetlands dominated by soft rush and water meadow species to be rare. However, for sensitivity testing purposes, if this was scored high, it would not have altered my conclusions or recommendations.

271 For clarity, I note that I consider small areas of mixed broom rush, soft rush rushland to be of low value, given the small extent this community occupies, limited other indigenous wetland species diversity, low representativeness and ecological context.

272 Two small mixed indigenous, exotic vegetation communities are of overall moderate ecological value based on their representativeness and diversity within:

272.1 wetland 25, where raupō and lake clubrush occur; and

272.2 wetland 38, where swamp millet, sharp spiked sedge *Isolepis prolifera* and *Machaerina rubiginosa* occur.

273 The EIANZ significance assessment is identical to application of the NPS-FM 'indigenous biodiversity' criterion.

274 Applying the NPS-FM hydrological value criterion, most wetlands have a low hydrological value because they are heavily grazed, drained, contain soils pugged (often heavily by cattle) and are likely sources of sediment and nutrients to streams. The only exceptions to this are the small parts of wetlands 25 and 38 that contain denser mixed indigenous, exotic wetland vegetation, which potentially provides some limited nutrient and sediment attenuation.

275 Applying the NPS-FM Māori freshwater value criterion, the only species of mahinga kai that I am aware of within all wetlands are raupō and lake clubrush. While exotic watercress was found in a few wetlands, I do not consider these to be in locations safe for food collecting purposes.

276 Overall, the ecosystem health values mirror these value determinations, with overwhelmingly (approximately 97%) having low-negligible ecosystem health values.

ASSESSMENT OF EFFECTS – WETLAND ECOLOGY

277 Using the data from my additional surveys, I spatially separated and determined the extent of wetland communities within the Proposed Designation into three categories based on potential effects (as shown in Appendix D):

277.1 On Indicative Alignment (habitat loss);

277.2 Within 100 m of the Indicative Alignment (potential edge effects and hydrological impacts); and

277.3 Beyond 100m of the Indicative Alignment (no effects likely unless major changes to the Indicative Alignment).

278 Tables 3 to 5 summarise the vegetation communities, area and ecological value for these three categories.

Table 3: Additional wetlands surveyed on the Indicative Alignment		
Vegetation types	**Area (ha)**	**Ecological value**
Native: exotic mosaic of broom rush, soft rush rushland	0.028	Low
Exotic dominant, soft rush rushland	0.854	Low-negligible
Exotic dominant, soft rush/ mixed water meadow	2.606	Low-negligible
Unsurveyed	0.632	Probable low-negligible
Sub-total	4.121	

Table 4: Additional wetlands surveyed within 100 m of the Indicative Alignment		
Vegetation types	**Area (ha)**	**Ecological value**
Native: exotic mosaic of raupō reedland	0.036	Moderate
Native: exotic mosaic of broom rush, soft rush rushland	0.153	Low
Exotic dominant: Soft rush/ mixed water meadow	4.009	Low-negligible
Sub-total	4.199	

Table 5: Additional wetlands surveyed beyond 100 m of the Indicative Alignment		
Vegetation types	**Area (ha)**	**Ecological value**
Native: exotic mosaic of Lake clubrush/ mixed water meadow	0.032	Moderate
Native: exotic mosaic of Swamp millet, *Isolepis prolifera*, mixed water meadow	0.068	Moderate
Native: exotic mosaic of Broom rush, soft rush rushland	0.028	Low
Exotic dominant: Mixed water meadow	0.551	Low-negligible
Exotic dominant: Soft rush/ mixed water meadow	4.548	Low-negligible
Sub-total	5.128	

279 Now I comment on these wetlands when placed into the broader ecological context. Prior to human colonisation, all areas where these wetlands are located would have been indigenous forest. Wetlands within gullies such as wetlands 25, 26, 34 to 37 and 39 would have provided habitat for kahikatea forest, likely with an understorey of swamp sedge. Potentially, the raupō and lake clubrush areas in wetland 25 and parts of 39 may have supported swamp maire and pukatea swamp forest. Wetlands including 27 to 33 and 38 which occur on kauri podzol soils, would have been a stunted kauri, mixed podocarp forest probably including a significant component of rimu and kahikatea, with an understorey of mapere (*Gahnia xanthocarpa*) and perhaps locally small areas of mānuka dominant gumland scrub.

280 Compared to these potential ecosystems, the wetlands which I surveyed are extremely modified.

281 In terms of magnitude of effect, the additional area of wetland habitat loss (ie for areas on the Indicative Alignment) amounts to approximately 4.121 hectares.

282 Applying EIANZ, I consider that for all exotic dominant wetlands impacted (either individually or cumulatively, identified in Table 3 above comprising 4.093 hectares), the overall level of effect is low. This is based on the magnitude of effect being very high (due to total loss and a permanent effect) (Tables 8 & 9) and the ecological value being low to negligible (Table 8). In my opinion, this is a less than minor overall effect.

283 For sensitivity testing purposes, if the rarity criterion was scored high on the basis that wetlands generally are rare, this overall level would increase to low-moderate overall level of effect. However, I do not consider this to be an objective application of this criteria, given exotic dominant wetlands are not rare.

284 For the 0.028 ha (280 m^2) of native: exotic mosaic of broom rush, soft rush rushland (identified in Table 3 above), the overall effect is moderate requiring effects management.

285 Within 100 m of the Indicative Alignment, some temporary or locally permanent wetland loss may be due to edge effects from machinery. While this remains unquantified, because most adjoining habitat is the exotic dominant: soft rush/ mixed water meadow community, the overall level of effect will be low.

286 I note that the Indicative Alignment dissects wetlands 27 and 33 and on the northwards approach to these, the expressway is located within a cut. Cuts have the potential to result in shallow ground water drawdown which is most impactful close to the cut face.

