

IN THE MATTER OF

the Fast-track Approvals Act 2024 ("FTAA")

AND

IN THE MATTER OF

an application for approvals by **NZ Transport Agency Waka Kotahi** to construct, operate and maintain the State Highway 1 Wellington Improvements project

**STATE HIGHWAY 1 WELLINGTON IMPROVEMENTS PROJECT
TECHNICAL REPORT #10
TERRESTRIAL ECOLOGY ASSESSMENT**

Table of Contents

Table of Contents	ii
1. INTRODUCTION	4
Qualifications and experience	4
Code of conduct	4
Project description	4
Scope of assessment	5
2. EXECUTIVE SUMMARY	6
Existing environment	6
Potential adverse effects without mitigation	6
Proposed measures to avoid, remedy or mitigate adverse effects, including conditions	6
3. ASSESSMENT FRAMEWORK	8
Planning context	8
Industry best practice or management guidance	8
4. ASSESSMENT METHODOLOGY	10
Desktop review of available information	10
Specific field and assessment methods	10
Approach to assessing effects	13
Residual effects approach	14
5. EXISTING ENVIRONMENT	15
Site description	15
Whole of Project	15
Terrace Tunnel	18
Te Aro	20
Basin Reserve	20
Mount Victoria Tunnel	21
Eastern Connections	23
Summary of ecological values	24
6. ASSESSMENT OF CONSTRUCTION EFFECTS	26
Permanent loss of terrestrial vegetation and habitats	26
Permanent loss of threatened plant species	31
Injury or mortality of indigenous fauna during vegetation clearance	31
Disturbance effects on indigenous fauna during vegetation clearance and construction	33
Incidental discovery of 'At Risk', 'Threatened' or protected invertebrates and non-vascular plants during construction	33
Summary of effects	34
7. ASSESSMENT OF OPERATIONAL EFFECTS	36
Edge effects	36
8. RESIDUAL EFFECTS MANAGEMENT	37
Wellington Town Belt Restoration	37
9. CONSULTATION	43
10. CONCLUSION AND RECOMMENDATIONS	45

References	46
ANNEXURE A: Ecology Maps	48
ANNEXURE B: Ecological Impact Assessment Guidelines	49
ANNEXURE C: Species Tables.....	50
ANNEXURE D: Photographs of representative vegetation types.....	51
ANNEXURE E: BOAM Model summaries, justification tables, and assessment against the Principles of Offsetting (as outlined in the NPS-IB).....	52

1. INTRODUCTION

1. My full name is Joshua Andrew Markham. I have prepared this technical assessment with the support and collaboration of Samuel Mulcock (Ecological Consultant, Tonkin + Taylor, Auckland), Jamie MacKay (Senior Ecologist, Tonkin + Taylor, Auckland), David Pickett (Senior Terrestrial Ecologist, Tonkin + Taylor, Wellington), Shaun Morgan (Environmental Scientist, Tonkin + Taylor, Auckland), and Bex Diederichsen (Ecologist, Tonkin + Taylor, Wellington). This technical assessment addresses the terrestrial ecology aspects of the SH1 Wellington Improvements Project.

Qualifications and experience

2. I am a Principal Ecologist with Tonkin & Taylor Ltd (T+T), based in Auckland, where I have been employed since 2016 to present.
3. I hold a Bachelor of Science (Ecology) and Postgraduate Certificate from Massey University of Palmerston North.
4. I have 15 years' experience in the field of ecology. In this time, I have worked across New Zealand in a wide variety of environments on projects for both the private and public sectors. From 2011 to 2013, I worked for Horizons Regional Council as Freshwater Field Ecologist; 2013 to 2015, I worked for Auckland Council as a Freshwater Ecologist advising on stream work resource consent applications; from 2015 to 2016 I worked for Golder Associates (now WSP) as a Senior Freshwater Ecologist, before joining Tonkin + Taylor.
5. As an ecologist I focus on Landscape Ecology combining both Freshwater and Terrestrial Ecological aspects and have undertaken lead ecologist roles on the following transport infrastructure projects: Petone to Grenada State Highway, Northland Corridor (Ara Tūhono), State Highway 25A (SH25A), Hawkes Bay Expressway (HBEX), Transport Rebuild East Coast (TREC), O Mahurangi (Penlink), Te Awa Kairangi (Riverlink), Te Ahu a Turanga (Manawatū Tararua Highway), Te Ara o Te Ata (Mt Messenger Bypass Project), and Puhoi to Warkworth Motorway Project.
6. I am familiar with the site and have visited it on many occasions.

Code of conduct

7. I confirm that I have read the code of conduct for expert witnesses contained in the Environment Court Practice Note 2023. This assessment has been prepared in compliance with that code, as if it were evidence being given in Environment Court proceedings. In particular, unless I state otherwise, this assessment is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Project description

8. The State Highway 1 (SH1) Wellington Improvements project (the Project) is a Road of National Significance (RoNS) which improves SH1 in Wellington City. The proposal includes the construction of improvements to SH1 within Wellington City, extending over 5 km through the city. The Project will provide for more efficient and reliable access on SH1 and includes duplicate tunnels at the Terrace and Mount Victoria, a new layout at the Basin Reserve as well as improvements along the remainder of the SH1 corridor from north of the Terrace Tunnel to the intersection of Cobham Drive and Evans Bay Parade. The Project aims to attract traffic

onto SH1, reduce traffic on other key routes, unblock critical bottlenecks on the state highway, maintain access for local movements and enable public transport growth.

9. A detailed Project Description is provided in the Assessment of Environmental Effects (AEE) report. The Project Description provided in the AEE should be read in conjunction with the General Arrangement drawings (SH1WI-DES-00-GEN-DRG-00010_00030). The scope of assessment outlined in this report is addressed below.
10. The information provided in the General Arrangement drawings outline the Indicative Design for the Project. Any numbers, area or dimensions outlined are approximate and may change as a result of detailed design. The final alignment of the Project (including the designs and locations) will be refined and confirmed at the detailed design stage following consenting.

Scope of assessment

11. This assessment addresses the following matters:
 - i. The methodology I have used to assess the effects of the Project
 - ii. The existing environment
 - iii. Effects of the Project during operation
 - iv. Effects of the Project during construction
 - v. Recommended measures to avoid, remedy or mitigate adverse effects
12. The 'Project area' as discussed in this report is defined as all land within the Project Designation, including existing and proposed extensions to the designation, where works are proposed. An overview of these areas is provided in Figure 1 below. Refer to the General Arrangement drawings (SH1WI-DES-00-GEN-DRG-00010_00030) for detailed extent of works. Where effects to ecological values extend beyond the Project Designation (i.e., the 'Zone of Influence'; ZOI), these have been discussed within the relevant report sections.

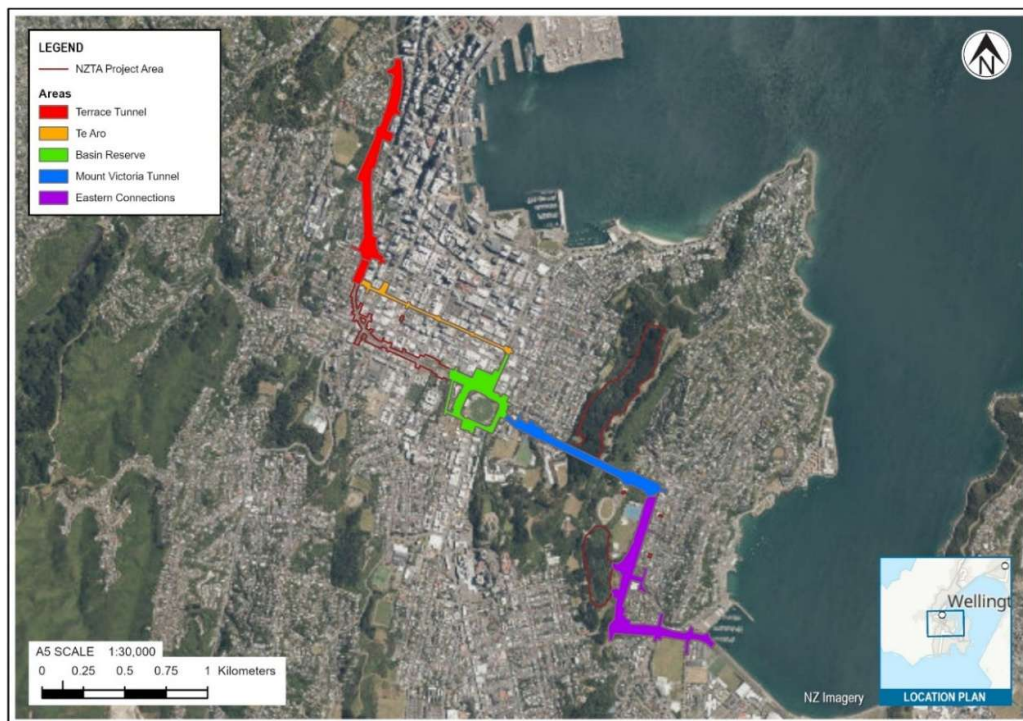


Figure 1 - Overview of Project area

2. EXECUTIVE SUMMARY

Existing environment

13. The Project sits across numerous terrestrial ecological features including the Wellington Town Belt around the Mount Victoria and Terrace Tunnels, private gardens, and mature specimen trees. These features occur within the highly urbanised Wellington City landscape and are subject to historic and ongoing disturbances typical of a changing metropolitan environment.
14. The Project area supports a range of indigenous and exotic flora and fauna, including:
 - i. **Avifauna:** Nineteen indigenous birds potentially occurring within the Project area, including regionally and nationally 'At Risk' and 'Threatened' species such as bush falcon/kārearea, North Island robin/toutouwai, and North Island rifleman/tītīpounamu. Common species like tūī, kererū, and bellbird/korimako have been observed across the Project area
 - ii. **Herpetofauna:** 7 indigenous lizard species have been identified as potentially present within the project area based on nearby records and an assessment of habitat values, with one confirmed as present and another considered likely present (based on detected footprints and nearby observations) within the Project area. Several of these species are classified as 'At Risk' or 'Threatened'
 - iii. **Vegetation:** The project area contains regenerating broadleaf forest, mixed indigenous-exotic forest and scrub, and specimen trees, including mature pōhutukawa. Seven nationally 'At Risk' and two regionally 'Threatened' indigenous plant species have been identified in the Town Belt, with two confirmed within the Project area

Potential adverse effects without mitigation

15. Without efforts to avoid, minimise, or remediate effects to terrestrial ecology, the Project will result in:
 - i. Permanent loss of up to 5.56 ha of terrestrial vegetation (4.73ha within the consent design), including high-value regenerating broadleaf forest and moderate-value mixed indigenous-exotic forest and specimen trees
 - ii. Permanent loss of habitat for indigenous birds and lizards, including 'At Risk' and 'Threatened' species
 - iii. Injury or mortality of indigenous fauna during vegetation clearance
 - iv. Disturbance effects on indigenous fauna during construction, including noise, dust, and vibration impacts

Proposed measures to avoid, remedy or mitigate adverse effects, including conditions

16. Various measures are recommended or have been undertaken to address adverse effects:
 - i. **Minimising Vegetation Clearance:** Vegetation clearance has been reduced in some areas by up to 10% through consent design iterations. Clearance of vegetation may continue to be minimised where practical through detailed design; replace lost vegetation with indigenous species in key locations
 - ii. **Threatened Plant Species:** Undertake targeted surveys, potential translocation, and replacement planting

- iii. **Fauna Management:** Implement a Lizard Management Plan, including salvage, relocation, and habitat enhancement at release sites. Prepare and implement an AMP, detailing how works will be timed outside of peak bird breeding season and appropriate management implemented if clearance is required within peak bird breeding season
 - iv. **Offsetting the loss of high and moderate value terrestrial vegetation:** I have recommended measures to offset the loss of high and moderate value terrestrial vegetation, with the assistance of Biodiversity Offsetting and Accounting Models (BOAMs). The recommended offset is revegetation planting across the Wellington Town Belt (if possible). A recommended specimen tree replacement ratio of three replacement trees for every identified specimen tree removed has been proposed. Details of recommended offsets are outlined in this report
17. Subject to full implementation of these recommended measures, the overall level of ecological effects is expected to be reduced to low or very low for most features, with residual effects adequately addressed through the recommended ecological offsetting.

3. ASSESSMENT FRAMEWORK

Planning context

18. The planning context for this assessment includes the provisions of the National Policy Statement for Indigenous Biodiversity 2023, as amended in December 2025 (NPS-IB).
19. Also relevant are the local regional and district plans. I understand while significant natural areas are included in the Wellington District Plan 2024, these are in rural locations and none are identified within the Project area. The Project area includes land that is zoned as Special Purpose (Wellington Town Belt Zone). The key objective for this zone is WTBZ-O1 'The Wellington Town Belt is used by and accessible to the public as a public recreation ground in such a way that maintains and, where possible, enhances the predominant values of the zone, which include:
 - i. Large areas of public open space with a high degree of accessibility, and landscape values which must be protected and enhanced
 - ii. A low extent and scale of built development and paving that is ancillary to public access to and use of the Wellington Town Belt for informal recreation activities, organised sport and recreation activities, and conservation activities
 - iii. A patchwork of vegetation of varying types, with the proportion of native vegetation increasing through continued planting and regeneration to support healthy indigenous ecosystem
 - iv. Historic and cultural heritage values, including the presence of Sites and Areas of Significance to Māori, notable trees, and heritage structures
20. The following statutory documents, frameworks and plans are relevant to this EclA:
 - i. NPS-IB, including Policy 3.16, which directs the approach for managing effects on indigenous biodiversity outside of SNAs and the definition of 'effects management hierarchy'
 - ii. Regional Policy Statement for the Wellington Region (2013) and RPS Change 1 Appeals Version (September 2025)
 - iii. Greater Wellington Regional Council Natural Resources Plan (NRP)
 - iv. Wellington City 2024 District Plan
 - v. Wildlife Act 1953
 - vi. Wellington Town Belt Management Plan (WCC) which recognises the important cultural, recreation, landscape and ecology values contained within the Wellington Town Belt

Industry best practice or management guidance

21. This assessment of ecological effects has been informed by professional judgement and guided by the following best practice guidelines:
 - i. Ecological Impact Assessment Guidelines – EIANZ Guidelines for use in New Zealand: Terrestrial and freshwater ecosystems. (Roper-Lindsay et al., 2018)
 - ii. Department of Conservation inventory and monitoring toolbox: Herpetofauna: Artificial Retreats (Lettink, M., 2012)
 - iii. Department of Conservation inventory and monitoring toolbox: Herpetofauna: Systematic searches (Hare, K., 2012)

- iv. Sampling techniques for New Zealand lizards. In New Zealand Lizards (pp. 269-291). Springer, Cham. (Lettink & Hare., 2016)

4. ASSESSMENT METHODOLOGY

Desktop review of available information

22. Publicly available information and databases were reviewed in October 2025 to inform the methodology and approach to the ecological assessment and to establish the ecological context of the site. This included a review of the following available information:
 - i. Greater Wellington Regional Council geographic information system (**GIS**) layers:
 - (a) Natural Resources Plan layers
 - (b) Current Ecosystem Extent layers
 - ii. Wellington City Council GIS: WCC District Plan Schedule 7: Sites and Areas of Significance to Māori
 - iii. iNaturalist database (accessed 12 October 2025, <https://iNaturalist.org>)
 - iv. eBird New Zealand Bird Atlas (accessed 12 October 2025) (<https://ebird.org/atlasnz/home>)
 - v. Wellington City Council Forest bird monitoring data (McArthur et al., 2024)
 - vi. Department of Conservation Herpetofauna Database (updated August 2024)
 - vii. Department of Conservation Bat Database (updated 5 August 2025)
 - viii. New Zealand Plant Conservation Network Checklists (**NPZCN**, accessed 12 October 2025)
 - ix. Manaaki Whenua | Landcare Research: [Maps » Our Environment](#)
 - x. Historic aerial imagery (Retrolens (<https://retrolens.co.nz/>) and Google Earth Pro historical imagery tool)
23. Ongoing consultation with Taranaki Whānui ki Te Upoko o te Ika and Ngāti Toa Rangatira, the mana whenua of Te Whanganui-a-Tara (Wellington), is being undertaken in regard to multiple components of this report, including the recommended residual effects management measures and the wildlife approval process.

Specific field and assessment methods

24. As noted above, I am familiar with the Project site and have visited it on many occasions. Specific site visits to assess ecological values within the project area were conducted by me and/or Tonkin + Taylor colleagues on the below dates:
 - i. 30 September 2025
 - ii. 20 October 2025
 - iii. 10 November 2025
 - iv. 11 November 2025
 - v. 17 November 2025
 - vi. 18 December 2025
 - vii. 20 May 2026

Vegetation and habitats

25. Vegetation surveys of vascular plants were undertaken during the site visits targeting forest and scrub vegetation cover within the Project areas, including areas of Town Belt, parks and reserves, roadside plantings, and specimen trees. The following information was recorded at each survey location:
 - i. Incidental observations of vascular plant species
 - ii. Habitat descriptions and assessment of likely fauna presence/use
26. Google Earth Pro Aerial Imagery and ESRI New Zealand was used to map the spatial extent of vegetation coverage in GIS. Aerial Imagery shows that the bulk of the project areas comprise built-up urban environments with numerous residential dwellings. Vegetation within residential dwellings has been mapped as 'Private gardens' for completeness.
27. A desktop assessment of 'At Risk' or 'Threatened' plant species was undertaken using iNaturalist and NZPCN databases.
28. A full list of plant species observed at all sites is provided in Annexure B. Photographs of representative vegetation are provided in Annexure D.

Non-vascular plants and fungi

29. A desktop review of records of non-vascular plants (mosses, liverworts, and hornworts) and fungi from within the project area and associated forested areas (such as the Town Belt and parks/reserves) was undertaken using iNaturalist observations and online documentation of location populations/observations, focussing on species with a national conservation status of 'At Risk' or 'Threatened'.
30. The iNaturalist database did not present any records for 'At Risk' or 'Threatened' non-vascular plants and fungi. As such, they are not considered further in this assessment.

