Before a Board of Inquiry
Transmission Gully
Notices of Requirement and Consents

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under: the Resource Management Act 1991

in the matter of: Notices of requirement for designations and resource consent applications by the NZ Transport Agency, Porirua City Council and Transpower New Zealand Limited for the Transmission Gully Proposal

between: **NZ Transport Agency**
Requiring Authority and Applicant

and: **Porirua City Council**
Requiring Authority and Applicant

and: **Transpower New Zealand Limited**
Applicant

Statement of evidence of Stephen Andrew Fuller (Terrestrial ecology) for the NZ Transport Agency, Porirua City Council and Transpower New Zealand Limited

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STATEMENT OF EVIDENCE OF STEPHEN ANDREW FULLER FOR THE NZ TRANSPORT AGENCY, PORIRUA CITY COUNCIL AND TRANSPOWER NZ LIMITED

QUALIFICATIONS AND EXPERIENCE

1 My full name is Stephen Andrew Fuller.

2 I am an Associate Director and Principal Ecologist with Boffa Miskell Limited (*BML*). I am a generalist ecologist working in a range of fields including the mapping and description of terrestrial flora and fauna, freshwater habitat analysis and monitoring, and avifauna studies. I work primarily in the Wellington region but have carried out assessments throughout the North Island.

3 I have worked as an ecologist over much of the last 28 years, including employment with the Department of Lands and Survey and Botany Division DSIR, when I conducted biological surveys of scenic reserves in the lower and central North Island. From 1992 to 1997 I ran my own ecological consultancy. From 1997 to 2002 I was the general manager of the Karori Wildlife Sanctuary. In November 2002 I joined BML.

4 I hold a Bachelor of Science in Zoology and Botany, and a Diploma of Applied Science in Ecology from Victoria University of Wellington. I am a Certified Environmental Practitioner with the Environment Institute of Australia and New Zealand and am bound by the Institute's code of ethics.

5 My professional memberships include:

5.1 The Environment Institute of Australia and New Zealand; and

5.2 The New Zealand Ecological Society.

6 My relevant experience includes:

6.1 In 1995 I conducted an ecological assessment of the Transmission Gully Designation on contract to the then Beca Stevens.[1] I appeared as an expert witness for Transit New Zealand at hearings in 1997 in support of that designation.[2]

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1 FULLER, S.A..WASSILIEFF. M.C., 1995. *Designation of Inland Route (Transmission Gully) Assessment of Ecological Impacts Survey and Assessment of Southern Section, Review of Northern Section, Assessment of Potential Cumulative Impacts*. Prepared for Beca Steven.

2 FULLER, S.A., 1997. *Notices of Requirement for Transmission Gully "Motorway Purposes"*. Statement of Evidence Prepared for Beca Carter Hollings and Ferner.

6.2 I was involved in the 2004 review of the Transmission Gully route, sometimes referred to as the 'costed viaduct' option.[3] In 2008, I was lead ecologist during the Scheme Assessment Review carried out for NZ Transport Agency (NZTA) when the present alignment was assessed and adopted.

6.3 I have conducted scoping studies and assessments of ecological effects for a number of other roading projects in the Wellington region including the Eastern Porirua Roading Study (1994), the Pukerua Bay Bypass Study (1994), the SH1 Rural Upgrade (completed in 2002), the Mana Bridge duplication (completed in November 2003), SH1 Mana Esplanade Upgrade (completed in November 2005), the Western Corridor Transportation Study (2004), and the Westchester Link Road (under construction).

6.4 I have been involved in a number of other major construction projects in the lower North Island, the most recent being Project West Wind wind farm. For that project I was lead ecologist during scoping, design and consenting and coordinated and reported on construction and post construction monitoring. This work involved avifauna studies, monitoring and reporting on construction effects on freshwater systems, weed surveys, and a major stream restoration project.

7 On 15 August 2011 the NZTA, Porirua City Council (*PCC*) and Transpower New Zealand Limited (*Transpower*) lodged Notices of Requirement (*NoRs*) and applications for resource consent with the Environmental Protection Authority (*EPA*) in relation to the Transmission Gully Project (the *Proposal*).

8 The Proposal comprises three individual projects, being:

8.1 The 'NZTA Project', which refers to the construction, operation and maintenance of the Main Alignment and the Kenepuru Link Road by the NZTA;

8.2 The 'PCC Project' which refers to the construction, operation and maintenance of the Porirua Link Roads by PCC;[4] and

8.3 The 'Transpower Project' which refers to the relocation of parts of the PKK-TKR A 110kV electricity transmission line between MacKays Crossing and Pauatahanui Substation by Transpower.

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[3] FULLER, S.A. 2004. *Transmission Gully Motorway; Options Estimate: Ecology*. Prepared by Boffa Miskell Limited for Beca. Job No W03149. February 2004.

[4] The Porirua Link Roads are the Whitby Link Road and the Waitangirua Link Road.

9 My evidence is given in support of all three Projects.

10 I am familiar with the area that the Proposal covers and the State highway and local roading network in the vicinity of the Proposal.

11 I am the author of Technical Report #6, Terrestrial Vegetation and Habitat: Description and Values report, and co-author of the Ecological Impact Assessment (*EIA*) report (Technical Report 11) and the draft Ecological Management and Monitoring Plan (*EMMP*) which formed part of the Assessment of Environmental Effects (*AEE)* lodged in support of the Project. I was also a member of the team that developed the various transmission corridor options for Transpower, and I prepared the assessment of effects of the chosen route, which was appended to Technical Report # 11.

12 I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Consolidated Practice Note (2011), and I agree to comply with it as if this Inquiry were before the Environment Court. 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

13 My evidence will deal with the following:

13.1 Background and role (including a brief discussion of my role in relation to the earlier Transmission Gully designation);

13.2 Description of methodology;

13.3 Existing terrestrial ecology including vegetation, avifauna, bats and terrestrial fauna including lizards and invertebrates;

13.4 Project shaping to reduce or avoid adverse effects;

13.5 Effects of construction and operation of the Project on the ecology of terrestrial flora and fauna and habitats;

13.6 Recommended mitigation, monitoring and management and assessment of residual effects following mitigation;

13.7 Consent conditions and the environmental management plans;

13.8 Assessment of ecological effects of the Transpower Project;

13.9 Response to submissions; and

13.10 Conclusions.

14 In my evidence I refer to several maps which are appended to this Statement.

SUMMARY OF EVIDENCE

15 My evidence addresses the effects of the Proposal on terrestrial ecology. In summary I conclude the following:

15.1 I have been involved in the review, design and assessment of the Transmission Gully alignment since 1994 and believe I have a comprehensive understanding of the sites ecology, of the physical effects that construction of the route is likely to have on the local ecology, and of the efforts that have been undertaken to minimise these ecological impacts.

15.2 The Project shaping process that has occurred through the two most recent phases of design and assessment, focused initially on avoidance of effects on important ecological values where that could reasonably be achieved. The current alignment is, in my view, a considerable improvement over any of the options that are constrained to the current designation. I am confident that all opportunities for the avoidance of effects have been fully explored.

15.3 A range of standard methodologies were used to identify and describe terrestrial vegetation, flora, fauna and their habitats. I am confident that all indigenous plant communities have been identified and that all common species of sensitive indigenous fauna have been identified. I acknowledge that some individual species of flora and fauna may be present but in such low numbers that standard sampling techniques will not record them. In these cases the habitat where they are most likely to be found has been identified and assessed.

15.4 Where the alignment could not avoid areas of ecological value or important habitats for flora and fauna, I believe all reasonable efforts have been made to minimise the extent of loss, and to identify further opportunities for minimising effects through the detailed design process that will follow.

15.5 These alignment and design changes have moved almost all of the designation into a pastoral landscape with limited habitat for indigenous flora and fauna. Overall, the avoidance or minimisation of effects through project shaping and initial design have reduced the scale of effects on valued terrestrial flora and fauna to the point that in my view they can be readily mitigated.

15.6 Where sites of ecological value will be lost or modified, the scale of adverse effect has been quantified and appropriate levels of mitigation determined based on the value of each site. Sites have been identified where appropriate mitigation can be carried out, and methods for protection of terrestrial fauna, and in some cases for their reinstatement of habitat, have been described.

15.7 I have taken a conservative approach to quantifying vegetation and habitat loss by assuming that all vegetation within the designation is at risk. While not all of this vegetation will be lost, sufficient uncertainty exists over the final design and the extent of associated site works that I considered this approach was prudent.

15.8 BML ecologists were involved in the development of indicative Site Specific Environmental Management Plans (*SSEMPs*) that established a template for these documents during construction. We have also developed a "Proposed Ecological Management and Monitoring Plan" (*EMMP*) which describes the methods for management of the site during construction that are necessary to ensure potential effects are appropriately monitored, managed appropriately, and that the required ecological mitigation is achieved. We have assisted in the development of consent conditions to this effect.

15.9 I consider that NZTA has acknowledged the ecological values of the terrestrial native forest remnants and of rare and threatened terrestrial fauna along the alignment. All reasonable steps have been taken to avoid or minimise the potential effects of this Project on this flora and fauna and on habitats. Where adverse effects cannot be avoided NZTA has accepted our recommendations and made adequate provision for remedy or mitigation of effects.

15.10 While there may be some short term effects of vegetation clearance and habitat disturbance, the retirement and revegetation that is proposed for both ecological and landscape mitigation will, in my opinion, result in long term ecological benefits for the ecology of the affected catchments.

16 I have also assessed the potential effects of relocation of transmission towers within the Te Puka, Horokiri and Ration stream Catchments on terrestrial ecology. I have concluded that:

16.1 The works required for the movement of these towers and the provision of access to them lie almost entirely in pasture and will have no adverse effects on terrestrial ecosystems.

16.2 In a small number of instances pioneer shrublands dominated by gorse will be cleared, but this will have negligible effect.

16.3 Several towers are located on steeper terrain, but with standard methods for management of erosion and sedimentation there should be little or no effect on adjacent streams

16.4 Over the length of the realignment only two temporary culverts will be required for access tracks. Assuming reinstatement of the stream following removal, I am satisfied that any effects will be short term and minor.

17 Overall, I conclude that with good site management the works for transmission tower relocation can be undertaken without adverse effects on indigenous ecology or biodiversity.