287 This cut could potentially result in some deleterious hydrological effects lowering the water table, at least near the cut. However, I do not expect that this would completely drain these wetlands because they are located on a podzol soil with an impervious pan near the summits of shallow ridges, and therefore not all ground water flow is likely to be drained by this.

288 These wetlands 27 and 33 in total amount to 1.213 hectares, and are mostly the exotic dominant: soft rush/ mixed water meadow community. Wetland 27 contains a very small area of sharp spike sedge of less than 40m^2. Even in the worst-case scenario, where total loss of these wetlands occurred due to high levels of hydrological effects, the overall level of effect would be low (given the low-negligible value and very-high magnitude level of effects).

289 On the downhill side of wetland 32 beyond the edge of the Indicative Alignment, there is a small area of mixed broom rush, soft rushland community. I do not expect there to be a meaningful loss of hydrology here, because this sits below a fill batter and will receive ground water and potentially treated stormwater. If there was a loss of hydrology of this wetland, the level of effect would be moderate.

290 It is important to recognise that the Indicative Alignment avoids most of native: exotic mosaic wetland vegetation communities I surveyed. For example, the Indicative Alignment is located well upstream of raupō reedland and lake club rush communities in wetland 25, and I do not anticipate any deleterious hydrological effects to these communities. Additionally, wetland 38 which has the highest diversity of indigenous wetland species is also avoided.

291 For sensitivity testing purposes, if the Indicative Alignment was moved, the effects on habitat loss and hydrological loss are likely to be very similar, given that 97% of the wetlands I surveyed are exotic dominant of low to negligible value.

RECOMMENDATIONS AND NZTA'S PROPOSED MITIGATIONS FOR WETLANDS

292 EIANZ provides guidance for addressing adverse effects based on overall level of effect.[36]

293 Firstly, there are no wetlands I surveyed which have high or very high overall level of effect. These generally should be avoided, minimised and where possible effects remediated. However, I do not think that is required here.

294 Apart from wetland 39 (which is greater than 100 m away from the Indicative Alignment and the landowner reported use by bittern), I do not consider any other wetlands to contain or provide suitable habitat for threatened species.

295 Given this finding, I do not consider there is any ecological justification to place limits on the extent of wetland loss that may occur within the Proposed Designation.

296 The following excerpts from EIANZ provide guidance as to the appropriate effects management where the overall effect is either low or moderate as determined:[37]

> *Low and Very Low categories should not normally be of concern, although normal design, construction and operational care should be exercised to minimise adverse effects. If effects are assessed taking impact management developed during project shaping into consideration, then it is essential that prescribed impact management is carried out to ensure Low or Very Low level effects.*
>
> *Options in the 'High and Moderate adverse' category represent a level of effect that requires careful assessment and analysis of the individual case. Such an effect could be managed through avoidance, design, or extensive offset or compensation actions. Wherever adverse effects cannot be avoided, no net loss of biodiversity values would be appropriate.*

297 Application of this guidance to the additional wetland areas would not require effects management for low level effects. No net loss would be consistent for habitat loss of the small area of native: exotic mosaic of broom rush, soft rush rushland community of

[36] EIANZ at page 84.

[37] EIANZ at page 84.

approximately 0.028 ha and if the alignment was altered, the other areas of native: exotic mosaic wetland communities.

298 Broom rush rushland is a vegetation community that is anthropogenic in origin, being created by farming and grazing activities.

299 A 'like for like' recreation whilst achieving no net loss, would not be enduring, unless it was created within pasture and grazed. For this reason, replacement by another longer lived and more resilient wetland plant community is recommended, such as using cabbage trees, harakeke, hukihuki, mingimingi and mānuka.

300 I acknowledge that Policy 6 of the NPS-FM contains the following direction:

> *There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.*

301 I further note that in the NPS-FM, Te Mana o te Wai is a concept that refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. Applicable principles contained relevant to this assessment and effects management are kaitiakitanga and stewardship.

302 For the Cambridge to Piarere Expressway Project, I recommended a 1 : 1 replacement ratio for addressing the loss of exotic dominant wetlands, such as soft rush and mixed water meadows. This ratio was determined through the use of the BOAM using plant structure as the attribute.

303 Upon reflection and consideration of effects of this Project, the NPS-FM and the goal of Te Mana o te Wai, I now hold a different view with respect to making progress towards protecting freshwater.

304 Policy 6 takes a rigid stance that every wetland is important, in effect lifting the overall level of effect for exotic wetlands to moderate or high, which requires offsetting loss of extent. At the same time, Policy 6 does not provide flexibility to consider integrated management (as described in section 3) and instead prioritise other restoration actions that would achieve greater gains for freshwater protection. I consider this to be a perverse outcome of this policy, given the overall goal to protect freshwater.

305 Considering the scale of this Project and the scale of potential effects holistically (including terrestrial vegetation, wetlands and freshwater), guidance within the EIANZ, the goal of Te Mana o te Wai, it is incumbent on NZTA to achieve a betterment or net gain for freshwater. This is of particular importance for nationally significant water bodies such as the Kaipara Harbour.

306 I do not consider however, that rigidly applying Policy 6 to achieve no net loss of extent for exotic wetlands, is the best approach for achieving this. Betterment or net gain is more likely to be successful through a combination of many effects management components integrated within priority catchments. This will include: adequate stormwater treatment wetlands to filter roadside contaminants, offsetting for the loss of moderate and high value wetlands, a combination of wetland restoration actions within and adjacent to existing wetlands and riparian, terrestrial and landscape planting implemented from headwaters downstream.

307 Whilst detailed design of the specific components for NZTA's mitigation measures will need to be developed following confirmation of detailed design, I consider the consent conditions include greater ratios for loss and direct different disciplines to ensure effects management measures work collaboratively together to achieve ecological outcomes. Further, given the cross-disciplinary effects management proposed, there is a high likelihood of betterment or a net gain for freshwater to be achieved with the priority catchments, even without offsetting loss of exotic dominant wetlands.

