BEFORE THE PALMERSTON NORTH CITY, MANAWATŪ DISTRICT (MDC) AND TARARUA DISTRICT COUNCILS

IN THE MATTER	of the Resource Management Act 1991 ("the Act")
AND	
IN THE MATTER	NOTICES OF REQUIREMENT by NZTA under s168 of the Act for the construction, operation, maintenance and improvement of approximately 11.5km of new State Highway between Ashurst and Woodville to replace the closed section of SH3 through the Manawatū Gorge and associated works, known as the Te Ahu a Turanga, Manawatū Tararua Highway Project ("the Project")

Timothy James Martin

EVIDENCE ON BEHALF OF THE DIRECTOR-GENERAL OF CONSERVATION (Ecology)

Dated: 15 March 2019

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1. QUALIFICATIONS AND EXPERIENCE

1.1. My full name is Timothy James Martin.

1.2. I am a Principal Ecologist with Wildland Consultants Ltd, based in Auckland. I have been employed as a consultant ecologist with Wildland Consultants since 2006.

1.3. In 2007 I graduated with a PhD in Environmental Science from the University of Auckland. I also hold the degrees of Bachelor of Science and a Master of Science with First Class Honours, both from the University of Auckland, where my studies were undertaken at the School of Biological Sciences and the School of Geography and Environmental Science.

1.4. I have considerable experience in New Zealand ecology, which I studied during both my Masters and Doctoral research. For my Masters research I studied the ecology of hutu (*Ascarina lucida*), a rare indigenous tree. My PhD research focused on the effects of wind disturbance on New Zealand indigenous forests, which involved extensive field research throughout the North Island. I am an author of five scientific papers published on these and other topics in peer-reviewed national and international scientific journals. I have also

presented aspects of my research at national and international scientific conferences.

1.5. My work as an ecological consultant has covered a wide range of habitat types, including forests, shrublands, wetlands, streams, grasslands, dunelands, and estuarine ecosystems. I have provided assessments of ecological effects for a range of development activities in natural areas, provided technical advice on community-led restoration projects, and undertaken surveys for threatened species.

1.6. I have undertaken surveys for a wide range of indigenous fauna throughout the North Island and associated offshore islands, including herpetofauna, birds, and land snails. I have undertaken reptile surveys in sand dunes, rocky coasts, riparian margins, and shrubland and forest habitats, and have led several reptile salvage projects at construction sites. I am familiar with the survey, capture, and handling of indigenous herpetofauna.

1.7. I recently provided ecological advice to New Plymouth District Council on the application for a designation to construct a new state highway through indigenous forest and wetland vegetation at Mt Messenger, involving a significant amount of proposed vegetation clearance.

1.8. I undertook a walk-through survey of habitats throughout the Manawatu Gorge project site on 23 November 2018, accompanied by two Wildlands staff, Jacqui Wairepo, a herpetologist, and Nick Goldwater, a wetlands and freshwater specialist, and Dr Forbes (ecologist for the Applicant). The focus of this survey was the older forest remnants and/or wetlands at Chainage 4000-4400 and 5500-5900, and wetlands and shrublands at Chainage 9300-9400. We also viewed many parts of the route from vantage points to understand the broader habitats along the route as a whole, e.g. shrubland areas on the Eastern Rise.

1.9. I have read the Code of Conduct for Expert Witnesses 2006 and have complied with it in the preparation of this statement of evidence. Except where I state that I am relying upon the specified evidence of another person, my evidence in this statement is within my area of expertise. I have not omitted to consider any material facts known to me that might alter or detract from the opinions which I express below.

2. SCOPE OF EVIDENCE

2.1. The Department of Conservation commissioned Wildland Consultants (Wildlands) to provide independent assessment and advice regarding the proposed SH3 bypass of Manawatu Gorge.

2.2. In December 2019 I was the author of a review of ecological aspects of the application, entitled "High-Level Initial Guidance on Ecological Aspects of the Application to Bypass the Manawatu Gorge at SH3, between Palmerston North and Woodville". This report reviewed the specialist ecology reports for the NOR (downloaded from the NZTA website on 9 November 2018), provided a critique of the assessment, and identified information gaps. Material reviewed included:

a. 'Statement of Evidence' of Dr Forbes in the AEE: "Te Ahu A Turanga: Technical Assessment #6 Terrestrial Ecology"
b. Technical Report 6.A.: Assessment of Terrestrial Vegetation and Habitats, prepared by Dr Forbes,
c. Technical Report 6.B: Terrestrial Fauna Ecological Effects Assessment, prepared by Mr Blayney and Ms. Sievwright,
d. Manawatu Gorge Road Realignment Threatened Plant Survey prepared by Mr Singers and Ms. Bayler,
e. Section 13 of the One Plan "Land Use Activities and Indigenous Biological Diversity"
f. The indicative alignment plan (Sheet 1-10), dated October 2018.
g. The designation plan (Sheet 1-10), dated October 2018.

2.3. Subsequent to this initial high-level review, I have reviewed the following documents.

a. Dr Forbes' response to the high-level guidance document that Wildlands prepared for the Department of Conservation (1 February 2019).
b. A map of potential restoration sites (13 February 2019).
c. Proposed Designation Conditions – Ecology (15 February 2019).
d. Summary of Conditions: Terrestrial Ecology (15 February 2019).
e. A map of ecological sites with regards to the NOR base option (19 February 2019).
f. "Further ecosystem type descriptions prepared for the Department of Conservation" prepared by Dr Forbes (21 February 2019).
g. The Evidence in Chief of Dr Forbes (8 March 2019)

h. The Evidence in Chief of Mr Blayney (8 March 2019).

2.4. My evidence will address the following issues in relation to the NOR and resource consent application:

a. Summary of conclusions.
b. A summary of the process and outcomes from the consultation that has been undertaken by NZTA with the Department of Conservation.
c. The existing environment, including historic habitat loss in the Manawatu Gorge area.
d. A review of the adequacy of the mapping and identification of habitats within the designation, and assessments of ecological values and ecological significance.
e. A summary assessment of the adverse effects of the Project on ecological values.
f. The adequacy of mitigation, offsets, and compensation proposed by the Applicant.

2.5. Because I understand that the offset/compensation package provided by the Applicant is intended to be preliminary, I raise issues with it but cannot provide definitive conclusions. Currently there is insufficient information to do so.

3. SUMMARY OF CONCLUSIONS

3.1. The proposed Manawatu Gorge Bypass will pass through hill country to the north of Manawatu Gorge Scenic Reserve. The designation crosses pasture, indigenous forest and shrublands, and hillslope seepage wetlands in a series of gully systems. The extent of indigenous habitat loss has been estimated to be approximately 32 hectares, including at least 3.99 hectares of wetlands. The extent of loss for exotic wetlands has not yet been confirmed. Within the context of the wider landscape, with high historic losses of indigenous vegetation, and close proximity to the Manawatu Gorge Scenic Reserve, the project will result in significant adverse ecological effects.

3.2. The extent of loss of indigenous vegetation and hillslope seepages could be further reduced by relocation or realignment of the proposed spoil sites. Some of the spoil sites include habitats of High ecological value, and these are likely to be habitat for At Risk fauna species.

3.3. The Applicant assessed the ecological value of the ecosystem types within the NOR boundaries, using the EIANZ framework[1]. As set out in detail in my evidence, if the Applicant was to reassess the 10 ecosystem types identified in the NOR evidence, two should be reclassified as having Very High Ecological Value, four should be classified as High value, three should be classified as Moderate value (an increase from two), and no ecosystem types would be classified as being of Low value. Two ecosystem types have been identified and mapped since the NOR evidence: divaricating *Coprosma* shrublands and exotic-dominated seepage wetlands. These ecosystem types have been assessed as being of High and Moderate ecological value, respectively. I agree with the ratings assigned to these two new ecosystem types.

3.4. The Applicant has not undertaken invertebrate surveys at this time, despite previous records of two "At Risk" moth species from within the local area, and the Horizons One Plan and the Ecological District description identifying several species of interest, e.g. *Asaphodes stinaria*, Threatened-Nationally Vulnerable, *Powelliphanta* species, and *Wainuia* species. These surveys need to be undertaken, targeting likely habitats for Threatened or At Risk invertebrate species, including shrublands.