BACKGROUND AND ROLE

Historic Involvement in the Project

18 In 1995 I was the lead ecologist carrying out assessments in support of the Notices of Requirement seeking what is now the existing Transmission Gully designation. My assessment of effects for that designation concluded that the potential adverse effects would be of such magnitude that they could not be completely mitigated. I identified the key impacts as:

18.1 Significant adverse effects of habitat loss on the ecology of Duck Creek, Ration Stream, and Horokiri Stream.

18.2 Potential loss during and for a period following construction of the indigenous freshwater fisheries of the eastern Horokiri Stream, Ration Stream and of Duck Creek.

18.3 Loss of native forest, and regenerating shrublands that buffer forest remnants in the Ranui and Kenepuru catchments.

18.4 Significant adverse effects from sediment discharge during construction and discharge of stormwater contaminants during operation that would cumulatively threaten the healthy functioning of the Pauatahanui Inlet ecosystem.

19 Through 1996 and 1997 I was involved in the consultation that was carried out by Transit and its consulting team, with key stakeholders and conservation agencies. This led to decisions on sediment and erosion control, and agreement on a range of avoidance and mitigation measures that included:

19.1 Early retirement and advanced planting of 13 sites along the alignment, to both provide protection of streams during

construction and assist in minimising erosion and sediment discharge to waterways.

19.2 Widening of the designation at all stream crossings to provide additional space for mitigation activities.

19.3 Creation of forest corridors from the Linden Interchange to Cannons Creek to connect forest fragments and buffer vegetation that had been affected, the slopes south of the Pauatahanui Stream crossing, the slopes above the alignment in the Horokiri, and in the Te Puka.

19.4 Extensive river bank retirement and riparian revegetation within the Duck, all of Horokiri Stream contained within the designation, and all of Te Puka stream contained within the designation.

19.5 Conditions on earthworks extent and duration, and erosion and sediment control, and remediation of storm effects, to protect Pauatahanui Inlet.

20 At the hearings for the existing Transit designation, I concluded that:

20.1 Adverse impacts upon stream habitat and some forest remnants will occur but with careful design some impacts could be avoided and others significantly reduced.

20.2 With appropriate sediment control measures there was a degree of confidence that there would be no significant adverse affect on Pauatahanui Inlet.

20.3 Where impacts could not be avoided the designation had been enlarged sufficiently to accommodate significant mitigation works and these works had been identified and agreed

20.4 In the long term, the retirement and restoration planting of land and protection of streams adjacent to the alignment that would be carried out would provide a net conservation gain for the Pauatahanui Catchment.

21 Following confirmation of the designation Transit NZ commenced early retirement and revegetation of the sites identified as part of the mitigation package. I reviewed and approved the planting plans for most of the sites. Planting began in 2003 and was completed in 2009. Ten of eleven sites were planted. One site was not planted because NZTA anticipated a change in the alignment that would put the planting at risk. For the planted sites the maintenance programme will finish in November 2012 by which stage the

revegetation sites will have reached a sufficient level of maturity that they will not need further maintenance.

22 In 2002 a process of further route refinement was carried out, which developed the "costed viaduct" option. I was also involved in this process which sought to further avoid construction and ecological effects. I carried out a more detailed assessment of the potential effects of the Project on the streams along the route taking into account the improved knowledge of issues relating to fish passage and habitat protection. Among other mitigation measures, this process added six 'ecological bridges' where effects on streams were considered to be high to very high and could not be otherwise avoided. Three of these ecological bridges are retained, three no longer required and two are added to the revised alignment (See Technical Report Section 7.3.2 and Appendix 11-C). I also considered in more detail the extent and costs of necessary mitigation planting. Finally, more consideration was given to issues relating to sediment and erosion control and the potential effects on Pauatahanui Inlet. This also took into account our improved knowledge of the risks to ecological systems, and the new tools and processes that were being developed nationally for improved management. The costed viaduct process was limited to works within the confirmed designation.

23 I was then involved in the Scheme Assessment process in 2008. During this process we were able to investigate alignment options outside the 2001 designation. This gave us scope to further avoid identified effects on streams and on areas of native forest. A key decision made during this process, was to move the alignment from the eastern slopes to the western slopes of the Te Puka Valley and of the upper sections of the Horokiri Valley. This allowed us to avoid some of the most important habitats along the route and in my opinion significantly reduced ecological effects on terrestrial flora and fauna. **Mr Edwards** discusses this process in more detail in his evidence.

24 BML was engaged in 2009 to carry out the ecological assessment for consenting and re-designating the Transmission Gully Project. Through this work BML ecologists have had the opportunity to test the conclusions drawn in 1997 regarding effects of sediment on Pauatahanui Inlet through harbour modelling, discussed by **Mr Martell** and **Mrs Malcolm**, and with this modelling to better define the ecological effects which are discussed by **Dr De Luca**. And we have explored in more detail the extensive stream mitigation that is proposed, as discussed by **Dr Keesing**.

Role in Project

25 My role in this Project has been as ecology team leader. The BML ecology team included a number of specialist ecologists from the Wellington, Auckland, and Christchurch offices, who were:

25.1 Mr Matiu Park: vegetation survey and mapping (Technical Report 6);

25.2 Mr Pat Enright; Rare plants (Technical Report 6).

25.3 Mr Simon Chapman: Herpetofauna and terrestrial invertebrates (Technical Report 7);

25.4 Dr Leigh Bull: avifauna and bat studies (Technical Report 8);

25.5 Dr Vaughan Keesing: freshwater and aquatic (Technical Report 9).

25.6 Dr Sharon De Luca: coastal and marine (Technical Report 10); and

26 **Drs Keesing** and **De Luca** are also presenting evidence for this Inquiry.

27 The results of the desktop and field studies and assessments of values for each ecological component are described in separate technical reports. The findings of these reports are then drawn together in an overarching EIA report (Technical Report 11).

28 As team leader I was the primary author of the initial scoping study which set out the methodology for carrying out the ecological investigations and reporting. I was present at, and assisted with much of the fieldwork, discussed research methods and fieldwork results, and reviewed the analysis. I approved each of the technical reports for release providing inputs from both a strategic overview and technical perspective. I was directly responsible for development of Technical Report 10, (Terrestrial Vegetation and Habitats), and was a lead author, together with Dr Keesing and Dr De Luca of Technical Report 11 and the draft EMMP.

29 I highlight that the evidence I am presenting draws upon and summarises the results of the two terrestrial fauna studies undertaken by Mr Simon Chapman and Dr Leigh Bull. I believe I am competent to present the results of these studies having observed the fieldwork, having carried out invertebrate and lizard studies in the past, and being currently involved in avifauna research at several sites. I am also closely familiar with most of the site and have been out on site in a wide variety of weather conditions and seasons. Mr Chapman and Dr Bull are available if the Board requires further detailed technical information.

30 Through this process I have been involved in a number of site visits, meetings and presentations to the Department of Conservation, Porirua and Wellington City Councils, the Guardians of Pauatahanui Inlet (*GOPI*) and the Pauatahanui Inlet Conservation Trust (*PICT*). I

was also present at public open days and discussed the ecological aspects of the Project with members of other interest groups and the wider community. I have also been closely involved with assisting Ngati Toa to understand the Project and its ecological effects – an area identified as being of particular interest for them.

31 I coordinated the team which developed the SSEMPs which are Technical Reports 25 to 30. I also coordinated the two SSEMP workshops held on 21 July 2010 and 20 October 2010, at which all identified stakeholder and interest groups had the opportunity to challenge, and contribute to discussions on the mitigation and management of environmental effects. Of the six SSEMPs, BML was responsible for preparing two, Horokiri Stream and Duck Creek. However, this work was highly collaborative and each plan was prepared with input from each key discipline. Further to this, I attended several workshops convened by Ms Rickard where draft consent conditions were discussed and refined, and reviewed and commented on the draft conditions that were appended to the application.

Transpower Consents

32 In addition to assessing the Transmission Gully road for NZTA, I was also requested to assess the relocation of the existing transmission lines running through Transmission Gully. This relocation is a necessary consequence of the NZTA Project and will be part of enabling works for the wider Project.

33 I present the findings of this additional assessment later in my evidence.

METHODOLOGIES

34 The methodologies for each component of the ecological investigations are described in detail in the technical reports that I listed previously and are summarised in the EIA - Technical Report 11. In this part of my evidence I will briefly list the key points of the methods for investigation, analysis and assessment for each component, and for the overall ecological impact assessment.

Scoping

35 The first step was to determine the extent of matters that would have to be covered in the assessment of effects. Scoping of the statutory context was carried out in conjunction with the planning team to determine the statutory framework against which the proposal would be judged.

36 The range and scale of activities that could affect the environment were identified by the full ecology team. This included determining which of these activities might have direct or indirect effects on

ecological values, and whether the effects would occur during the construction and / or the operational phases,

37 The area to be assessed, that is, the Project's "zone of influence", was then identified, based on the previous two scoping steps (Technical Report 11, Section 2.3, page 6). This was the area over which ecological investigations were then carried out.

38 The "Study Area" for ecological investigations encompassed all land, water bodies and receiving environments that could potentially be affected by the Project. It included all catchments that are crossed by the Main Alignment, or which feed into either arm of Porirua Harbour. It has a total area of 20,699ha (and is depicted in Map 1 as **Annexure A**). In addition the Avifauna study included five 10km square grids (based on OSNZ field sheets) that encompass the alignment and study area (refer Map 2 – attached as **Annexure B**).

39 The "Designation" boundaries have been defined to encompass all construction activities and most mitigation activities, including the road itself, site storage, site offices, sediment and erosion control measures, temporary access tracks, concrete batching, and landscaping (488ha - Refer to Map 1 – **Annexure A**).

40 The "Project Footprint" relates to the portion of the designation directly affected by physical works such as vegetation clearance, bulk earthworks, cut and fill batters, and fill disposal sites (171ha - Refer to Map 1 – **Annexure A**).

Ecological Investigations

Terrestrial vegetation

41 An initial desktop review of relevant literature was carried out and used to produce maps of historical and current vegetation cover and to identify the potential occurrence of rare or threatened plant communities or species within the study area. Field investigations were then carried out to confirm the desktop information and to fill in gaps.

42 Vegetation was mapped along a corridor extending a minimum of 250 m either side of the proposed centre-line of the Main Alignment. and Kenepuru and PCC Link Roads. This provided a practical limit to site mapping and beyond this, the LCDBII (national land cover database) was used. Maps of vegetation types were initially prepared on high-resolution aerial photography before field investigation confirmed and described each community.

43 Vegetation within the corridor was described in terms of dominant canopy species, height and structure of vegetation and other relevant matters, and vegetation was surveyed along transects in six forest communities to refine those descriptions.