Annelids, Arthropods, and Molluscs

31. A desktop review of annelid, arthropods (insects and arachnids), and mollusc records from within and around the project area was undertaken using iNaturalist observations and online documentation of local populations/observations, focussing on species with a national conservation status of 'At Risk' or 'Threatened', including those listed under Schedule 7 of the Wildlife Act 1953.
32. The following species were identified within 10 km of the Project area through the desktop review; however, they are considered unlikely to present within the Project area for the reasons outlined below:
 - i. **Cook Strait Giant Wētā** (*Deinacrida rugosa*, 'Threatened – Nationally Vulnerable'; Trewick et al., 2022): This species is only found in a managed population held at Zealandia Te Māra a Tāne, a pest-free sanctuary located in the suburb of Karori
 - ii. **Travers' land snail** (*Powelliphanta traversi latizona*, 'Threatened – Nationally Endangered'; Walker et al., 2024). The only known population of this species within 10 km of the project area is restricted to Khandallah Park (GRWC, 2019). Vegetation within the Project area generally lacks suitable microhabitat preferred by *Powelliphanta spp.*, such as consistent areas of deep leaf litter and soft, friable soils rich in organic matter
33. No other records of 'At Risk' or 'Threatened' species, or those listed under Schedule 7 of the Wildlife Act 1953, were noted within the project area. Habitat suitability for annelids, arthropods and molluscs is highly limited across the Project area, however, there remains the potential for incidental discovery of 'At Risk', 'Threatened', and protected invertebrate species.

While considered unlikely, the potential for incidental discovery of 'At Risk' or 'Threatened' fauna is addressed in Section 6.

Avifauna

34. All incidental bird observations (both visual and auditory) were recorded during the site visit. These records, together with the results of the desktop assessment, are provided in Annexure C. Areas of suitable habitat for terrestrial avifauna was also recorded during the on-site assessment.
35. Most of the data used for this assessment has been derived from nearby records found in the avifauna databases listed in the Desktop review of information.
36. Due to the extensive diversity of terrestrial and coastal avifauna within the wider Wellington region, an assessment of the likelihood of presence within the Project area has been undertaken.

Bats

37. A review of the DOC National Bat Database identified 528 acoustic bat surveys conducted within a 25 km radius of the Project. No bats were recorded during any of these surveys. The nearest detection of a bat is a 2024 record of lesser short-tailed bat (*Mysticina tuberculata rhyacobi*; 'At Risk – Declining' (O'Donnell et al., 2023)) from a site approximately 30 km from the Project area. The predominance of highly urbanised environments, lack of extensive mature indigenous forest, and lack of suitable roosting and foraging habitats greatly limit the likelihood of bats being present within the project area. As a result, bats are not considered present within the Project area and are not assessed further in this report.

Herpetofauna

38. A desktop review to assess potential lizard species' presence in the landscape within and surrounding the Project area was informed by the DOC herpetofauna database (DOC, November 2023) and publicly collected lizard observations on iNaturalist. In total, seven indigenous lizards were identified within a 5 km radius of the Project area. This includes five nationally 'At Risk' and two 'Not Threatened' species, as outlined in Table 3.
39. Lizard values across the Project area have been assessed using the following methods:
 - i. **On-site lizard habitat mapping:** identification of macro and micro-habitat availability within mapped vegetation types across the Project area
 - ii. **Tracking tunnel survey:** Deployment of 142 tracking tunnels across 3.6 ha of vegetation, targeting suitable habitat features such as dense rank grass, leaf litter, harakeke (flax/*Phormium tenax*), scree/rock piles, and rubbish piles/non-organic debris. Tracking tunnels were baited using fresh banana and left for a minimum of seven consecutive nights
 - iii. **Nocturnal spotlighting survey:** Nocturnal spotlighting was undertaken along a 2.5 kilometre transect to detect the presence of crepuscular/nocturnal arboreal geckos within suitable vegetation types. A total of 13.5 person-hours of night-time gecko spotlighting was undertaken across three nights
 - iv. **Manual habitat searches:** Systematic manual habitat searching was undertaken within vegetation types containing suitable habitat, targeting areas such as dense rank grass, tradescantia (*Tradescantia fluminensis*), deep leaf litter, coarse woody debris, and inorganic materials. Twelve person hours of manual habitat searching was undertaken across the project area

40. One copper skink (*Oligosoma aeneum*, At Risk – Declining; Hitchmough et al., 2025) was observed during nocturnal spotlighting surveys undertaken on 25 November 2025, and two tracking tunnels detected the presence of unknown skink species within the Project area. The unknown skink species is highly likely to be native based on the shape of the footprints. Locations of skink detections are shown in Annexure A.
41. On-site lizard habitat mapping and an assessment of habitat suitability against potentially present species (outlined in Table 3) has informed a likelihood-of-presence assessment for those species not detected during on-site surveys.
42. A single record of a forest gecko (*Mokopirirakau granulatus*; nationally 'At Risk – Declining') was identified during the database search. The Wellington Region sits outside of the known natural geographic range of forest gecko (New Zealand Herpetological Society), and the database record is likely a misidentification. As such forest gecko has not been considered further in this assessment.
43. The dates, personnel and weather conditions during the above surveys are outlined in Table 1 below. Weather conditions for all surveys met best practice guidelines for lizard surveys (Hare, 2012).

Table 1: Dates and weather conditions for lizard surveys

Date	Survey methodology	Minimum temperature during survey period (°C)	Maximum temperature (°C)	Weather	Personnel
10-17 November 2025	Tracking tunnel survey	10.5	21.2	Overcast with periods of clear and sunny weather. 11.4 mm total rainfall during survey period.	Sam Mulcock Bex Diederichsen
11 November 2025	Nocturnal spotlighting	13.0	18.4	Low wind and no rain during spotlighting.	Sam Mulcock Bex Diederichsen
25 November 2025	Nocturnal spotlighting	12.5	24.6	Low wind and no rain during spotlighting.	Sam Mulcock Bex Diederichsen
18 December 2025	Nocturnal spotlighting	14.7	20.8	No wind or rain during spotlighting.	Dr Christopher Woolley Bex Diederichsen

Approach to assessing effects

44. The method applied to this EclA broadly follows the Ecological Impact Assessment Guidelines 2018 (EclAG) published by the Environmental Institute of Australia and New Zealand (Roper-Lindsay et al., 2018). The guidelines provide a standardised framework and matrix allowing a consistent and transparent assessment of ecological effects. I have also applied my professional judgement.
45. The guidelines were used to establish the following (Refer to Annexure B for the criteria and tables used in this assessment):
 - i. The ecological values of terrestrial areas within the sites (Annexure B Table 1 to Annexure B Table 4)
 - ii. The magnitude of effect (Annexure B Table 5) on ecological values from the proposed Project works in the absence of any controls
 - iii. The overall level of effects to determine whether avoidance, minimisation or remediation is required (Annexure B Table 7)

- iv. The magnitude of effect and overall level of effect, taking into consideration any additional measures to avoid, minimise or remedy effects
- 46. Where an overall level of effect is assessed as moderate or higher after applying proposed measures to avoid, minimise and remediate effects, then additional effects management in the form of offset and/or compensation is recommended to achieve a no net loss of biodiversity values. Details of how these residual effects are approached within this EclA are outlined below.

Residual effects approach

- 47. The EclAG state that if, after all efforts to avoid, minimise, and remedy effects, there remains an overall effect of **moderate** or higher, then consideration of further efforts to address these residual adverse effects in the form of offset and/or compensation is recommended so that at least no net loss of biodiversity value occurs (and, if the effects are in the 'very high' category, then a net biodiversity gain may be appropriate).¹
- 48. The NPS-IB directs that where there are any significant adverse effects on indigenous biodiversity outside of SNAs, these must be managed by applying the effects management hierarchy,² which is defined as avoiding adverse effects where practicable, minimising where practicable, remedying where practicable, and then "*where more than minor residual adverse effects cannot be avoided, minimised, or remedied, biodiversity offsetting is provided where possible*", failing which, biodiversity compensation may be considered.³
- 49. **Biodiversity offset** is defined by the NPS-IB as "...a measurable conservation outcome that meets the requirements in Appendix 3 and results from actions that are intended to:
 - i. *redress any more than minor residual adverse effects on indigenous biodiversity after all appropriate avoidance, minimisation, and remediation measures have been sequentially applied; and*
 - ii. *achieve a net gain in type, amount, and condition of indigenous biodiversity compared to that lost*
- 50. **Biodiversity compensation** is defined by the NPS-IB as "...a conservation outcome that meets the requirements in Appendix 4 and results from actions that are intended to compensate for any more than minor residual adverse effects on indigenous biodiversity after all appropriate avoidance, minimisation, remediation, and biodiversity offsetting measures have been sequentially applied"
- 51. Having regard to both of the above guidance, it is my opinion that where the Project will have moderate or higher residual adverse effects, it is appropriate to consider offset or compensation measures that will achieve at least a no net loss, if not a net gain outcome. The scale of offset or compensation to be provided is a matter of professional judgement, having regard to the particular values of the biodiversity to be lost.

¹ Page 84.

² Policy 3.16.

³ Definition of 'effects management hierarchy'.

5. EXISTING ENVIRONMENT

Site description

52. In addition to existing roads and urban infrastructure, the Project area encompasses forested areas of the Town Belt located around the existing Mount Victoria Tunnel, forested areas around the Terrace Tunnel, private residential gardens, and mature street and reserve trees (identified as 'specimen trees' in this report).
53. The ecology features described in this report occur within the highly urbanised Wellington City landscape and are subject to historic and ongoing disturbances typical of a changing metropolitan environment. Although degraded or regenerating, these features still provide important functions at a regional scale and form part of the wider mosaic of ecosystems supporting local biodiversity. While their urban context is acknowledged, the ecological roles and values have been assessed with regard to their appropriate spatial context.
54. An overview of the Project area and natural features identified and described in this report are provided in Annexure A.

Whole of Project

Avifauna

55. Avifauna values have been assessed across the entire Project area. This section outlines avifauna species values where presence in a foraging or breeding capacity within the Project area is considered possible or likely. Specific habitat values provided by vegetated areas is discussed in the relevant 'vegetation and habitats' sections below.
56. Seventeen species with a national conservation status of 'Threatened', 31 'At Risk', and 24 'Not Threatened' bird species have been recorded via databases within 10 km of the Project (Annexure C). The high diversity of indigenous birds is characteristic of the Wellington Region, containing numerous forest and coastal bird species supported by regional conservation initiatives and, notably, Zealandia Te Māra a Tāne, a pest-free sanctuary located in the suburb of Karori.
57. Of the 72 species recorded via database searches, 19 species are considered possible or likely to forage and/or breed within the Project area (Table 2). This includes six regionally 'Threatened' and 13 'Not Threatened' indigenous bird species.
58. For the purposes of this assessment, national and regional threat classifications have been considered when assigning a species value. Where the national and regional threat status of a species differs, the higher threat classification has been used. In accordance with EclAG, all 'Not Threatened' bird species have been assigned a **low** ecological value, while 'At Risk' and 'Threatened' bird species have been assigned a **high** and **very high** ecological value, respectively.
59. Likelihood of presence has been assessed based on the habitat suitability, context of database records, and proximity of these records to habitat features within the Project area.

Table 2: Indigenous bird species potentially present within the Project area

Common name	Species name	Threat Status – Regional	Threat Status – National	Presence Likelihood	IANZ Value
Bush falcon /kārearea	<i>Falco novaeseelandiae ferox</i>	Threatened - Regionally Critical	Threatened – Nationally Increasing	Possible	Very High
North Island rifleman / tītītipounamu	<i>Acanthisitta chloris granti</i>	Threatened - Regionally Vulnerable	At Risk – Declining	Possible	Very High
New Zealand pipit / pīhoihoi	<i>Anthus novaeseelandiae novaeseelandiae</i>	Threatened - Regionally Vulnerable	At Risk – Declining	Possible	Very High
North Island kaka / kākā	<i>Nestor meridionalis septentrionalis</i>	Threatened - Regionally Vulnerable	At Risk – Recovering	Confirmed	Very High
North Island robin / toutouwai	<i>Petroica longipes</i>	Threatened - Regionally Vulnerable	At Risk – Declining	Likely	Very High
Kākāriki / Red-crowned parakeet	<i>Cyanoramphus novaezelandiae</i>	Threatened – Regional Endangered	At Risk - Relict	Likely	Very High
Bellbird / korimako	<i>Anthornis melanura melanura</i>	Not Threatened	Not Threatened	Likely	Low
Shining cuckoo / pīpīwharau	<i>Chrysococcyx lucidus lucidus</i>	Not Threatened	Not Threatened	Likely	Low
Australasian harrier / kāhu	<i>Circus approximans</i>	Not Threatened	Not Threatened	Possible	Low
Grey warbler / riroriro	<i>Gerygone igata</i>	Not Threatened	Not Threatened	Confirmed	Low
Kererū	<i>Hemiphaga novaeseelandiae</i>	Not Threatened	Not Threatened	Confirmed	Low
Whitehead / pōpokotea	<i>Mohoua albicilla</i>	Not Threatened	Not Threatened	Likely	Low
Ruru	<i>Ninox novaeseelandiae novaeseelandiae</i>	Not Threatened	Not Threatened	Likely	Low
North Island tomtit / miromiro	<i>Petroica macrocephala toitoi</i>	Not Threatened	Not Threatened	Likely	Low
Pūkeko	<i>Porphyrio melanotus melanotus</i>	Not Threatened	Not Threatened	Possible	Low
Tūī	<i>Prothemadera novaeseelandiae novaeseelandiae</i>	Not Threatened	Not Threatened	Confirmed	Low
North Island fantail / pīwakawaka	<i>Rhipidura fuliginosa placabilis</i>	Not Threatened	Not Threatened	Confirmed	Low
New Zealand kingfisher / kōtare	<i>Todiramphus sanctus vagans</i>	Not Threatened	Not Threatened	Likely	Low
Silvereye / tauhou	<i>Zosterops lateralis lateralis</i>	Not Threatened	Not Threatened	Confirmed	Low

60. Various bird species identified in the database searches have not been considered in this assessment on the basis that the Project area does not contain suitable habitat or the known population within 10 km of the Project area is restricted to Zealandia Te Māra a Tāne.
61. Coastal and marine birds, including little penguin/ kororā (*Eudyptula minor*; 'At Risk – Declining') are addressed in the Technical Assessment Report #12 (Ecology – Marine effects). Kororā are known to use habitats within the Project area close to the Evans Bay outfall.

Herpetofauna

62. Herpetofauna values have been assessed across the entire Project area using the methodology outlined in Section 4. This section outlines the results of on-site surveys undertaken to detect the presence of species across the Project area. Specific habitat values provided by vegetated areas are discussed in the relevant 'vegetation and habitats' sections below.
63. No lizards were detected across the Terrace Tunnel and Basin Reserve Project areas. One copper skink (At-Risk- Declining) was detected during nocturnal spotlighting within the Mount Victoria Tunnel project area (Figure 2), and two tracking tunnels recorded the presence of skinks within the Mount Victoria Tunnel project area and Evans Bay outfall within the Eastern Connections project area (Figure 3), respectively. No lizards were recorded during targeted manual habitat searches.



Figure 2 - Copper skink detected during nocturnal surveys on 25 November 2025



Figure 3 - Skink prints detected at Evans Bay Outfall

64. The Evans Bay outfall skink detection is likely to be Northern grass skink (*Oligosoma polychroma*; Not Threatened) because of the habitat type present within the area. This species has also been recorded on Cobham Drive approximately 500m from the Evans Bay Detection.
65. The Mount Victoria Tunnel skink detection is expected to be that of a copper skink or Northern grass skink, based on the microhabitat where the tracking tunnel was installed. Habitat at this survey location included dense rank grass with no canopy and full sunlight exposure, typical of habitats occupied by Northern grass skink and copper skinks.
66. For the purposes of this assessment, both national and regional threat classifications have been considered when assigning a species value. Where the national and regional threat status of a species differs, the higher threat classification has been used. In accordance with EclIA guidelines all 'Not Threatened' indigenous lizard species have been assigned a **low** ecological value, while 'At Risk' and 'Threatened' indigenous lizard species have been assigned a **high** and **very high** ecological value, respectively.

67. Likelihood of presence has been assessed based on the habitat suitability, context of database records, and proximity of these records to habitat features within the Project area. Based on the low detections during on-site surveys, and expert opinion, we conservatively estimate that the combined population of indigenous lizards within the works footprint could be between 20-100 individuals. Ornate skink and glossy brown skink may utilise habitats within the Project area, and the identified gecko species are considered unlikely to be present.

Table 3: Indigenous lizard species potentially present within the project area

Common name	Species name	Threat Status – Regional	Threat Status – National	Likelihood of presence	EIANZ Value
Barking gecko /moko kākārīki	<i>Naultinus punctatus</i>	Regionally Vulnerable	At Risk – Declining	Unlikely	Very High
Ngahere gecko	<i>Mokopirirakau</i> “southern North Island”	At Risk – Declining	At Risk – Declining	Likely	High
Moko pāpā/Raukawa gecko	<i>Woodworthia maculata</i>	Not Threatened	Not Threatened	Unlikely	Moderate
Copper skink	<i>Oligosoma aeneum</i>	At Risk - Declining	At Risk – Declining	Confirmed	High
Ornate skink	<i>Oligosoma ornatum</i>	At Risk – Declining	At Risk – Declining	Possible	High
Glossy brown skink	<i>Oligosoma zelandicum</i>	At Risk – Declining	At Risk – Declining	Possible	High
Northern grass skink	<i>Oligosoma polychroma</i>	Not Threatened	Not Threatened	Likely	Moderate

Terrace Tunnel

68. Assessment of the Terrace Tunnel area focusses on both the current SH1 infrastructure and the surrounding natural environment within the Project area. Broadly, the following areas have been considered in this assessment:
- Land on the eastern side of SH1 from Everton Terrace to the northern entry of the Terrace Tunnel
 - MacDonald Crescent to Ghuznee Street
69. Areas of vegetation not mapped within the project area have not been assessed within this report.

