

Northern Corridor Improvements

Assessment of Terrestrial Ecological Effects

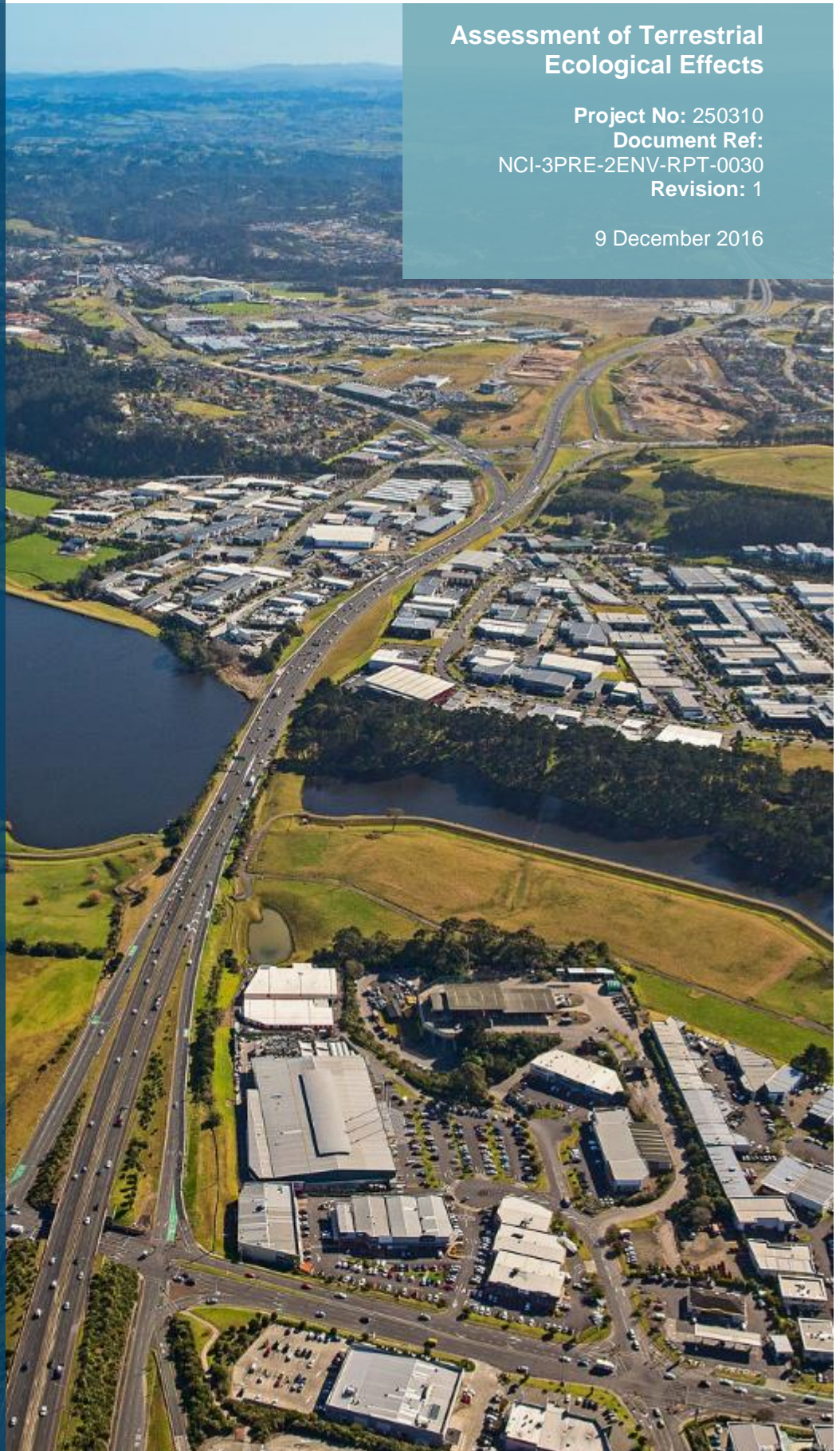
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Quality Assurance Statement	
Prepared by:	Chris Wedding, Jennifer Shanks (Bioresarches Group)
Reviewed by:	Graham Don (Bioresarches Group)
NZTA Reviewer:	Carol Bannock
Approved for issue by Aurecon:	Jon Hind
Approved for use by NZTA:	Deepak Rama