44 Surveys for plant species of conservation interest were also conducted at locations of preferred habitat identified during desktop surveys.

Herpetofauna

45 Initially, the Department of Conservation's Herpetofauna database was searched for all records of herpetofauna detected within 10km of the alignment since 1980. This was supplemented by a review of high resolution aerial imagery and preliminary vegetation maps to identify likely habitat areas for field investigations.

46 On-site investigations comprised a drive through to assess herpetofauna habitat quality; diurnal manual searches of potential habitats along bush and shrubland edges and areas of rocks or debris such as logs (concentrated towards the northern end of the Main Alignment); nocturnal searches for arboreal geckos in the northern section using spotlights in the evening over two nights; and use of Artificial Retreats in areas of good lizard habitat. The use of artificial retreats is described in Technical Report 7, page 3.

Terrestrial inverts

47 Targeted searches for indigenous snails and other potentially significant invertebrate species were undertaken by way of searching in situ leaf litter quadrats, located within native forest at the northern end of the Project. This was considered to be the only habitat in the Project area likely to support such fauna.

48 Observations of terrestrial macroinvertebrate communities/habitats were also recorded opportunistically during other fieldwork when rocks, logs and other debris were searched for any fauna present.

Avifauna

49 Desktop investigations identified the bird species recorded in the wider study area (encompassing Pauatahanui Inlet and Porirua Park Bush, as well as their primary habitat and New Zealand threat status.

50 In the field the avifauna was surveyed within three areas of representative fauna habitat along and adjacent to the Main Alignment. Replicated five-minute point counts, were undertaken within each of the three survey areas in summer and autumn 2010. In addition, all incidental observations were recorded while walking between the point count stations and by other BML ecologists working in the study area. Features such as unusually large numbers of a common or exotic bird species, or any unusual and noteworthy behaviour were also noted.

51 All birds heard vocalising at night while undertaking the bat surveys (in January 2010) were also recorded.

Bats

52 Desktop studies confirmed that there has not been any recorded bat activity within the study area but that the long-tailed bat is known to occur nearby and the forests of the Akatarawa and Whakatikei contained habitat suitable for both species of native bat.

53 Field investigations were targeted at forests within the designation that are contiguous with remnant forests of the Akatarawa – Whakatikei Regional Forest where the only likely habitat for native bats occurs. Sampling methods comprised hand held bat boxes deployed at night, along two transect; automated bat recorders left on site for four nights in March 2010.

Assessment Methods

Terrestrial vegetation

54 The ecological value of all the plant communities described was assessed by taking into account the results of field work and mapping, historic and project-related rare plant surveys, LENZ (Land Environments of New Zealand) threat classes for indigenous vegetation and habitats, priority habitats described in the Wellington Conservancy Conservation Management Strategy (CMS), National Priorities for protecting rare and threatened indigenous biodiversity and recent case law on criteria for assessing significance. Plant communities were assessed and mapped as having high, medium or low value or significance.

Fauna

55 Analysis of lizard, bird, terrestrial invertebrate and bat data involved description (including threat status) and mapping of species found and their relative abundance in relation to the habitats which they utilised or were reliant upon, and their sensitivity to potential Project impacts.

Ecological value

56 The overall ecological value of sites and habitats was assessed taking into account terrestrial vegetation, abundance and distribution of species, and habitat assessments. The methods for this valuation are summarised in Section 2.6, page 12 of Technical Report 11.

Ecological impact assessment

57 The Institute of Ecology and Environmental Management (UK) guidelines for assessment of ecological impacts were used as the basis of our assessment method (Technical Report 11, Section 2.7, page 17). This took into account:

57.1 Whether an impact would be adverse or beneficial;

57.2 The extent of the impact (that is, its scale);

57.3 The duration of the impact (whether permanent, long-term or short-term); and

57.4 The sensitivity of the receptor or receiving environment.

58 These matters together provided a scale of magnitude of impact. The significance of the impact on a site or species was then derived from the assessment of impact magnitude combined with the assessment of ecological value.

59 The statutory and legal context in which the assessment would be applied was also considered.

60 Based on this analysis I considered the acceptability of the predicted impacts and the necessity to remedy or mitigate.

Project shaping

61 Project shaping began during the Phase 1 Investigations (Scheme Assessment and preliminary design) where a number of key decisions were made that led to avoidance or a significant reduction of a number of potential effects. It continued through the Phase 2 assessments (Engineering and Environmental Assessments) to the point that the design was finalised in March 2011.

62 A cooperative process of identification of potential adverse effects on ecological values and refinement of designs occurred which involved a number of disciplines. It including two major meetings and reviews at the end of each of the Phase 1 and Phase 2 investigations.

63 The shaping process focussed on identifying opportunities for avoiding adverse effects, or reducing effects if they could not be avoided. As well as taking part in Project shaping workshops I was involved in stakeholder consultation meetings which fed information into the shaping process.

64 Project shaping is described in detail by **Mr Edwards**.

Impact mitigation

65 Once the actual and potential adverse effects had been identified and Project shaping had identified all reasonable options to avoid effects, the Project ecologists considered opportunities to remedy or mitigate effects through site management, maximising potential benefits, and identifying necessary mitigation for residual effects.

66 A conservative approach was taken to calculating the quantum of effects on terrestrial vegetation that required mitigation. Because there remains a degree of uncertainty over the detailed design and construction programme it was assumed that all vegetation within

the designation was at risk of clearance, though some areas may be avoided once detailed design is complete.

67 Mitigation was calculated based on this potential worst case. This approach also allows for greater flexibility in design and placement of sediment control and erosion measures, which in turn should reduce the risk to freshwater and estuarine ecosystems.

68 Identification of mitigation opportunities for terrestrial ecology was carried out in conjunction with ecologists working on freshwater and estuarine ecosystems, as well as other disciplines within the Project team to enable an integrated package of mitigation measures to be developed.

69 After mitigation measures had been developed, the residual adverse effects of the redesigned Project on sites or places were assessed.

Monitoring

70 A monitoring programme was then developed to enable NZTA to assess the success of the mitigation measures during and post-construction. This monitoring is described in the Draft EMMP and in consent conditions which are discussed later in this evidence.

THE EXISTING ENVIRONMENT

71 In this section of my evidence I summarise very briefly the key points from the desktop and field study findings set out in the technical reports.

72 The study area lies almost entirely within the Wellington Ecological District (39.01) and to a lesser extent the Tararua ED (38.01). The Wellington ED is characterised by steep, strongly faulted hills and ranges, and the Wellington and Porirua Harbours. The district is windy with frequent NW gales, warm summers, and mild winters. Rainfall is typically between 900 and 1400mm per year. The Wellington ED includes a range of soils derived from greywacke and loess on slopes, and areas of peaty and stony alluvial soils in the valleys.

73 The Wellington ED was originally forested but also included salt marsh communities around the inlets. The forests were rimu-rata/kohekohe forest nearer the coast; podocarp forests (kahikatea, totara, matai) on the hills; and miro-rimu/tawa forest at higher altitudes. Today the Wellington ED is modified by farming and urbanisation, with pasture, gorse and regenerating shrublands throughout. Some small forest fragments occur.

74 The Tararua ED extends into the upper Horokiri and Te Puka Valleys, and is crossed by the Project designation in several locations. This ED is typified by steep, high, and dissected hills and

mountains, high winds, long periods of low cloud and high rainfall which can lead to flash flooding. The steeplands soils are shallow and stony with limitations for revegetation.

75 The study area stops just short of the Foxton ED to the north. The Foxton ED is a district typified by coastal processes, dunes and wetlands.

Terrestrial Vegetation & Habitats (Technical Report 6)

Vegetation mapping & rare plants

76 Table 6.12[5] in Technical Report 6 compares the vegetation recorded within the 483ha designation and the 172ha footprint. This shows that the great majority of the Project footprint lies in a highly modified pastoral landscape with plantations and urban components. Indigenous forest makes up less than 4% (20ha) of potentially affected plant communities. A further 10% of the vegetation within the designation is within seral scrub and forest dominated by either manuka or kanuka.

77 Table 6.14[6] shows the distribution of vegetation communities across the catchments crossed by the Proposal. Of note is that the majority of mature indigenous forest lies in the Te Puka catchment, while wetlands are found only within the designation in the Whareroa catchment and Horokiri Stream.

78 Only one plant species that has a national threat classification was found within the Project designation – this was *Leptinella tenella*, which was found in a heavily grazed, sphagnum-dominated wetland in the Horokiri Valley. The presence of this and other uncommon species was taken into account in assessing the significance of sites.

79 Table 6.15[7] lists the assessed rank of each of the major vegetation communities described (in terms of negligible, low, moderate, or high).

Significant natural areas

80 A number of sites along the Transmission Gully route have some degree of protection through reserve or covenant status. In addition, each of the relevant councils has historically commissioned surveys of Significant Natural Areas which have identified a number of sites of ecological value within each District. These are variously referred to as PCC sites (Porirua City Council), K sites (Kapiti Coast District Council) or WCC sites (Wellington City Council) in the Project's ecological technical reports. Each council treats their identified sites differently with regard to recognition and level of protection afforded to them in rules, policies and objectives.

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5 Technical Report 6, page 38.

6 Technical Report 6, page 42.

7 Technical Report 6, page 49.

81 Tables 6.10 and 6.11[8] list all the sites which are currently protected or listed in Regional and District Plans and which are crossed or lie in close proximity to the Alignment. In total eighteen protected natural areas are listed in table 6.10, and a further 21 sites of ecological value are listed in table 6.11.

Assessment of value

82 Table 6.17[9] then combines all protected natural areas, identified sites of significant vegetation, habitats of indigenous flora and fauna, and plant communities, and provides a significance assessment for each. In total 46 sites are identified. Their position in relation to the designation is shown in Figures 6.12a-e.[10]

Birds/Avifauna (Technical Report 8)

83 Table 8.3[11] in Technical Report 8 lists the avifauna recorded during surveys carried out for this Project with an indication of their preferred habitats. A total of 37 species were recorded, comprising 17 exotic species; 20 native but not threatened species; three 'Threatened' species (bush falcon, kaka, and pied shag) and two 'At Risk' species (NZ pipit and black shag).

Bats (Technical Report 8)

84 There were no confirmed observations of bats, however, bat recorders placed adjacent to the Akatarawa – Whakatikei forest to either side of Wainui Saddle collected one recording of interest in the upper Te Puka site in kohekohe forest. The old growth podocarp forest at this location is ideal bat habitat and the presence of bats is not unexpected. Additional monitoring is planned for this summer.