Vegetation and habitats

70. Vegetation present within the Terrace Tunnel area consists of mixed indigenous-exotic forest and scrub, specimen trees, and low-stature vegetation. Approximately 0.67 ha of mixed indigenous-exotic forest and scrub, 0.39 ha of mixed low-stature vegetation, and 25 indigenous specimen trees are present in this area.
71. Mixed indigenous-exotic forest and scrub located around the Terrace Tunnel contains karaka (*Corynocarpus laevigatus*), wattle species (*Acacia* spp.), sycamore maple (*Acer pseudoplatanus*), red matipo (*Myrsine australis*), pine (*Pinus* spp.), and lancewood (*Pseudopanax crassifolius*), found throughout the canopy. Sub-canopy vegetation generally consists of younger canopy species, with understory cover dominated by rank exotic vegetation, including ginger (*Hedychium gardnerianum*), German ivy (*Delairea odorata*), moth plant (*Araujia hortorum*), tradescantia, wild carrot (*Daucus carota*), nasturtium (*Tropaeolum majus*), rank grass, and bare earth. Occasional harakeke flax (*Phormium tenax*), coarse woody debris, and inorganic debris are present.

72. Specimen trees within this area consist of semi-mature pōhutukawa ranging between 5-10 m in height, with historic aerial imagery suggesting an age of more than 25 years old. Pōhutukawa's natural southern limit is thought to be between Pukearuhe (northern Taranaki region) and Mahia Peninsula (Hawke's Bay region), with all pōhutukawa south of these areas typically being planted rather than naturally occurring (de Lange, 2004).
73. Mixed low-stature vegetation encompasses areas of exotic plants or public amenity areas which sit beneath specimen trees or adjacent to man-made structures. This vegetation is expected to undergo infrequent disturbance associated with the maintenance of park or roading infrastructure, restricting vegetation succession into more structurally complex or diverse vegetation.
74. No 'At Risk' or 'Threatened' plant species were observed and all 'Not Threatened' indigenous plant species have been assigned an ecological value of **low**.
75. Woody vegetation associated with areas of Mixed indigenous-exotic forest and scrub and specimen trees may provide low-quality foraging or nesting habitat for common indigenous forest birds such as North Island fantail / pīwakawaka, silvereye / tauhou, grey warbler / riroriro, and tūī. Proximity to existing SH1 infrastructure and location within dense urban environments likely impacts the favourability of this habitat for indigenous nesting birds, with anthropogenic stressors such as noise, light, and higher pest-presence potentially impacting behaviour. However, areas of connected or continuous canopy cover (such as Mixed indigenous-exotic forest and scrub) may still be utilised for nesting by common indigenous forest birds (van Heezik et al., 2008). Additionally indigenous birds may utilise this vegetation for temporary stops and flyways when commuting between more preferable habitats.
76. Although pōhutukawa specimen trees are beyond their natural southern limit in the Wellington region, the species still provides foraging opportunities for nectivorous birds, such as tūī and bellbird / korimako, during its flowering season (typically November to February). As specimen pōhutukawa are mostly isolated to a single canopy, lack connection to other forested areas, and exist in more exposed locations, it is unlikely that they are favourably used for nesting purposes (Thiele, 2025). However, the potential for nesting indigenous forest birds cannot be ruled out.
77. Additional to the provision of low-quality nesting habitat for indigenous birds, large indigenous specimen trees have been assigned a **moderate** ecological value due to the provision of foraging habitat for nectivorous bird species and general ecosystem services (such as air quality improvement). Exotic specimen trees have been assigned a **negligible** ecological value.
78. Areas of Mixed indigenous-exotic forest and scrub within this Project area provide low-quality habitat for the arboreal gecko species listed in Table 3. In addition, due to a general lack of forest connectivity, presence of arboreal geckos within this forest area is considered unlikely. Habitat quality for indigenous skinks varies across this area, with very little native vegetation/groundcover and isolated patches of dense tradescantia and English ivy located in canopy gaps providing low value habitat. No skinks or geckos were detected through this Project area.
79. Isolated areas of mixed low stature vegetation are unlikely to provide suitable habitat for ground-dwelling indigenous skinks, however areas of more substantial coverage and less-frequent disturbance may provide low quality habitat for these skinks.
80. In accordance with EclAG, mixed indigenous-exotic forest and scrub across the Terrace Tunnel area have been assigned a **low** ecological value, primarily due to the provision of low-quality foraging and breeding habitat for common indigenous birds and indigenous lizards.

81. Indigenous specimen trees have been assigned a **moderate** ecological value due to the provision of foraging habitat for nectivorous bird species and general ecosystem services.
82. Mixed-low stature vegetation has been assigned a **low** ecological value, as it provides limited ecological value to indigenous lizards.

Te Aro

83. Terrestrial ecology values and effects within Te Aro have not been assessed. While some specimen trees are present across the road corridors within this Project area, these are not expected to be impacted or altered as a result of the Project, and are therefore not considered further.

Basin Reserve

84. Assessment of the Basin Reserve area focusses on both the current SH1 infrastructure and the surrounding natural environment within the Project area. Broadly, the following areas have been considered in this assessment:
 - i. Tory Street to the intersection of Tasman Street and Rugby Street
 - ii. Cambridge Terrace from Fifeshire Avenue to the Basin Reserve
 - iii. Intersection of Brougham Street and Paterson Street
85. Areas of vegetation not mapped within the Project area have not been assessed within this report.

Vegetation and habitats

86. Vegetation present within the Basin Reserve Project area consists of specimen trees and mixed low-stature vegetation.
87. 32 Pōhutukawa and 13 exotic specimen trees are present within this Project area. Indigenous specimen trees within the Basin Reserve area range in size and maturity, with historic aerials suggesting some specimen trees are over 35 years old.
88. Pōhutukawa specimen trees provide foraging opportunities for nectivorous birds, such as tūt and bellbird / korimako, during its flowering season (typically November to February). Specimen trees in this area lack connectivity to other forested areas and exist in more exposed and urbanised locations. As such, it is considered unlikely that they are used for nesting purposes and provide only seasonal foraging habitat for indigenous nectivorous birds.
89. Additional to the provision of low-quality habitat for indigenous birds, large indigenous specimen trees like those observed across the Project area provide ecosystem services, such as canopy shading or stepping stones for indigenous birds when moving between larger forested areas.
90. Mixed low-stature vegetation comprising 0.48 ha is located within the Basin Reserve area, containing a mix of street/amenity plantings (such as flax, karamu, manuka (*Leptospermum scoparium*) koromiko, karo (*Pittosporum crassifolium*), kōwhai, *Carex* sp. and pohuehue) and exotic rank grasses/vegetation. Mixed low-stature vegetation within this Project area is not considered suitable habitat for indigenous skinks, primarily due to low ecological connectivity and a general lack of habitat complexity. Vegetation around Buckle Street was also cleared in 2013 and replanted in 2015 (assessed via Google Earth Pro historic aerial imagery). No indigenous skinks were detected during the on-site surveys within these areas, but mice were detected on most tracking cards indicating high predator abundance.

91. No 'At Risk' or 'Threatened' plant species were observed and all 'Not Threatened' indigenous plant species have been assigned an ecological value of **low**.
92. In accordance with EclA guidelines, indigenous specimen trees have been assigned a **moderate** ecological value due to the provision of foraging habitat for nectivorous bird species and general ecosystem services (such as air quality improvement). Exotic specimen trees have been assigned a **negligible** ecological value.
93. Mixed-low stature vegetation has been assigned a **low** ecological value.

Mount Victoria Tunnel

94. Assessment of the Mount Victoria Tunnel and Eastern Connections area focusses on both the current SH1 infrastructure and the surrounding natural environment within the Project area. Broadly, the following areas have been considered in this assessment:
 - i. Intersection of Brougham Street and Paterson Street to the western portal of the existing Mount Victoria tunnel
 - ii. The eastern portal of the Mount Victoria Tunnel
 - iii. Wellington Road between SH1 and Henry Street
95. Areas of vegetation not mapped as being within the Project area have not been assessed within this report.

Vegetation and habitats

96. Vegetation present within the Mount Victoria Tunnel area consists of regenerating broadleaf forest, mixed indigenous-exotic forest and scrub, specimen trees, private gardens, and low-stature vegetation. Table 7 summarises the total area of each vegetation type mapped within this project area.
97. Vegetation within private residential property has been assessed using aerial imagery and desktop information. Where necessary, ecological values including specific vegetation and habitat provision values have been assumed using expert opinion and interpretation of nearby fauna records. Private gardens generally contain highly modified exotic/native vegetation, which is likely to be frequently disturbed, and subject to greater selective pressures such as pest predation by domestic animals (i.e., cats).
98. Approximately 1.08 ha of regenerating broadleaf forest is found around the Mount Victoria Tunnel and is contiguous with approximately 22 ha of regenerating broadleaf forest within the Town Belt. A full list of species observed across this area is provide in Annexure C. Vegetation structure includes:
 - i. Canopy vegetation dominated by a mix of broadleaf species including māhoe (*Melicytus ramiflorus*), ngaio (*Myoporum laetum*), karo (*Pittosporum crassifolium*), lemonwood, kōhūhū (*Pittosporum tenuifolium*), and pōhutukawa
 - ii. Sub-canopy vegetation containing varying densities of kawakawa (*Piper excelsum*), rangiora (*Brachyglottis repanda*), lacebark (*Hoheria populnea*), five finger (*Pseudopanax arboreus*), kāpuka (*Griselinia littoralis*) and coastal tree daisy (*Olearia solandri*)
 - iii. Sparsely vegetated ground cover, with occasional pōhuehue (*Muehlenbeckia australis*), Hounds tongue fern (*Microsorium pustulatum*), shaking brake (*Pteris tremula*), and shining spleenwort (*Asplenium oblongifolium*). Coarse woody debris and dense leaf litter constitute most of the groundcover within this vegetation type

99. Nine nationally 'At Risk' indigenous plant species were identified in the desktop assessment within the Town Belt, with three confirmed as present within the project area during site surveys. These species are outlined below in Table 4. Narrow leaved houhere is nationally 'Not Threatened'; however, it has been recorded within the Wellington Town Belt, and it is naturally uncommon in the North Island with few populations of this species existing on protected land.
100. For the purposes of this assessment, both national and regional threat classifications have been considered when assigning a species value. Where the national and regional threat status of a species differs, the higher threat classification has been used.

Table 4: 'At Risk' Indigenous plant species identified as potentially or confirmed present within the Mount Victoria Tunnel project area

Common name	Species name	National threat status (de Lange et al., 2024)	Regional threat status (Crisp et al., 2020)	EIANZ Value	Observed within project area
	<i>Brachyglottis greyi</i>	At Risk – Declining	Threatened -Regionally endangered	Very High	N
Thick-leaved mahoe	<i>Meliclytus crassifolius</i>	At Risk – Declining	At Risk – Regionally declining	High	N
Northern Rātā	<i>Metrosideros robusta</i>	At Risk – Declining	N/A	High	Y
Fierce Lancewood	<i>Pseudopanax ferox</i>	At Risk – Declining	Threatened – Regionally critical	Very High	Y
	<i>Pseudopanax laetus</i>	At Risk – Declining	N/A	High	N
Raukawa	<i>Raukawa edgerleyi</i>	At Risk – Declining	Not Threatened	High	N
Coastal tree daisy	<i>Shawia solandri</i>	At Risk – Declining	N/A	High	Y
Kōpata	<i>Pelargonium inodorum</i>	At Risk – Naturally Uncommon	N/A	High	N
Kōkihi, New Zealand spinach	<i>Tetragonia tetragonoides</i>	At Risk – Naturally Uncommon	At Risk – Regionally naturally uncommon	High	N
Narrow-leaved houhere	<i>Hoheria angustifolia</i>	Not Threatened	N/A	Moderate	N

101. Mixed indigenous-exotic forest and scrub is found around the western tunnel portal and a small area adjacent to private properties, contiguous with the regenerating broadleaf forest surrounding the eastern tunnel portal. These areas contain limited indigenous plants, such as ngaio, mapou, mahoe and koromiko, and common exotic species including gorse (*Ulex europaeus*), kikuyu grass (*Cenchrus clandestinus*), pine (*Pinus radiata*) and English ivy. This vegetation is contiguous with Town Belt, the species mentioned in Table 4 may be present in low numbers through this area. A total of 0.16 ha of mixed indigenous-exotic forest and scrub is located within this Project area.
102. A total of 17 indigenous specimen trees are located within the Project area, consisting of 15 pōhutukawa and two tōtara (*Podocarpus totara*) trees. Most specimen trees within this location maintain canopy connectivity to other specimen trees, however, are mostly disconnected from wider forested areas. This added canopy connectivity likely improves the habitat quality and provision for indigenous bird species.

103. Mixed low-stature vegetation is present beneath some specimen trees across this Project area, mostly associated with un-managed vegetation between the road network and private residences. This vegetation contains a mix of rank grass and exotic weed species, and comprises a total area of 0.12 ha. Although not detected during site surveys, ground-dwelling skinks may be present within low stature vegetation where sufficient connectivity or refugia are present.
104. Regenerating broadleaf forest within the Town Belt is considered to provide high quality foraging and nesting/breeding habitat for indigenous birds and lizards. This habitat has been assessed on the basis of:
 - i. Higher diversity in plant species and structural tiers is likely supporting a more diverse range of avifauna, and potentially arboreal gecko species
 - ii. Multiple 'Threatened' or 'At Risk' bird and lizard species have been recorded within the Town Belt, including the regionally 'Threatened – Regionally Critical' bush falcon/kārearea (Crisp et al., 2023) and 'At Risk – Declining' Ngahere gecko (Joakim Liman, verbal comms)
 - iii. Pest mammal control is undertaken across the Town Belt and wider Hataitai community. Pest mammal control is a core focus of ecological objectives outlined in the Wellington Town Belt Management Plan v1.2 (Wellington City Council, 2018)
 - iv. Canopy connectivity and presence of diverse habitat types in wider environment
105. Regenerating broadleaf forest has been assigned a **high** ecological value, driven by the dominant indigenous vegetation with diverse structure and species assemblage, including two confirmed threatened plant species, the provision of high-quality habitat for indigenous birds, moderate quality habitat for indigenous lizards, and the fact that it currently receives pest animal control.
106. Mixed indigenous-exotic forest and scrub across the Mount Victoria Tunnel area has been assigned a **moderate** ecological value due to its association with the Wellington Town Belt, the provision of moderate-quality foraging and nesting/breeding habitat for common indigenous birds and indigenous lizards, supported by the active pest animal control undertaken across the Town Belt.
107. Indigenous specimen trees have been assigned a **moderate** ecological value due to the provision of foraging habitat for nectivorous bird species and general ecosystem services (such as air quality improvement).
108. Mixed-low stature vegetation has been assigned a **low** ecological value, providing limited low value habitat to indigenous lizards.
109. Private gardens have been assigned a **low** ecological value, as they are generally limited to small, ecologically disconnected areas which are subject to frequent disturbance and higher selective pressures. However, indigenous lizards and birds may utilise garden habitat.

Eastern Connections

Vegetation and habitats

110. Vegetation across the Eastern Connections Project area consists of mixed indigenous-exotic forest and scrub, specimen trees, private gardens, and mixed low-stature vegetation. Table 7 summarises the total area of each vegetation type mapped within this Project area.
111. Mixed indigenous–exotic forest and scrub is found within Hataitai Park adjacent to SH1. This vegetation is characterised by indigenous shrubs beneath a canopy of mature pōhutukawa

and exotic trees (such as eucalypts and wattles). Indigenous shrub species include ngaio, houhere, karo, kohuhu (*Pittosporum tenuifolium*), kawakawa, and tī kōuka (*Cordyline australis*). This vegetation type is contiguous with the Wellington Town Belt, with multiple connections through Hataitai Park, and forms a linear strip along Ruahine Street within the Project area.

112. The high edge-to-area ratio has promoted the establishment of low-growing shrub species along the margins, including hebe (*Veronica stricta*), harakeke, and gorse. Given the connectivity with the Town Belt, additional species listed in Table 4 may also occur in low numbers within this area.
113. In total, 1.96 ha of mixed indigenous–exotic forest and scrub is present within the Project area. Pest animal control devices were observed throughout this vegetation type, indicating ongoing pest animal control.
114. ‘At Risk’ or Regionally ‘Threatened’ Indigenous plant species identified in the desktop assessment within the Town Belt may be present within the mixed indigenous-exotic forest and scrub across this project area. However, none were encountered during on-site surveys.
115. A total of 69 indigenous specimen trees are located within the Project area, consisting of 68 pōhutukawa and a single tī kōuka. Specimen trees across this location are generally isolated, with few forming a connected canopy with other specimen trees. This added canopy connectivity likely improves the habitat quality and provision for indigenous bird species.
116. Approximately 0.34 ha of mixed low-stature vegetation is present beneath some specimen trees across this project area, mostly associated with un-managed vegetation between SH1 and private residences. This vegetation contains a mix of rank grass and exotic weed species. Although not detected during site surveys, ground-dwelling skinks may be present within low stature vegetation where sufficient connectivity or refugia are present.
117. Mixed low-stature vegetation is present in small areas around the Evans Bay outfall, consisting mostly of pohuehue (*Muehlenbeckia australis*) and other small stature plants. Skink prints were detected in one tracking tunnel deployed across this area, and nearby records indicate the presence of northern grass skink within the surrounding environment.
118. Mixed indigenous-exotic forest and scrub across the Eastern Connections project area has been assigned a **moderate** ecological value, primarily due to the provision of moderate-quality foraging and nesting/breeding habitat for common indigenous birds and indigenous lizards, improved by the active pest animal control likely in association with the Town Belt.
119. Indigenous specimen trees have been assigned a **moderate** ecological value due to the provision of foraging habitat for nectivorous bird species and general ecosystem services (such as air quality improvement).
120. Mixed-low stature vegetation has been assigned a **low** ecological value.
121. Private gardens have been assigned a **low** ecological value, as they are generally limited to small, ecologically disconnected areas which are subject to frequent disturbance and higher selective pressures, totalling 0.44 ha across this project area. However, indigenous lizards and birds may utilise garden habitat.