OVERALL EFFECTS POST-IMPLEMENTATION OF RECOMMENDATIONS – WETLAND ECOLOGY

308 As outlined above, I generally agree with the approach and assessment of effects in the Freshwater Assessment, and NZTA's effects management measures.

309 Considering the results of my additional surveys, the Indicative Alignment will result in the potential loss of an additional approximately 4 hectares of wetland from direct habitat loss, edge effects and potentially some minor hydrological loss on podzol soils. However, considering the generally low value of the impacted features, I consider this to be a less than minor effect prior to implementation of effects management measures.

310 I support NZTA's mitigation package for wetlands, and consider that following implementation there is a high likelihood of betterment or a net gain for freshwater to be achieved, with the priority catchments, even without offsetting loss of exotic dominant wetlands.

RESPONSE TO COMMENTS IN RELATION TO WETLANDS

311 In this section, I respond to a few additional comments from Patuharakeke, DOC and Te Parawhau relating to wetlands.

312 Patuharakeke have proposed limits on wetland loss within recommended changes made to consent conditions. I do not consider these limits to be ecologically justified. As outlined above, I do not consider any particular wetland features warrant avoidance,

and to the extent the remaining wetlands are impacted, NZTA's proposed mitigation package will ensure these effects are appropriately managed.

313 DOC have stated there is a need to undertake faunal surveys to inform effects management measures. I do not consider this is necessary, noting that NZTA's proposed mitigation package will ensure that the values and habitat for wetland fauna are appropriately identified and managed during implementation of the approvals.

314 DOC have recommended increased ratios for moderate and high value wetlands. As outlined above, I consider that NZTA's proposed ratios for wetland offsetting are appropriate. My BOAM calculation ratios were the product of the % cover of indigenous species lost and the expected recovery of indigenous cover over time, with restoration planting and weed control. Sedgeland and raupō reedland wetlands grow very rapidly and should create dense wetland vegetation (≥80%) cover within 3 years. The potential loss is comparatively very temporary and so I do not consider higher ratios sought are ecologically justified.

Nicholas Singers
28 October 2026

APPENDIX A – RELEVANT QUALIFICATIONS AND EXPERIENCE

1 I am a plant ecologist with over 29 years' experience in government and private consultancy, focused primarily in the central and lower North Island. I worked for the Department of Conservation as a botanical technical expert from 1998 to 2012. During the period from 2010 to 2012 I was part of a team which prioritised threatened species and ecosystem management, which included publishing a terrestrial and wetland ecosystem classification system.

2 Since 2012 I have worked in my own private consultancy for a range of governmental and private clients. For NZTA I led the effects assessment including undertaking biodiversity offset accounting for the Mt Messenger deviation and Cambridge to Piarere expressway projects.

3 I have an expert understanding of New Zealand's ecosystem and vegetation patterns which has assisted national and regional governments prioritise biodiversity management and acquire areas for protection. My expertise also encompasses natural value assessments, wetland delineation, assessment of effects, production of conservation action plans particularly focused on weed control, animal pest control, vegetation restoration, wetland restoration and threatened species management, application of environmental policy and ecological restoration project management. In professional (and private) capacity, I project manage the delivery of conservation management and predator control to protect wetlands.