Executive summary

Purpose of Report

This report identifies and assesses the potential effects of the Northern Corridor Improvements Project (the Project) on terrestrial ecological values. The values assessed include vegetation and flora, lizards, avifauna and long-tailed bats within the Project area. Where values are identified and are potentially affected by the construction or operation of the Project, recommendations are provided to avoid or mitigate those effects.

Assessments Undertaken

The assessments were undertaken across the Project area and include desktop and database reviews, site visits and formal surveys for flora and fauna.

Results of Assessments

The majority of the vegetation and potential fauna habitat values within the Project area are low, being predominantly planted areas. While vegetation clearance is proposed within the Project area, the overall value of this vegetation is low.

Exceptions to this include some naturally regenerating vegetation within Significant Ecological Area (SEA_T_8297) at the Oteha Valley Road on-ramp where the existing corridor currently crosses Lucas Creek. However, vegetation and habitats within this SEA will not be impacted by the Project. Further, recommendations are provided for mitigation and enhancement planting.

Two small areas have potential to support native lizards, including 'At Risk' skinks or geckos which have been recorded in contiguous or nearby vegetation. The affected areas have generally low ecological value other than the lizard fauna they potentially support, and it is recommended that any lizards present are relocated to safe habitats out of the Project area.

Threatened New Zealand dotterel (*Charadrius obscurus*) were observed using a proposed construction yard within the Project near the Albany commercial block area on an intermittent basis through August 2016. This species is conservation dependent and nest destruction or abandonment during the breeding season as a result of construction activities would be a significant adverse effect. It is recommended that measures are implemented to discourage dotterel from nesting within construction yards to avoid potential adverse effects on nests, eggs or chicks.

The Rosedale Waste Water Treatment Ponds (RWWTP) support important avifauna populations, including conservation dependent species such as the Threatened New Zealand dabchick (*Poliiocephalus rufopectus*), which may nest within the Project area, particularly on the northern side of the ponds, during the breeding season. Nest destruction or abandonment during the breeding season as a result of construction activities would be a significant adverse effect. Adverse effects on nests, eggs or chicks during construction should be avoided by removing nesting habitat prior to the breeding



season. Overall, the network of new ponds proposed in the RWWTP area as part of the Project is likely to have a habitat enhancement effect for avifauna.

Overall, the potential construction effects associated with the Project will be temporary and/or within relatively small areas.

Suggested Mitigation

Proposed mitigation measures involve replacement planting for any areas of vegetation lost, and onsite supervision of vegetation clearance to capture and relocate native lizards at two sites at Oteha Valley Road and the Rosedale Closed Landfill. Avoidance of nesting threatened birds, including dotterels and waterfowl is recommended in that first instance, and this includes discouragement of dotterels from nesting at construction support areas and pre-breeding season vegetation clearance of potential waterfowls nesting habitat at the RWWTP.



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Glossary of Abbreviations

Item	Description
ABM	Automatic Bat Monitoring box
AEE	Assessment of Environmental Effects
ARDS	Amphibian and Reptile Distribution Scheme
AUP	Auckland Unitary Plan (Operative in Part, 15 November 2016)
CSA	Construction Support Area
DoC	Department of Conservation
MPI	Ministry for Primary Industries
RWWTP	Rosedale Waste Water Treatment Plant
SEA	Significant Ecological Area
SHx	State Highway (number)
SUP	Shared Use Path
UHH	Upper Harbour Highway



Terms and Definitions

Item	Description
Earthworks	The disturbance of land surfaces by blading, contouring, ripping, moving, removing, placing or replacing soil or earth, or by excavation, or by cutting or filling operations.
Project	Refers to the Northern Corridor Improvements Project including the extension to the Northern Busway and proposed Shared Use Pathway.
Project area	The area within the new and altered designation footprint for the Northern Corridor Improvements Project and that abutting this corridor
Project corridor	The area within the new and altered designation footprint for the Northern Corridor Improvements Project.
Project works	All proposed activities associated with the Project.
NZ Transport Agency	The New Zealand Transport Agency.