Summary of ecological values

122. A summary of ecological values identified throughout the Project area is provided in Table 5 below.

Table 5: Summary of ecological values

Ecological Features		Ecological Value
Avifauna	Regionally 'Not Threatened' Birds	Low
	Regionally 'Threatened' Birds	Very High
Herpetofauna	Regionally 'Not Threatened' Lizards	Moderate
	Regionally 'At Risk' Lizards	High
	Regionally 'Threatened' Lizards	Very High
Terrestrial vegetation and habitats	Regenerating broadleaf forest (bird and lizard habitat)	High
	Mixed indigenous-exotic forest and scrub (bird and lizard habitat)	Mount Victoria Tunnel: Moderate Terrace Tunnel: Low
	Mixed low-stature vegetation (lizard habitat)	Low
	Private gardens (bird and lizard habitat)	Low
	Indigenous specimen trees (bird habitat)	Moderate
	Exotic specimen trees	Negligible
	Nationally 'At Risk' or regionally 'Threatened' indigenous plant species	At Risk – High Threatened – Very High
	'Not Threatened' narrow-leaved houhere	Moderate

6. ASSESSMENT OF CONSTRUCTION EFFECTS

123. The following section summarises the actual and potential effects of construction activities, before and after proposed effects management measures, on the ecological features and values discussed above. Recommended measures to address effects are included within the relevant section and conclusions are drawn as to the overall effect considering those ecological values. The following effects have been identified for this Project:
 - i. Permanent loss of terrestrial vegetation and habitat for indigenous fauna (birds and lizards)
 - ii. Permanent loss of threatened plant species
 - iii. Injury or mortality of indigenous fauna during vegetation clearance
 - iv. Disturbance effects on indigenous fauna during vegetation clearance and construction
124. Operational effects of the road, such as edge effects, are expected to be similar to current operational effects associated with existing State Highway Infrastructure. Edge effects are discussed in Section 7 below.
125. A summary of the potential effects is provided at the end of this report section. Assessment of the vegetation and habitats that will be removed has been guided by the Vegetation and Building Removal Plans (SH1WI-DES-00-UDL-DRG-00212_00230).

Permanent loss of terrestrial vegetation and habitats

Terrestrial vegetation

126. The permanent loss of terrestrial vegetation and habitats is required in various locations across the Project area to enable the construction of upgrades to SH1 infrastructure.
127. The total extent of vegetation within the Project area comprises 5.56 ha of regenerating broadleaf forest, mixed indigenous-exotic forest and scrub, mixed low-stature vegetation, and private gardens. 143 indigenous specimen trees have been identified within the Project area.
128. Based on the consent design, up to 4.73 ha of vegetation removal and the removal of 105 indigenous specimen trees will be required.
129. The permanent removal of vegetation alters the baseline conditions within the Project area, and the environment post-construction will be changed. Consequently, the magnitude of effect for the permanent removal of terrestrial vegetation and habitats is considered to be **high** without efforts to avoid, minimise, or remedy the extent of vegetation loss within the Project area. An assessment of the unmitigated level of effect is provided in Table 7 below.
130. Regenerating broadleaf forest within the Project area comprises less than 5% of this vegetation type within the Town Belt, and a much smaller percentage across the Ecological District. Despite its abundance in the surrounding environment, regenerating broadleaf forest is considered to have **high** ecological value through the provision of high-quality habitat for indigenous fauna and active pest animal control. Without efforts to avoid, minimise, or remedy the extent of vegetation loss, the permanent loss of this vegetation type results in a **very high** level of effect.
131. Mixed indigenous-exotic forest and scrub within the Mount Victoria Tunnel area is considered to have **moderate** ecological value primarily due a diverse assemblage of native species, active pest control and contiguous canopy connection to the Wellington Town Belt. Without efforts to avoid, minimise, or remedy the loss of this vegetation type, the level of effect is considered to be **high**.

132. Mixed indigenous-exotic forest and scrub around the Terrace Tunnel is considered to have **low** ecological value primarily due to a lack of connectivity to other forest areas and dominance of exotic vegetation. This area of vegetation does however provide stepping stone habitats and linkages across the landscape and may provide limited habitat for indigenous skinks. Without efforts to avoid, minimise, or remedy the loss of this vegetation type, the level of effect is considered to be **low**.
133. Indigenous specimen trees across the Project area similarly present important ecological linkages and stepping stone habitats for mobile fauna, including threatened bird species. Up to 105 indigenous specimen trees (of the 143 total specimen trees) could be impacted by the proposed design. Although beyond its natural southern limit, mature pōhutukawa provide seasonal foraging habitat for nectivorous birds and generally support the movement of bird species throughout the urban environment. Indigenous specimen trees across the project area have been assigned a **moderate** ecological value, and the removal of these trees without efforts to avoid, minimise, or remediate, is expected to result in a **high** level of effect.
134. Mixed low-stature vegetation, private gardens, and exotic specimen trees of **low** ecological value are expected to be lost across the project area. Mixed low-stature vegetation consists mostly of exotic species which provide minimal ecological value across the wider Ecological District. Without efforts to avoid, minimise, or remedy the extent of vegetation loss, the permanent loss of this vegetation type results in a **low** level of effect.
135. Following updates to consent design, measures to avoid, minimise, and remediate effects resulting from the permanent loss of terrestrial vegetation have been identified and proposed (as illustrated on the Indicative Landscape Plans (SH1WI-DES-00-UDL-DRG-00001-00130).
136. Updates during the consent design process following my initial assessment have included reductions in the proposed extent of vegetation loss, including retaining vegetation of high and moderate ecological value within the Mount Victoria Tunnel Project area:
 - i. The extent of vegetation clearance of high ecological value regenerating broadleaf forest reduced from an initial 1.08 ha to 0.93 ha (13.9% reduction) around the eastern portal of the Mount Victoria Tunnel
 - ii. The extent of vegetation clearance of moderate ecological value mixed indigenous-exotic forest and scrub reduced from an initial 1.76 ha to 1.47 ha (16.5% reduction) around the Mount Victoria Tunnel and Eastern Connections Project area
137. Of the vegetation being removed across the Project, approximately 2.4 ha of vegetation (50.7%) is within the Wellington Town Belt across the Mount Victoria Tunnel and Eastern Connections Project area. The remaining 2.33 ha of vegetation (49.3%) is located outside of the Wellington Town Belt area.
138. Additionally, the Project has identified numerous areas suitable for landscape remediation/revegetation following construction completion, with proposed revegetation planting to include indigenous groundcover, shrubland, and broadleaf forest across the Project area. The proposed landscape revegetation planting is outlined in Table 6 below. While not intended as ecological offset or compensation, this landscape remediation planting will eventually provide benefits to local ecology through sustaining general indigenous vegetation cover across the wider landscape.
139. Due to the size and maturity of specimen trees present across the Project area, avoidance, relocation, or trimming activities should be prioritised. In the event specimen trees cannot be avoided or relocated, a replacement ratio of 1:3 is recommended to be incorporated into the landscape planting to ensure ecological value is retained across the Project area.

Replacement specimen trees should be eco-sourced saplings of a regionally appropriate species, with plant schedules and tree locations incorporated into appropriate areas of the landscape design. It is expected that planting of replacement specimen trees at this ratio will meet and/or exceed existing ecological values and ecosystem service provision over the medium to long term (10-25 years).

Table 6: Summary of proposed indigenous landscape planting (sourced from WSP landscape design team, and detailed within the AEE Project Description)

Section	V-A1 - Indigenous groundcover	V-A3 - Indigenous shrubland	V-A4 - Indigenous broadleaf forest
Terrace Tunnel	390 m ²	4,850 m ²	370 m ²
Basin Reserve	9,010 m ²	1,630 m ²	-
Mount Victoria Tunnel & Eastern Connections	11,610 m ²	4,670 m ²	14,550 m ²
TOTAL	21,010 m²	11,150 m²	14,920 m²

140. Following efforts to avoid, minimise, and remediate the permanent loss of terrestrial vegetation and habitats which has occurred through the concurrent consent design development and preparation of this assessment, the magnitude of effect is considered **moderate**, with the overall level of effect for each vegetation type is considered as follows:
 - i. Regenerating broadleaf forest, assessed as having **high** ecological value, has an overall level of effect following efforts to minimise the extent of vegetation clearance and re-establish a proportion of the vegetation type through indigenous landscape planting of **high**
 - ii. Mixed indigenous-exotic forest and scrub (Mount Victoria Tunnel), assessed as having **moderate** ecological value, has an overall level of effect following efforts to minimise the extent of vegetation clearance and re-establish indigenous vegetation through indigenous landscape planting of **moderate**
 - iii. Mixed indigenous-exotic forest and scrub (Terrace Tunnels), assessed as having **low** ecological value, has an overall level of effect following efforts to minimise the extent of vegetation clearance and re-establish indigenous vegetation through indigenous landscape planting of **low**
 - iv. Indigenous specimen trees, assessed as having **moderate** ecological value, has an overall level of effect following efforts to minimise the extent of vegetation clearance and re-establish indigenous specimen trees throughout landscape planting at a ratio of 1:3 of **low**
 - v. Mixed low-stature vegetation, private gardens, and exotic specimen trees of **low** ecological value, following efforts to re-establish indigenous vegetation cover across the project area, has an overall level of effect of **low**
141. The EclAG identifies that where a moderate or higher overall level of effect remains after efforts to avoid, minimise and remedy effects, then further efforts to address these residual adverse effects in the form of offset and/or compensation should occur so that a no net loss of biodiversity value is realised. Therefore, additional recommended measures are presented in Section 8.

Table 7: Summary of terrestrial vegetation types, area/count of impact, ecological value, and overall level of effect

Vegetation type	Project area	Area (ha) / Count present within the project area	Area (ha) / Count impacted	Magnitude of effect (un-mitigated)	Ecological Value	Level of effect (un-mitigated)	Overall level of effect (following mitigation)	Residual effects management recommendation
Regenerating broadleaf forest	Mount Victoria Tunnel	1.08	0.93	High	High	Very High	High	Offsetting recommended – see Section 8.
Mixed indigenous-exotic forest and scrub	Mount Victoria Tunnel	0.16	1.47	High	Moderate	High	Moderate	Offsetting recommended – see Section 8.
	Eastern Connections	1.60		High	Moderate	High	Moderate	Offsetting recommended – see Section 8.
	Terrace Tunnel	0.67	0.56	High	Low	Low	Low	None recommended
Mixed low-stature vegetation	Mount Victoria Tunnel	0.12	0.35	High	Low	Low	Low	None recommended
	Eastern Connections	0.34		High	Low	Low	Low	None Recommended
	Basin Reserve	0.48	0.48	High	Low	Low	Low	None recommended
	Terrace Tunnel	0.39	0.21	High	Low	Low	Low	None recommended
Private gardens	Mount Victoria Tunnel	0.30	0.73	High	Low	Low	Low	None recommended
	Eastern Connections	0.44		High	Low	Low	Low	None recommended
Totals		5.56	4.73					
Indigenous specimen trees	Mount Victoria Tunnel	17	67	High	Moderate	High	Low (long term)	None recommended
	Eastern Connections	69		High	Moderate			
	Basin Reserve	32	23	High	Moderate			
	Terrace Tunnel	25	15	High	Moderate			
Totals		143	105					

Avifauna habitat

142. The removal of vegetation will result in the permanent loss of low, moderate and high-quality habitat for indigenous birds.
143. Threatened and not-threatened indigenous bird species are expected to utilise foraging and nesting habitat across the regenerating broadleaf forest and mixed indigenous-exotic forest and scrub within the Mount Victoria Tunnel area. This vegetation provides suitable foraging and potentially nesting habitat for high value threatened indigenous birds, such as North Island robin / toutouwai ('Threatened – Regionally Vulnerable'), North Island rifleman / tītītipounamu ('Threatened – Regionally Vulnerable') and Bush falcon / kārearea ('Threatened – Regionally Critical'). Common 'Not Threatened' forest birds are also expected to regularly utilise this habitat for foraging or nesting purposes.
144. Other vegetation types across the Project area, including mixed low-stature vegetation, private gardens, and indigenous specimen trees, are likely to provide occasional foraging habitat for common indigenous birds. Nesting is considered unlikely across mixed low-stature vegetation and indigenous specimen trees, as frequent disturbance and greater predation pressures likely deter nest establishment across these vegetation types. Private gardens may provide varying levels of nesting habitat for common indigenous bird species.
145. Habitat provision values have been incorporated into the assessment of ecological value for vegetation types within this Project. As such, the assessment of the level of effect associated with vegetation loss will also account for the loss of these habitat values. The loss of these habitat types is expected to be adequately addressed through landscape plantings and the residual effects management approach detailed in Paragraph 98.

Herpetofauna habitat

146. The removal of vegetation will result in the permanent loss of low and moderate quality habitat for indigenous lizards.
147. Copper skinks and skink prints likely to be Northern grass skink have been recorded within regenerating broadleaf forest, and it is considered likely that both species are present in mixed indigenous-exotic forest and scrub around the Mount Victoria Tunnel Project area. Indigenous skinks may also be present across private gardens. It is likely that ground-dwelling skinks are present in higher numbers within the Mount Victoria Tunnel area due to the ongoing predator control.
148. Arboreal gecko species were not detected across the Project area during the site surveys, however, due to their cryptic nature and the inherent uncertainty associated with nocturnal spotlighting, arboreal gecko species including the Ngahere gecko may be present across the regenerating broadleaf forest and mixed indigenous-exotic forest and scrub across the Mount Victoria Tunnel area, albeit in low numbers. Similarly, the terrestrial gecko species moko pāpā/Raukawa gecko may be present across areas of rocky outcrops or clay crevices within the Wellington Town Belt. Active pest control likely supports ongoing populations of gecko species within these forest areas. Arboreal geckos are not expected to be present across the remainder of the Project area.
149. Habitat provision values have been incorporated into the assessment of ecological value for vegetation types within this Project. As such, the assessment of the level of effect associated with vegetation loss will also account for the loss of these habitat values. The loss of these habitat types is expected to be adequately addressed through landscape plantings and the residual effects management approach detailed in Section 8.

Permanent loss of threatened plant species

150. Seven nationally 'At Risk' plant species, two regionally 'Threatened' plant species, and one 'Not Threatened' but naturally uncommon plant species have been identified as present or potentially present within the Mount Victoria Tunnel or Eastern Connections area. Three of these species have been confirmed as present within this area:
 - i. Coastal tree daisy (*Shawia solandri*; nationally 'At Risk – Declining') within the impacted Regenerating broadleaf forest of the Mount Victoria Tunnel
 - ii. Northern rātā (*Metrosideros robusta*; nationally 'At Risk – Declining'), within the impacted Regenerating broadleaf forest of the Mount Victoria Tunnel
 - iii. Fierce lancewood (*Pseudopanax ferox*; regionally 'Threatened – Regionally critical') within the impacted Regenerating broadleaf forest of the Mount Victoria Tunnel as two 2 m tall saplings
151. All nationally 'At Risk' species are considered to have a **high** ecological value, while regionally 'Threatened' species are considered to have **very high** ecological value. Limited information is available online on the distribution of these species within the Wellington Town Belt and wider Ecological district, and the un-mitigated loss of these species from within the Mount Victoria Tunnel area may reduce the size of local populations of these species. Without effects management, the magnitude of effect is potentially **moderate** for 'At Risk' or 'Threatened' plant species, resulting in a **high** to **very high** overall level of effect.
152. To ensure the loss of 'Threatened', 'At Risk', or naturally uncommon plant species is avoided, minimised, and remedied, the following actions are recommended:
 - i. A survey of the regenerating broadleaf forest and mixed indigenous-exotic forest and scrub area is recommended to map the distribution of 'At Risk', 'Threatened', or naturally uncommon plant species. This survey is recommended to be undertaken within 1 year from the commencement of vegetation clearance and should include details on the extent and population of these species within the potential impact area. Track logs, time spent searching and waypoints of survey efforts will be recorded and captured in the proposed residual effects management measures
 - ii. Following the site survey, presence/absence of 'At Risk', 'Threatened' or naturally uncommon plant species expected to be impacted by the Project can be confirmed. The results of this assessment should be incorporated into the residual effects management proposed for the loss of regenerating broadleaf forest vegetation, whereby a replacement ratio of 1:3 should be utilised for any nationally or regionally 'At Risk', 'Threatened' or naturally uncommon plant species and incorporated into the planting schedule for the proposed revegetation/enhancement planting
153. Following the above steps, it is expected that the magnitude of effect will be reduced to **low**, as impacts on the local population of 'At Risk', 'Threatened' or naturally uncommon plant species will be significantly reduced or avoided. A **high** ecological value combined with a **low** magnitude of effect results in an overall **low** level of effect to threatened or naturally uncommon plant species.

Injury or mortality of indigenous fauna during vegetation clearance

154. Vegetation clearance activities and earthworks have the potential to cause accidental injury and mortality to indigenous 'Not Threatened' and 'At Risk' lizards and birds. All indigenous birds and lizards, regardless of conservation status are protected under the Wildlife Act 1953,

administered by Department of Conservation (DOC), and therefore measures to avoid injury/mortality immediately prior to and during construction are required.

155. As described above, habitat for indigenous birds and lizards is present across all vegetation types. Up to 5.56 ha of vegetation is present across the Project, with 4.73 ha likely to be removed to facilitate construction. Without effects management measures, the potential for lizard and bird injury or mortality during vegetation clearance is considered to have a **moderate** magnitude of effect.