3.5. Given the lack of information, if a precautionary approach were to be taken, all 10 ecosystem types identified in the NOR evidence potentially meet the Rarity and Distinctiveness criterion in the One Plan due to the potential presence of Threatened or At Risk species.

3.6. The Applicant has proposed a package of measures "to address adverse effects and to offset residual adverse effects to a biodiversity net-gain position". The use of offsets to reasonably demonstrate a net gain requires a high degree of certainty regarding the type, extent, and values of the habitat to be lost, and the location, extent, and condition of the restoration site (the offset site). At present, the Application has significant information gaps for both the sites where loss is to occur, and the sites of proposed gain.

3.7. The Applicants use of the term "offsets" was discussed at expert conferencing between Dr Forbes and myself on 22 February 2019. It was agreed that the offsetting proposed does not fully meet the principle of no-

[1] Environment Institute of Australia and New Zealand.

net-loss under the biodiversity offsetting framework[2], and that due to limits to offsetting that restoration to address the loss of old-growth alluvial forests and raupō-dominated seepage wetlands would need to be addressed through compensation[3]. However Dr Forbes has retained 'offsets' as the terminology throughout the description of the positive effects package.[4]

3.8. The Applicant has revised the calculations of habitat loss to include ecosystems previously omitted from the Application (e.g. exotic-dominated wetlands) but the actual extent of loss has not been finalised. Detailed descriptions of current condition for all habitats within the project footprint have not been provided, e.g. canopy health, cover of indigenous plant species, existing pest control regimes.

3.9. No restoration sites have been confirmed. Consequently, the existing ecological values and condition of these sites is unknown, and cannot be considered in the development of a package of works to address adverse effects. Some of the proposed restoration sites are unsuitable (e.g. a hill country stream as a wetland restoration site), or will not be available as they are within the proposed road footprint (e.g. the wetland within the embankment). This is particularly problematic for the demonstration of net-gain or even no-net-loss, as the degree to which these restoration sites can be improved needs to determine the extent of the restoration sites (along with other factors).

3.10. Additionally, extent of habitat types to be lost and to be restored, on a purely area-for-area basis, is a very rudimentary approach for development of a restoration package using Environmental Compensation Ratios (ECRs). The package might achieve, for forest and shrublands, a net increase in extent, but demonstration of no-net-loss for all elements of indigenous biodiversity requires more components of these ecosystems to be assessed and quantified.

3.11. The wider landscape through which the route is to pass provides a range of opportunities and locations for the restoration and or enhancement of ecological values, so, except for wetlands, this is not a factor limiting the potential for adverse effects on terrestrial ecology to be addressed. However, as it currently stands, the Application does not reasonably

[2] Joint Witness Statement of Dr Forbes and Dr Martin, 22 February 2019 at [10b]
[3] Joint Witness Statement of Dr Forbes and Dr Martin, 22 February 2019 at [10a]
[4] Dr Forbes EIC.

demonstrate a net biodiversity gain, or even no-net-loss. To do so would require greater certainty regarding the ecological values of the habitats within the footprint, confirmation of the location, extent, and ecological condition of the restoration sites, and the availability of these sites in the long term (preferably in perpetuity).

3.12. Unless this certainty can be provided, the package proposed to address adverse effects should not claim that it will result in a net biodiversity gain.

3.13. The currently proposed package will result in residual adverse ecological effects. Some of these residual effects could be addressed, at least in part, by additional ecological management. Others, such as isolation of habitats, are inherently related to the construction of roads, and cannot be addressed (except perhaps by avoidance). On the current level of information, these residual adverse effects are potentially significant.

4. CONSULTATION

4.1. The Department of Conservation has met with NZTA several times to discuss the ecological matters of this Application. I describe relevant aspects of that consultation and some revisions that occurred following this consultation, and the revisions are also discussed further in the body of my evidence.

4.2. As stated, I visited habitats within the designation on 23 November 2018.

4.3. I discovered a population of ramarama (Threatened-Nationally Critical) within the project footprint. The population includes hundreds of plants, and in places is the dominant species within “advanced secondary broadleaved forest”. This species was not previously noted by the Applicant, or addressed in the threatened plant survey report. In response, the Applicant has identified and mapped two large stands of ramarama, and a “no-go” zone adjacent to Chainage 5700-5800. The Applicant has not revised the significance assessment for this habitat type.

4.4. A meeting was held in Hamilton on 5 December 2018 with NZTA, Dr Forbes, the Department of Conservation, and myself in attendance. I provided NZTA with the initial high level review of the project prepared by Wildlands[5], and Dr Forbes provided further documentation in response to issues and questions raised at the site meeting on 23 November 2018. Dr

[5] Wildland Consultants Contract Report No. 4860a, December 2018.

Forbes prepared a detailed response to the review by Wildlands (1 February 2019). As I explain below in my evidence, at this time the Applicant increased the extent of direct loss by 3.8 hectares, to 34.6 hectares.[6]

Subsequently, a meeting was held in Palmerston North on 15 February 2019 with NZTA, Dr Forbes, the Department of Conservation, and myself in attendance. At this meeting the key remaining information gaps and proposed mitigation package were discussed. On the basis of maps that had been received, at this meeting I identified several potential wetland areas that, if confirmed, have also been excluded from the current calculations of habitat loss. If any of these are confirmed as being wetlands, the extent of wetland loss will increase from the current estimated total of 3.99 hectares.

On 21 February 2019, Dr Forbes provided descriptions for the terrestrial indigenous ecosystem types that had not been provided in the NOR.

4.5. On 22 February 2019, Dr Forbes met with me in Auckland to discuss the terminology used in the Application with regards to mitigation, offsetting, and compensation, the adequacy of the ECRs proposed by the Applicant, and additional information requests. This meeting is the subject of a Joint Witness Statement (JWS) finalised on 25 February 2019.

5. EXISTING ENVIRONMENT

5.1. Dr Forbes[7] correctly states that the proposed route spans three ecological districts, that the landscape prior to human settlement was forested, and that due to vegetation clearance, all of the designation is classified as either "Chronically" or "Acutely" Threatened Land Environments. Thus, land environments over most of the route, at a national scale, have less than 20% or 10% indigenous cover remaining. Dr Forbes notes that outside of the Manawatu Gorge Scenic Reserve "a number of smaller native vegetation remnants exist in the surrounding landscape".

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[6] This increase included:
   a. Exotic-dominated wetlands (2.74 hectares), which were previously excluded from the assessment as an ecosystem type.
   b. An additional 0.56 hectares of indigenous seepage wetlands.
   c. 0.33 hectares of divaricating Coprosma shrubland.

[7] Forbes NOR Evidence at [20-23].

5.2. In the description of the Manawatu Gorge North Ecological District[8], the following is relevant to this assessment:

a. "Forests cleared for grazing in the Manawatu Gorge area; scattered pockets of podocarp/hardwood forest restricted to damp gullies";

b. The presence of land snails in the genera *Powelliphanta* and *Wainuia*.

The relevance of these references is discussed further below.

5.3. The Landscape Context description provided by Dr Forbes discusses forest remnants but omits discussion of wetlands or shrublands. The designation includes areas of early successional vegetation and wetlands. It should be noted that: [9]

a. In relation to early successional vegetation, within the wider Manawatu-Wanganui Region "scrub as potential future forest is particularly important in areas where vegetation cover has been drastically reduced"; and

b. wetlands have been reduced to 3.04% of former extent.

6. IDENTIFICATION AND MAPPING OF ECOLOGICAL FEATURES AND VALUES

6.1. Dr Forbes (in his NOR evidence) stated that indigenous ecosystems were identified and mapped by the Applicant with regards to "the designation and the indicative design"[10] , and "ecosystems within the designation area but not mapped are assumed to be clear of works"[11] . The Applicant stated that "38.5 hectares (*c*.10%) of the designation area comprises indigenous terrestrial ecosystems", and that the balance is mostly exotic pasture and exotic plantation forest.[12] The Applicant's habitat mapping did not include exotic vegetation.

6.2. The AEE did not include a list of plant species for the project site. This deficiency has now been addressed.

[8] McEwan M. 1987: Ecological Districts of New Zealand. New Zealand Biological Resources Centre. Department of Conservation, Wellington.
[9] Maseyk F. 2007: Past and current indigenous vegetation cover and justification for the protection of indigenous biodiversity within the Manawatu Region: Technical report to support policy development. Prepared for Horizons Regional Council.
[10] Dr Forbes, NOR evidence at [16].
[11] Dr Forbes, NOR evidence at [19].
[12] Dr Forbes, NOR evidence at [26].