Herpetofauna (Technical Report 7)

85 Table 7.2[12] in Technical Report 7 lists the ten species of endemic lizard that could potentially occur along the Main Alignment. Of these only common skink, copper skink and common gecko were located during surveys for the Project.

86 They were found under logs and debris in pasture in Te Puka; and in the stone fields and scree slopes of the Te Puka, upper Horokiri and Duck Creek. They were also found at the scrub / pasture interface near Cannons Creek bush.

87 Overall, it was concluded the highest quality habitat for herpetofauna within the Designation were the boulder and scree fields in the Te Puka and Horokiri valleys.

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8 Technical Report 6, Pages 34 and 36.

9 Technical Report 6, Page 55.

10 Technical Report 6, Pages 62-66.

11 Technical Report 8, Page 18.

12 Technical Report 7, Page 8.

Terrestrial Invertebrates (Technical Report 7)

88 A wide variety of common terrestrial invertebrates were detected. The area around Wainui Saddle appears to be a stronghold for Peripatus or velvet worm (*Peripatoides novaezealandiae)* which was found in a variety of habitats beneath logs and within boulderfields. This animal does not currently have a threat status.

Ecological Value

89 Technical Report 11 combines the descriptions and assessments from each of the Technical Reports discussed above. Chapter 6 of Technical Report 11 (the EIA)[13] summarises our determinations of ecological value of each identified sites, plant communities, streams, important species of flora and fauna and their habitats.

90 In summary 5 terrestrial sites are scored as having high ecological value. From north to south they are:

90.1 MacKay's Crossing Wildlife Reserve;

90.2 Rowan's Bush;

90.3 Akatarawa/Whakatikei Forest Park;

90.4 Porirua Park Bush; and

90.5 PCC12 Cannons Creek Bush

91 There are seven sites of terrestrial vegetation and habitat of moderate value. They are:

91.1 K229 – Paekakariki Bush I;

91.2 PCC 196, Scoresby Grove Kanuka;

91.3 PCC155b – Whitby West Bush;

91.4 PCC33 – James Cook Drive Bush;

91.5 PCC190 – Exploration Drive Kanuka;

91.6 WCC0702.15 – Tawa remnant;

91.7 WCC0702.16 – Tawa remnant;

92 Finally, there are 26 sites or areas of vegetation of low (but some) ecological value including regenerating shrublands and young seral forest, boggy pasture, and riparian margins of *Juncus* spp.

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[13] Page 59.

93 These 26 sites include the areas of advanced mitigation planting undertaken by NZTA since 2002. This planting has achieved sufficient maturity to now provide habitat for flora and fauna.

94 In addition table 11.25[14] lists eleven species of terrestrial flora and fauna of varying ecological value which are potentially affected by the Project and require specific consideration. Seven species have a national threat status. They are:

94.1 Leptinella tenella (wetland herb) – At Risk (Declining);

94.2 Bush falcon – Nationally vulnerable;

94.3 NI kaka – Nationally vulnerable;

94.4 NZ pipit – At Risk (Declining);

94.5 Pied shag – Nationally vulnerable;

94.6 Black shag – At Risk (Naturally uncommon); and

94.7 Long-tailed bat- - Nationally vulnerable.

94.8 A further four species that do not have a threat status were found in low numbers and in specific habitats within the designation. Their distribution and abundance suggests they are declining relics of past populations. Protecting these populations is considered to be appropriate.

PROJECT SHAPING

95 The project shaping process is described in Technical Report 11, Section 7.[15] Since the original ecological assessment was carried out in 1995, ecological factors have been considered in repeated refinements of the current designation and the recent preferred route alignment. This has included discussion with a range of stakeholders.

96 The shaping process carried out during the current study focused on the opportunities for design to avoid or reduce effects. A log of changes made was maintained by Mr Edwards (Opus) and the design changes made in part or all as a result of ecological considerations are listed in Appendix 11.C of Technical Report 11.[16]

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14 Technical Report 11, page 67.

15 Page 75.

16 Page 150.

97 The main terrestrial effects avoided at this stage were:

97.1 Bridging of the lower Te Puka stream (BSN28) to both avoid a high value section of stream and reduce the clearance of riparian kohekohe – titoki forest (Site K223 & 224);

97.2 A number of decisions regarding the road alignment at Wainui Saddle to minimise effects, including the avoidance of loss of mature podocarps, in the high value vegetation and habitat of the Akatarawa – Whakatikei Forest;

97.3 A number of minor realignments in the Horokiri Catchment to avoid or minimise loss of streams and associated riparian vegetation;

97.4 A number of decisions regarding Cannons Creek Bridge (Bridge BSN20) to minimise effects on regenerating forest in Cannons Creek reserve (Site PCC12);

97.5 Bridging of a gully in Kenepuru (BSN21) to minimise effects on a tawa-podocarp forest remnant in Porirua Park Bush (PCC 76);

97.6 Bridging of a deep gully in Kenepuru (BSN22) in part to avoid both the stream and a small unnamed stand of tawa pukatea forest;

97.7 Minor realignments to ensure early advanced mitigation planting in the Ration, Pauatahanui and Duck catchments, were affected as little as possible.

98 Further avoidance or reduction of adverse effects may be possible during the detailed design stage where areas of high value vegetation and habitats lie within the Designation boundaries but outside or only partly beneath the road footprint. An example of this is given in Table 11.49[17] which notes the possibility that careful design and site management could reduce Project effects on mature indigenous forest from 21ha to 6ha.

[17] Technical Report, page 104.

ASSESSMENT OF THE EFFECTS ON ECOLOGICAL VALUES

99 In this section of evidence I summarise the key potential and actual ecological effects on terrestrial vegetation, habitats, and plant and animal species. These effects are discussed in detail in Technical Report 11, sections 8 (Construction Effects) & 9 (Operational Effects). These two sections determine whether remedy or mitigation is required. The form and quantity of mitigation is then discussed in Section 10 of that report.

100 The criteria used to assess the magnitude and significance of an effect on a site or place are set out in Section 8.1[18] of Technical Report 11.

Direct Construction Effects

Terrestrial Vegetation

101 Table 11.31[19] presents the results of the assessment for the sites discussed above.

102 In summary, 40ha of native vegetation lies beneath the Project footprint and will be permanently removed at the construction stage. A further 80ha native vegetation lies within the designation boundaries and may be lost or modified by earthworks. The magnitude of loss of vegetation is assessed in relation to the total cover of the vegetation type within the study area.

103 Table 11.31 shows that for seven sites; two of regenerating broadleaf forest (totalling 10 ha), and four of mature tawa-podocarp forest (totalling 1.7 ha), the potential loss will have "moderate" significance. I consider that mitigation is required for this loss. This is discussed in the following section of this statement on mitigation.

104 For all other sites or vegetation communities, the effects were assessed to be low or very low. Despite this some mitigation was considered necessary in some cases, particularly where the vegetation provided habitat for native fauna or rare native plants.

Rare Plants

105 The uncommon plant *Leptinella tenella* grows in an area that is likely to be used for the formation of stormwater treatment ponds. Depending on how the Project is designed and built, it could result in the loss of this plant from this site, or create additional habitat for it. I consider that remediation is required.

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[18] Page 85.

[19] Page 86.

Lizards & Invertebrates

106 The three lizard species and the invertebrate Peripatus were found in areas of scree and boulderfield that will be reduced by earthworks. Individuals that take refuge in these habitats will be lost during earth-working activities. I consider that some mitigation is required.

Birds and Bats

107 Because of the changes made to the alignment through the shaping process and the fact that falcon and kaka utilise habitat over a very large area it is unlikely that kaka or falcon would be affected by loss of small areas of bush along the margin of the Akatarawa forest.

108 I considered the possibility that kaka or falcon might attempt to breed in close proximity to the road and concluded that this matter could be addressed by management plan.

109 I considered the possibility of black and pied shag being displaced from the Horokiri Stream bed by construction activity. I consider that any effect would be very low.

110 I consider that some common birds may be displaced through clearance of areas of regenerating forest and shrubland and this should be considered when developing mitigation.

111 No bat habitat will be lost and so I consider that this species will not be affected by construction activities.

Indirect Construction Effects

112 The indirect effects of construction on vegetation and habitats include dust, fire and issues related to weed introduction, either on vehicles or with topsoil and aggregates.

113 The risk level associated with these cannot be quantified, but can be managed through industry accepted construction methods, including construction management plans (CEMP) which I will describe in the mitigation section of my evidence.

Operational Effects

114 I consider that operation of the road will not have adverse effects on vegetation and flora.

115 In considering potential effects on avifauna I concluded that falcon and kaka are present in very low numbers, are not reliant on habitat adjacent to the road, and are unlikely to be adversely affected by the operation of the road.

116 The NZ Pipit may be displaced by the proposed land retirement and revegetation. These birds are, however opportunistic users of the modern landscape where forest has been cleared and will move to

other sites. Overall, we consider that the effect on this species from operation of the road will be low and does not require mitigation.

117 We have been unable to verify whether bats are present at the site, but have recommended additional study to confirm this. If they are present international research suggests that they may be at risk of traffic collision and this still needs to be determined.

Summary

118 In summary, the key adverse effects on terrestrial ecological values requiring mitigation are:

118.1 Permanent loss of 40ha of indigenous vegetation beneath the road footprint;

118.2 Temporary loss or modification to a further 85 ha of indigenous vegetation due to earthworks and construction activities;

118.3 Potential loss of sedentary species (e.g. lizards) when their habitat is removed;

118.4 Disturbance and displacement of mobile species (e.g. birds) by construction activity; and

118.5 Potential effects of road operation on sensitive bird and/or bat populations.

MITIGATION, MONITORING AND MANAGEMENT OF ADVERSE EFFECTS

119 Detailed discussion of mitigation for direct and indirect impacts of construction and operation are presented in Section 10[20] Technical Report 11. They are summarised in Section 10.3[21] including recommendations for consent conditions.

120 Note that some mitigation actions such as riparian planting, will address more than one adverse effect; conversely a number of mitigation actions may be needed to address a single adverse effect such as impacts on lizard habitat.