Avifauna

156. Habitat removal during peak bird breeding season (September to January inclusive) can result in direct harm to nests, eggs, and nestlings. An Avifauna Management Plan (AMP) detailing best practice avifauna management measures should be prepared for the Project (and required as a condition of consent). As adult birds are mobile, the plan will focus on minimising the risk of killing or injuring eggs and chicks in nests. Potential adverse effects can largely be minimised by undertaking vegetation clearance outside of peak breeding season.
157. If it is not possible to avoid peak breeding season, the risk of damaging an occupied nest can be minimised through undertaking nest surveys no more than 48 hours prior to vegetation clearance. Nest surveys will include both on the ground visual inspections for any visible nests on branches and / or inspection of cavities and hollows utilised which may be utilised by avifauna for nesting (such as ruru and kōtare).
158. In the event an active nest is detected through the above nest surveys, best practice management of the active nest will be undertaken, including the establishment of a minimum buffer of 20 m around the active nest and active nest monitoring to track chick behaviour and fledging. These management measures will be detailed in the AMP.

Herpetofauna

159. Indigenous lizards may not be able to disperse during site preparation and vegetation clearance works and will therefore be susceptible to injury and mortality. Vegetation clearance in areas of suitable habitat will result in permanent displacement, and may cause stress, injury or incidental mortality of individuals.
160. Implementation of best-practice measures for lizard management will reduce the magnitude of effect of incidental injury and mortality to low. The overall level of effect in accordance with the EclAG framework therefore ranges from low ('Not Threatened' species) to very high (regionally 'Threatened' species, including the barking gecko).
161. The risk of injuring or killing indigenous fauna can be minimised through reducing the spatial extent of vegetation clearance required to complete the works. The risk can be further minimised through the implementation of a Lizard Management Plan (LMP). An Application for Wildlife Approval in respect of lizards detailing the specific requirements under Schedule 7 of the FTAA, including a Lizard Management Plan, has been prepared in conjunction with this report and for consideration as part of this FTAA process.
162. The LMP supporting the Application for Wildlife Approval details measures to salvage lizards from the works area and relocate them to a release site in accordance with best-practice methodologies from DOC's Inventory and Monitoring Toolbox: Herpetofauna (Hare 2012a,b,c; Lettink 2012), sampling techniques for New Zealand lizards (Lettink and Hare (2016)) and DOC's key principles for lizard salvage and transfer in New Zealand (DOC 2019).
163. The LMP includes detail of habitat enhancement measures at the lizard release site/s, including pest plant management, enhancement planting, addition of habitat features such as

logs/refugia, and pest animal control to increase lizard carrying capacity and population establishment.

Disturbance effects on indigenous fauna during vegetation clearance and construction

164. Indigenous birds and lizards have the potential to be present across much of the vegetation identified within this Report and have the potential to be affected by both vegetation clearance activities and on-going construction activities during the life of the project.
165. Disturbance from noise, dust and vibrations may cause lizards and birds to disperse into adjacent habitats. Where habitats sit adjacent to larger forest areas, such as around the Mount Victoria Tunnel area, dispersal into these areas is unlikely to result in adverse effects to lizards. However, where vegetation is isolated or lacks connectivity to larger habitat areas, displaced lizards may be at risk of lower survival and breeding success through lower food availability, absence of protective cover, and/or competition with other resident lizards. The potential adverse effect of disturbance during vegetation clearance and construction is considered to be **moderate**.
166. The ecological value of indigenous lizards range from **moderate** to **high**, resulting in an unmitigated magnitude of adverse effect of **moderate**. Implementation of lizard salvage and relocation measures prior to and during vegetation clearance will reduce the magnitude of effect to **low** by minimising the number of lizards that are displaced into surrounding habitats. Details of proposed lizard salvage and relocation measures are provided in the Application for Wildlife Approval report and proposed LMP.
167. Project activities will lead to increased levels of disturbance and may lead to birds abandoning feeding areas in habitats within and adjacent to the project area and in rare cases could result in nest abandonment. The land surrounding the existing road is already subject to disturbance from existing roading infrastructure, suggesting that the local bird population has adapted to the existing disturbance regime. It is expected that increased levels of disturbance will happen over a relatively short time frame, and it is considered unlikely that construction activities will have a high level of adverse effect.
168. Overall, the magnitude of effect of disturbance on birds is considered **low**. The ecological value of indigenous bird species that may be impacted ranges from **low** to **very high**, resulting in an overall level of effect according to the ECIAG framework ranging from **very low** to **low**.

Incidental discovery of 'At Risk', 'Threatened' or protected invertebrates and non-vascular plants during construction

169. While the presence of 'At Risk', 'Threatened', or protected invertebrates and non-vascular plants has been assessed as highly unlikely based on a desktop review of potential species presence and a review of habitat suitability across the project areas, there remains the potential for 'At Risk', 'Threatened', or protected non-vascular plants and invertebrates to be discovered across forested habitats throughout the project area during pre-clearance management detailed in the LMP and AMP.
170. To manage this risk of incidental discovery, I recommend an incidental discovery protocol is developed, detailing the below steps:
 - i. **Discovery:** Ecologists on-site for pre-clearance lizard and bird management will be briefed to look for non-vascular plants and invertebrates. If an 'At Risk', 'Threatened' or

protected non-vascular plant or invertebrate is discovered during any stage of the project, a Project Ecologist will identify the discovery to a species level and record the habitat type it was discovered in

- ii. **Stop-Works response:** All works resulting in the removal of the identified habitat type will cease while the Project Ecologist contacts DOC to determine appropriate next steps
- iii. **Notification:** Project Iwi, WCC, and GWRC will be notified of the discovery, and provided an opportunity to be involved in the subsequent management of this species
- iv. **Management procedures:** Management procedures based on the incidental discovery will be developed in consultation with DOC and incorporated into the operational management approach for the Project

Summary of effects

171. Table 8 below summarises the ecological values of the Project, potential adverse effects, magnitude and overall level of effect following recommended effects management measures.

Table 8: Summary of actual and potential effects on ecology values, magnitude of effect, and overall level of effect following measures to avoid, minimise or remedy effects

Effect	Feature	Location Details	Ecological value	Magnitude of effect (unmitigated)	Proposed effects management (avoid, remedy, minimise)	Overall level of effect (mitigated)	Residual effects management
Permanent loss of terrestrial vegetation and habitats	Regenerating broadleaf forest	Mount Victoria Tunnel – 0.93 ha	High	High	Minimise vegetation clearance through detailed design process. Landscape planting associated with the project is recommended to replace indigenous and exotic vegetation with appropriate indigenous species in key locations throughout the project. A replacement ratio of 1:3 is recommended to address the ecological effects of losing mature specimen trees.	High	Biodiversity offsetting is recommended to address residual adverse effects on high and moderate value vegetation following efforts to avoid, remedy, and minimise the loss of terrestrial vegetation and habitats.
	Mixed indigenous-exotic forest and scrub	Mount Victoria Tunnel and Eastern Connections – 1.47 ha	Moderate			Moderate	
		Terrace Tunnel – 0.56 ha	Low			Low	No further action required.
	Mixed low-stature vegetation	Mount Victoria Tunnel and Eastern Connections – 0.35 ha	Low			Low	
		Basin Reserve – 0.48 ha	Low			Low	
		Terrace Tunnel – 0.21 ha	Low			Low	
	Private gardens	Mount Victoria Tunnel and Eastern Connections – 0.73 ha	Low			Low	
	Indigenous specimen trees	Mount Victoria Tunnel and Eastern Connections – 67 Basic Reserve – 23 Terrace Tunnel – 15	Moderate			Low (Long term)	
Permanent loss of threatened plant species	7x nationally 'At Risk' Indigenous Plants 2x regionally 'Threatened' indigenous plants 1x 'Not Threatened' but naturally uncommon plant	Mount Victoria Tunnel Eastern Connections	High-Very High	Moderate	Minimise vegetation clearance through detailed design process. A site survey to identify and confirm presence of At-Risk or Threatened species within the Wellington Town Belt is recommended, covering both Regenerating broadleaf forest and mixed indigenous-exotic forest and scrub vegetation types. If identified, it is recommended these species are incorporated into the replanting schedules to promote the ongoing survival of these species across the offset area.	Low	No further action required.
Disturbance effects on indigenous fauna during construction. Injury or mortality of indigenous fauna	6 regionally 'Threatened' and 13 'Not Threatened' indigenous birds 7x 'Not Threatened' or 'At Risk' indigenous lizard species including barking gecko, ngahere gecko, Raukawa gecko, copper skink, glossy brown skink, ornate skink, and northern grass skink.	Mount Victoria Tunnel Basin Reserve Terrace Tunnel	Low-Very High	Moderate	Minimise vegetation clearance through detailed design process, taking opportunities to avoid fauna habitat where possible. It is recommended avifauna management measures be set out in an Avifauna Management Plan to minimise the risk of killing or injuring birds, particularly in nesting birds during peak bird breeding season (September to January). A Lizard Management Plan (LMP) has been prepared to support the application for Wildlife Approval, detailing how requirements of Schedule 7 of the FTAA will be met. Measures to salvage lizards from the works area and relocate them to a release site in accordance with best-practice methodologies are provided.	Low - Very Low	For fauna management, the potential incidental mortality and disturbance during salvage will be addressed through the wildlife approval process.

7. ASSESSMENT OF OPERATIONAL EFFECTS

172. Other terrestrial operational effects typically associated with roading projects—such as habitat fragmentation, barrier effects to fauna movement, vehicle-related fauna mortality, noise and visual disturbance, artificial lighting effects, and long-term maintenance-related vegetation modification—are expected to be negligible in the context of this project. The Project is located within an existing urban transport corridor where terrestrial habitats are already fragmented, traffic activity is well established, and fauna use of the area is generally limited to high ecological value areas. As such, the operational road environment is not expected to result in a meaningful change to baseline terrestrial ecological conditions.

Edge effects

173. A wide range of weed species are present within the project area, ranging from weedy herbs and grasses to shrubs (gorse, blackberry). However, vegetation clearance and the operation of machinery can disturb the ground and create further opportunities for weed invasion, or may introduce additional weed species to the site on machinery, vehicles or within soil brought in. In addition, construction activities that affect relatively small areas of forest margins may compromise the integrity of larger areas of remaining forest by introducing weeds and causing 'edge effects', whereby smaller areas of forest are relatively weedier due to encroachment.
174. Edge effects can limit the range of plants due to increased exposure to light, wind, heat, cold, as well as weeds (Didham & Ewers, 2006; Didham et al., 2007). The creation of habitat edge effects can alter the composition and health of adjacent vegetation (i.e., habitat degradation), which may affect habitat suitability for indigenous flora and fauna (Didham & Ewers, 2006; Didham et al., 2007).
175. The vegetation within the Project area is however already affected by edge effects due to existing State Highway or urban infrastructure. It is expected that the clearance of vegetation will have a minimal effect on existing vegetation left remaining following vegetation clearance.

8. RESIDUAL EFFECTS MANAGEMENT

176. As outlined in Section 6, residual effects have been identified for the permanent loss of regenerating broadleaf forest and mixed indigenous-exotic forest and scrub across the Mount Victoria Tunnel and Eastern Connections project areas. Up to 2.4 ha of high and moderate value vegetation will be removed (as shown in Table 7), all of which is located within the Wellington Town Belt.
177. To address these residual effects within the Wellington Town Belt, biodiversity offsetting is proposed. Through consultation with WCC, exotic dominated pine/eucalypt forest located on the west face of Mount Victoria has been selected as a preferred location for residual effects management, containing areas suitable for restoration and enhancement.
178. This section details residual effects management (REM) measures as they relate to biodiversity offsetting. The preferred offset site is subject to landowner approval, and generally to confirming implementation details. If the preferred offset site is ultimately unworkable, there will be other ways to offset or compensate for the relevant residual effects: either through restoration activities at an alternative site, or through an appropriate financial contribution to existing schemes targeted at benefitting terrestrial ecology (as a form of compensation).
179. The following information will need to be confirmed based on expert advice, in light of the final Project footprint and in order to achieve a no net loss outcome:
- i. The final quantum of offset and/or compensation
 - ii. Detailed offset and/or compensation actions to be undertaken
 - iii. The specific location of the offset and/or compensation actions, and
 - iv. Any monitoring measures required to show that offset actions have been achieved or completed
180. The proposed measures have been developed having regard to the principles for offsetting as outlined in the NPS-IB and relevant guidance in the EclAG. By implementing the residual effects management recommendations, residual adverse effects are considered to be adequately addressed.

Wellington Town Belt Restoration

181. Following the effects management hierarchy, residual effects resulting from the permanent loss of 2.4 ha of high and moderate value terrestrial vegetation and habitats are proposed to be addressed through biodiversity offsetting across the Wellington Town Belt. A 12-ha area of exotic pine/eucalypt forest was assessed by an Ecologist on 20 May 2026 and mapped according to the existing understory vegetation cover. In total, two distinct areas were mapped across the 12-ha envelope and include:
- i. **Area 1:** 5 ha of exotic forest with little-to-no understory vegetation
 - ii. **Area 2:** 7 ha of exotic forest with moderate density native regeneration/plantings between 2 and 5 m in height across the understory
182. The extent of Area 1 and Area 2 within the Wellington Town Belt is mapped in Figure 4. Measures to refine the offset site prior to offset works commencing will be undertaken by a suitably experienced ecologist. A representative photograph of each area is provided in Figure 5 and Figure 6, respectively.

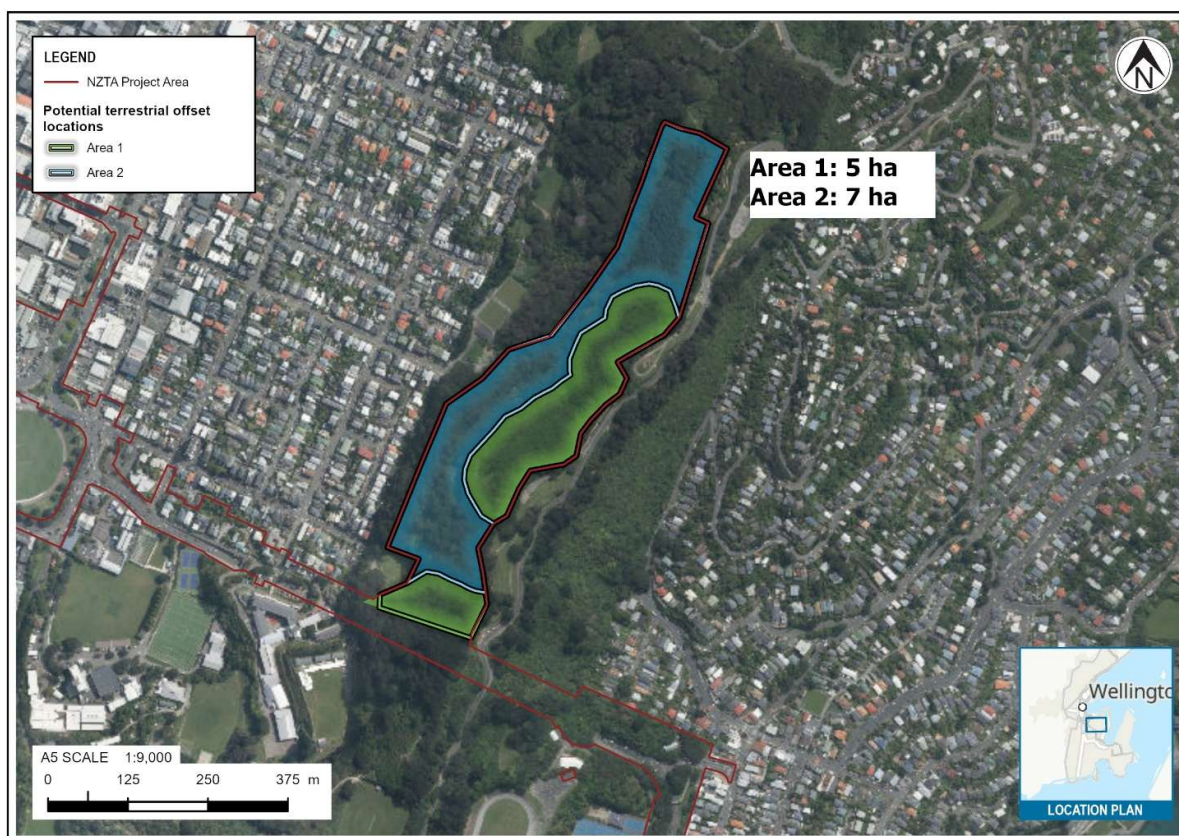


Figure 4 - Overview of potential terrestrial offset areas

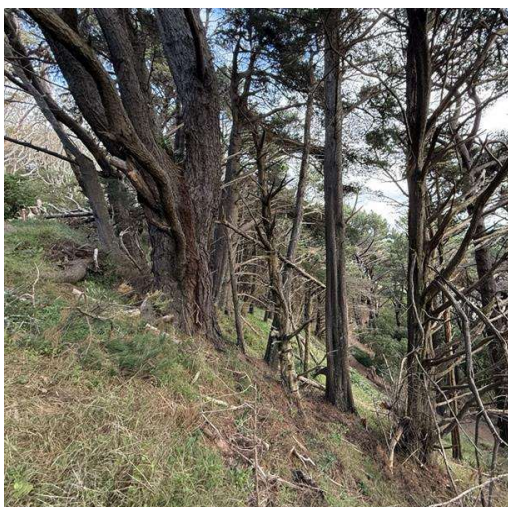


Figure 5 - Representative photograph of Area 1, taken 20 May 2026

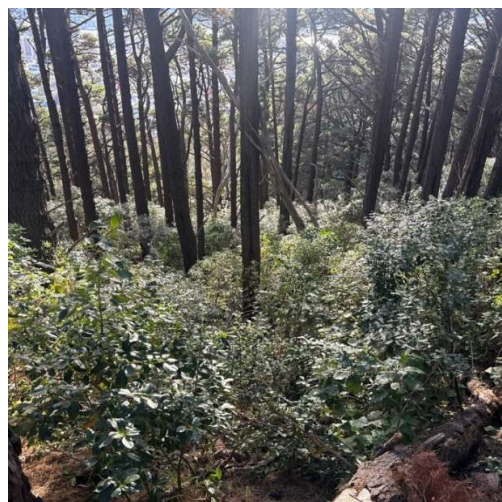


Figure 6 - Representative photograph of Area 2, taken 20 May 2026

183. Exotic pine/eucalypt forest is considered a suitable location for ecological offsetting due to its potential for restoration and location within the Wellington Town Belt. If implemented successfully, the restoration and enhancement of this area of exotic forest will provide complimentary ecological benefits across the broader area of the Wellington Town Belt in terms of positive biodiversity gains. The following attributes of the offset site have been considered and used to inform the offset actions proposed in Table 9:

- i. **Existing vegetation:** The existing exotic forest canopy has likely suppressed the regeneration of native vegetation beneath the canopy of Area 1. Rank grass and infestation of weeds are common, and habitat provision values for indigenous fauna are low. Through the managed removal and modification of the existing exotic canopy, more suitable conditions for restoration and revegetation can be established across the offset site to allow for offset targets to be achieved
 - ii. **Potential to enhance fauna habitat:** Existing habitat features across the exotic/pine forest provides known foraging and breeding habitat for cavity nesting birds, including Kākā and Kārearea. Through targeted management of the exotic pine canopy, these features can be increased and enhanced to provide greater amounts and quality of habitat features for native birds. Additionally, woody material can be recycled within the forest understory to provide a bulk increase in the quantities of refugia and coarse woody debris for native lizards and other native species such as invertebrates
 - iii. **Low diversity native vegetation:** Existing native vegetation across Area 2 generally lacks diversity, with common broadleaf species present in abundance. Enrichment underplanting would increase the diversity of native species across the area, introducing important seed sources and accelerating successional development of this forest area. A focus of both restoration planting and enrichment underplanting is to introduce both successional species and a diverse foraging source for fructivorous native birds and lizards
184. The restoration actions proposed across Areas 1 and Area 2 include the removal or poisoning in situ of low-value exotic trees, veteranisation of suitable mature exotic trees, retention and enrichment of existing native understory vegetation, restoration planting, and weed and pest management. The expected biodiversity benefits and considerations of the proposed actions are outlined in Table 9 below and will be implemented under expert guidance to ensure successful implementation and achievement of offset outcomes.