APPENDIX B – UPDATED INDIGENOUS VEGETATION MAPPING

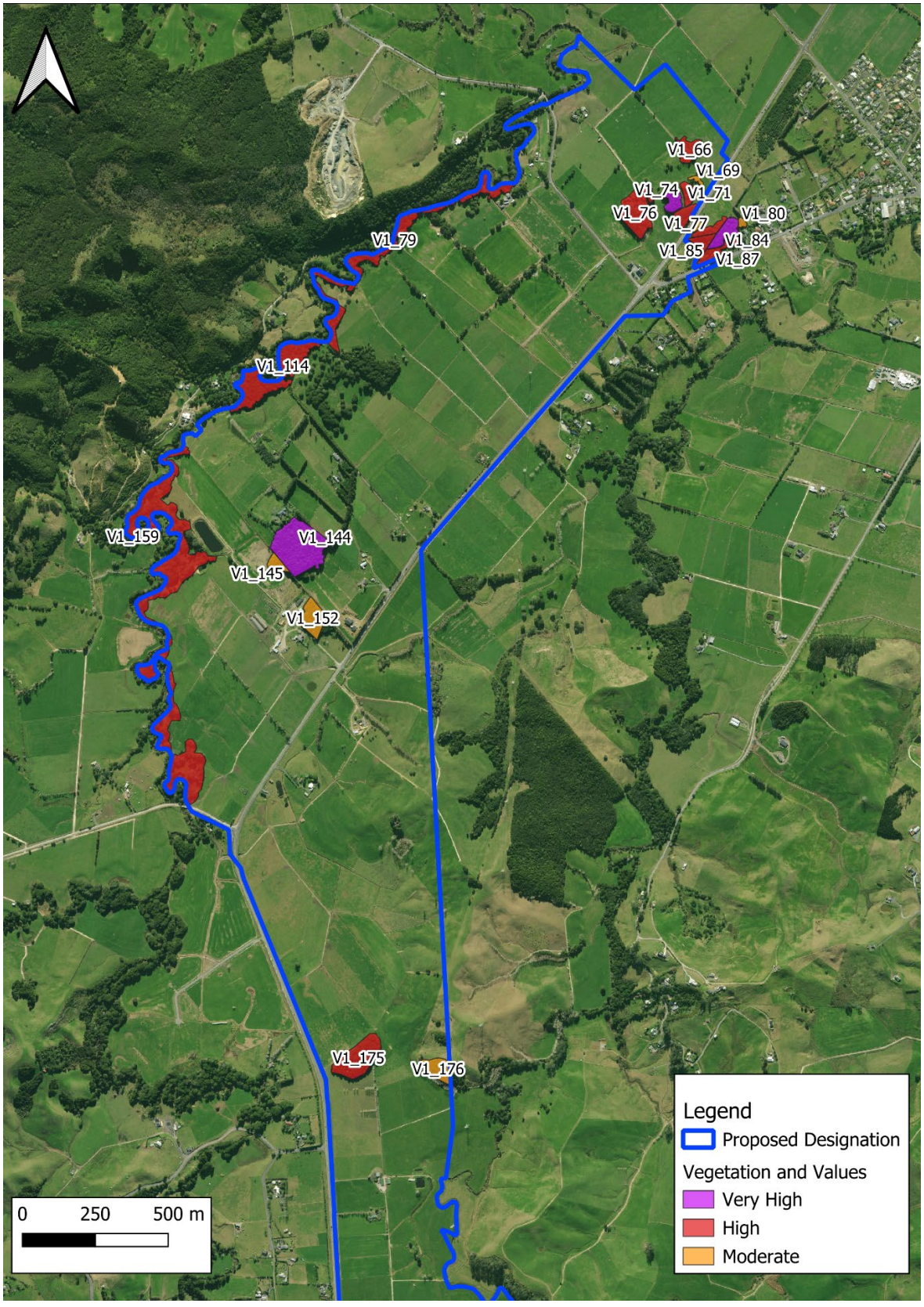

Figure B1: Moderate to Very High Ecological Areas and their unit codes

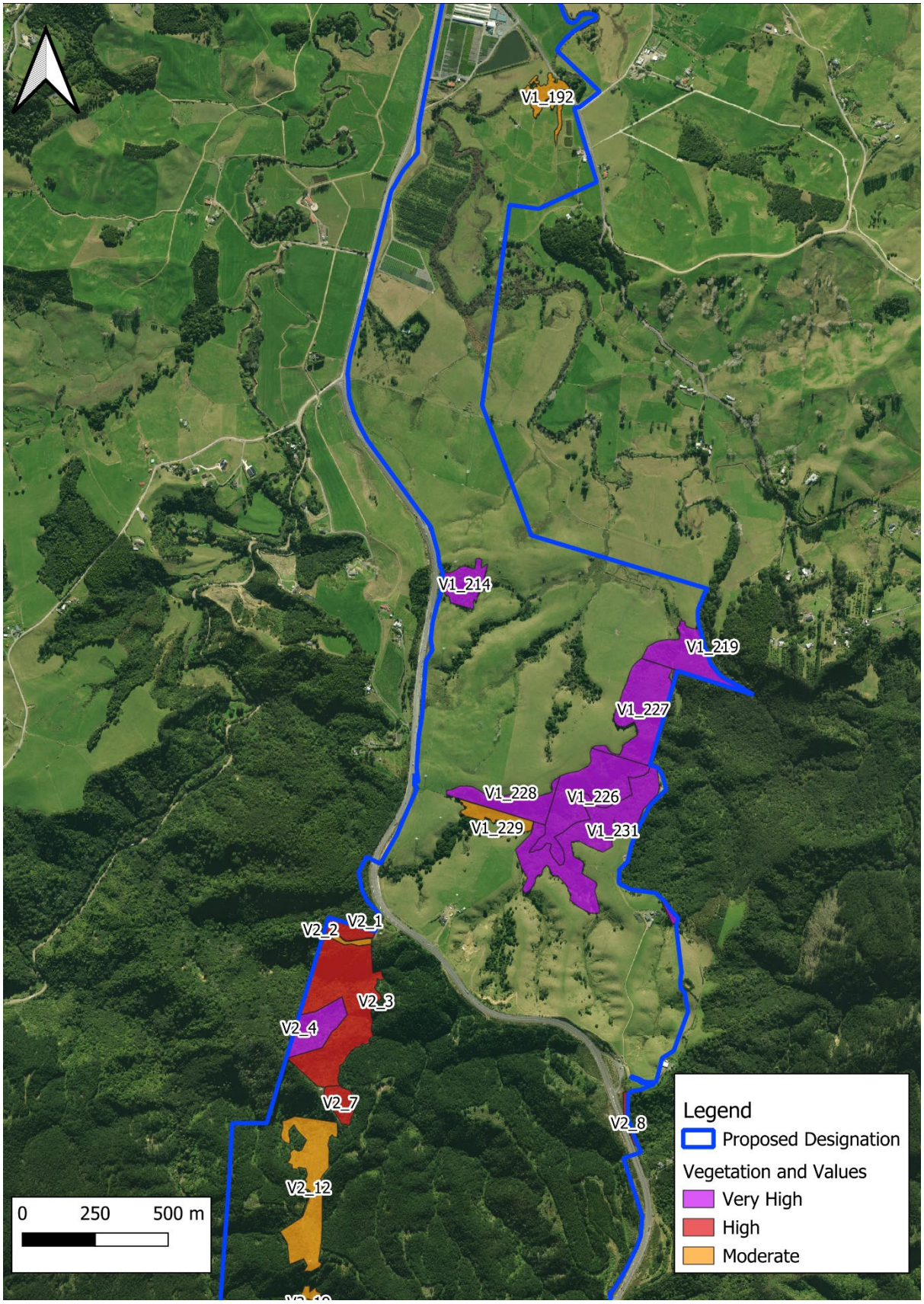

Figure B2: Moderate to Very High Ecological Areas and their unit codes

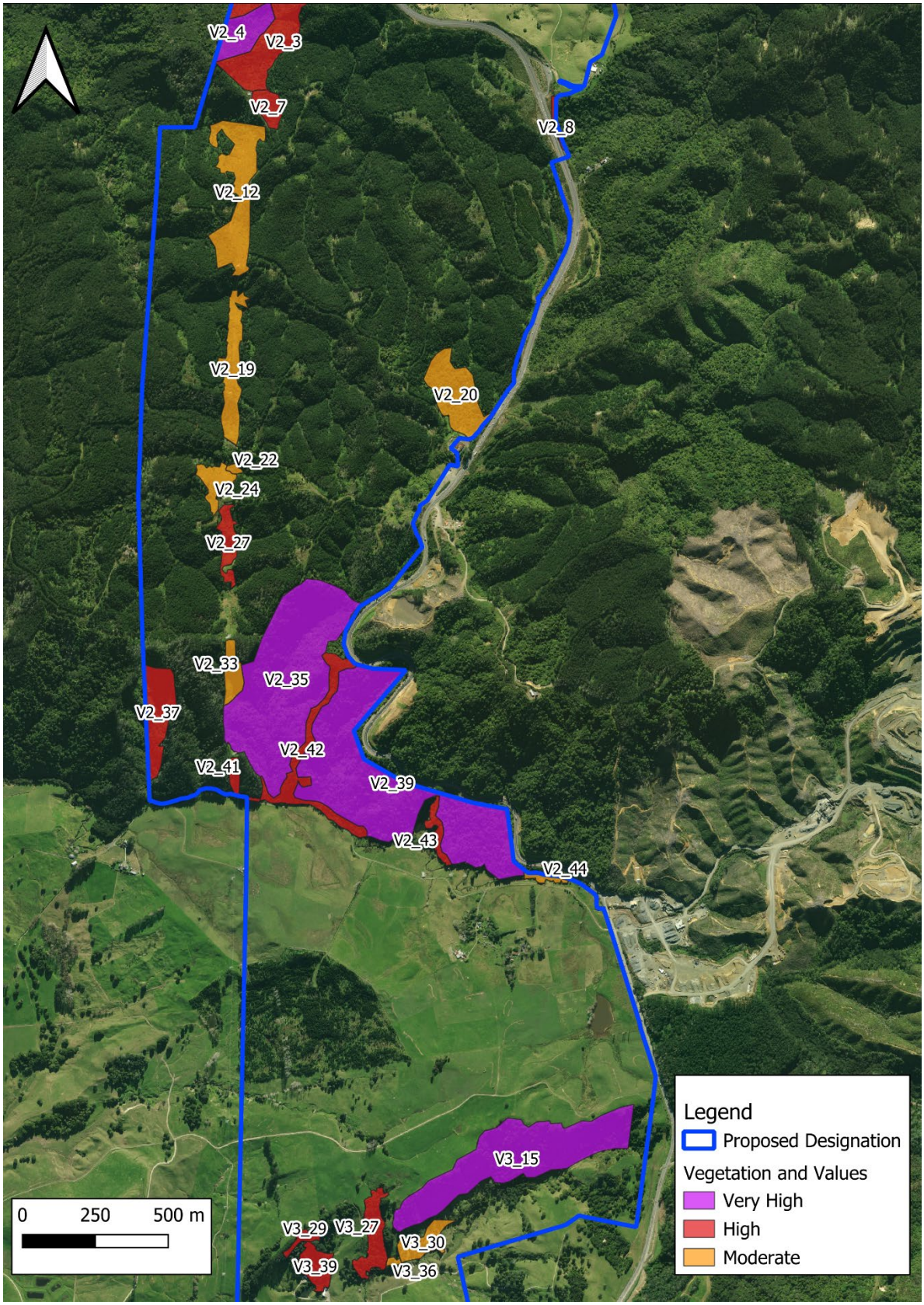

Figure B3: Moderate to Very High Ecological Areas and their unit codes

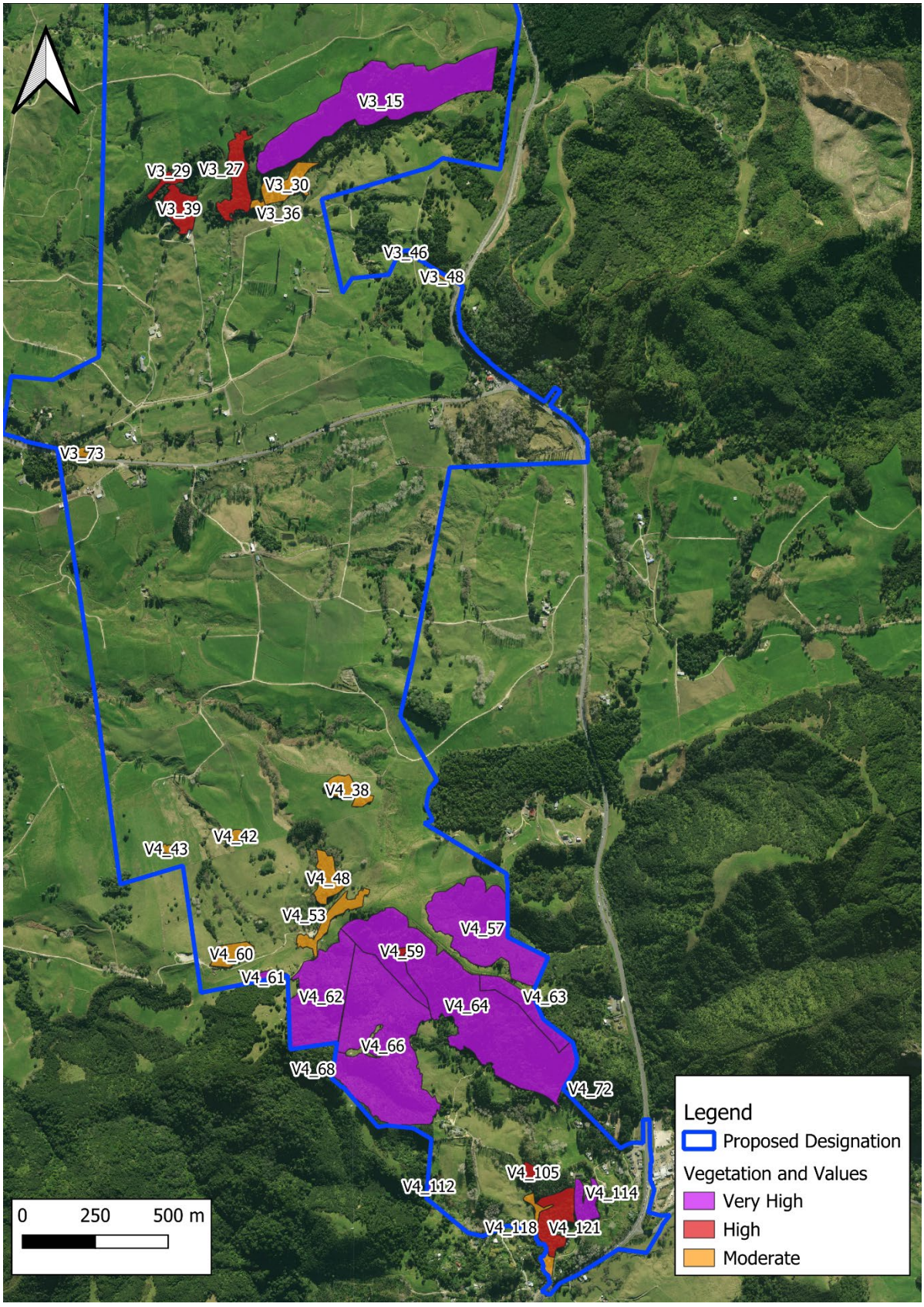

Figure B4: Moderate to Very High Ecological Areas and their unit codes

APPENDIX C – ADDITIONAL WETLAND SURVEY RESULTS AND MAPS

Table 1: Ecological value assessment for additional wetlands surveyed (October 2026)

Wetland	Size (Ha)	Vegetation types	Ecological significance				Overall ecological value
			Representativeness	Rarity and distinctiveness	Diversity and Pattern	Ecological context	
W25	0.839	Broom rush, soft rush/ water meadow species; Raupō reedland; Lake club rush sedgeland	Low to moderate	Low to moderate	Low to moderate	Low	Moderate
W26	0.551	Exotic dominant creeping bent water meadow and soft rush rushland	Low	Low	Low	Low	Low
W27	0.737	Exotic dominant soft rush rushland/ mixed water meadow	Low	Low	Low	Low	Low