Terrestrial Vegetation

121 The approach that was used to determine the extent of adverse effects was to assume that all vegetation within the Project designation is at risk of clearance even though some of it will not be cleared and can be avoided through detailed design work. This conservative approach recognises that the construction programme and areas of work have the potential to be modified as the Project

[20] Page 104.
[21] Page 126.

develops. This approach allows the construction team the flexibility to make those changes without making reassessments or needing to seek additional consents and approvals. It also provides the maximum opportunity for revegetation, which will be an essential part of the sediment control package. The areas of vegetation within the study area, designation and project footprint are shown in Table 11.49.[22]

122 There is no national standard or guideline for calculating mitigation for vegetation loss, so the ecology team agreed on three simple "environmental compensation ratios" (ECRs) for calculating an appropriate level of mitigation of terrestrial vegetation loss. They are:

122.1 Shrublands in pasture dominated by tauhinu (x 1);

122.2 Kanuka scrub and low forest (x 2); and

122.3 All other vegetation types (x 3).

123 This approach requires that larger areas of vegetation should be planted for those communities that are less common (e.g. indigenous wetlands), and which will take longer to reach their existing condition or maturity (e.g. native forest).

124 Using these ratios, Table 11.50[23] shows that 250ha of revegetation is required to compensate for the 120ha of vegetation that could be lost within the designation.

125 The next step was to identify where the mitigation planting should be carried out and how the sites should be managed.

126 A number of potential additional sites for mitigation work were considered and assessed in terms of their existing values and the potential benefits of planting at those sites. This analysis is presented in Appendices 11.G and 11.H of Technical Report 11. From this, four large sites were chosen (in addition to the early retirement sites).

127 The total area of selected mitigation sites (including early retirement sites) is 426ha, of which 250ha is required for mitigation of effects on terrestrial flora and fauna, the remainder provides mitigation of effects on freshwater and riparian habitats. This will be described by **Dr Keesing** in his evidence.

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22 Page 104.

23 Page 105.

128 Within these areas I have proposed four broad types of "treatment", not all of which involve planting. These are:

128.1 Terrestrial revegetation (mass planting);

128.2 Riparian planting (mass planting);

128.3 Enrichment planting (localised and site specific), and;

128.4 Land retirement, including stock removal and fencing, of sites which are already regenerating (with associated pest control).

129 Included in the 426 ha of sites is the 31ha of land (Advanced Ecological Mitigation) that has already been retired and managed by the NZTA over the last eight years. This work is described in Appendix 11.L, page 178, to Technical Report 11.

130 Mitigation planting and management will be guided by principles set out in the Section 3 of the draft EMMP. A Mitigation Planting Plan for one of the early retirement areas is appended to the draft EMMP (Section D.4) to provide an example of where revegetation has been successfully carried out and the type of planning that supported the work. My expectation is that this would be used by the Council compliance officer as a "check back" when determining compliance with conditions and management plans.

131 In summary, direct mitigation for adverse effects on terrestrial and/or freshwater ecological values is proposed at 10 sites, using four different restoration treatments. These sites are listed in Appendix 11.I to Technical Report 11 and shown in Figures 11.11a-i of Appendix 11.J.

132 In addition Section 10.3[24] identifies a number of sites where adverse effects may be minimised further or in some cases avoided during the detailed design phase of the Project.

133 Recommended consent conditions are listed in Section 10.3.1.

Terrestrial Fauna

134 The mitigation described above will also address adverse effects on habitats of indigenous fauna, particularly avifauna.

135 I have recommended that immediately prior to construction, logs and debris containing Peripatus should be translocated from the footprint area to safe habitats nearby.

136 Similarly, common lizards can be captured and translocated from habitats immediately prior to vegetation clearance or interference

[24] Technical Report 11, Page 126.

with habitats along the footprint. New areas of suitable habitat could be created at appropriate places for recolonisation. I note that permits for trap and translocation of lizards will be required from the Department of Conservation under the Wildlife Act 1953.

137 With regard to avifauna the only operational effect that we identified requiring consideration was the risk of collision with transparent barriers used on some roads. We recommended that transparent barriers not be used around the key habitats of Wainui Saddle or the Pauatahanui Stream crossing. **Dr Chiles** has advised me that while barrier materials will be determined in detailed design, transparent barriers are not proposed and that, in any event, no barriers are proposed in either of the above locations.

138 We identified the need to verify the presence, species and distribution of native bats at Wainui Saddle.

139 Recommended consent conditions and standard methods are listed in Section 10.3.2.[25]

Potential Positive Effects/Benefits

140 The actions that will be taken to improve indigenous biodiversity outcomes within the Project Area and which may have effects across the wider Ecological district mean that the Project offers some beneficial effects on ecological values. These arise mainly from the extension of indigenous vegetation cover through natural regeneration and restoration in areas where stock are removed. This will contribute to improved water quality and aquatic habitat (as described by **Dr Keesing**).

141 The early retirement areas (as required by the existing designation) that have already been purchased, fenced and planted by the NZTA, are already providing benefits in terms of riparian habitat and slope stability.

142 In addition, the extensive studies carried out as part of the Project investigations have improved knowledge and understanding of the local flora, fauna and habitats.

143 Finally, the EIA recognises in Section 10.3.7 (page 129) that additional relatively large sections of the route will undergo revegetation with native plants as part of landscape mitigation. We have been careful to keep the ecological and landscape mitigation packages separate for the purpose of these separate assessments. However, combined these plantings will provide a nearly continuous green corridor along much of the route.

[25] Technical Report 11, Page 127.

ASSESSMENT OF RESIDUAL EFFECTS FOLLOWING MITIGATION

144 Table 11.71 of Technical Report 11[26] summarises our assessment of adverse effects before mitigation and our assessment of residual effects, both positive, neutral and negative, assuming mitigation has been successfully carried out.

145 In summary I consider that after all the mitigation actions that are described in the EIA report and the draft EMMP have been carried out, adverse effects can be reduced to neutral or long term positive once the benefits of retirement and regeneration are felt.

146 It is our expectation that effects on lizards can be fully mitigated and the effects will be neutral.

147 The retirement and revegetation of large areas of land abutting the Akatarawa Whakatikei forest will provide long term benefits for forest species.

148 Ironically, revegetation may result in a decline in pipit, a species of open country that has colonised the rough pasture around Wainui Saddle. However, the benefits to other species will in my opinion outweigh this small minor negative effect.

149 The potential effect on bats, if any, is still to be determined and will be confirmed after further testing. The conditions (E.23) require any effect on bats to be minimised.

CONSENT CONDITIONS AND THE ENVIRONMENTAL MANAGEMENT PLANS

150 The proposed consent conditions require preparation of various management plans, and provide guidance on what the plans are to cover and the standards that management of the issues covered by the plans needs to achieve.

151 The two key plans for the management of adverse effects on Terrestrial ecology are the Ecological Management and Monitoring Plan (EMMP) and the Site Specific Environmental Management Plans (SSEMP).

EMMP

152 Each of the recommended mitigation measures described in the EIA is picked up and elaborated in the proposed EMMP. This plan includes the following sections:

152.1 A summary of all valued ecological components, of potential adverse effects, and proposed mitigation;

[26] Technical Report 11, Page 129.

152.2 A general approach to management and protection of each ecological component during construction;

152.3 A description of the monitoring that is required for each ecological component; and

152.4 Indicative management and monitoring plans for stream diversions, stream monitoring and adaptive management, estuarine monitoring and adaptive management, and ecological revegetation.

153 The draft EMMP Section C.1.[27] sets out the ecological monitoring needed to verify that the mitigation actions that have been carried out, achieve the required levels of ecological benefit. Additional baseline information will need to be collected, and vegetation, lizards, and birds will need to be monitored during and after construction.

154 The plan sets out an adaptive management programme that will allow feedback from baseline studies, construction and post construction monitoring to be fed into construction and operational management decisions. This is outlined in Section 6[28] of the draft EMMP.

155 On the topic of adaptive management for ecological monitoring I note that in my experience, while I appreciate the desire for certainty when setting conditions of consent, locking a Project rigidly to a set of fixed outcomes or measures does not always produce the best environmental outcomes.

156 Accepting an iterative and adaptive management system essentially recognises that complex ecological systems are inherently unpredictable but that gathering information during a period of change and establishing trends is the best way to improve understanding and confidence in predictions. Adaptive Management recognises that:

156.1 It can be difficult and sometimes impossible to predict with certainty the exact scale or precise duration of an ecological effect in a complex system with multiple environmental variables operating;

156.2 Further, it can be difficult and sometimes impossible to predict with certainty if a planned mitigation tool will deliver within a specific timeframe, or to a desired or required standard.

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27 Page 29.

28 Page 35.

156.3 The act of monitoring, carried out as part of an adaptive management process, almost always provides additional information that can improve predictions, refine mitigation methods, and inform a process of continuous improvement. This increases certainty over time and allows for real time responses to un-expected or unpredictable events;

156.4 Entering into a complex restoration project with all parties expecting to be part of an adaptive management process can lead to improved collaboration and communication, which also leads to improved environmental outcomes.

157 The key to an adaptive management process is the establishment of agreed triggers and a clear process and agreed responsibilities for response to unexpected events. Also critical is communication within the team and externally. Each of these matters should be, and are, set out in the proposed conditions (E24). Examples of the recommended adaptive management process for aquatic and marine monitoring are provided in Section D of the EMMP (page 39).

158 I note that the EMMP is still in draft form. Further information will be gathered during detailed design, from baseline studies and from the development of SSEMPs, that will refine this plan and provide specific measures and targets. Consent condition E.24 provides for this further refinement before the plan is submitted for approval to Council. Condition E.24 also requires consultation with the Department of Conservation during refinement of this plan.

SSEMP

159 Site Specific Environmental Management Plans are working construction documents that are specific to each area of the construction footprint. They build on the methods provided in the EMMP providing additional detail relevant to that specific site or area.

160 SSEMPs include a list of specific activities that are required to be carried out in that area, and detailed maps with agreed locations for activities such as fencing, planting, habitat management and so on. They provide the rules for activities to protect identified areas of value and manage effects. They cover staging of works including the many activities typically required as part of enabling works.

161 As part of the Phase II investigations discussed in this evidence a series of indicative SSEMPs were prepared. These plans explored the most challenging sections of the alignment and provided opportunities for the team to collaborate on the resolution of environmental issues. These indicative plans provide a good overview of the issues faced in each of these areas and how they will be addressed.

162 The development of the final plans typically involves the full construction environment team and Regional Council compliance and consenting staff. They involve combined site visits and discussions.

163 The final documents are working documents in a form that are to be used and understood by construction teams.

Consent Conditions

164 A number of proposed consent conditions relate to management of effects on terrestrial flora, fauna and habitats. They are:

164.1 Condition G.7 (a) and (b) provides for a review of conditions to deal with any unanticipated adverse effects on the environment and to review the adequacy of any monitoring plans.