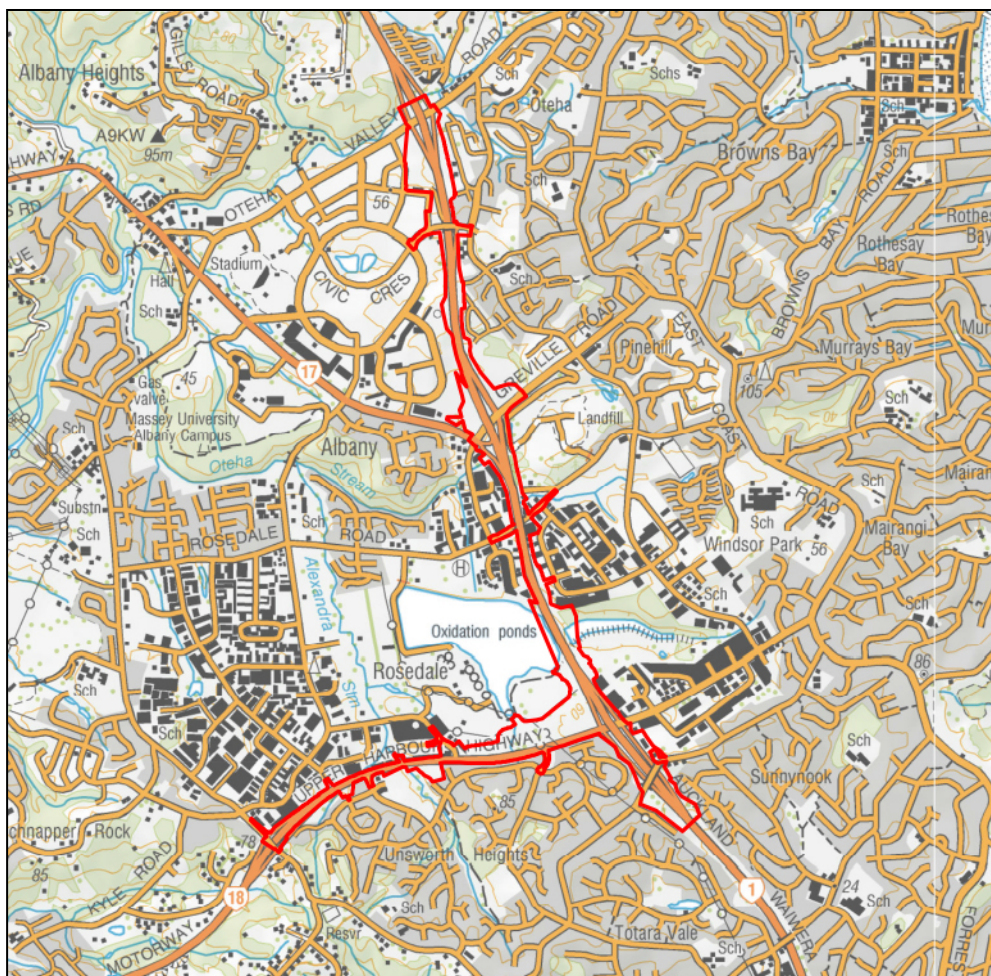


1 Description of Project

1.1 Project Background

The Northern Corridor Improvements Project (the Project) is an accelerated project. The Project area covers the area of SH18 between Albany Highway and Constellation Drive, and SH1 between Upper Harbour Highway (UHH) interchange to just beyond the Oteha Valley Road Interchange as indicated on **Figure 1** below and confirmed in the suite of plans provided in **Volume 5**.