W28	0.213	Exotic dominant soft rush rushland/ mixed water meadow	Low	Low	Low	Low	Low
W29	0.179	Exotic dominant soft rush rushland/ mixed water meadow; Broom rush, soft rush rushland	Low	Low	Low	Low	Low
W30	2.846	Exotic dominant soft rush/mixed water meadow	Low	Low	Low	Low	Low
W31	0.147	Exotic dominant soft rush/mixed water meadow	Low	Low	Low	Low	Low
W32	0.796	Exotic dominant soft rush/mixed water meadow; Broom rush, soft rush rushland	Low	Low	Low	Low	Low
W33	4.227	Exotic dominant soft rush/mixed water meadow; Broom rush, soft rush rushland	Low	Low	Low	Low	Low

Wetland	Size (Ha)	Vegetation types	Ecological significance				Overall ecological value
			Representativeness	Rarity and distinctiveness	Diversity and Pattern	Ecological context	
W34	0.561	Soft rush rushland/mixed water meadow					Not surveyed, no access
W35	0.220	Probably Soft rush rushland/mixed water meadow					Not surveyed, no access
W36	0.412	Probably Soft rush rushland/mixed water meadow					Not surveyed, no access
W37	0.293	Soft rush rushland/mixed water meadow					Not surveyed, no access
W38a		Broom rush, soft rush rushland	Low	Low	Low	Low	Low