6.3. I made the following points (some of which have since been addressed):

a. The restriction of habitat mapping to indigenous ecosystems has resulted in the NOR not quantifying the extent and effects for the loss of wetlands dominated by exotic plant species, which is a significant deficiency. This point has now been partly addressed, with some additional mapping proposed at the resource consents stage.

b. Spoil sites: For the NOR, the Applicant did not map or quantify the extent of terrestrial habitat loss for spoil sites. The only mention of spoil sites in the ecological assessments is a passing reference in relation to fauna (in Section 6.B.7.1). Indicative spoil sites occur along the route and include streams, forest, and possibly wetlands (e.g. spoil sites at Chainage 4500-4750), forest and streams (e.g. Chainage 5700-6000), and shrublands, wetlands and streams (e.g. Chainage 9300-9700). The proposed spoil site at Chainage 9050-9850 includes shrubland habitats that have been assessed as being of “High” ecological value by the Applicant (refer to Table 1). Habitat loss due to spoil sites, when mapped and quantified, will add to the quantum of habitat loss to result from the project. This matter has now been partly addressed.

c. There are inconsistencies between the Applicant’s specialists with regards to the location and extent of indigenous habitats. For example, mapping by the terrestrial ecologist for Chainage 3800-4800 (NOR Drawing Number D-02) omits areas mapped as indigenous vegetation by the threatened plant specialist (Technical Report 6.A.G, Figure 2). These omissions remain in the latest vegetation map provided by the Applicant (Ecology- Vegetation Map Book, 18 February 2019).

d. Areas of divaricating *Coprosma* shrubland are a distinctly separate vegetation type within the designation, with their own set of ecological values. These were, however, mapped as part of a broader composite vegetation type called “mānuka-kānuka and divaricating shrublands”. This point has since been addressed.

6.4. As a result of these issues, the extent of ecosystem loss has been underestimated in the NOR documentation.

7. ASSESSMENT OF ECOLOGICAL VALUES

7.1. In the NOR evidence, Dr Forbes[13] identified and mapped 10 ecosystem types within the designation boundaries. As stated above, ecosystems were only included if they are "indigenous terrestrial communities and terrestrial habitats[14] ; thereby excluding habitats that are of ecological value but dominated by exotic species, such as seepage wetlands with a cover of mainly exotic plants. Two additional ecosystem types were subsequently identified and mapped.

7.2. For the 12 indigenous ecosystem types now identified by the Applicant, values were assigned using the Environment Institute of Australia and New Zealand (EIANZ) framework, based on "detailed information available for each ecosystem type as described by the previous section".[15] The values assessment was also informed by "project related survey data (e.g. for flora, habitats/ ecosystems, avifauna, and herpetofauna) and "regional and district planning documents and supporting technical reports".[16]

7.3. The EIANZ method for assessment of ecological values is based on four criteria: Representativeness, Rarity/Distinctiveness, Diversity and Pattern, and Ecological Context. For each habitat within the designation, each of the four criteria is given a categorical ranking of High, Moderate, Low, or Negligible. The overall ecological value of a habitat is then summed on the basis of the relative rankings for each criteria, as described by Dr Forbes.[17]

7.4. Of the 12 ecosystem types identified by the Applicant[18], two have been assessed as being of Very High Ecological Value, four have been assessed as High value, three have been assessed as Moderate value, and one has been assessed as being of Low value. Table 1 compares these values to my assessment of these habitats, also using the EIANZ criteria, and as explained further below.

Table 1: Assessment of ecological values by Dr Forbes and Dr Martin.

[13] Dr Forbes NOR Evidence at [Table 6.1].
[14] Technical Report 6.A at [Section 3.1].
[15] Technical Report 6.A at [Section 2.2].
[16] Technical Report 6.A at [Section 2.2]
[17] Technical Report 6.A at [Section 2.2]
[18] Two additional ecosystem types have been mapped and described following consultation with the Department of Conservation.

Habitat Type	Ecological Values	
	Dr Forbes[19]	Dr Martin
Old Growth Forests (alluvial)	Very High	Very High
Old Growth Forests (hillslope)	Very High	Very High
Secondary Broadleaved Forests with Old Growth Signatures	High	High
Old-Growth Treelands	High	High
Advanced Secondary Broadleaved Forests	High	High
Raupō-Dominated Seepage Wetlands	High	High
Divaricating Coprosma shrublands	High	High
Secondary Broadleaved Forests and Scrublands	Moderate	Moderate
Kānuka forests	Moderate	Moderate
Indigenous-Dominated Seepage Wetlands	Moderate	Moderate
Exotic-dominated seepage wetlands	Low	**Moderate**
Mānuka, Kānuka Shrublands	Low	**Moderate**

7.5. The previous section with "*detailed information*" refers to the methods used to undertake the habitat assessment, and that the data was used to "*provide detailed descriptions of the distribution, composition, and condition of vegetation and habitats*". However, except for old growth forests which were rated as being of "Very High Value", the NOR provides little or no information on the composition and condition of the ecosystem types, e.g. percentage canopy composition, height for woody vegetation, or abundance of exotic plant species.[20]

Herpetofauna

7.6. The assessment of ecological features and values undertaken by the Applicant did not adequately survey for or consider herpetofauna habitats.

7.7. Dr Forbes states that "counts of lizards were attempted at length"[21] and that "all surveys were conducted in a robust manner"[22]. This conflicts with the terrestrial ecology assessment that acknowledges "the lack of intensive lizard surveys"[23]. Daytime surveys occurred over three days,

[19] Dr Forbes EIC at [11]
[20] For mostecosystem types, a written description, with accompanying photographs, has since been provided. There are still significant information deficiencies with regards to vegetation composition, condition, and maturityfor some wetland types and shrublands.
[21] Dr Forbes, EIC at [43]
[22] Dr Forbes, EIC at [44].
[23] Terrestrial Fauna assessment Section 6.B.5.1 p. 51.

during which weather conditions were suitable for one day, and of the 9.16 hours of spotlighting undertaken, weather conditions were ideal for only three hours[24]. Given that the extent of indigenous vegetation within the designation is approximately 40 hectares, this equates to approximately four and a half minutes per hectare of spotlighting in ideal conditions.

7.8. No weight can therefore be given to the non-detection of lizards in the surveys undertaken to date.

7.9. Given the known presence of At Risk lizard species in the Manawatu Gorge Scenic Reserve, the Applicant uses habitats as a proxy for presence. The Applicant concludes that the designation, except for raupō reedland and grazed pasture, has "high ecological value for native herpetofauna". This assessment of herpetofauna habitat value is appropriate, but it is not reflected in the assessment of ecological values.

7.10. In the ecological values assessment[25] the Applicant states for several ecosystem types that they are "not known" to support Threatened or At Risk species, but acknowledges that these may nevertheless be present, e.g. for mānuka-kānuka shrublands. Technical Report 6.B (p.32) states that forest and scrub habitats, including kānuka and divaricating scrub "may contain all the potentially present lizard species" and in Table 6.B.11, the herpetofauna value of this vegetation has been assessed as "High". In contrast, in Technical Report 6.A (Table 6.A.9) the habitat value of mānuka, kānuka, divaricating shrublands has been assessed as Moderate, and the overall ecological value as Low.

7.11. A lack of survey effort for herpetofauna is acknowledged by the Applicant, and overall, the Applicant considers that early successional habitats are of 'High' value for herpetofauna. The ecological values assessment in the NOR evidence should therefore be based on likely presence, and 'High' herpetofauna habitat values. If this was to be corrected, it would lift the overall ecological value for these shrublands from "Low" to 'Moderate". Mr Blayney subsequently assessed the shrublands as having an overall ecological value of "Moderate", due to 'low' invertebrate, flora, and avifauna values, and 'high' herpetofauna values[26]. The Applicant should justify how "avoidance" was not feasible

[24] Terrestrial fauna survey 6.B.1 p.13
[25] Table 6.A.5.
[26] Mr Blayney EIC at [39-40]

for shrubland habitats of High value for herpetofauna, e.g. at the proposed spoil site at Chainage 9050-9850.