Figure 1 Extent of Project Area



Source: Base Map from LINZ

The Project proposes to upgrade the existing State highways within the Project area. In summary, the key elements of the Project are as follows:

- North and West Motorway Interchange connections – SH1/SH18;
- State highway capacity and safety improvements;
- Northern busway extension from Constellation Bus Station and connection to Albany Bus Station;
- Reconfiguration of Constellation Bus Station converting it from a terminus station to a dual direction station;



- Shared Use Path (SUP) provision along existing SH1 and SH18 routes for the full extent of the Project corridor:
 - Constellation Bus Station to Oteha Valley Road;
 - Constellation Drive to Albany Highway; and
 - Intermediate linkages to local network.

A full description of the Project, including its components and construction, is contained in section 5 of the Assessment of Environmental Effects (AEE).

1.2 Purpose of this Report

This report is one of a suite of technical reports that has been prepared to inform the AEE for the Project.

The particular focus of this report is assessment of the effects of the Project on terrestrial ecological values, specifically vegetation and wildlife. A separate report addresses effects on freshwater ecosystems, being the Assessment of Freshwater Ecological Effects provided in **Volume 3 – Technical Assessment 5**.

Existing terrestrial ecological features and values of the Project area are described, the scale and severity of potential effects of the Project on these values is assessed, and measures to minimise or mitigate adverse effects on the ecology of the site are identified where required.



2 Assessment Methodology

2.1 General Assessment Method

The assessments contained in this report were undertaken by ecologists with expertise in the fields of botany and fauna (lizards, birds and long-tailed bats). The specific methods used by each expert are addressed in detail in the sections below.

Ecologists assessed the vegetation and potential fauna habitats within the Project area using a combination of desktop and field inspections, and survey.

Site visits were undertaken of the entire Project area to ascertain the actual or potential presence of indigenous vegetation and fauna habitats. Database searches for native fauna, including lizards, birds and bats were undertaken (Bioweb, Auckland Council Fauna records) and these records were then compiled for locations within or near the Project area. Particular focus was given to fauna records from vegetation that is contiguous with that within the Project area where their habitats were potentially present.

Ecological values are described in this report as being high, moderate, low or very low and the corresponding assessment of effects are described as high, moderate, minor or negligible. **Table 1** provides generalised ecological descriptions with corresponding simplified value descriptors and associated impact scales.

Table 1 Generalised Ecological Descriptors and Corresponding Valuation

Vegetation/ Habitat Description	Ecological Value Descriptor
<p>Vegetation: Entirely or predominantly exotic pest plants; may have some scattered common natives.</p> <p>Fauna: May support some habitat value to common native fauna (birds and lizards), though potential habitats are largely occupied by introduced fauna.</p>	Very Low
<p>Vegetation: Planted young (<20 years) native vegetation comprising common species. Vegetation is generally of small size (<15m tall)</p> <p>Fauna: Potential habitat likely to support some common native fauna (birds and lizards).</p>	Low
<p>Vegetation: Naturally regenerating kanuka/ broadleaf forest with understorey.</p> <p>Fauna: Potential habitat likely to support common native fauna. Some Nationally 'At Risk' species may potentially occur.</p>	Moderate
<p>Vegetation: Naturally regenerating podocarp or broadleaved forest with mature trees.</p> <p>Fauna: Potential habitat likely to support common native and Nationally 'At Risk' or 'Threatened' fauna.</p>	High



2.2 Vegetation and Flora

Key areas of vegetation were identified from the aerial maps and the Project area was assessed by an experienced botanist on 10 to 11 May 2016. Both the Rosedale Waste Water Treatment Plant (RWWTP) and Rosedale Closed Landfill sites were accessed and key areas of vegetation were visited and walked through. A few minor areas that were not easily accessible were assessed from a vantage point using binoculars.

The characteristics of the vegetation were recorded including canopy species and their approximate height, key native species and any weed infestations. There are numerous strips of native revegetation planting along the motorways, however these consist of a standard palette of mostly pioneer shrubs such as karamu, kanuka, manuka, flax and cabbage trees, sometimes with the addition of young canopy trees such as puriri, totara etc. None are of any great age or size and they were generally not assessed separately. The conclusions reached in this report rely on the site visits described above by an experienced botanist.