W38b	0.107	Swamp millet, Isolepis prolifera, sharp spiked sedge sedgeland Gorse/ broom rush, soft rush rushland,	Low	Low to Moderate	Low to Moderate	Low	Moderate
W39	1.397	Occasional soft rush, broom rush over creeping bent, sweet grass; small open ponds	Low	Low	Low	Low	Low

Table 2: Species composition and percentage cover for additional wetlands surveyed (October 2026)

Scientific Name	Wetland Status	Percentage Cover											
		W25	W26	W27	W28	W29	W30	W31	W32	W33	W38a	W38b	W39
**Agrostis stolonifera*	FACW	20-30	70	15	5	15	15	15	15-20	45	25	2	45-65
** Alisma plantago-aquatica*	OBL												1
** Anthoxanthum odoratum*	FACU			5	<1	5	<1	<1	1	<1			
** Bellis perennis*	FACU								<1				
** Callitriche stagnalis*	OBL			<1	<1	<1	<1	<1					<1
Carex geminata	FACW											<1	
Carex secta	OBL	<1											
Carex virgata	FACW												<1
**Cenchrus clandestinus*	FACU			5	<1	1					2	<1	
Centella uniflora	FACW						<1		<1	<1			
** Cerastium glomeratum*	FACU								<1				
**Cyperus eragrostis*	FACW	1											<1
Cyperus ustulatus	FACW	1											<1
Dicksonia squarrosa	FACU											<1	
Eleocharis acuta	OBL			1	<1	<1	<1	<1		5		<1	
Gahnia xanthocarpa	FAC											<1	