7.12. "Mānuka, kānuka, divaricating shrublands" were assessed by the Applicant as having an overall ecological value of "Low" (Technical Report 6.A, Section 3.3) The Applicant did not adequately consider the location of this habitat type within Acutely or Chronically Threatened Land Environments (less than 10% and 20% of indigenous cover remaining, respectively), the potential succession of these habitats to indigenous forest, their role in habitat connectivity and buffering, and, as discussed above, their "High" value as herpetofauna habitat. The Applicant states that, with regard to the criteria for rare or distinctive species that the habitat is "not known to support Threatened or At Risk species" but subsequently, in February 2019, the Applicant provided a description of shrubland that includes 27 species, including three Threatened or At Risk species (Description of divaricating shrublands, 4-12-18). The assessment therefore needs to be updated to reflect the results of the February 2019 survey.

7.13. The habitat type "mānuka, kānuka, divaricating shrublands" includes areas of vegetation that are contiguous with indigenous forest, including the Manawatu Gorge Scenic Reserve. This habitat type should be assessed as being of 'Moderate" value for Ecological Context, which would also lift its overall ecological value from "Low" to "Moderate".

7.14. Following separation of mānuka and kānuka shrublands from divaricating *Coprosma* shrublands, the ecological value of the latter has been assessed as High[27]. No detail is provided as to how this conclusion was reached, as the ecosystem type was not separated at the time of the NOR application. However, based on my assessment of the known values of the ecosystem type, I agree that this ecosystem type is likely to be of High ecological value. The extent of divaricating *Coprosma* shrubland in the project footprint is 0.33 hectares.[28] The proportion of this shrubland within the proposed road footprint compared to other construction impacts (e.g. spoil sites) is not provided by the Applicant. My estimate, based on Google Earth imagery, is that approximately 0.038 hectares is within a road embankment, and the remainder (*c.*0.292 hectares) is within a proposed spoil site. Therefore, most of this

[27] Dr Forbes EIC at [11].
[28] Dr Forbes EIC at [13].

High value shrubland type (89%) lies outside of the embankment, and could feasibly be avoided (by relocation of one proposed spoil site).

Invertebrates

7.15. The Applicant states that existing information for terrestrial invertebrates was reviewed, and if a Threatened or At Risk species was identified, "a very-high score would have been given".[29] By doing so, the "scoring framework enabled the scoring of high value based on habitat characteristics alone"[30]. This is an appropriate framework, but is very dependent on either knowing which species are present, or which habitat types support Threatened or At Risk species,

7.16. No terrestrial invertebrate surveys have been undertaken by the Applicant. This is an oversight given the presence of mature and early successional indigenous vegetation that is contiguous with Manawatu Gorge Scenic Reserve. Additionally, the Ecological District descriptions note the potential presence of two land snail genera that are of conservation importance: *Powelliphanta* species and *Wainuia* species. The Horizons One Plan also notes the presence in the region of a Threatened moth species (*Asaphodes stinaria*; Threatened-Nationally Vulnerable),

7.17. Section 6.B.3.2.1 of the NOR states that high quality invertebrate habitats within the project footprint are mature indigenous forest, older secondary indigenous forest, and the Manawatū Gorge Scenic Reserve. The Applicant has then applied the ecological scoring guide to prioritise "intact forest invertebrate communities', thereby failing to consider the high invertebrate habitat values that can be supported by early successional vegetation. In Section 6.B.5.2, the "rest of the designation", which includes all shrubland areas within the eastern rise area, has been assessed as having "Low-Negligible" habitat value for terrestrial invertebrates.

7.18. Some of the areas of "divaricating *Coprosma* shrubland" within the eastern rise are well-established and support a wide range of shrubland species, including *Olearia solandri* and *O. virgata,* and *Muehlenbeckia complexa*. These species are not noted by the Applicant as being present in other vegetation types within the designation, and *Olearia*

[29] Mr Blayney EIC at [80]
[30] Mr Blayney EIC at [80]

solandri and *Muehlenbeckia complexa* have been omitted from the plant species list for the designation. Based on this information, it is therefore likely that these species are of localised occurrence within the designation.

7.19. *Olearia virgata* is a host plant for two At Risk moth species that have previously been recorded in habitats within the designation: *Meterana exquisita* and *M. grandiosa* are both classified as At Risk-Relict[31]. In a study undertaken 1977-1981, both of these species were commonly caught in light traps set at the Ballantrae Hill Country Research Station of Grasslands Division, DSIR[32]. This research station included most of the "eastern rise", and habitats present at the time of the study were broadly similar to those present now, including pasture, seepages, mānuka scrub, and regenerating indigenous forest. Locations of the light trapping sites were not mapped, but the higher altitude site was described as "about 300 m above sea level near a large farm dam at the head of a stream". This may be the farm dam at Chainage 9300-9500, which is beside the *Coprosma* divaricating shrublands at Chainage 9300-9600. Neither *Meterana exquisita* nor *Meterana grandiosa* are mentioned in the Application, and no targeted invertebrate surveys have been undertaken by the Applicant. If these were to be undertaken, and if either or both of these species were to be confirmed as still being present, the habitats they occur in would meet the One Plan significance criteria for Rarity and Distinctiveness. Using the rationale provided by the Applicant[33], these habitats would, on the basis of presence of an At Risk species, be ranked as being of "Very-High" value.

7.20. The Wildlands' review of the NOR, which was provided to NZTA, highlighted the importance of shrubland communities for terrestrial invertebrates, and the potential presence of Threatened or At Risk invertebrate species in those habitat types[34]. In response, Mr Blayney stated that this pattern is "more prevalent in the South Island"[35], that "these invertebrate species generally occur in association with similarly

[31] Hoare R.J.B., Dugdale J.S., Edwards E.D., Gibbs G.W., Patrick B.H., Hitchmough R.A., and Rolfe J.R. 2017: Conservation status of New Zealand butterflies and moths (Lepidoptera), 2015. *New Zealand Threat Classification Series 20*. Department of Conservation, Wellington. 13 pp.

[32] McGregor P.G., Watts P.J., and Esson M.J. 1987: Light trap records from southern North Island hill country. New Zealand Entomologist 10:1, 104-121, DOI: 10.1080/00779962.1987.9722515

[33] Mr Blayney EIC at [80]

[34] Wildland Consultants 2018: High-level guidance on ecological aspects of the application to bypass the Manawatū Gorge at SH3, between Palmerston North and Woodville. *Wildland Consultants Ltd Contract Report No. 4860a*. Prepared for Department of Conservation. 6 pp.

[35] Mr Blayney EIC at [32]

range-restricted, “At Risk” or “Threatened” plant species”[36], and that there is “large abundance of the same plant genera within the other habitat types assessed”.[37] On this basis, NZTA concluded that shrubland habitats should not be given “importance or value over and above other native habitats for terrestrial invertebrates” (1 February 2019). This is problematic, for the following reasons:

a. *Olearia virgata* is an early successional shrubland species that is not classified as Threatened or At Risk, but is nevertheless known to support at least two At Risk moth species that are known to occur near (and possibly within) the proposed project footprint.

b. Key species in the shrubland areas at Chainage 9300-9600 (e.g. *Olearia virgata*, *Olearia solandri*) are not noted as present in any of the descriptions of other vegetation types provided by the Applicant, and two are not listed on the plant species list for the designation (*Olearia solandri*, *Muehlenbeckia complexa*). The statement of Mr Blayney that these species are abundant in areas protected from stock grazing nearby[38] is therefore not supported by other information provided by the Applicant. It may also be possible that the persistence of these shrubland habitats, and any At Risk invertebrates that depend on them, is facilitated by stock grazing, as grazing may impede succession to older forest habitats. In this case, the grazed shrubland habitats at Chainage 9300-9600 could be of greater importance for some invertebrates than nearby forest and shrubland habitats from which livestock have been excluded.

c. The critique provided (by Wildlands) was not that these shrubland habitats should be ranked as having invertebrate values “over and above” other habitats, rather that recognition is needed that shrubland habitats can also have high habitat values for invertebrates. But in response to the review by Wildlands, NZTA (1 February 2019), stated (p.8) that they “do not propose any change to the assessed value of this habitat for terrestrial invertebrates” (i.e. from “Low-Negligible”, for the invertebrate values of the “eastern rise area”).