164.2 Condition G.10 & .11 require all works to be carried out in general accordance with the management plans required by these conditions.

164.3 Condition G.12 relates to the development of the over-arching Construction Environmental Management Plan (CEMP). Within this conditions are G.12(1)(b) qualifications and experience of principal staff employed on the Project, G.12(1)(c) methods and systems to inform and train staff on environmental issues, G.12(2)(i) which covers management of weed introduction, and G.12(2)(j) which deals with the identification and marking out of construction zones.

164.4 Condition G.13 lists the environmental management plans (including the EMMP) that are included in the appendices to the CEMP.

164.5 Conditions E.20 and E.21 detail the purpose and contents of the SSEMPs. E.20 (c) covers revegetation and rehabilitation activities.

164.6 Conditions E.22 to E.29 present a set of objectives for the management and mitigation of adverse ecological effects. Specifically:

(a) E.22 covers protection and rehabilitation of lizard habitat & mortality, Peripatus habitat and mortality, breeding of kaka and falcon, and protection of valued vegetation during construction.

(b) E.23 covers bat mortality, habitat for rare plants, retirement of regenerating land, and revegetation

required as mitigation during the operational life of Project.

(c) E.24 covers the updating and finalising of the EMMP prior to approval.

(d) E.25 requires implementation of the EMMP, its actions, methods and monitoring.

(e) E.26 covers the recording and reporting of the results of monitoring carried out as part of the EMMP.

(f) E.27 covers the identification of valued natural areas and any protection mechanisms that are required.

165 On the whole I consider that the issues identified in my assessment of effects on Terrestrial flora, fauna and habitats have been covered by these proposed conditions.

166 I have considered whether additional conditions are required. I recommend that the condition regarding completion of the EMMP (E.24) specify the need for monitoring of the success of mitigation activities.

167 I also recommend that additional certainty of terrestrial and riparian mitigation could be achieved by modifying condition E.23 (d) and (e) to specify the total areas that have been agreed to be set aside and revegetated.

TRANSPOWER CONSENTS

Introduction

168 As part of the wider NZTA project consent applications, Transpower is seeking land use consent under the National Environmental Standards for Electricity Transmission (NESET) for the necessary relocation of twenty four transmission towers, located within the Te Puka valley, Horokiri East Valley and Ration Stream catchment, which are 'displaced' by the road footprint.

169 My assessment of ecological effects of the Transpower Project draws upon the various technical reports described above, as well as information gathered on several additional site visits with other members of the team.

Project Description

170 In summary, the Transpower Project involves

170.1 Relocation of twenty-four transmission towers;

170.2 Removal of one existing tower;

170.3 Strengthening of ten towers; and

170.4 Formation of access roads to some tower locations.

Project Shaping

171 The process for identifying a preferred route was based on a modified version of the Transpower ACRE model. It included a number of team workshops and site visits, many of which I attended, and is described in further detail in the evidence of **Ms Lesley Hopkins**. Options were assessed using a multi-criteria analysis.

172 A number of options for the line route were identified The process identified Wainui Saddle as a significant pinch point for the Transmission Gully project forcing the transmission corridor out of the valley floor.

173 The range of options was refined to two, using multi-criteria analysis. Each of these two options had environmental challenges: the eastern option would have potentially significant effects on remnant native forest and habitat for threatened wildlife, the western option would potentially have adverse effects on an outstanding landscape feature

174 For a range of reasons, including avoidance of effects on ecology, the western option was selected as the preferred option, and my detailed assessment was carried out for this option.

Summary of Ecological Effects Assessment

Direct Impacts of Construction

175 I consider that no indigenous vegetation would be affected by tower or access road formation and no mitigation was required.

176 Some areas of pioneer shrubland and scrub dominated by gorse will be cleared. I consider this would have no or negligible effects on the local ecology.

177 Only two towers (13AW and 16AW) will require a temporary stream crossing for access. The streams are headwaters and we conclude that, assuming streams are remediated following culvert removal; temporary crossings will only have shorter term and minor effects.

Indirect Impacts of Construction

178 The great majority of tower locations are on flat ground, either river terraces or downland, and almost all of these sites have existing access tracks to them. I consider that there was no risk of erosion and sediment discharge from these works.

179 Seven towers will be built on steeper slopes. Three of these are on high spurs and are removed from streams. The risk of significant

sediment discharge to streams is considered low. Four are on slopes above streams and additional care is needed to minimise erosion.

180 Overall, and given the modest scale of earthworks required, I conclude that the risk of significant effects from sediment discharge is low.

Operation Impacts

181 We conclude that due to the existing low structure of vegetation no vegetation clearance is likely to be necessary for a number of decades.

182 The preferred western alignment moves three towers out of the valley and 200 to 300m west from the Akatarawa forest which is the prime habitat for native birds and bats. 2 towers move slightly closer and two do not change. Overall I consider the effect of these changes to be neutral.

Other

183 All but 5 of the proposed tower relocations lie within the existing designation. The 5 new tower locations that occur outside the TG designation all lie on improved pasture and are accessible by existing farm or forestry access tracks. No clearance of native vegetation or stream crossings will be required.

Summary of Monitoring & Mitigation

184 In summary I conclude that no mitigation is required for the negligible effects that will occur. However, I recommend that consent conditions be imposed to recognise and protect values:

184.1 Conditions for the identification and protection during construction of four areas of valued vegetation (K224, K228, P172, and P199).

184.2 Conditions that require best endeavours to minimise clearance of other native vegetation, in particular riparian vegetation.

184.3 Conditions relating to the installation and removal of temporary culverts on construction access tracks.

184.4 Conditions relating to sediment and erosion management.

RESPONSE TO SUBMISSIONS

185 Five submissions raised issues relating to terrestrial ecology. They are as follows.

Ranui Residents Association

186 This submission[29] requests that all efforts will be made to increase native tree planting and complement the increased bird life that Ranui is experiencing.

187 I have recommended that all earthworked areas down-slope of the road from chainage 24900 to near bridge 22 at chainage 25900 be revegetated in natives. This is necessary to mitigate for the loss of some vegetation in Porirua Park Reserve and Cannons Creek bush, and to maintain a connection of native vegetation between these two sites. Refer to Appendix 11.J, Plan 11.11i of Technical Report 11 for detail.

188 South of Bridge 22 any planting becomes a matter of Landscape mitigation which is discussed by **Mr Lister**.

189 The submission also requests that pine trees are discouraged. The future of pines on NZTA land is discussed by **Mr Lister**. Pine trees will not be included in any of the mitigation planting.

Cannons Creek Residents & Ratepayers Assoc

190 This submission[30] raises the concern that chemical run off from the new link road tar seal will affect pet and plant life.

191 Contaminants carried by stormwater are typically sufficiently diluted at the source so that effects on flora and fauna are highly unlikely to occur. Adverse effects typically only occur at the point of discharge if contaminants settle and become concentrated. As I understand it management of stormwater will be carried out so that there will be a neutral or at worst a negligible increase in contaminants entering Pauatahanui Inlet and that all discharge points that currently meet ANZECC guidelines for water quality will continue to do so. This suggests that there will be no increased risk to pets or vegetation.

192 Management of stormwater contaminants is discussed by **Mr Martell**.

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29 Submitter 12.

30 Submitter 15.

Kapiti Coast District Council

193 KCDC[31] makes the following requests that relate to terrestrial ecology:

193.1 Further information on the nature of effects on K106 MacKays Crossing wetland.

193.2 That the EMMP include a long term plan to control possums, rats, mustelids, deer and goats to low levels permanently.

193.3 The EMMP include reporting to Territorial Authorities (*TA's*).

194 The activity proposed for MacKays wetland is the expansion of an existing stormwater treatment pond, created during formation of the MacKays crossing interchange, into a more comprehensive stormwater treatment wetland, together with any associated works. The proposed location of this wetland can be seen in Plan Set drainage layout plan DR01. Landscape Plan LA01 locates the wetland over an aerial photograph.

195 The proposed wetland does not extend into the core raupo wetland habitat, but lies to the south in broken rushland, sedgeland and wet pasture. The mitigation that is proposed is that the design and construction of the treatment wetland avoid the core raupo wetland. I note that this site was omitted from the EMMP (section 3.2 Valued Vegetation) which requires specific attention, and we will add it to this list.

196 The management of browsers is a standard requirement for the revegetation programme and must continue for an agreed maintenance period until the plants are established at the required density, and are showing normal growth, and there is a realistic expectation of survival. However to require control of all browsers including possums, deer and goats, in perpetuity is, in my view, entirely unjustified.

197 I have recommended predator control if there is a requirement to transfer lizards and only until populations re-establish in their transfer site. There is no other adverse effect on indigenous fauna that requires predator control as mitigation.

198 I have no objection to the EMMP including TA's in the reporting requirements.

Wellington Regional Council

199 WRC[32] states simply that ecology (terrestrial) is a key issue that they wish to focus on. However, no other information is provided that requires a specific response.

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31 Submitter 23.

Department of Conservation

200 This submission[33] raises the following issues that relate to terrestrial ecology:[34]

200.1 That NZTA has not adequately addressed effects of works on some species and habitats, in particular keystone species (e.g. tui, bellbird and kereru),some lizard species (e.g. ornate skink, forest gecko, brown skink, green gecko), and naturally rare ecosystems (e.g. cloud forest);

200.2 That NZTA has not assessed the viability of habitat in release locations;

200.3 That NZTA has not considered the provision of ecological corridors;

200.4 That NZTA has not identified mechanisms for avoiding adverse effects on breeding areas and breeding times.

201 With regard to keystone bird species I agree that our focus was on threatened species. However, I believe it is logical to assume that the efforts taken to protect mature podocarp forest habitat upon which falcon, kaka, and bat rely, will also provide equal benefit to other forest species such as tui, bellbird and kereru. In support of this conclusion I note that all bellbird, most kereru (75%), and a majority of tui (50%) were recorded in the Te Puka and upper Horokiri Valleys.[35] Almost all remaining observations of tui and kereru were in and around the tawa podocarp forest of Porirua Park Bush where we have required an 'environmental' bridge (BSN 21) to avoid loss of podocarp forest within this reserve.