2.3 Fauna

Fauna surveys of the Project area were undertaken from 26 April to 13 May 2016. It is acknowledged that the timing for fauna surveys was outside of peak activity periods for terrestrial fauna. In particular, activity of long-tailed bats and lizards (skinks and geckos) is significantly reduced over winter. However, activity does not cease completely and the survey method used reduced the potential effect of reduced activity on detectability by baiting traps (lizards) and undertaking the survey during warm, fine weather conditions before the winter period.

2.3.1 Lizards / Mokonoko

The survey aspect of this assessment was completed by a herpetologist, acting under Wildlife Act Authority WA-37604-FAU.

New Zealand has two major groups of terrestrial reptiles: lizards (*Order Squamata*) and tuatara (*Order Rhynchocephalia*). Tuatara are not present on mainland New Zealand outside wildlife sanctuaries, and therefore are not considered in this assessment. Nine species of native lizard have been recorded on the Auckland mainland (**Table 2**) and six of these are classified as Nationally “At-Risk” by the Department of Conservation (Hitchmough et al. 2013).

Table 2 Threat Classification of Native Lizards from the Auckland Region

Species	Threat Category	Threat Status
Copper skink (<i>Oligosoma aeneum</i>)	Not Threatened	
Ornate skink (<i>Oligosoma ornatum</i>)	At Risk	Declining
Moko skink (<i>Oligosoma moco</i>)	At Risk	Relict
Shore skink (<i>Oligosoma smithi</i>)*	Not Threatened	
Striped skink (<i>Oligosoma striatum</i>)	At Risk	Declining
Common gecko (<i>Woodworthia maculata</i>)	Not Threatened	
Forest gecko (<i>Mokopirirakau granulatus</i>)	At Risk	Declining
Pacific gecko (<i>Dactylocnemis pacificus</i>)	At Risk	Relict
Elegant gecko (<i>Naultinus elegans</i>)	At Risk	Declining

*Strictly a coastal species

Note - Threat category as per Hitchmough et al. (2013).



One introduced species, the rainbow skink (*Lampropholis delicata*), is classified as an “Unwanted Organism” by the Ministry for Primary Industries (MPI) under the Biosecurity Act (1993) and was not considered in this assessment, other than noting its presence when observed.

Desktop investigations involved a review of the Department of Conservation’s (DoC) Amphibian and Reptile Distribution Scheme (ARDS) database (accessed April 2016), as well as an analysis of aerial and topographic imagery for the presence of tracks and vegetation cover to plan survey design and spatial coverage.

2.3.1.1 Assessment Method

All sites that were identified as potentially supporting habitat for indigenous lizards were visited to undertake a qualitative habitat description. These sites are numbered in **Table 3** and shown in **Figure 2**.

Representative areas that were considered to support the highest quality lizard habitat were surveyed using baited double-end funnel traps, in accordance with the Department of Conservation best practice (Hare 2012). Funnel traps are suitable for capturing terrestrial skinks and geckos and were baited with banana to maximise encounter opportunities with both lizard groups at targeted sites. Night searching for arboreal (tree dwelling) lizards was not undertaken because habitat quality was particularly poor at all sites except Site 1. At Site 1 records indicated that such species (forest, green and pacific gecko) were present in nearby, contiguous vegetation and this area was therefore not surveyed.

In total, 33 baited funnel traps were installed across Sites 2 (n = 5); 7 (n = 8); 8 (n = 10); and 9 (n = 10) (**Table 3**). A combined total of 99 trap days was achieved across these sites.