[36] Mr Blayney EIC at [32]
[37] Mr Blayney EIC at [36]
[38] Mr Blayney EIC at [36]

7.21. Given the known records of these moth species in the designation, and a lack of surveys by the Applicant to assess their current distribution, the assessments of ecological values and significance for shrubland habitats containing *Olearia* species should apply a precautionary approach and assume that these species are still present. This would result in the divaricating shrublands being ranked as being significant, and lift the ecological value from High to Very High. Regardless of whether the shrubland is of High or Very High value, the loss of this habitat type due to the location of a spoil site does not conform to the mitigation hierarchy, i.e. the Applicant should seek the avoidance of 89% of this habitat type, as per Paragraph 7.14 of my evidence.

7.22. If either of the At Risk moth species are still present, this would also have implications for the likely effects of habitat loss, and the optimal timing of vegetation clearance. Potential adverse effects on the At Risk moth species would be reduced if clearance was to occur when the adults have emerged from the vegetation and are flying; which occurs from August to December for *Meterana exquisita*, and from April to June for *Meterana grandiosa*[39]. Conversely, if clearance occurs in the period January to July for *M. exquisita*, or July to March for *M. grandiosa*, this could lead to complete mortality of eggs, larvae, and pupae within the cleared habitats.

7.23. The Applicant should undertake targeted invertebrate surveys of indigenous vegetation within the project footprint. These surveys should include the potential habitat for the Threatened or At Risk land snails that could potentially be present, along with shrubland habitats that should be assessed for the presence of Threatened or At Risk invertebrates that specialise on particular shrubland plant species. The results of this assessment could then inform the appropriate management response. The need for targeted invertebrate surveys and an invertebrate management plan is also identified in the Section 42a report for ecology prepared by Mr Lambie of Horizons Regional Council.[40]

7.24. A survey of terrestrial invertebrates has now been suggested as a condition of consent by the Applicant[41], but it is critical that this survey is

[39] Patrick B. 2000: Lepidoptera of small-leaved divaricating Olearia in New Zealand and their conservation priority. *Science for Conservation 168*. Department of Conservation.
[40] Mr Lambie Section 42a report, paragraph 101, 233-234.
[41] Mr Blayney EIC at [82].

extended to include shrubland habitats within the “eastern rise” where *Meterana* species have been recorded. At present the proposed methods refer to “targeted surveys in assessed high value habitats in the confirmed impact areas”, and the Applicant only acknowledges the higher invertebrate values of older vegetation (Section 6.B.3.2.1 of the NOR).

Bats

7.25. Surveys for bats undertaken to date have not confirmed the presence of long-tailed bat (*Chalinolobus tuberculatus;* Threatened-Nationally Critical) within the designation. As a precautionary measure, a further survey using acoustic monitoring devices is currently underway, and due for completion in early April 2019. If the results of this survey confirm the presence of long-tailed bats within the designation, further investigations will be needed, prior to construction, to determine the effects of construction and operation of the road on bats. Additional work will also be required to map and assess the habitat value of exotic vegetation that may provide bat roost sites. At present, exotic woody vegetation within the designation, such as stands of radiata pine (*Pinus radiata*), have not been mapped and assessed. Recent research has shown that, in North Island pastoral landscapes, long-tail bats can roost in exotic trees with trunk diameters as small as 15 centimetres[42].

Conclusion

7.26. On the basis of the above, if the Applicant was to reassess the 12 ecosystem types, two should be classified as having Very High Ecological Value, four should be classified as High value, four should be classified as Moderate value (an increase from three), and no ecosystem types would be classified as being of Low value.

8. ASSESSMENT OF ECOLOGICAL SIGNIFICANCE

8.1. The Applicant uses criteria provided by the One Plan Policy 13-5 for assessment of the significance of the 10 ecosystem types identified for the NOR (Technical Report 6.A, Section 4.1). This policy states that an

[42] Long-tail bat radiotracking studies undertaken in southern Hamilton by Wildland Consultants, summer 2018.

area of indigenous vegetation is significant if one or more criteria are met, including the following criteria:

a. Representativeness
b. Rarity and Distinctiveness
c. Ecological Context – habitat that provides connectivity or an ecological buffer or an ecological sequence or important habitat.

8.2. Criteria for significance therefore have some overlap with the criteria used by the Applicant for assessment of ecological values. However whilst the assessment of ecological values considers a range of values for each criteria to provide an overall score, a habitat is significant if it meets one or more of the criteria.

8.3. The values and significance assessment states that "regional and district planning documents and supporting technical reports" (Section 2.2 of Technical Report 6.A) have been considered, but this does not appear to be the case. The One Plan criteria for significance are set out in full in the next section of my evidence, along with an assessment of each habitat against these criteria. A report prepared for Horizons Regional Council on policy development[43] provides the following guidance:

a. Representativeness is not a measure of condition, and fragments in highly modified states and relatively poor health can still contribute to representativeness.
b. Representativeness can be applied as a criterion at a smaller scale (e.g. Ecological District).
c. In most cases, significance of a site will be evaluated at the Ecological District level.

8.4. The Applicant concludes that four of the 12 ecosystem types are not significant in terms of Policy 13-5[44]: advanced secondary broadleaved forest, secondary broadleaved forest and scrublands, mānuka, kānuka, shrublands, and divaricating *Coprosma* shrublands. This assessment of significance is incorrect.

[43] Maseyk F. 2007: Past and current indigenous vegetation cover and justification for the protection of indigenous biodiversity within the Manawatu Region: Technical report to support policy development. Prepared for Horizons Regional Council.
[44] Dr Forbes EIC at [11]

8.5. Table 2 compares my significance assessments with those of Dr Forbes. The remainder of this section then explains these differences.

Table 2: Comparison of Significance Assessments of Dr Forbes and Dr Martin.

Habitat Type	Significance	
	Dr Forbes	**Dr Martin**
Old Growth Forests (alluvial)	Significant	Significant
Old Growth Forests (hillslope)	Significant	Significant
Secondary Broadleaved Forests with Old Growth Signatures	Significant	Significant
Old-Growth Treelands	Significant	Significant
Advanced Secondary Broadleaved Forests	Not Significant	**Significant**[45]
Raupō-Dominated Seepage Wetlands	Significant	Significant
Secondary Broadleaved Forests and Scrublands	Not Significant	**Significant**[46]
Kānuka forests	Significant	Significant
Indigenous-Dominated Seepage Wetlands	Significant	Significant
Mānuka, Kānuka Shrublands	Not Significant	**Significant**[47]
Divaricating *Coprosma* shrublands	Not Significant	**Significant**[48]
Exotic-dominated seepage wetlands	Significant	Significant

8.6. "Advanced secondary broadleaved forest" is habitat for ramarama (*Lophomyrtus bullata*) (Threatened-Nationally Critical), triggering significance under the criterion for Rarity and Distinctiveness. The Applicant does not note this habitat type as being significant for this criterion.

8.7. All habitats where the Applicant states "Threatened or At Risk fauna may be present" should conservatively be assessed as meeting the criterion for presence of Threatened species (a sub-criterion for Rarity and Distinctiveness). This would be a reasonable approach, given the lack of survey effort for terrestrial invertebrates and herpetofauna. At present, the only habitat type assessed as "Significant" for this criterion is "raupō seepage wetland", due to the potential presence of spotless crake (*Porzana tabuensis tabuensis*) and Australasian bittern (*Botaurus poiciloptilus*). It is notable that for the significance assessment, the

[45] Presence of ramarama (Threatened-Nationally Critical), ecological buffer to old-growth forest.
[46] Likely presence of At Risk herpetofauna, habitat connectivity.
[47] Likely presence of At Risk herpetofauna, habitat connectivity.
[48] Likely presence of At Risk invertebrates and herpetofauna.

Applicant takes a precautionary approach for the potential presence of spotless crake and Australasian bittern (Section 6.B.2.2) but the same precautionary approach is not applied to the likely presence of Threatened or At Risk herpetofauna.

8.8. If the Applicant was to be consistent in its precautionary approach, all indigenous ecosystem types would meet the Rarity and Distinctiveness criterion due to the potential or confirmed presence of Threatened or At Risk species.