Scientific Name	Wetland Status	Percentage Cover											
		W25	W26	W27	W28	W29	W30	W31	W32	W33	W38a	W38b	W39
* *Galium palustre subsp. palustre*	OBL						<1		<1				
**Glyceria declinata*	OBL	2	1		5	5	<1	2	<1	<1		<1	5-10
Gonocarpus aggregatus	FACU						<1						
**Helosciadium nodiflorum*	OBL		5										
**Holcus lanatus*	FAC	1			<1		1	<1	1		2	5	<1
**Hypochaeris radicata*	FACU								<1	<1			
Isachne globosa	OBL											2	
Isolepis prolifera	OBL	1										5	<1
Isolepis sp.	OBL	<1							<1	2		<1	<1
**Juncus acuminatus*	OBL								<1				<1
**Juncus articulatus*	FACW	1	10	5		<1	3	1	<1	35		<1	
**Juncus bufonius* var. *bufonius*	FACW						3	<1	<1	1		<1	
**Juncus effusus* var. *effusus*	FACW	10	3	35	45	45	65	65	55	20	40	40	20
Juncus planifolius	FACW		<1			<1	<1		<1	<1			
Juncus sarophorus	FACW	25	3	3	15	2	2		3-10	(45)	25	25	10
**Juncus tenuis* subsp. *tenuis*	FACU								<1				

Scientific Name	Wetland Status	Percentage Cover											
		W25	W26	W27	W28	W29	W30	W31	W32	W33	W38a	W38b	W39
Juncus usitatus	FACW	<1											
**Lolium arundinaceum* subsp. *arundinaceum*	FAC	1											
* *Lolium perenne*	FACU				<1					10			
**Lotus pedunculatus*	FAC	<1		15-20	2	3	<1	<1	3-5	2	5	5	<1
* *Ludwigia palustris*	OBL												2
* *Lythrum portula*	OBL				<1								<1
Machaerina rubiginosa	OBL											2	
**Myosotis laxa* subsp. *caespitosa*	OBL	<1	<1					<1	<1	2			<1
**Nasturtium officinale*	OBL	5-10	<1										
Parablechnum novae-zelandiae	FAC											<1	
**Paspalum dilatatum*	UPL	<1	3				<1	<1					
* *Paspalum distichum*	FACW												1-2
**Persicaria hydropiper*	FACW			<1	<1	<1	1	<1	<1				15-20
**Plantago lanceolata*	FACU							<1	<1	<1			
* *Prunella vulgaris*	FACU				<1				<1	<1			
* *Ranunculus repens*	FAC	20	1	35	20	15	1		5-10	3	2	2	<1

Scientific Name	Wetland Status	Percentage Cover											
		W25	W26	W27	W28	W29	W30	W31	W32	W33	W38a	W38b	W39
* *Rumex crispus*	FAC	<1			<1	<1	<1		<1	1			<1
* *Salix fragilis* × *S. euxina*	FACW												3
Schoenoplectus tabernaemontani	OBL	10											
Schoenus maschalinus	FACW						<1		<1				
**Trifolium repens*	FACU							<1		5			
Typha orientalis	OBL	25											
* *Ulex europaeus*	FACU											20	
**Zantedeschia aethiopica*	FAC	<1											
Pugged/bare earth			10	10	5	5	5	2	20	15-20			