Table 9: Overview of proposed offset actions and considerations

Proposed offset actions	Overview and considerations
Removal of exotic trees	Exotic trees in Area 1 will be removed or poisoned to open the canopy for restoration planting, with the remainder retained as standing deadwood through veteranisation or drill-and-fill to enhance bird foraging and nesting habitat. In Area 2, selective removal or poisoning will increase canopy light where native understory unlikely to be affected, with remaining trees either veteranized or pruned where felling is not feasible. Removal and / or poisoning of exotic trees is expected to support restoration and enrichment planting by facilitating more favourable lighting and soil conditions.
Veteranisation of mature exotic trees	Veteranisation enhances habitat for cavity roosting birds (e.g. kōtare, kākā, ruru) by creating hollows, cavities, and crevices, while promoting natural decay through contouring and ring barking. Increased natural decay is expected to improve the invertebrate populations and thus provide greater foraging opportunities for insectivorous bird species. Pre-veteranisation surveys of habitat characteristics across the offset site which will be used to inform the selection and creation of veteranized trees. Veteranisation is a proven technique for managing the progressive removal of exotic trees while enhancing habitat values for indigenous fauna. The approach aims to minimise disturbance to the understory typically associated with the removal of large trees, through targeted and selective management. Methods include crown and limb reduction, drill-and-fill, and ringbarking to restrict further growth and create canopy gaps that promote unrestricted forest succession. This offset measure is specifically intended to address the loss of potential habitat features within the project area by locally increasing habitat availability across the Town Belt through the creation of structural complexity across the managed exotic forest.
Enrichment underplanting	Enrichment underplanting will be undertaken across Area 2, focussed on improving the diversity of indigenous plant species and introducing podocarp/broadleaf species characteristic of the region. These include, kohekohe (<i>Didymopanax spectabilis</i>), tawa (<i>Beilschmiedia tawa</i>), miro (<i>Pectinopitys ferruginea</i>), matai (<i>Prumnopitys taxifolia</i>), and rimu (<i>Dacrydium cupressinum</i>). A

	full planting schedule focussed on introducing late successional indigenous plant species to the offset area will be prepared prior to implementation.
Restoration planting	The full planting schedule of restoration planting will include a diverse range of species characteristic of the historic ecosystem types occupying the Wellington Town Belt. Restoration planting will include species known to provide high quality foraging habitat for fructivorous birds and lizards, as well as complex habitat for both ground-dwelling and arboreal lizards. Focus will be placed on creating pockets of microhabitat for indigenous lizards, complementary to the habitat enhancement measures.
Habitat enhancement	Woody material generated from exotic tree removal will be retained and distributed across the offset area to enhance understory habitat and refuge availability. Increasing habitat availability across the understory of the restoration site is expected to benefit ground-dwelling indigenous lizards or ground-nesting birds, such as karearea.
Weed management	Weed management will be undertaken across the offset areas targeting current infestations, including tradescantia and English ivy. Weed management will be undertaken for a minimum of 5 years.

185. Biodiversity Offsetting and Accounting Models (BOAMs, Maseyk et al., 2014) have been prepared to estimate the quantum of restoration required to achieve both no net loss, and net gain outcomes for terrestrial biodiversity and habitat provision values. Models have been prepared to account for the two identified offset areas, ensuring the ecological values across Area 1 and Area 2 are accounted for according to their respective present ecological values.
186. Under all scenarios modelled, offsetting across Area 1 has been explored first and once all the area has been allocated then any residual offsetting area needed has been addressed through offsetting across Area 2. This approach prioritises biodiversity improvements across Area 1 due to its present low ecological value. Similarly, it recognises that where necessary to achieve a no net loss or net gain outcome, offsetting can be undertaken across Area 2 to achieve gains in biodiversity value.
187. Provisional BOAM model results outlining the required offset areas are provided in Table 10 below. Across all scenarios, a positive component net biodiversity value has been targeted, with no net loss scenarios presenting smaller positive component net biodiversity values, and net gain scenarios presenting at minimum a 10-20% (or 0.1-0.2) positive component net biodiversity values (provided in Annexure E).
188. If the proposed offset actions are undertaken in advance of the impact occurring, restored habitats are expected to provide ecological benefits years in advance of the impact, securing early ecological gains and reducing the period between the point of impact and establishment of new habitat. Additionally, where corrections and intervention are required if offset outcomes fail to be achieved, these can be implemented before the time of impact.
189. Provisional modelling indicates that with advanced offsetting 5 years prior to the impact, 15% less offset area than that set out in Table 10 would be required to achieve a no net loss/net gain outcome. Similarly, advanced offsetting 10 years prior to impact would require 30% less offset area than set out in Table 10 to achieve a no net loss/net gain outcome. BOAM modelling for advanced offsetting will be confirmed through expert advice if a suitable offset horizon is decided upon following the consenting process.

Table 10: Summary of BOAM outputs and offset areas required at the point of impact, at 5 years offset horizon, and 10 years offset horizon

Biodiversity type	No Net Loss		Net Gain	
	Area 1 (ha)	Area 2 (ha)	Area 1 (ha)	Area 2 (ha)
Offset at the point of impact				
Regenerating broadleaf forest	3.1	0 *	3.5	0 *
Mixed indigenous broadleaf forest	1.9	2	1.5	4

Biodiversity type	No Net Loss		Net Gain	
	Area 1 (ha)	Area 2 (ha)	Area 1 (ha)	Area 2 (ha)
Total	5.0	2	5	4.0
Advanced offset: 5 year offset horizon				
Regenerating broadleaf forest	2.6	0*	3.0	0*
Mixed indigenous broadleaf forest	2.4	0.5	2.0	2.0
Total	5.0	0.5	5.0	2.0
Advanced offset: 10 year offset horizon				
Regenerating broadleaf forest	2.1	0	2.5	0
Mixed indigenous broadleaf forest	2.3	0	2.5	0
Total	4.4	0	5.0	0

* Note: a 0 ha value indicates there is sufficient offset area for this biodiversity type/impact within Area 1, and no offsetting within Area 2 is required to address residual effects to this biodiversity type.

190. The BOAM models have been referenced against data from a forest ecosystem representative of the region or through expert opinion, and account for the following habitat metrics at both the impact sites and Areas 1 and Areas 2 of the offset site:
 - i. Canopy height (m)
 - ii. Canopy foliar cover (%)
 - iii. Canopy tree basal diameter (m² per ha)
 - iv. Groundcover foliar cover (%)
 - v. Groundcover height (m)
 - vi. Native plant species diversity
 - vii. Fauna habitat in the form of coarse woody debris (m³/ha)
 - viii. Fauna habitat in the form of leaf litter (mm)
 - ix. Fauna habitat in the form of vertical cavity structures (count/ha)
191. As discussed above, the Wellington Town Belt is a preferred offset site as it sits in close proximity to the point of impact, which enables ecological benefits to be realised within the immediate local environment. Additionally, the selected offset areas are owned by WCC, allowing offset outcomes to be secured for the duration of the impacts. If the required offset quantum increases due to design refinements, further land within the reserve is available to accommodate additional restoration actions.
192. Through the implementation of the above offset actions, it is expected that like-for-like measurable gains in biodiversity attributes can be achieved across the respective components for Area 1 and Area 2 within the timeframes established within the respective BOAMs. While additional benefits are expected through the likes of habitat enhancement and ongoing management of the restoration areas, these metrics are traditionally more difficult to measure and are assessed based on professional judgement.
193. Across the offset location, management of avifauna will follow the project AMP and align with best practice methodology, as outlined in Section 6. Native lizards may be present within the proposed offset area, however, so a focus will be placed on minimising disturbance and damage to the native understory through the guidance of the Project Ecologist and experienced arborist. An incidental

- discovery protocol, detailed in the project LMP, will instead be implemented across the offset area rather than salvage and relocation actions.
194. The area required for offsetting will be confirmed through expert advice, within the Wellington Town Belt in consultation with Wellington City Council (WCC). In addition to the reasons outlined above, the Wellington Town Belt has been proposed as the site for offset due to:
- i. Its proximity to the impact sites, allowing biodiversity gains to be realised close to the point of impact
 - ii. The offset sites are owned and maintained by WCC, which allows any offset outcomes to be secured for as long as the impacts occur
 - iii. The proposed offset actions align with the objectives and policies outlined in Section 5 (Ecology) of the Town Belt Management Plan, whereby enhancing connectivity and diversity across the Town Belt are primary objectives
 - iv. Should the quantum of offset change due to changes in the design resulting in additional needs for biodiversity offsetting, additional biodiversity offsetting actions which align with the policies and intentions within the Hataitai Park (Sector 8) and Matairangi (Sector 9) Management Sectors of the Town Belt Management Plan can be implemented across a wider area of the Wellington Town Belt
195. The recommended offsetting would be delivered through the following:
- i. Confirmation via written agreements/memorandum of understanding regarding the securement of offset locations within the Wellington Town Belt
 - ii. Terrestrial revegetation/restoration planting should focus on establishing appropriate indigenous ecosystems which enhance the ecology and biodiversity of the Wellington Town Belt
 - iii. Weed control, implemented prior to planting (for successful establishment) and for a minimum of 5 years following planting
 - iv. Revegetation/restoration planting should be undertaken at a density of 1.5m centres and maintained for a period of 5 years
 - v. Addition of habitat features and pest animal control during vegetation establishment, targeted at increasing habitat suitability for indigenous birds and lizards will be included as a component of the biodiversity offset package
196. The design and delivery of the ecological offsetting can be undertaken in partnership with mana whenua.

9. CONSULTATION

197. I understand that NZTA has engaged in community consultation in developing the Project, seeking feedback on the proposed design through a community engagement survey. This survey was developed to get community feedback to help future project development and has addressed general themes relating to terrestrial ecology across the Project areas.
198. In general, the loss of high and moderate value terrestrial vegetation across the Second Terrace Tunnel, Basin Reserve, Second Mt Victoria Tunnel and Hataitai and Kilbirnie Connections was raised with strong concern, including potential impacts to indigenous fauna. While the loss of terrestrial vegetation is necessary to facilitate the construction of the project, the indicative landscape plans includes indigenous revegetation of groundcover, shrubland, and broadleaf forest vegetation, and residual effects to terrestrial ecology identified for the removal of high and moderate value vegetation is to be addressed through biodiversity offsetting. Additionally, injury or mortality of indigenous fauna during vegetation clearance is proposed to be managed through the implementation of the AMP and LMP.
199. A previous version of this report was provided to Greater Wellington Regional Council (GWRC), Department of Conservation (DOC) and Wellington City Council (WCC) for an initial review. Review comments were made in relation to the following:
- i. DOC and GWRC sought clarification on the replacement ratios proposed for specimen trees and 'At Risk', 'Threatened' or naturally uncommon plant species, and how these replacement ratios will be confirmed and implemented by the Project. Further detail has been provided in Section 6
 - ii. DOC sought additional information on how avifauna management will be implemented across the project. While an AMP is to be prepared as a condition of consent, detail on best practice bird management including nest avoidance during peak breeding season, measures of avoidance around active nests, and the approach to assessing nest presence have been added to this report
 - iii. DOC raised concern around the loss of cavity habitat through clear felling vegetation. All potential nesting habitat, including cavities, will be surveyed prior to felling and managed in accordance with best practice methodology and the project AMP, as outlined in Section 6. The loss of cavity features is proposed to be addressed through tree veteranisation, which provides a proven framework for increasing the quantity of cavity habitat and other fauna provision services for indigenous avifauna
 - iv. GWRC identified that data from the Wellington City Council forest bird monitoring reports has not been included in this assessment. Following a review of the most recent Bird Monitoring Report (McArthur et al, 2024), I have assessed the avifauna values detailed in these reports as consistent with the information presented in this report
 - v. GWRC outlined concern that the potential discovery of 'At Risk' or 'Threatened' non-vascular plants and invertebrates (annelids, arthropods, and molluscs) has not been accounted for. While considered unlikely, as a result of this concern, I have included the recommendation for an incidental discovery protocol detailing the response to discovery of any 'At Risk' or 'Threatened' non-vascular plants and invertebrates
200. DOC, GWRC, and WCC requested that a clearer summary of management measures is provided, with review opportunities for DOC and WCC (as primary regulator). I have provided additional detail of the management measures in Section 6, Section 8 and Section 10.
201. While multiple recommendations and concerns were raised by DOC, GWRC, and WCC, there was consensus on the valuation of terrestrial ecology features and potential effects to terrestrial ecology.

Through consultation, clarification has been provided on the various management measures proposed.

10. CONCLUSION AND RECOMMENDATIONS

- 202. The proposed upgrades and improvements to SH1 infrastructure will involve construction extending over 5 km through the city. The Project will provide for more efficient and reliable access on SH1 and includes duplicate tunnels at The Terrace and Mount Victoria, a new layout at the Basin Reserve as well as improvements along the remainder of the SH1 corridor from north of the Terrace Tunnel to the intersection of Cobham Drive and Evans Bay Parade. Vegetation removal of up to 4.73 ha and 105 indigenous specimen trees could be impacted by the Project.
- 203. The vegetation removal will result in the permanent loss of habitat for indigenous fauna, including birds and lizards, and potentially result in the loss of nationally 'At Risk' or regionally 'Threatened' plant species.
- 204. Residual effects following efforts to avoid, minimise, and remedy have been identified for the permanent loss of 0.93 ha regenerating broadleaf forest and 1.47 ha mixed indigenous-exotic forest and scrub around the Mount Victoria Tunnel, totalling 2.40 ha of terrestrial vegetation and habitats (all of which is in the Wellington Town Belt). It is recommended these residual effects are addressed through the proposed terrestrial offsets within the Wellington Town Belt, which have been guided by the implementation of BOAMs in the determination of an appropriate offset quantum.
- 205. The terrestrial offsetting is recommended to be finalised and implemented based on expert advice.
- 206. An LMP has already been prepared to support the application for Wildlife Approval under Schedule 7 of the FTAA. This LMP details how the necessary requirements and obligations of Schedule 7 are proposed to be managed and addressed through best practice methodology.
- 207. An Avifauna Management Plan should also be prepared to set out best practice construction management measures for avifauna, including in respect of the timing of works.
- 208. Overall, if the proposed measures to avoid, remedy, mitigate, and offset effects are implemented as intended, the level of residual ecological effects is considered to be low, and no additional effects management is required beyond what is recommended in this report.

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ANNEXURE A: Ecology Maps





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APPROVED	DATE	

CLIENT	NEW ZEALAND TRANSPORT AGENCY WAKA KOTAHI		
PROJECT	SH1 WELLINGTON IMPROVEMENTS		
TITLE	ECOLOGY INVESTIGATIONS		
SCALE (A3)	1:20,000	FIG No.	FIGURE 1.
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ANNEXURE B: Ecological Impact Assessment Guidelines

Annexure B Table 1: Factors to consider in scoring sites values in relation to species representativeness, rarity, diversity and pattern, and ecological context (adapted from EIANZ, 2018)

Value	Species values	Vegetation/Habitat values
Very High	Nationally threatened – endangered, critical, or vulnerable.	Supporting more than one national priority type. Nationally Threatened species found or likely to occur there, either permanently or occasionally.
High	Nationally At Risk– declining.	Supporting one national priority type or naturally uncommon ecosystem and/or a designated SEA in a regional or District Plan. At Risk - Declining species found or likely to occur there, either permanently or occasionally.
Moderate-high	Nationally At Risk– recovering, relict, or naturally uncommon.	A site that meets ecological significance criteria as set out the relevant regional or district policies and plans.
Moderate	Not nationally threatened or At Risk, but locally uncommon or rare.	A site that does not meet ecological significance criteria but that contributes to local ecosystem services (e.g. water quality or erosion control).
Low	Not threatened nationally, common locally.	Nationally or locally common with a low or negligible contribution to local ecosystem services.