8.9. The Applicant does not assess any of the 12 ecosystem types present as meeting the significance criterion for "Ecological Context" (Technical Report 6.A, Table 6.A.11), which has the sub-criterion "connectivity between two or more areas of habitat". This is clearly an error, given the connectivity of many of the habitats to forest within the Manawatu Gorge Scenic Reserve. The Applicant also acknowledges elsewhere the importance of the habitats as habitat linkages. For example, Dr Forbes states that "the old growth forest of the Western QEII has direct connection with the MGSR".[49]

8.10. If the errors above were to be corrected, all ecosystem types mapped by the Applicant would be assessed as being significant in terms of the One Plan criteria. Mr Lambie also notes that additional ecosystem types may meet the Policy 13-5 criteria for significance.[50]

9. POTENTIAL ECOLOGICAL EFFECTS OF THE MANAWATU GORGE BYPASS PROJECT

9.1. The Applicant provided a summary of "actually/potentially affected" habitats in Table 6 A.19 of the NOR. The extent of loss across the habitat types is not summed, but comprises a total of 30.28 hectares of indigenous vegetation. This extent of loss is the sum of the area to be affected by *direct* removal, and should be acknowledged as such. Indirect effects will extend beyond the limits of vegetation removal, e.g. edge effects where construction will create new forest edges. These have been acknowledged by the Applicant (Section 6.4), but are not quantified.

[49] Forbes NOR evidence at [31].
[50] Mr Lambie S42A response at [31, 33].

9.2. Subsequent to a review of the NOR by the Department of Conservation[51], the Applicant corrected errors in the habitat loss assessment for the NOR, and increased the extent of direct loss by 3.8 hectares, to 34.6 hectares. This increase is explained in detail by Dr Forbes (Response to Ecology Review, 1 February 2019) but included, for the first time, exotic wetlands (2.74 hectares), an additional 0.56 hectares of indigenous seepage wetlands, and a further 0.33 hectares of divaricating *Coprosma* shrubland.

9.3. The most recent calculations of habitat loss for the project are provided in the Proposed Designation Conditions – Ecology 15 February 2019. If the areas of loss in Condition 13 are summed the revised total is now 32.02 hectares. The decrease from 34.6 hectares to 32.02 hectares has resulted from recent refinements to the project effects envelope.

9.4. The extent of indigenous vegetation loss has therefore been revised through the review process and now includes previously-omitted vegetation types. Further revisions to the extent of loss may arise from ongoing discussions between the Department of Conservation and the Applicant and by calculation of losses during the detailed design phase.

9.5. Regardless of the final quantum of vegetation loss, construction will result in the loss of over 30 hectares of indigenous vegetation and wetlands. Most of this habitat loss will be indigenous forest and scrub within an otherwise pastoral landscape that is classified as Acutely or Chronically Threatened Environments. The areas of loss typically comprise indigenous vegetation within stream gullies, with hydrological and or ecological connectivity to the forests within Manawatu Gorge Scenic Reserve.

9.6. The Applicant has correctly identified the very high ecological value and irreplaceability of old growth forest (alluvial) and seepage wetlands with raupō and swamp maire. I agree with Dr Forbes that for this area (Chainage 400-4400) that there are "ecological grounds to avoid or otherwise minimise adverse effects"[52]. Following the mitigation hierarchy, these habitats are partly avoided, with loss minimised to 0.15 and 0.13 hectares, respectively. The restoration package proposed to address the adverse effects of the project may include the protection of

[51] Wildland Consultants Contract Report No. 4860a, December 2018.
[52] Dr Forbes Technical Report 6A, p. 47.

the remainder of the forested gully (32 hectares) within which these high value habitats occur, but this has not been confirmed.

9.7. The loss of wetlands is currently estimated at 3.99 hectares (Proposed Designation Conditions – Ecology 15 February 2019) and includes 1.25 hectares of indigenous wetland vegetation in hillslope seepages. It is intended that any remaining wetland areas within the designation, which have not yet been identified due to time constraints, will be identified and mapped as a condition of consent during the Outline Plan stage[53]. The total extent of wetland loss is therefore not currently known.

9.8. Wetlands within the construction footprint are located within the proposed road footprint and spoil sites, particularly between Chainage 9200 and 9600 where there are two hillside seepage wetlands. These two seepage wetlands were identified by Wildlands during the site visit on 23 November 2018, and were subsequently mapped by the Applicant. Hillslope seepages are a rare ecosystem type that the Applicant acknowledges cannot be addressed by replacement planting. The location of exotic-dominated seepage wetlands were not known at the time the alignment plans were drawn, the selection of spoil sites did not consider any opportunities to avoid them, and the project therefore does not comply with the mitigation hierarchy in this respect.

Closure of existing SH 3

9.9. The Applicant has not provided an assessment of ecological effects for closure of the existing SH3 through the Manawatu Gorge. The existing route is characterised by open road margins, including landslides, rock faces held in place by gabions, and gravelled road edges. Exotic plant species are widespread and locally abundant along the road margins, including, but not limited to, pampas (*Cortaderia selloana*), Japanese honeysuckle (*Lonicera japonica*), red valerian (*Centranthus ruber*), and Scotch broom (*Cytisus scoparius*). If road closure leads to a reduction in pest plant control along the road margins, pampas and Japanese honeysuckle are likely to pose the greatest threat to habitats in Manawatu Gorge Scenic Reserve. Pampas is wind-dispersed and could spread seed into open habitats throughout the reserve. In the absence of control, this species could become dominant on eroding surfaces adjacent to the road, and inhibit succession to forest habitats. Similarly,

[53] Dr Forbes EIC at [69].

Japanese honeysuckle is bird-dispersed and can invade disturbed habitats and shrublands. Any potential change in the maintenance regime of the existing SH3 needs to be assessed to ensure it does not lead to unforeseen and or undesirable adverse ecological effects.

9.10. The objective of pest plant control for the Department of Conservation land beside the existing SH3 is to "identify high priority weeds and control if feasible"[54]. Under the Biosecurity Act 1993, NZTA undertake pest control to "mitigate adverse effects of road infrastructure, maintenance and improvements"[55]. Areas of control include state highway reserves where the adjacent landowner is undertaking pest plant control. For the existing SH3, the adjacent landowner is the Department of Conservation and the area is subject to a pest plant control plan. As such there are current obligations for NZTA to control pest plants within the road corridor. Any change to the status of the existing section of SH3 needs to consider how pest plants in this area will be controlled, in order to address any potentially adverse effects of road closure on the Manawatu Gorge Scenic Reserve.

9.11. Mr Lambie proposes that the restoration of the road surface to indigenous vegetation would address this pest plant issue.[56] I agree with this approach.

9.12. In summary, adverse effects on terrestrial ecosystems include:

a. The loss of 29.28 hectares of indigenous vegetation and habitats, including 1.15 hectares of old-growth forest and 1.25 hectares of indigenous wetland.
b. Loss of host plants for two species of At Risk moths.
c. The loss of at least 2.74 hectares of hillslope seepage wetlands dominated by exotic plant species.
d. The loss of indigenous ecosystems, including High value shrubland habitats, within proposed spoil sites.
e. The complete severance of habitats in gullies where the road is to be constructed on embankments.
f. Increased edge effects on indigenous forests, including old-growth forests on alluvium and on hillslopes.

[54] Te Apiti-Manawatu Gorge Management Plan, 8 August 2017, p. 9.
[55] NZTA State Highway Control Manual SM012 p. 22.
[56] Mr Lambie S42A response at [220].

g. Potential increase in pest plants in the Manawatu Gorge if pest plant control on the road margins ceases or is reduced.

10. ADEQUACY OF PROPOSED MITIGATION, OFFSETS, AND COMPENSATION

Mitigation

10.1. The Applicant states that edge effects where the road will cross forested gullies will be addressed through edge buffer plantings to seal newly-created forest edges. As agreed in expert conferencing[57], this is an example of mitigation, and the Applicant needs to revise the restoration package so that these plantings are specified as a quantum separate from those to be provided to address direct habitat loss, for which an offset approach is proposed. The Applicant needs to provide a detailed plan for the location, width, species composition, and management of the plantings to seal forest edges. This is needed to assess the likelihood that this adverse effect will be addressed adequately, and the predicted timeframes over which this will occur. The Applicant states that edge effects will be temporary (5-15 years) but it is likely that some forest edges will not be 'sealed', due to project design considerations. It should also be acknowledged that even with buffer plantings, there will be permanent edge effects.