202 I also note that one of the criteria used for the selection of mitigation sites was the protection and enhancement for avifauna generally[36] and that the 360 ha of land that will be retired from farming in the Te Puka and Horokiri catchments, and the 70 ha of revegetation that will be carried out, are in areas where I consider that greatest benefit to avifauna populations will accrue. In my opinion this will more than mitigate for any minor effects on local populations of these birds caused by construction of this route. I therefore disagree that there has been inadequate assessment of effects on keystone birds species and do not believe any further study or assessment is required.

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32 Submitter 29.

33 Submitter 43.

34 Paragraph 22 and 23.

35 See Technical Report 8, Tables 8.5 to 8.7, pages 21-23.

36 See Technical Report 11, Appendix 11.G, page 166.

203 In paragraph 6 the Departments submission states that *"there is inadequate assessment of the potential effects on high value species, particularly estuarine birds and their feeding habitats".* The areas of tidal flat that will be affected in anything less than a 10 yr event will be negligible. In a ten year event, during peak earthworks, modelling suggests there will be a temporary (short term) adverse effects on marine habitats within which estuarine birds may feed. However, the hydrodynamic modelling indicates that the areas affected will be small and that the great majority of potential estuarine bird feeding habitat will be unaffected (Evidence of **Dr De Luca** and **Ms Malcolm**). In my opinion, there are unlikely to be adverse effects on estuarine bird populations or their behaviour/feeding due to the construction or operation of the Project.

204 With regard to lizard species, Technical Report 7 identifies the range of constraints faced when surveying for lizards, not least of which is the risk of destroying habitat in order to confirm presence. Standard non-destructive survey methods were used for our survey and I am confident that any species that are common on the route were identified. However, I fully accept that rare species present in very low numbers may not have been identified by the search methods used. Because of this I included recommendations in my assessment and the EMMP to provide additional certainty during capture and release programmes.[37] Pre-construction capture and transfer can use destructive methods and this is the appropriate time to carry out this work. I do not believe any further study or assessment is required at this stage.

205 With regard to naturally rare ecosystems I disagree that I have not given this matter due consideration. Only five of the 72 rare ecosystems identified in Williams et.al (2007) are present within the designation.[38] These have been identified and considered in the various technical reports. The Project potentially affects one damp sand plain / dune slack at MacKays Wetland (Technical Report 6). A number of small ephemeral wetlands are found in the upper Horokiri Valley, and BML surveys confirmed the lack of ecological value of the exotic plant communities that dominate them (Technical Report 9). The potential effects on estuaries were the focus of considerable investigation and assessment which are described by Dr De Luca (Technical Report 10). Finally the Project scoping section of our EIA describes in detail the efforts taken to successfully avoid the cloud forest found at Wainui Saddle and in the upper Te Puka Valley.[39] I do not believe any further consideration is required.

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37 See EMMP Section 5, page 20.

38 Technical Report 11, Section 6.2, page 54.

39 Technical Report 11.

206 With regard to release sites for fauna, I can confirm that our assessment does not assess the appropriateness of release sites, but I do not believe this current process is the appropriate time for this work to occur. Any capture and release of lizards, birds, and macro-invertebrates require permits from the Department of Conservation, and in some cases the use of DOC certified ecologists. It is at the permitting stage under the separate Wildlife Act process that we would normally expect to provide detailed information on the capture and transfer methods, the specific staff to be used, and the chosen release sites.

207 With regard to ecological corridors, I believe the planting proposed for ecological mitigation will contribute in a meaningful way to forming a long term green corridor along the Project alignment, particularly when taken in combination with the large areas along the alignment that will also be planted for landscape and amenity purposes. However, while the goal of a green corridor is important, the Project ecologists had to also consider the reason mitigation planting was being carried out, and in some cases this was quite specific and limited our choices of location, particularly in relation to the riparian planting needed to heal diverted and modified streams. Overall, however, I am satisfied that in selecting our sites for ecological mitigation planting, the formation of green and blue (stream) corridors were given consideration, alongside other ecological considerations.

208 With regard to breeding areas and times, the EMMP requires the monitoring of breeding of threatened native birds in adjacent forests, together with appropriate management responses if required. It also identifies peak periods of freshwater fish migration to inform timing of in-stream works.

209 The Departments submission states in paragraph 28 that due to the scale of effects and the significance of ecosystems, habitats and species:

> *"efforts to follow best practice methodologies and ensure good biodiversity outcomes through the avoidance, remediation and or mitigation (including offsets) of adverse effects are warranted. This is not reflected in the current proposal".*

210 I believe the ecology team that has carried out this assessment has used best practice methodologies. We have, as is best practice, sought to firstly avoid, then minimise effects before looking to the need to mitigate. With regard to terrestrial effects I do not recommend offsetting or compensation as I believe the residual effects that cannot be avoided, can be readily mitigated in the areas that adverse effects occur.

211 The Department states in paragraph 29, bullet 1, that we omitted some significant habitat types such as *'stone fields and scree slopes'* in our assessment. This is incorrect. *'shrublands containing boulderfields'* are listed as habitats of moderate value in the Te Puka, Horokiri and Duck Catchments and identified as prime habitat for native lizards in Technical Reports 6, 7, and 11. A number of recommendations are provided for minimising effect and where loss cannot be avoided, the transfer of lizards from these habitats before construction (EMMP Section B-5, page 20). I would note that these boulderfields are not 'naturally rare ecosystems' which is implied by the Departments comments. They are common and abundant on steep slopes within the highly faulted Sounds Wellington Ecological Region.

212 The Department states in paragraph 29, bullet 2, that more information is needed to *"quantify or estimate the proportion of populations and individuals affected"*. I agree that we still do not have enough information on the presence of bats and more study has been recommended. And additional investigation has been recommended for lizards within affected habitats, prior to earthworks commencing. However, for all other species I would argue that our understanding of their habitat use, the extent and distribution of those habitats, and the relative scale of loss of those habitats beneath the Projects footprint provides sufficient information to determine the scale of adverse effects, and the form that any mitigation must take. I do not believe any additional investigation is required except for bats and lizards.

213 In paragraph 29, bullet 3 the Department suggests more information is needed *"to better provide for recovery of source populations and critical ecosystem processes and functions provided by keystone and other species"*. As discussed above, I am confident that any minor effects on the keystone species identified by the Department are addressed by our consideration of threatened avifauna that utilise the same habitats. I do not believe further investigation is required.

214 In paragraph 29, bullet 5, the Department raises the possibility of pest management to offset adverse effects. I have discussed this when responding to the KCDC submission.

215 The Department states in paragraph 30 that there are "*a number of deficiencies in the draft conditions and management plans that have been proposed in the Applications*". My response to this is that the Proposed Ecological Monitoring and Management Plan can only be a draft at this stage until further work including detailed design is carried out. Further the Draft EMMP is complemented by consent conditions which require the consent holder to undertake specific actions to finalise it as follows:

The consent holder shall, in consultation with the Director-General of Conservation,

(a) *update and finalise the Draft Ecological Management and Monitoring Plan dated July 2011 to:*

i. include performance measures, actions, methods, trigger levels and monitoring programmes designed to achieve the objectives specified in Conditions E.22 and E.23 above;

ii. provide for the continual review and monitoring of the effects of construction activities, including the inspection of all erosion and sediment control devices after all heavy rainfall trigger events, and the upgrading of devices where necessary to achieve the most efficient and effective treatment;

216 I believe that these conditions satisfy the concerns raised in paragraph 30.

217 The Departments submission concludes with a number of conditions of consent. Those that affect my consideration of terrestrial ecology are:

217.1 33(a) Conditions to ensure that there is no-net loss to indigenous biodiversity as a result of construction and operation of the TGP;

217.2 33(d) Conditions requiring "Avoidance through detailed design" as recommended in the BML EIA Page 104;

217.3 33(e) Conditions establishing standards to be achieved, rather than leaving "objectives" to be set under management plans at later dates;

217.4 33(g) Conditions requiring the effects on herpetofauna and invertebrates are appropriately avoided, remedied or mitigated;

217.5 33(p) A condition recording that NZTA obtains the Ministers written approval in respect of any disturbance or killing of any protected wildlife as defined under the Wildlife Act 1953.

218 With regard to a condition requiring no net loss of biodiversity, I am confident that mitigation proposed will in fact lead to a long term net gain of indigenous biodiversity within the Pauatahanui watershed. The retirement, protection and revegetation of 400ha of farmland will greatly expand the extent of indigenous vegetation and habitat for flora and fauna within this landscape. The

management plans describe how this will be archived and consent conditions will ensure that this work will be carried out. I am comfortable that the current consent conditions will meet the Departments aims.

219 With regard to a condition requiring avoidance through detailed design, the EMMP lists all sites where there are opportunities to further avoid or minimise adverse effects on some valued habitats and vegetation communities during detailed design and also provides mechanisms for carrying this out. Further, the completion and implementation of the EMMP is a requirement of proposed consent condition E.24. I therefore believe the Departments requirement is already addressed. For clarity, however, we note that the wording must be 'the avoidance or minimisation through detailed design' as avoidance is not possible for many of the sites we have identified and listed, but reduction of effects may be possible for many.

220 With regard to a condition requiring standards rather than objectives, as noted above (paragraph 158), proposed consent condition E.24 already requires finalising of the EMMP to include the establishment of performance measures, trigger levels and monitoring programmes, and that this plan be completed in consultation with the Department. I believe this request is already addressed.

221 With regard to a condition requiring the avoidance, remedy or mitigation of effects on herpetofauna, this is again dealt with in our proposed EMMP and condition E.24. Further I note that condition E.22 (a) and (b) require re-establishment of lizard and invertebrate habitat and minimising mortality during construction. I believe this request is already addressed.

222 With regard to a condition recording NZTA to obtain the Ministers written approval in respect of any disturbance or killing of any protected wildlife as defined under the Wildlife Act 1953, this duplicates the current consenting process under that Act (which already requires such approval).

CONCLUSIONS

223 Through this process continual refinement of the road alignment has been carried out in an attempt to avoid the most ecologically sensitive areas, or where that was not possible to minimise effects as much as possible.

224 The most significant change made has been to move the alignment outside the existing designation to avoid forests and stream habitat of high value on the eastern slopes of Te Puka and Horokiri Streams. There have been a large number of other smaller changes of alignment or design that have all contributed to an improved environmental result. In my opinion the proposed alignment is a considerable improvement over any of the options that are constrained to the current designation. Overall, I am satisfied that every opportunity to avoid effects through refinement of the road alignment has now been explored.

225 Where the alignment could not avoid areas of ecological value or important habitats for flora and fauna, I believe all reasonable efforts have been made to minimise the extent of loss, and to identify further opportunities for minimising effects through the detailed design process that will follow.