Annexure B Table 2: Ecological values assigned to terrestrial habitats (adapted from EIANZ, 2018)

Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/habitat/community	
Matters	Attributes to be considered
Representativeness	Attributes for representative vegetation and aquatic habitats: ▪ Typical structure and composition. ▪ Indigenous species dominate. ▪ Expected species and tiers are present. Attributes for representative species and species assemblages: ▪ Species assemblages that are typical of the habitat. ▪ Indigenous species that occur in most of the guilds expected for the habitat type.
Rarity/distinctiveness	Attributes for rare/distinctive vegetation and habitats: ▪ Naturally uncommon, or induced scarcity. ▪ Amount of habitat or vegetation remaining. ▪ Distinctive ecological features. ▪ National priority for protection. Attributes for rare/distinctive species or species assemblages: ▪ Habitat supporting nationally Threatened or At-Risk species, or locally uncommon species. ▪ Regional or national distribution limits of species or community. ▪ Unusual species or assemblages. ▪ Endemism
Diversity and Pattern	▪ Level of natural diversity, abundance, and distribution. ▪ Biodiversity reflecting underlying diversity. ▪ Biogeographical considerations – pattern, complexity ▪ Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation.
Ecological context	▪ Site history, and local environmental conditions which have influenced the development of habitats and communities. ▪ The essential characteristics that determine an ecosystem’ s integrity, form, functioning, and resilience (from “intrinsic value” as defined in the RMA). ▪ Size, shape, and buffering. ▪ Condition and sensitivity to change. ▪ Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material.

Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/habitat/community

- Species role in ecosystem functioning – high level, key species identification, habitat as proxy.

Annexure B Table 3: Scoring for sites or areas combining values for four matters in Appendix B Table 2

Value	Description
Very High	Area rates High for three or all the four assessment matters listed in Annexure B Table 2. Likely to be nationally important and recognised as such.
High	Area rates High for two of the assessment matters, Moderate and Low for the remainder, or Area rates High for one of the assessment matters, Moderate for the remainder. Likely to be regionally important and recognised as such.
Moderate	Area rates High for one matter, Moderate and Low for the remainder, or Area rates Moderate for two or more assessment matters Low or Very Low for the remainder. Likely to be important at the level of the Ecological District.
Low	Area rates Low or Very Low for majority of assessment matters and Moderate for one. Limited ecological value other than as local habitat for tolerant native species.
Negligible	Area rates Very Low for three matters and Low or Very Low for remainder.

Annexure B Table 4: Factors to consider in scoring ecological freshwater values (adapted from Roper-Lindsay et al., 2018)

Value	Explanation	Characteristics
Very High	A reference quality watercourse in condition close to its pre-human condition with the expected assemblages of flora and fauna and no contributions of contaminants from human induced activities including agriculture. Negligible degradation e.g. stream within a native forest catchment.	▪ Benthic invertebrate community typically has high diversity, species richness and abundance. ▪ Benthic invertebrate community contains many taxa that are sensitive to organic enrichment and settled sediments. ▪ Benthic community typically with no single dominant species or group of species. ▪ MCI scores typically 120 or greater. ▪ EPT richness and proportion of overall benthic invertebrate community typically high. ▪ SEV scores high, typically >0.8. ▪ Fish communities typically diverse and abundant. ▪ Riparian vegetation typically with a well-established closed canopy. ▪ Stream channel and morphology natural. ▪ Stream banks natural typically with limited erosion. ▪ Habitat natural and unmodified.
High	A watercourse with high ecological or conservation value but which has been modified through loss of riparian vegetation, fish barriers, and stock access or similar, to the extent it is no longer reference quality. Slight to moderate degradation e.g. exotic forest or mixed forest/agriculture catchment.	▪ Benthic invertebrate community typically has high diversity, species richness and abundance. ▪ Benthic invertebrate community contains many taxa that are sensitive to organic enrichment and settled sediments. ▪ Benthic community typically with no single dominant species or group of species. ▪ MCI scores typically 80-100 or greater. ▪ EPT richness and proportion of overall benthic invertebrate community typically moderate to high. ▪ SEV scores moderate to high, typically 0.6-0.8. ▪ Fish communities typically diverse and abundant. ▪ Riparian vegetation typically with a well-established closed canopy. ▪ No pest or invasive fish (excluding trout and salmon) species present. ▪ Stream channel and morphology natural. ▪ Stream banks natural typically with limited erosion. ▪ Habitat largely unmodified.

Value	Explanation	Characteristics
Moderate	A watercourse which contains fragments of its former values but has a high proportion of tolerant fauna, obvious water quality issues and/or sedimentation issues. Moderate to high degradation e.g. high-intensity agriculture catchment.	▪ Benthic invertebrate community typically has low diversity, species richness and abundance. ▪ Benthic invertebrate community dominated by taxa that are not sensitive to organic enrichment and settled sediments. ▪ Benthic community typically with dominant species or group of species. ▪ MCI scores typically 40-80. ▪ EPT richness and proportion of overall benthic invertebrate community typically low. ▪ SEV scores moderate, typically 0.4-0.6. ▪ Fish communities typically moderate diversity of only 3-4 species. ▪ Pest or invasive fish species (excluding trout and salmon) may be present. ▪ Stream channel and morphology typically modified (e.g. channelised). ▪ Stream banks may be modified or managed and may be highly engineered and/or evidence of significant erosion. ▪ Riparian vegetation may have a well-established closed canopy. ▪ Habitat modified.
Low	A highly modified watercourse with poor diversity and abundance of aquatic fauna and significant water quality issues. Very high degradation e.g. modified urban stream.	▪ Benthic invertebrate community typically has low diversity, species richness and abundance. ▪ Benthic invertebrate community dominated by taxa that are not sensitive to organic enrichment and settled sediments. ▪ Benthic community typically with dominant species or group of species. ▪ MCI scores typically 60 or lower. ▪ EPT richness and proportion of overall benthic invertebrate community typically low or zero. ▪ SEV scores low to moderate, typically less than 0.4. ▪ Fish communities typically low diversity of only 1-2 species. ▪ Pest or invasive fish (excluding trout and salmon) species present. ▪ Stream channel and morphology typically modified (e.g. channelised). ▪ Stream banks often highly modified or managed and maybe highly engineered and/or evidence of significant erosion. ▪ Riparian vegetation typically without a well-established closed canopy. ▪ Habitat highly modified.

Annexure B Table 5: Summary of the criteria for describing the magnitude of effect (EIANZ, 2018)

Magnitude	Heading
Very High	Total loss of, or very major alteration to, key elements/features/ of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR

Magnitude	Heading
	Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature.

Note: Baseline conditions are defined as 'the conditions that would pertain in the absence of a proposed action' (Roper-Lindsay et al., 2018).

Annexure B Table 6: Timescale for duration of effect (EIANZ, 2018)

Timescale	Description
Permanent	Effects continuing for an undefined time beyond the span of one human generation (taken as approximately 25 years).
Long-term	Where there is likely to be substantial improvement after a 25-year period (e.g. the replacement of mature trees by young trees that need >25 years to reach maturity, or restoration of ground after removal of a development) the effect can be termed 'long term'.
Temporary¹	Long term (15-25 years or longer – see above). Medium term (5-15 years). Short term (up to 5 years). Construction phase (days or months).

Note: ¹Note that in the context of some planning documents, 'temporary' can have a defined timeframe.

Annexure B Table 7: Criteria for describing overall levels of ecological effects (EIANZ, 2018)

Magnitude of effect	Ecological value				
	Very high	High	Moderate	Low	Negligible
Very High	Very high	Very high	High	Moderate	Low
High	Very high	Very high	Moderate	Low	Very low
Moderate	High	High	Moderate	Low	Very low
Low	Moderate	Low	Low	Very low	Very low
Negligible	Low	Very low	Very low	Very low	Very low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

Note: Overall level-of-effect categories are used to determine if residual effects management is required over and above measures to reduce the severity of effects through efforts to avoid, remedy or mitigate adverse effects. Usually, if the level of residual effect is assessed as being "Moderate" or greater, this warrants efforts to offset or compensate for these effects.

ANNEXURE C: Species Tables

Birds

Common name	Scientific name	Conservation status (Roberston et al., 2021)
Salvin's mollymawk/ toroa	<i>Thalassarche salvini</i>	Threatened – Nationally Critical
Black-fronted tern/ tarapirohe	<i>Chlidonias albostratus</i>	Threatened – Nationally Endangered
reef heron/ matuku moana	<i>Egretta sacra sacra</i>	Threatened – Nationally Endangered
rowi/ rowi	<i>Apteryx rowi</i>	Threatened – Nationally Endangered
Bush falcon	<i>Falco novaeseelandiae</i>	Threatened – Nationally Endangered
yellow-eyed penguin/ hoiho	<i>Megadyptes antipodes antipodes</i>	Threatened – Nationally Endangered
Caspian tern/ taranui	<i>Hydroprogne caspia</i>	Threatened – Nationally Vulnerable
hihi/ hihi	<i>Notiomystis cincta</i>	Threatened – Nationally Vulnerable
Hutton's shearwater/ Kaikōura tītī	<i>Puffinus huttoni</i>	Threatened – Nationally Vulnerable
light-mantled sooty albatross/ toroa pango	<i>Phoebastria palpebrata</i>	Threatened – Nationally Vulnerable
northern royal albatross/ toroa	<i>Diomedea sanfordi</i>	Threatened – Nationally Vulnerable
South Island takahe/ takahē	<i>Porphyrio hochstetteri</i>	Threatened – Nationally Vulnerable
spotted shag/ kawau tikitiki,	<i>Phalacrocorax punctatus</i>	Threatened – Nationally Vulnerable
brown teal/ pāteke	<i>Anas chlorotis</i>	Threatened – Nationally Increasing
little spotted kiwi/ kiwi pukupuku	<i>Apteryx owenii</i>	Threatened – Nationally Increasing
New Zealand dabchick/ weweia	<i>Poliocephalus rufopectus</i>	Threatened – Nationally Increasing
wrybill/ ngutu-pare	<i>Anarhynchus frontalis</i>	Threatened – Nationally Increasing
banded dotterel/ pohowera	<i>Charadrius bicinctus bicinctus</i>	At Risk – Declining
black-billed gull/ tarāpuka	<i>Chroicocephalus bulleri</i>	At Risk – Declining
Buller's shearwater/ Rako	<i>Ardenna bulleri</i>	At Risk – Declining
eastern bar-tailed godwit/ kūaka	<i>Limosa lapponica baueri</i>	At Risk – Declining
New Zealand pipit/ pīhoihoi	<i>Anthus novaeseelandiae novaeseelandiae</i>	At Risk – Declining
New Zealand white-capped mollymawk/ toroa	<i>Thalassarche cauta steadi</i>	At Risk – Declining
North Island rifleman/ tītītipounamu	<i>Acanthisitta chloris granti</i>	At Risk – Declining
North Island robin/ toutouwai	<i>Petroica longipes</i>	At Risk – Declining
red-billed gull/ tarāpunga	<i>Chroicocephalus novaehollandiae scopulinus</i>	At Risk – Declining
South Island pied oystercatcher/ tōrea	<i>Haematopus finschi</i>	At Risk – Declining
southern Buller's mollymawk/ toroa	<i>Thalassarche bulleri bulleri</i>	At Risk – Declining
white-fronted tern/ tara	<i>Sterna striata</i>	At Risk – Declining
yellow-crowned parakeet / kākārīki	<i>Cyanoramphus auriceps</i>	At Risk – Declining
Australian little penguin	<i>Eudyptula novaehollandiae</i>	At Risk – Recovering
North Island kaka/ kākā	<i>Nestor meridionalis septentrionalis</i>	At Risk – Recovering
pied shag/ kāruhiruhi	<i>Phalacrocorax varius varius</i>	At Risk – Recovering

Common name	Scientific name	Conservation status (Roberston et al., 2021)
variable oystercatcher/ tōrea pango	<i>Haematopus unicolor</i>	At Risk – Recovering
black shag/ māpunga	<i>Phalacrocorax carbo novaehollandiae</i>	At Risk – Relict
broad-billed prion/ parārā	<i>Pachyptila vittata</i>	At Risk – Relict
fairy prion/ tītī wainui	<i>Pachyptila turtur</i>	At Risk – Relict
flesh-footed shearwater/ toanui	<i>Ardenna carneipes</i>	At Risk – Relict
fluttering shearwater/ pakahā	<i>Puffinus gavia</i>	At Risk – Relict
little shag/ kawaupaka	<i>Microcarbo melanoleucos brevirostris</i>	At Risk – Relict
North Island saddleback/ tīeke	<i>Philesturnus rufusater</i>	At Risk – Relict
northern diving petrel/	<i>Pelecanoides urinatrix urinatrix</i>	At Risk – Relict
red-crowned parakeet/ kākārīki	<i>Cyanoramphus novaezelandiae novaezelandiae</i>	At Risk – Relict
southern diving petrel/	<i>Pelecanoides urinatrix chathamensis</i>	At Risk – Relict
Weka/ weka	<i>Gallirallus australis hectori</i>	At Risk – Relict
Auckland Island pipit / pīhoihoi	<i>Anthus novaeseelandiae aucklandicus</i>	At Risk – Naturally Uncommon
Snares Cape petrel	<i>Daption capense australe</i>	At Risk – Naturally Uncommon
Westland petrel/ tāiko	<i>Procellaria westlandica</i>	At Risk – Naturally Uncommon
Australasian gannet/ tākapu	<i>Morus serrator</i>	Not Threatened
Australasian harrier/ kāhu	<i>Circus approximans</i>	Not Threatened
Australasian shoveler/ kuruwhengi	<i>Spatula rhynchotis</i>	Not Threatened
bellbird/ korimako	<i>Anthornis melanura melanura</i>	Not Threatened
grey teal/ tētē-moroiti	<i>Anas gracilis</i>	Not Threatened
grey warbler/ riroriro	<i>Gerygone igata</i>	Not Threatened
kererū/ kererū	<i>Hemiphaga novaeseelandiae</i>	Not Threatened
New Zealand kingfisher/ kōtare	<i>Todiramphus sanctus vagans</i>	Not Threatened
New Zealand scaup/ pāpango	<i>Aythya novaeseelandiae</i>	Not Threatened
North Island brown kiwi/ kiwi-nui	<i>Apteryx mantelli</i>	Not Threatened
North Island fantail/ pīwakwaka	<i>Rhipidura fuliginosa placabilis</i>	Not Threatened
North Island tomtit/ miromiro	<i>Petroica macrocephala totoi</i>	Not Threatened
paradise shelduck/ pūtangitangi	<i>Tadorna variegata</i>	Not Threatened
pukeko/ pūkeko	<i>Porphyrio melanotus melanotus</i>	Not Threatened
ruru/ ruru	<i>Ninox novaeseelandiae novaeseelandiae</i>	Not Threatened
shining cuckoo/ pīpīwharauoa	<i>Chrysococcyx lucidus lucidus</i>	Not Threatened
silveryeye/ tauhou	<i>Zosterops lateralis lateralis</i>	Not Threatened
southern black-backed gull/ karoro	<i>Larus dominicanus</i>	Not Threatened
tūī/ tūī	<i>Prosthemadera novaeseelandiae novaeseelandiae</i>	Not Threatened
welcome swallow/ warou	<i>Hirundo neoxena neoxena</i>	Not Threatened
whitehead/ pōpokotea	<i>Mohoua albicilla</i>	Not Threatened
Australian white-faced storm petrel	<i>Pelagodroma marina dulciae</i>	Non-resident Native – Vagrant
little pied shag	<i>Microcarbo melanoleucos melanoleucos</i>	Non-resident Native – Vagrant

Common name	Scientific name	Conservation status (Roberston et al., 2021)
southern giant petrel/ pāngurunguru*	<i>Macronectes giganteus</i>	Non-resident Native – Migrant

Lizards

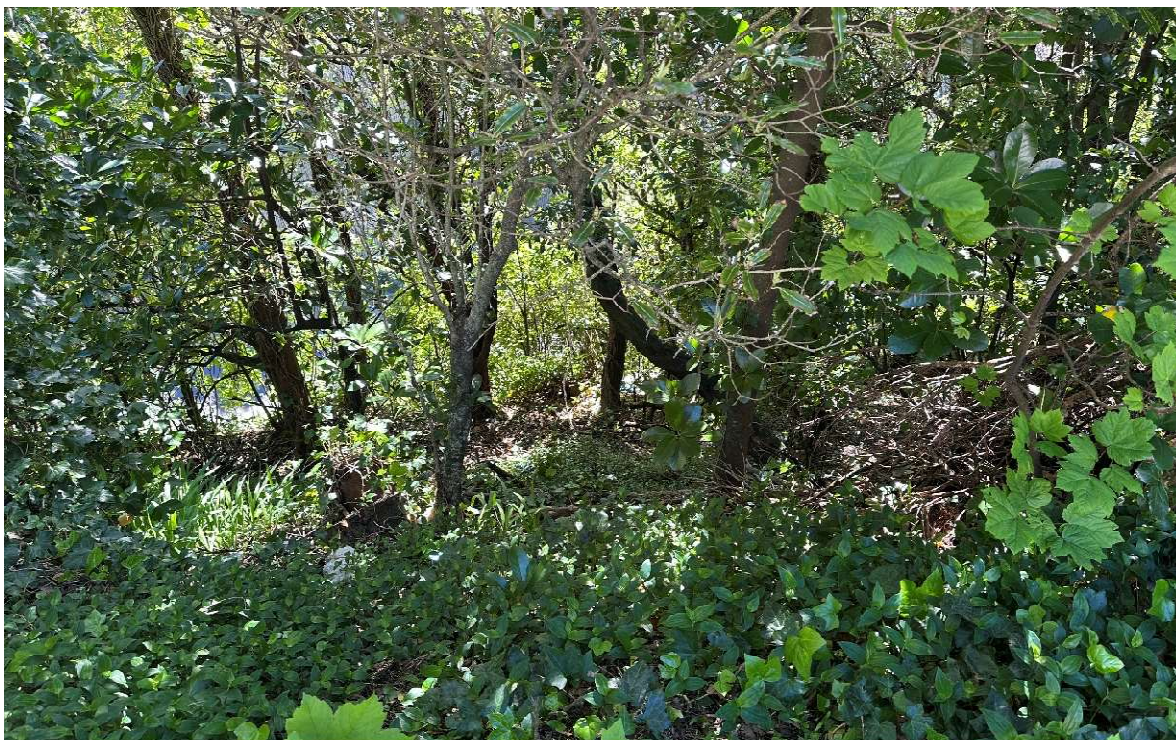
Common name	Scientific name	Conservation status (Hitchmough et al., 2021)
barking gecko	<i>Naultinus punctatus</i>	At Risk – Declining
copper skink	<i>Oligosoma aeneum</i>	At Risk – Declining
forest gecko	<i>Mokopirirakau granulatus</i>	At Risk – Declining
glossy brown skink	<i>Oligosoma zelandicum</i>	At Risk – Declining
minimac gecko	<i>Woodworthia "Marlborough mini"</i>	At Risk – Declining
ngahere gecko	<i>Mokopirirakau "southern North Island"</i>	At Risk – Declining
ornate skink	<i>Oligosoma ornatum</i>	At Risk – Declining
northern grass skink	<i>Oligosoma polychroma</i>	Not Threatened
Raukawa gecko	<i>Woodworthia maculata</i>	Not Threatened