10.2. The Applicant states that fragmentation will be addressed through bridge structures and plantings to create linkages between existing habitats. However the Applicant does not provide any plans for the location or width of these plantings and their management. It is likely that there will be residual fragmentation effects for indigenous habitats to the north of the proposed bypass, e.g. upper gully heads at Chainage 6100-6400, and broadleaved forest and scrub to the north of the proposed road at Chainage 9900-10100. The Applicant notes that habitat fragmentation will be "permanent where replacement plantings cannot remedy the severance" (Table 6.A.16), and that "there is little that can be done to mitigate for this obstacle in respect of reconnecting forest fragments that are located on either side of the road".[58]

[57] Joint Witness Statement of Dr Forbes and Dr Martin, 22 February 2019 at [9].
[58] Mr Blayney, EIC at [64].

10.3. Additional detail is needed for these mitigation measures, so that their likely effectiveness can be assessed.

Offsets and compensation to address residual effects

10.4. The positive effects package proposed by the Applicant does not, at this point in time, provide an offset that can "reasonably demonstrate that a net indigenous biodiversity gain has been achieved" (One Plan Policy 13-4). Mr Lambie also states that the project has "not yet demonstrated that the proposal will achieve a net gain".[59]

10.5. The offset sites, or, if they are defined more broadly, the compensation sites, are where these gains must be realised. Dr Forbes notes that "as the restoration sites are currently unconfirmed, it is difficult to confirm the precise level of gain that restoration activities would yield"[60]. As the current package does not include confirmed restoration sites or confirmed ECRs, it cannot be demonstrated where and how these gains will be made, or the magnitude of these gains. However the Applicant still concludes, despite these uncertainties, that "the proposed gains are greater than the losses"[61]. Given the high level of uncertainty regarding restoration outcomes, the Applicant needs to place greater emphasis on the avoidance of irreplaceable or significant habitats. Mr Lambie is also of this view, and has requested greater surety for the restoration package.[62]

10.6. The Application cannot, at this stage, demonstrate that no-net-loss will be achieved.

Extent of habitats to be retired and protected

10.7. The Applicant states that retirement, protection and canopy gap planting of *c*.32 hectares of existing indigenous forest is "required"[63] as part of the offsets package to address effects that cannot be addressed by ECRs. These management actions, if they were to be implemented over a site of sufficient size, could potentially address the indirect effects of the project that cannot be addressed through avoidance or mitigation (above). The other offset/compensation measures (i.e. ECRs) are for

[59] Mr Lambie S42A Report at [37].
[60] Dr Forbes, EIC at [90].
[61] Dr Forbes, EIC at [95].
[62] Mr Lambie S42A Report at [137].
[63] Technical Report 6.A. Table 6.A.19 and p. 64.

the purposes of addressing direct vegetation loss through clearance, and will be reduced if actual clearance is less than predicted.

10.8. The Application does not include a rationale for why the required extent of “retirement, protection, and canopy gap planting” is 32 hectares, relative to the extent of forest and shrubland loss (29.28 hectares), and the extent and nature of forest edge creation and fragmentation. Any proposed “retirement, protection, and canopy gap planting” needs to clearly demonstrate the additionality of the proposed actions (e.g. effects of planting versus natural regeneration, pest numbers and pest control outcomes assessed against the existing management regime, and which species will benefit), and also demonstrate how this management will be of the same duration as the effect it is addressing, i.e. in perpetuity.

10.9. There also needs to be justification by the Applicant as to how 32 hectares of “retirement, protection, and canopy gap planting” is adequate to address the following:

a. Permanent edge effects where road design prevents the planting of forest buffers.
b. Permanent fragmentation and isolation where forested gullies are severed by the road being constructed on an embankment.
c. Loss of habitats where restoration plantings will take centuries to reach an equivalent state to the habitats to be lost.

10.10. As currently proposed, the 32 hectares may be at least partly driven by cadastral boundaries and or likelihood of landowner approval, rather than the likely quantum required to address adverse effects.

10.11. The current condition and existing management for the potential restoration sites have not been described, and subsequently, additionality is not certain. The approach does not meet the requirements for an offset, and must therefore be viewed as compensation. Using a compensation approach, this quantum would likely be an order of magnitude greater than is currently proposed.

10.12. The Application does not provide management plans for the potential restoration sites, even at the level of broad “habitat guidelines”, e.g. width of retired or planted buffers for wetland restoration. This is needed

to assess the likely success and conservation outcomes of the management proposed.

Potential wetland restoration sites

10.13. The five areas of potential wetland restoration mapped by the Applicant[64] include:

a. A river oxbow wetland within Ashhurst Domain described by Palmerston North City Council as "conservation wetlands"[65].
b. The raupō seepage with swamp maire within the designation ranked as "High" ecological value by the Applicant.
c. An area of exotic seepage wetland (0.409 hectares, Chainage 4200-4300) that lies within a proposed embankment (Indicative Alignment Plan Sheet 2 of 10, October 2018). This wetland was described as an "opportunity to restore a rare ecosystem wetland type"[66] in the NOR.
d. A steep hillslope catchment that is primarily pasture, with a headwater stream (south of Chainage 11300-11600) and some small hillslope seepages (assessed using Google Earth imagery).
e. A small hillslope catchment with some small areas of wetland on the gully floor (assessed using Google Earth imagery).

10.14. Therefore, of the five potential wetland restoration sites currently proposed, two are unlikely to meet the requirements for additionality (a) and (b), one will be lost through road construction (c), one is primarily a pastoral stream (d), and one has small areas of exotic wetland that may have potential as restoration sites (e). This preliminary desktop assessment of the wetland restoration sites proposed by the Applicant raises serious concerns regarding the ability of the package to address adverse effects on wetland habitats.

10.15. The Application cannot reasonably demonstrate that the proposed restoration sites are of sufficient size, or meet the requirements for equivalence, additionality, or permanence. Mr Lambie also questions the additionality of the proposed wetland restoration sites.[67]

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64 Dr Forbes, EIC Appendix C.
65 Palmerston North City Council 2018: **https://www.pncc.govt.nz/services/parks-venues-recreation/walks-and-walkways/ashhurst-domain-walkways/.** Downloaded 25 February 2019.
66 Technical Report 6.A. Section 6.5, p. 66.
67 Mr Lambie S42A Reportat [156].

Threatened plant management

10.16. The Applicant provided a preliminary list of plant species for habitats within the designation on 1 February 2019. Of note, poroporo (*Solanum aviculare*, Threatened-Nationally Vulnerable) is recorded as being present. This species was not found during the threatened plant survey undertaken by the Applicant. The Application should provide further details regarding the location, habitat, and population size for this species, and the management proposed to address adverse effects on this species.

10.17. The proposed designation conditions indicate that the loss of ramamara will be addressed by planting "at a rate of 1:100 where any ramarama greater than 15 cm tall located in the "Ramarama Protection Zone" is removed" (Designation Condition 13c). This designation condition should be revised to require the plantings to occur for the loss of any ramarama within the designation, as the species occurs within the development footprint outside of the "no-go" zone. I also note that the "no-go" zone for ramarama includes an area mapped as a proposed spoil site for the NOR.

Environmental Compensation Ratios

10.18. Under a biodiversity offsetting approach, ECRs would be determined using a quantitative analysis that takes account of ecological values, time lag, and restoration risk. The Applicant does not provide this, but provides:

> *"recommended multipliers applied to address the differing degrees of induced scarcity of existing ecosystem types and also the time lag required to replace the pre-existing qualities of affected ecosystems"* (Technical Report 6.A, p.64).

As the ECRs proposed by the Applicant are based on professional judgement, rather than quantification and calculations to address the factors above, the following commentary is also based on professional judgement. I rely on Dr Lloyd's evidence that, at least until further information can be provided, the approach is not an offset but is (at best) a compensation approach. However I also understand that the ECRs may be put forward as 'placeholders' until further information can be provided to support an offsetting approach.

10.19. Dr Forbes states that the Department of Conservation in the high-level review[68] queried five of the 12 proposed ECRs, and, on this basis, assumes that the other seven ECRs are not in contention[69].

10.20. The high-level review focused comment on specific ECRs that, on the basis of the information provided, were the least supportable. Not discussing any specific ECR at that stage did not imply agreement, and the following excerpts from the high-level report document the wider concern regarding all ECRs, as follows:

a. The high-level review suggested a minimum of 1:5 for all forest types in the project area. Of note here is the use of the word 'minimum', and the current proposed ratio of 1:3 for secondary broadleaved forests and scrublands[70]. Dr Forbes includes this ECR in the list of those not in contention.

b. The high-level review suggested a minimum of 1:3 for divaricating *Coprosma* shrubland, but stated "this ratio should be increased to 1:4 or 1:5 if indigenous herpetofauna or Threatened or At Risk invertebrates are confirmed as present"[71]. This knowledge gap poses a query for this ECR.

c. The high-level review stated that the ECRs for old growth forest "may be appropriate"[72], but also that "no data are provided to support these ratios"[73]. These statements pose queries for the ECRs for old-growth forests.

d. The high-level report also stated that compensation ratios should consider "the lag times for the restoration of habitats of similar structure and function"[74]. This has not been demonstrated by the Applicant.