226 The result of this work is that the great majority of the proposed Project designation now lies in a pastoral landscape, with only limited areas of mature vegetation and habitat for indigenous flora and fauna. Some further opportunities to minimise effects during detailed design process have also been identified.

227 Overall, the avoidance or minimisation of effects through Project shaping and initial design have reduced the scale of effects on valued terrestrial flora and fauna to the point that residual effects can in my view they can be readily mitigated.

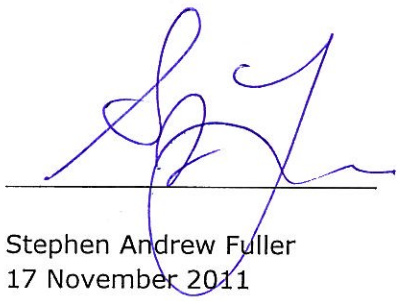
228 The quantum of mitigation has been calculated and a number of sites selected where this mitigation can be carried out. Assuming the proposed mitigation is put in place, there will be a reduction in adverse effects over time, to the point where most effects are considered to be neutral.

229 Overall, with the scale of retirement and revegetation that is proposed, some of which has already been carried out, I believe there will be long term ecological benefits for the terrestrial ecology, through the formation of a green corridor along large sections of the alignment which will in some areas connect other fragments of native bush and habitats. Some mitigation planting has already been carried out successfully and provides a template for future activities. In addition the revegetation of steep slopes in the Te Puka, Horokiri, and Duck Catchments will, over time, reduce slope

instability and erosion with benefits for freshwater and marine ecosystems.

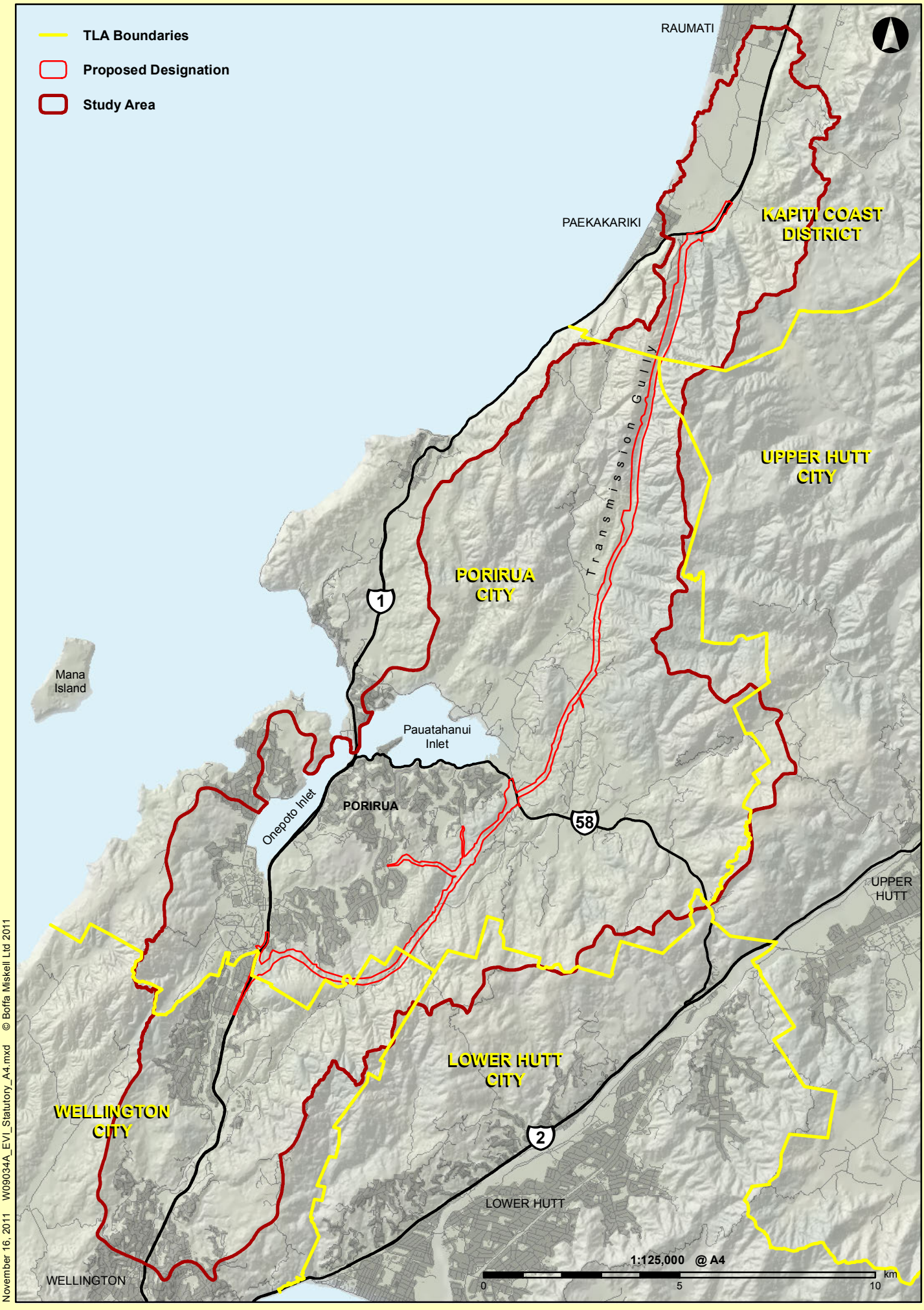
230 To provide confidence that these benefits will occur, BML ecologists were involved in the development of indicative Site Specific Environmental Management Plans that establish a template for these documents during construction We have also developed a "Proposed Ecological Management and Monitoring Plan" which describes the methods for management of the site during construction that are necessary to ensure potential effects are appropriately monitored, management responds accordingly, and that the required ecological mitigation is achieved. We have assisted in the development of consent conditions to this effect.

231 I consider that NZTA has acknowledged the ecological importance of the native forest remnants and of rare and threatened fauna along the alignment. All reasonable steps have been taken to avoid or minimise the potential effects of this Project on this flora and fauna and the habitats. Where adverse effects cannot be avoided NZTA has accepted our recommendations and made adequate provision for remedy or mitigation of effects.



Stephen Andrew Fuller
17 November 2011

ANNEXURE A: MAP 1: STUDY AREA



Boffa Miskell

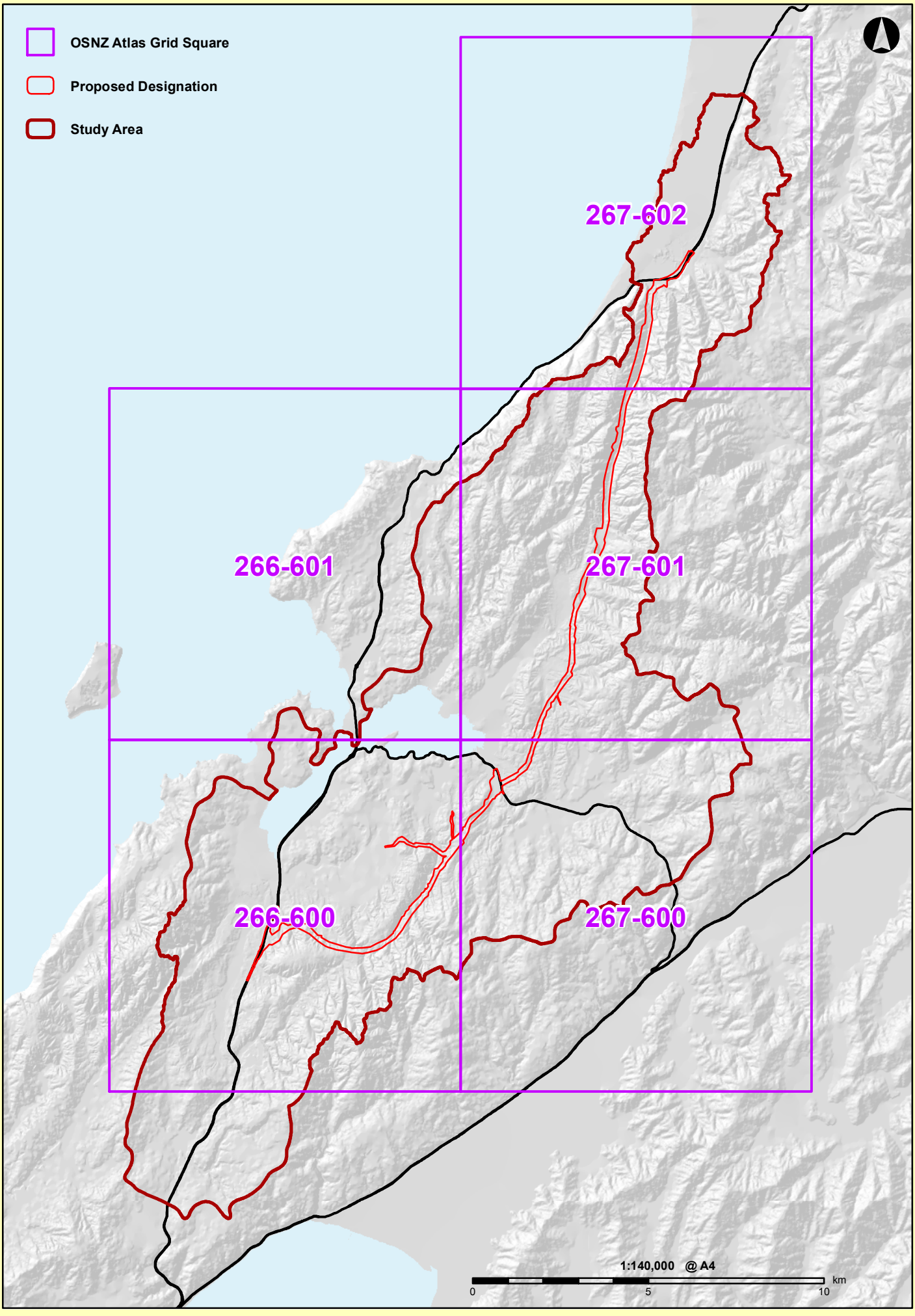
NZ TRANSPORT AGENCY WAKA KOTAHI

TRANSMISSION GULLY

STUDY AREA & TERRITORIAL BOUNDARIES

1

ANNEXURE B: MAP 2: AVIFAUNA EXTENT (OSNZ)



Boffa Miskell

NZ TRANSPORT AGENCY
WAKA KOTAHI

TRANSMISSION GULLY
OSNZ ATLAS GRID 2