Plants

Common name	Species name	National threat status (de Lange et al., 2023)	Regional threat status (Crisp et al., 2020)
	<i>Brachyglottis greyi</i>	At Risk – Declining	Threatened – Regionally endangered
Thick-leaved mahoe	<i>Melicactus crassifolius</i>	At Risk – Declining	At Risk – Regionally declining
Northern Rātā	<i>Metrosideros robusta</i>	At Risk – Declining	
Fierce Lancewood	<i>Pseudopanax ferox</i>	At Risk – Declining	Threatened – Regionally critical
	<i>Pseudopanax laetus</i>	At Risk – Declining	
Raukawa	<i>Raukawa edgerleyi</i>	At Risk – Declining	Not Threatened
Coastal tree daisy	<i>Shawia solandri</i>	At Risk – Declining	
Kōpata	<i>Pelargonium inodorum</i>	At Risk – Naturally Uncommon	
Kōkihi, New Zealand spinach	<i>Tetragonia tetragonoides</i>	At Risk – Naturally Uncommon	At Risk – Regionally naturally uncommon
Narrow-leaved houhere	<i>Hoheria angustifolia</i>	Not Threatened	
Akepiro	<i>Olearia solandri</i>	At Risk - Declining	
Akeake/Varnishleaf	<i>Dodonaea viscosa</i>	Not Threatened	
Broadleaf	<i>Griselinia littoralis</i>	Not Threatened	
Cabbage Tree	<i>Cordyline australis</i>	Not Threatened	
Common Pig Fern	<i>Hypolepis distans</i>	Not Threatened	
Taupata	<i>Coprosma repens</i>	Not Threatened	
Karamu	<i>Coprosma robusta</i>	Not Threatened	
Creeping Groundsel	<i>Senecio skirrhodon</i>	Not Threatened	
Five Finger	<i>Pseudopanax arboreus</i>	Not Threatened	
Griselinia Littoralis	<i>Griselinia littoralis</i>	Not Threatened	
Hounds Tongue Fern	<i>Microsorium pustulatum</i>	Not Threatened	
Kanuka	<i>Kunzea ericoides</i>	Not Threatened	
Karaka	<i>Corynocarpus laevigatus</i>	Not Threatened	
Karamu	<i>Coprosma robusta</i>	Not Threatened	

Common name	Species name	National threat status (de Lange et al., 2023)	Regional threat status (Crisp et al., 2020)
Karo	<i>Pittosporum crassifolium</i>	Not Threatened	
Kawakawa	<i>Macropiper excelsum</i>	Not Threatened	
Kohuhu	<i>Pittosporum tenuifolium</i>	Not Threatened	
Koromiko	<i>Hebe stricta</i>	Not Threatened	
Lacebark	<i>Hoheria populnea</i>	Not Threatened	
Lancewood	<i>Pseudopanax crassifolius</i>	Not Threatened	
Lemonwood	<i>Pittosporum eugenoides</i>	Not Threatened	
Mahoe	<i>Melicytus ramiflorus</i>	Not Threatened	
Mahoe	<i>Melicytus ramiflorus</i>	Not Threatened	
Ngaio	<i>Myoporum laetum</i>	Not Threatened	
Pohutukawa	<i>Metrosideros excelsa</i>	Not Threatened	
Poroporo	<i>Solanum laciniatum</i>	Not Threatened	
Shaking brake	<i>Pteris tremula</i>	Not Threatened	
Rangiora	<i>Brachyglottis repanda</i>	Not Threatened	
Shining Karamu	<i>Coprosma lucida</i>	Not Threatened	
Shining Spleenwort	<i>Asplenium oblongifolium</i>	Not Threatened	
Silver Fern	<i>Cyathea dealbata</i>	Not Threatened	
Taupata	<i>Coprosma repens</i>	Not Threatened	
Totora	<i>Podocarpus totara</i>	Not Threatened	
Veronica Stricta	<i>Hebe stricta</i>	Not Threatened	
Wharangi	<i>Melicope ternata</i>	Not Threatened	
Wineberry	<i>Aristotelia serrata</i>	Not Threatened	
Shining spleenwort	<i>Asplenium oblongifolium</i>	Not Threatened	
Pohuehue	<i>Meuhlenbeckia australis</i>	Not Threatened	
Eucalyptus	<i>Eucalyptus spp.</i>	Introduced	
Fanchets Cotoneaster	<i>Cotoneaster glaucophyllus</i>	Introduced	
Honey Suckle	<i>Lonicera japonica</i>	Introduced	
Indian Hawthorn	<i>Raphiolepis indica</i>	Introduced	
Ivy	<i>Hedera helix</i>	Introduced	
Japanese Cherry	<i>Prunus serrulata</i>	Introduced	
Oak Tree	<i>Quercus spp.</i>	Introduced	
Pale Pink Sorrel	<i>Oxalis debilis</i>	Introduced	
Sycamore Maple	<i>Acer pseudoplatanus</i>	Introduced	
Tradescantia	<i>Tradescantia fluminensis</i>	Introduced	
Tree Lucerne	<i>Chamaecytisus palmensis</i>	Introduced	
White Sally Wattle	<i>Acacia floribunda</i>	Introduced	

ANNEXURE D: Photographs of representative vegetation types



Annexure D Figure 1 - Mixed indigenous-exotic forest and scrub at the Terrace Tunnel project area. Photograph taken 30 September 2025



Annexure D Figure 2 - Mixed low-stature vegetation beneath specimen trees at the Terrace Tunnel project area. Photograph taken 30 September 2025



Annexure D Figure 3 - Regenerating broadleaf forest at the Mount Victoria Tunnel project area. Photograph taken on 30 September 2025



Annexure D Figure 4 - Mixed indigenous-exotic forest and scrub at the Eastern Connections project area. Taken on 30 September 2025

ANNEXURE E: BOAM Model summaries, justification tables, and assessment against the Principles of Offsetting (as outlined in the NPS-IB)

Regenerating broadleaf forest – no net loss

Regenerating broadleaf forest		Offset area (Area 1)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value (no net loss)	Component Net Present Biodiversity Value (no net loss)
Canopy	Cover	3.1	1.46	-0.90	0.55	0.26
	Average height		0.26	-0.33	-0.07	
	Basal area		0.51	-0.52	-0.01	
Diversity	Diversity of native vascular plants		0.75	-0.74	0.01	0.01
Understory	Percentage cover of indigenous species		0.53	-0.27	0.25	0.60
	indigenous understory height		1.42	-0.47	0.95	
Fauna habitat provision	CWD		0.40	-0.30	0.10	0.28
	Leaf litter		0.35	-0.12	0.24	
	Vertical cavity structures		0.74	-0.23	0.51	

Mixed indigenous-exotic forest and scrub – no net loss

Mixed indigenous-exotic forest and scrub		Offset area (Area 1)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Offset area (Area 2)	Biodiversity value at offset site (Area 2)	Attribute Net Present Biodiversity Value capturing biodiversity value across both offset areas (no net loss)	Component Net Present Biodiversity Value (no net loss)
Canopy	Cover	1.9 ha	0.89	-1.06	-0.17	2 ha	0.41	0.24	0.03
	Average height		0.16	-0.44	-0.28		0.12	-0.16	
	Basal area		0.36	-0.62	-0.26		0.26	0.00	
Diversity	Diversity of native vascular plants		0.46	-0.57	-0.11		0.22	0.11	0.11
Understory	Percentage cover of indigenous species		0.41	-0.43	-0.02		0.18	0.16	0.56
	indigenous understory height		0.87	-0.37	0.50		0.46	0.96	
Fauna habitat provision	CWD		0.24	-0.47	-0.23		0.26	0.03	0.31
	Leaf litter		0.22	-0.18	0.03		0.23	0.26	
	Vertical cavity structures		0.39	-0.18	0.21		0.42	0.63	

Regenerating broadleaf forest – net gain

Regenerating broadleaf forest		Offset area (Area 1)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value (net gain)	Component Net Present Biodiversity Value (net gain)
Canopy	Cover	3.5	1.65	-0.90	0.74	0.32
	Average height		0.29	-0.33	-0.03	
	Basal area		0.58	-0.52	0.06	
Diversity	Diversity of native vascular plants		0.84	-0.74	0.10	0.10
Understory	Percentage cover of indigenous species		0.60	-0.27	0.32	0.73
	indigenous understory height		1.60	-0.47	1.13	
Fauna habitat provision	CWD		0.45	-0.30	0.15	0.35
	Leaf litter		0.40	-0.12	0.28	
	Vertical cavity structures		0.84	-0.23	0.61	

Mixed indigenous-exotic forest and scrub – net gain

Mixed indigenous-exotic forest and scrub		Offset area (Area 1)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Offset area (Area 2)	Biodiversity value at offset site (Area 2)	Attribute Net Present Biodiversity Value capturing biodiversity value across both offset areas	Component Net Present Biodiversity Value (net gain)
Canopy	Cover	1.5 ha	0.71	-1.06	-0.36	4 ha	0.82	0.46	0.19
	Average height		0.12	-0.44	-0.32		0.24	-0.08	
	Basal area		0.28	-0.62	-0.34		0.52	0.19	
Diversity	Diversity of native vascular plants		0.36	-0.57	-0.21		0.43	0.23	0.23
Understory	Percentage cover of indigenous species		0.32	-0.43	-0.11		0.36	0.25	0.49
	indigenous understory height		0.69	-0.37	0.32		0.91	1.23	
Fauna habitat provision	CWD		0.19	-0.47	-0.28		0.51	0.23	0.28
	Leaf litter		0.17	-0.18	-0.01		0.46	0.44	
	Vertical cavity structures		0.31	-0.18	0.13		0.83	0.96	

Biodiversity component	Biodiversity attribute	Benchmark	Impact value (onsite assessment)		Benchmark justification	Measure after offset (time until endpoint)	Measure after offset justification	Impact area	Offset area (no net loss) (ha)	Offset area (net gain)	Reference
			Regenerating broadleaf forest	Mixed indigenous-exotic forest and scrub							
Indigenous canopy	Canopy cover (%)	90	87.5	65	A benchmark of 90% canopy cover considers the formation of a closed canopy of dominant indigenous pioneer species including a mix of manuka/kanuka, mahoe, mapou, and other broadleaf species.	70(10) (area 1) 80(10) (area 2)	10 years is considered an appropriate time to establish a closed canopy across restoration planting. Enrichment planting is expected to increase canopy cover through planting of canopy/emergent species.	Regenerating broadleaf forest: 0.93 ha Mixed indigenous-exotic forest and scrub: 1.47 ha	Regenerating broadleaf forest: Area 1: 3.1 ha Area 2: 0 ha Mixed indigenous-exotic forest and scrub: Area 1: 1.9 ha Area 2: 2 ha Total: Area 1: 5 ha Area 2: 2 ha	Regenerating broadleaf forest: Area 1: 3.5 ha Area 2: 0 ha Mixed indigenous-exotic forest and scrub: Area 1: 1.5 ha Area 2: 4 ha Total: Area 1: 5 ha Area 2: 4 ha	Tanes Tree Trust (2011)
	Average height of indigenous canopy (m)	15	7	6	A benchmark of 15 meters is based on the expected canopy height of a mature WF13 tawa, kohekohe forest, with a range of other broadleaf species expected.	5(30) (area 1) 7 (30) (area 2)	Based on the growth rates of common broadleaf species, including kohekohe. Conservative 2m of additional growth accounting for existing understory within Area 2.				Richardson et al (2014)
	Basal area (m2/ha)	70	44.79	29.5	A benchmark of 70m2/ha has been chosen based on a range of data available for secondary broadleaf forest and forest succession.	30(20)	Basal area expected to increase rapidly between 0 and 20 years and level once vegetation begins to mature and canopy closure occurs.				Allen et al., (2013)
Indigenous diversity	Diversity of native vascular plants	44	35	17	Up to an average of 44 vascular plant species is expected of a target/reference regenerating ecosystem, with mature WF13 ecosystems likely to contain a higher quantity.	24(20)	Reduced diversity compared to impacted ecosystem is expected during initial restoration period, with species diversity likely to increase towards benchmark as vegetation matures.				Smale et al (2008)
Indigenous understory	Percentage cover of indigenous understory vegetation (%)	40	20	15	Based on expected tier structure and diversity in mature forest ecosystems. Considered applicable to WF13 forest reference.	25(20)	A diverse assemblage of understory vegetation is expected at 20 years, however, will continue to develop and change beyond the modelled timeframe.				

	Indigenous understory height (m)	4	1	0.5	Based on secondary forest succession understory structure/characteristics.	2(20)	Closed canopy at 20 years with a height of 5m expected to support understory vegetation of 2m height.				Sullivan et al (2007)
Fauna habitat provision	Course woody debris (m3/ha)	25	8	8	25 considered appropriate for a WF13 reference ecosystem.	25(20)	Course woody debris forms naturally within a forest ecosystem over an extended time period to varying densities depending on the ecosystem type. Enrichment/enhancement will be undertaken to increase course woody debris density				Smale et al (2008)
	Average leaf litter depth (mm)	40	5	5	40mm average leaf litter depth considered suitable for habitat provision to native lizards and invertebrates.	25(20)	It is expected that nutrient recycling and leaf litter fall in the restored ecosystem will be occurring to a reduced extent compared to a benchmark ecosystem at 20 years.				
	Vertical cavity structures (count/ha)	120	30	15	An estimate value derived from an average number of emergent trees within a broadleaf/podocarp forest with no historic logging.	50(5)	A target of 50 veteranized trees per hectare will be				Beveridge et al., (1985)

Principles of Offsetting (Appendix 3, NPS-IB; 2023)	Summary of how principle has been addressed in this report or reference to relevant report section.
1) Adherence to effects management hierarchy: A biodiversity offset is a commitment to redress more than minor residual adverse effects and should be contemplated only after steps to avoid, minimise, and remedy adverse effects are demonstrated to have been sequentially exhausted.	Efforts to avoid, minimise, and remedy have been detailed in Section 6.
(2) When biodiversity offsetting is not appropriate: Biodiversity offsets are not appropriate in situations where indigenous biodiversity values cannot be offset to achieve a net gain. Examples of an offset not being appropriate include where: (a) residual adverse effects cannot be offset because of the irreplaceability or vulnerability of the indigenous biodiversity affected; (b) effects on indigenous biodiversity are uncertain, unknown, or little understood, but potential effects are significantly adverse or irreversible; (c) there are no technically feasible options by which to secure gains within an acceptable timeframe.	Measurable attributes of ecological values impacted have been detailed in Section 8, with impacts on indigenous biodiversity generally certain, known, and understood.
(3) Net gain: This principle reflects a standard of acceptability for demonstrating, and then achieving, a net gain in indigenous biodiversity values. Net gain is demonstrated by a like-for-like quantitative loss/gain calculation of the following, and is achieved when the indigenous biodiversity values at the offset site are equivalent to or exceed those being lost at the impact site: (a) types of indigenous biodiversity, including when indigenous species depend on introduced species for their persistence; and (b) amount; and (c) condition (structure and quality).	Both like-for-like net gain and no-net-loss biodiversity offset scenarios have been modelled in Section 8.
(4) Additionality: A biodiversity offset achieves gains in indigenous biodiversity above and beyond gains that would have occurred in the absence of the offset, such as gains that are additional to any minimisation and remediation undertaken in relation to the adverse effects of the activity.	The proposed offsets are additional to work that would have occurred in the absence of the proposed offset.
(5) Leakage: Biodiversity offset design and implementation avoids displacing harm to other indigenous biodiversity in the same or any other location.	The design and implementation of the proposed offsets will be undertaken using best practice methodology and guided by expert advice, as outlined in Section 8.
(6) Long-term outcomes: A biodiversity offset is managed to secure outcomes of the activity that last at least as long as the impacts, and preferably in perpetuity. Consideration must be given to long-term issues around funding, location, management and monitoring.	The proposed offsets will be secured through the use of the Wellington Town Belt land in agreement with WCC.
(7) Landscape context: Biodiversity offsetting is undertaken where this will result in the best ecological outcome, preferably close to the impact site or within the same ecological district. The action considers the landscape context of both the impact site and the offset site, taking into account interactions between species, habitats and ecosystems, spatial connections, and ecosystem function.	The proposed offsets consider the surrounding landscape and potential benefits associated with the offset actions to the surrounding landscape.
(8) Time lags: The delay between loss of, or effects on, indigenous biodiversity values at the impact site and the gain or maturity of indigenous biodiversity at the offset site is minimised so that the calculated gains are achieved within the consent period or, as appropriate, a longer period (but not more than 35 years).	Time lags have been addressed through the use of discount rates.
(9) Science and mātauranga Māori: The design and implementation of a biodiversity offset is a documented process informed by science and mātauranga Māori.	The design and delivery of the terrestrial revegetation/restoration can be undertaken in partnership with mana whenua to incorporate mātauranga Māori.
(10) Tangata whenua and stakeholder participation: Opportunity for the effective and early participation of tangata whenua and stakeholders is demonstrated when planning biodiversity offsets, including their evaluation, selection, design, implementation, and monitoring.	The design and delivery of the terrestrial revegetation/restoration can be undertaken in partnership with mana whenua.
(11) Transparency: The design and implementation of a biodiversity offset, and communication of its results to the public, is undertaken in a transparent and timely manner.	