APPENDIX D: ADDITIONAL WETLANDS SURVEYED

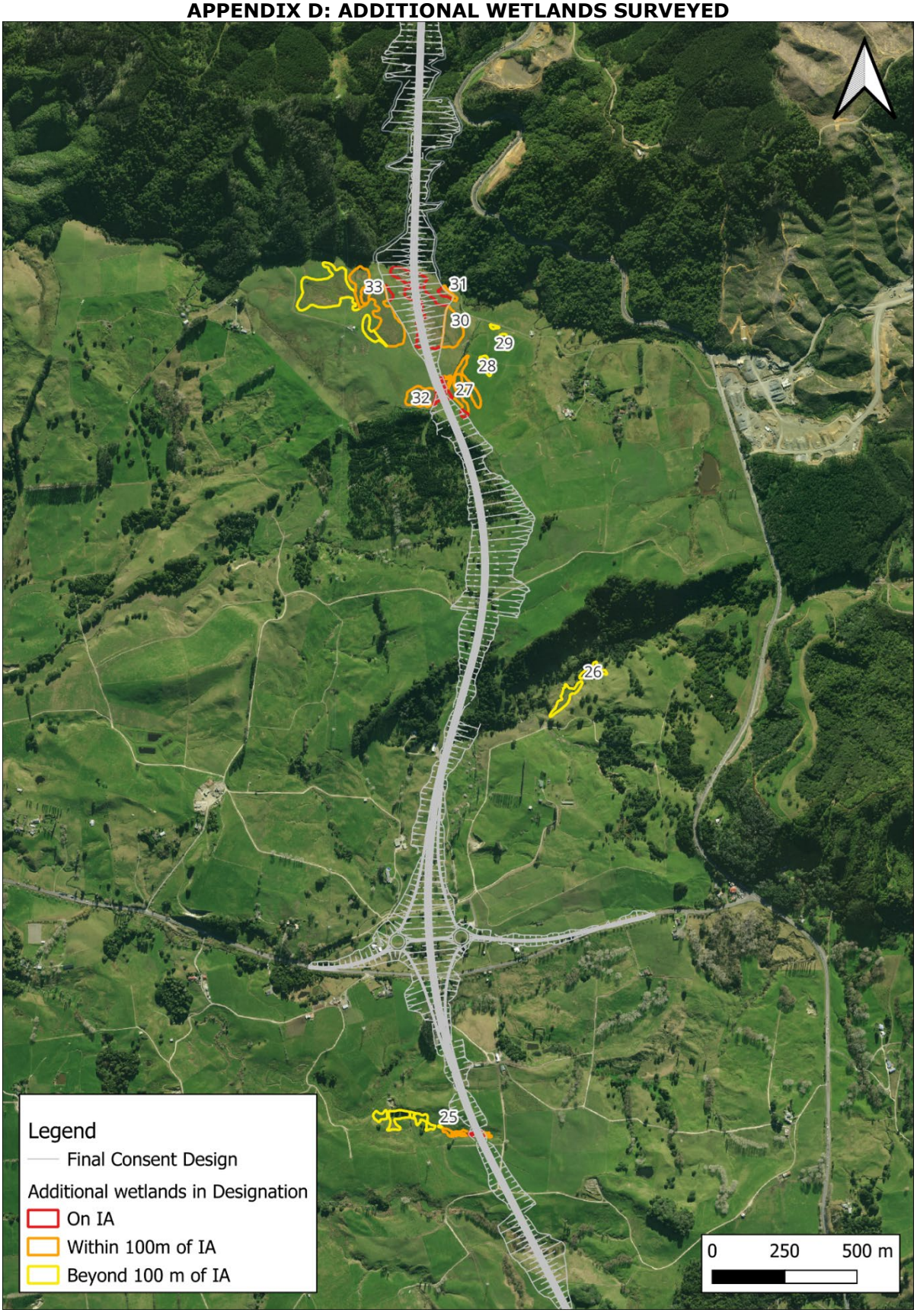

Figure D1: Location of additional wetlands (25 to 33) surveyed in October 2026

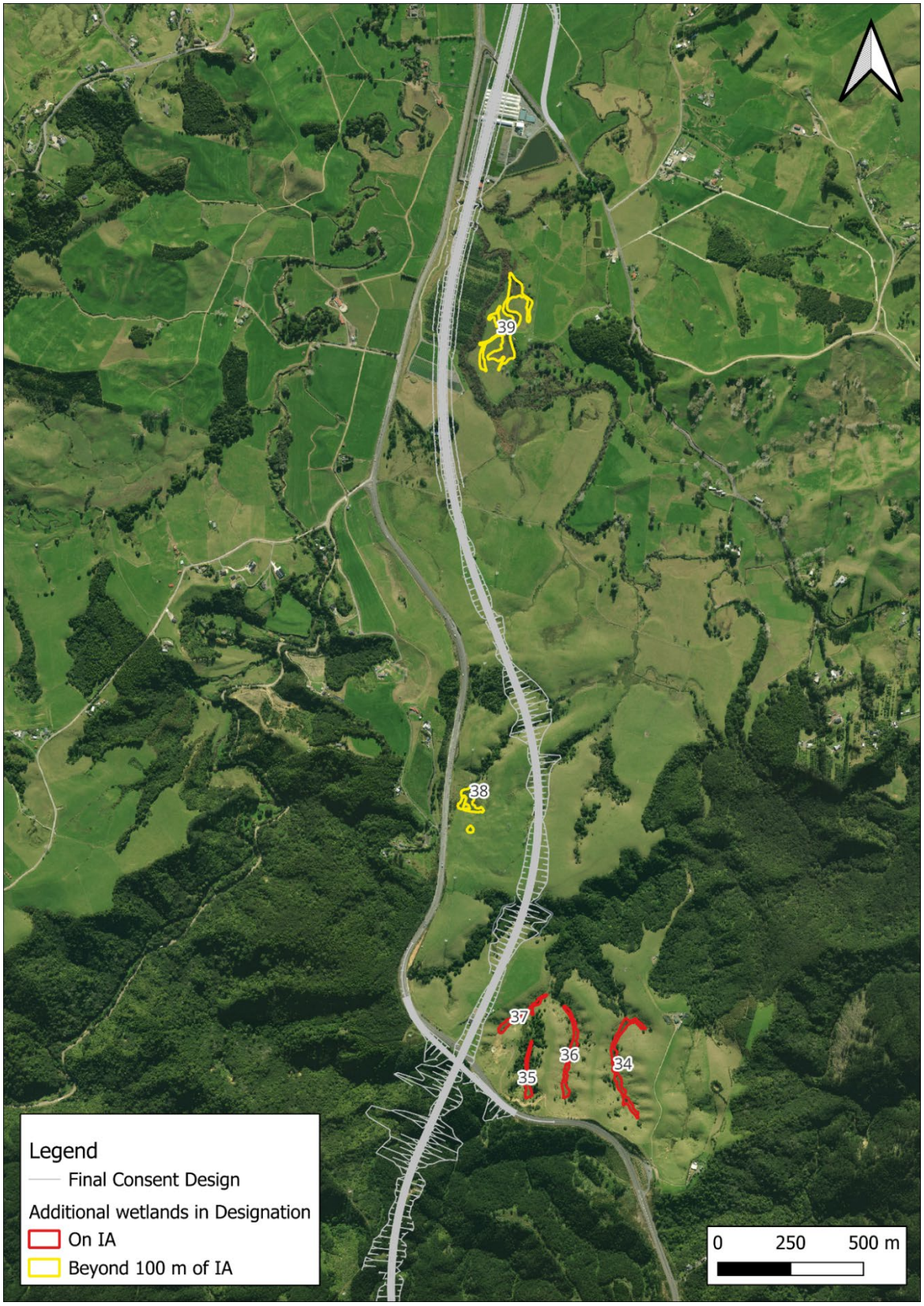

Figure D2: Location of additional wetlands (34 to 39) surveyed in October 2026

APPENDIX E – REPRESENTATIVE PHOTOS OF WETLANDS



Figure E1: General location (marked by person) where the Indicative Alignment will dissect through wetland 25, showing exotic soft rush, mixed water meadow wetland vegetation



Figure E2: Exotic soft rush, mixed water meadow (right) merging into native, exotic mosaic of raupō reedland & mixed water meadow (left)



Figure E3: Exotic dominant soft rush/ mixed water meadow (foreground) grading into native: exotic mosaic of broomrush, softrush rushland (brown rush & centre) in wetland 32. The lower edge of the fill batter of the Indicative Alignment is near the upper edge of the broom rush zone.



Figure E4: Exotic dominant soft rush, mixed water meadow, wetland 30



Figure E5: Exotic dominant soft rush/ mixed water meadow and characteristic pugged soil (wetland 30).



Figure E6: Overview of wetland 39, situated with former oxbows of the Waihoihoi River