10.21. Dr Forbes states that revisions to the ECRs means that no shrubland or forest ECRs are left in contention[75]. This is not correct and is discussed further below.

[68] Wildland Consultants Contract Report No. 4860a, December 2018.
[69] Dr Forbes, EIC at [70]
[70] Dr Forbes, EIC at [70]
[71] Wildland Consultants Contract Report No. 4860a, December 2018. p. 5.
[72] Wildland Consultants Contract Report No. 4860a, December 2018. p. 5
[73] Wildland Consultants Contract Report No. 4860a, December 2018. p. 4
[74] Wildland Consultants Contract Report No. 4860a, December 2018. p. 6
[75] Dr Forbes, EIC at [79]

10.22. Effects management will "trade reduced wetland extent for improved condition of existing wetlands"[76] at a ratio of 1:1.5 for exotic wetlands[77], 1:3 for indigenous-dominated seepage wetlands[78], and 1:4 for raupō-dominated seepage wetlands[79].

10.23. These ECRs need to be driven, in part, by the existing condition, and therefore the level of additionality, of the restoration sites. As this is unknown, Dr Forbes recommends "the wetland ECR be confirmed at the time the restoration sites are confirmed".[80] As wetland ECRs need to be tailored for each type of wetland loss, and the existing condition at each restoration site, it is not one ECR that needs confirmation, but many. This raises considerable uncertainty about how and where the effects of wetland loss will be addressed, and whether a "net gain biodiversity offset package[81]" will be achieved for wetlands.

10.24. The Applicant should, in the first instance, avoid the placement of spoil sites where indigenous vegetation and or hillslope seepages are present. As stated, the location of exotic-dominant wetlands was not a consideration for the design of the project, as these were not mapped until early 2019. Where avoidance is not possible (which would need to be robustly and transparently demonstrated), I consider that the compensation ratios would at least need to be increased to consider the rarity of wetland habitats, and the net loss in the extent of seepages that will result from the project. The proposed loss of wetlands is currently a significant adverse effect that hasn't been minimised, or adequately addressed in the positive effects package.

10.25. The Applicant proposes to address the loss of 4.55 hectares of mānuka kānuka shrublands using an ECR of 1:1.5[82]. Whilst the establishment of mānuka kānuka shrubland is of relatively low risk, and may reach an equivalent state in 10-20 years, an ECR of 1:1.5 does not adequately allow for time lag, i.e. it implies that the restoration plantings are of equivalent ecological value soon after being planted. Dr Forbes claims that a 1:1.5 ratio includes an intrinsic multiplier, because the density of

[76] Dr Forbes, EIC at [81].
[77] Dr Forbes, EIC at [82].
[78] Dr Forbes, EIC at [82].
[79] Dr Forbes, EIC at [71].
[80] Dr Forbes, EIC at [62].
[81] Dr Forbes, EIC at [50].
[82] Dr Forbes, EIC at [73].

the planted stems would be greater than the density of stems in the vegetation to be removed[83]. Whilst this may be the case, ecological value, including habitat value for fauna, has little to do with stem density, but is driven by relative maturity of the vegetation, with factors such as degree of canopy cover, vegetation height, and plant characteristics such as flaking bark and nectar production.

10.26. An ECR of at least 1:2 would better acknowledge the time lag for these plantings to reach an equivalent state. To ensure that fauna habitat value of this restored habitat is maximised, these plantings should be contiguous with areas of indigenous vegetation to be retained.

10.27. As exotic wetlands and divaricating *Coprosma* shrublands are now mapped in the Application as ecosystem types, the Applicant proposed ECRs for their loss of ratios of 1:1.5 and 1:3, respectively. The ECR of 1:3 for *Coprosma* shrublands was suggested by Wildlands as appropriate if no Threatened or At Risk species are present, and accepted by the Applicant. However At Risk moth species may be present in this habitat type[84].

10.28. As agreed in conferencing between myself and Dr Forbes on 22 February 2019, ECRs need to consider the value of habitat being lost, time lag for replacement, and the risk of failure. The ECRs proposed by the Applicant for the loss of forest ecosystem types do not consistently do this.

10.29. Advanced secondary broadleaved forests are dominated by broadleaved species such as lancewood, māhoe, nīkau, and rewarewa, with 100% canopy cover and canopy height of 6-8 metres[85]. This vegetation type occurs in steep-sided stream gullies where access by livestock has been limited by the terrain. The canopy species are likely to have regenerated under a canopy of mānuka and or kānuka, and the oldest trees are likely to be 50-80 years old. Advanced secondary broadleaved forest is also habitat for ramarama, classified as "Threatened-Nationally Critical", and the Applicant has ranked this forest type as being of "High" ecological value. The NOR recommended an ECR of 1:4 for this forest type, in contrast to an ECR of 1:5 for kānuka forest. The kānuka forest, ranked "Moderate" ecological value by the

[83] Dr Forbes, EIC at [72].
[84] Dr Martin EIC at [7.19]
[85] Further Ecosystem Type Descriptions prepared for the Department of Conservation, February 2019.

Applicant, are of more recent origin, with 80-100% canopy cover, and a canopy height of 5-8 metres. Additionally, Google Earth imagery shows that some of the areas of kānuka forest were rough pasture in 2005. The advanced secondary broadleaved forests are of higher ecological value, older, more complex, and of higher restoration risk than the kānuka forest (which with successful plantings could be replaced in 20-30 years).

10.30. The NOR may have justified the higher ECR for kānuka forest as it was assessed as being "Significant" under Policy 13-5 (a) (i) (A) of the One Plan. However, as discussed in Section 6 of my evidence, all of the indigenous ecosystem types meet at least one of the criteria for significance under Policy 13-5. Relative age, composition, and ecological values of the vegetation and habitats, should also be taken into account and are a more useful guide for determination of ECRs than justification significance *per se*.

10.31. In response to this critique, the ECR for advanced secondary broadleaved forest has been increased to 1:5.[86]

The Applicant suggests ECRs of 1:12 and 1:10 for old-growth alluvial forests and old-growth hill-country forests. These replacement plantings are likely to take centuries to reach an equivalent state in terms of structure and composition. Mr Lambie also notes that the ECRs are driven by habitat value and not age, with the resulting concern that time lags are not adequately addressed[87]. Avoidance of these habitats should be sought in the first instance, prior to entering into a discussion of mitigation and ECRs. <u>Residual effects not addressed</u>

10.32. Due to a lack of detail in relation to the assessment of ecological effects and the proposed positive effects package, it is difficult at this stage to identify with certainty the residual effects that will not be addressed. Key information deficiencies that feed into this uncertainty include the lack of data for Threatened or At Risk fauna species (and in particular herpetofauna and invertebrates), a lack of detail with regards to the planned ecological management, and the lack of confirmed restoration sites.

[86] Dr Forbes EIC at [78].
[87] Mr Lambie S42A response at [182].

10.33. If appropriate restoration sites and ECRs are selected, and these sites are protected in perpetuity, residual effects on forest and shrubland habitats may be addressed. However the location of restoration sites and the ECRs have not been confirmed.

10.34. A residual effect that may not have been addressed is the loss of shrubland habitats for terrestrial invertebrates and herpetofauna. These shrublands have developed under a grazing regime and are unlikely to be replaced by traditional restoration methods, i.e. exclude livestock and plant. Inclusion of these species in forest and shrubland plantings will not guarantee the development and long-term persistence of habitats equivalent to those to be lost.

10.35. If long-tailed bats are confirmed as being present by the survey that is currently underway, there may be long-term residual effects on long-tailed bats, e.g. loss of roosts, habitat fragmentation, road mortality.

10.36. Residual effects that will not, or cannot, be addressed by the proposed package include the loss in extent of hillslope seepage wetlands, fragmentation and isolation of habitats that will be separated by the road, and forest edge effects where road design precludes the establishment of buffer plantings.