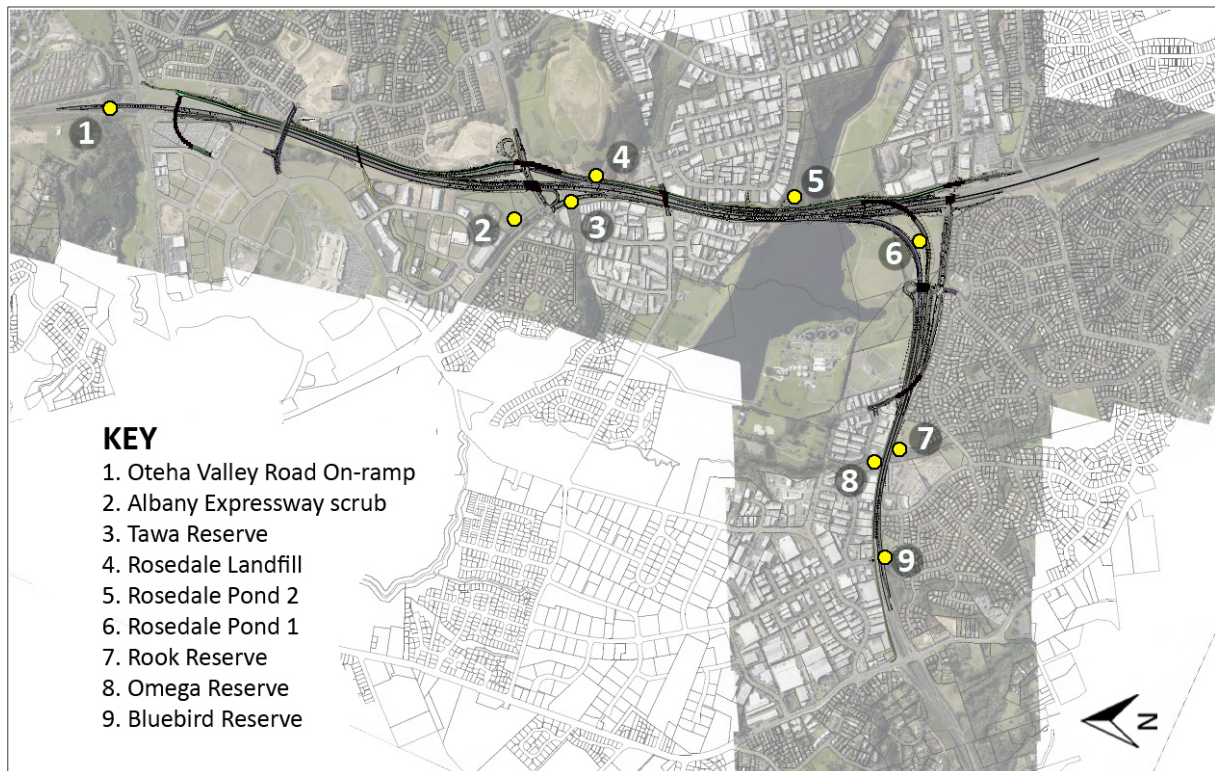
Table 3 Sites Identified as Supporting Potential Habitat for Indigenous Lizards

	Site	Qualitative	Habitat Searches	Funnel Trap
1	Oteha Valley Road On Ramp	✓	✓	
2	Albany Expressway Scrub	✓	✓	✓
3	Tawa Reserve	✓	✓	
4	Rosedale Landfill	✓	✓	
5	Rosedale Treatment Pond 2	✓	✓	
6	Rosedale Treatment Pond 1	✓	✓	
7	Rook Reserve	✓	✓	✓
8	Omega Reserve	✓	✓	✓
9	Bluebird Reserve	✓	✓	✓

Note: Refer to Table 3 for assessment methods



Figure 2 Sites Identified as Supporting Potential Habitat for Indigenous Lizards



Source: Base image from Aurecon NZ Ltd

Vegetation within Sites 1 and 3 to 6 was viewed once during the assessment period, during which qualitative assessments of potential habitats at those sites were undertaken in addition to habitat searches of a minimum 2 person search hours per site.

2.3.2 Birds / Manu Māori

Indigenous avifauna and their potential habitats were reviewed and assessed throughout the Project area. Species classified as “At Risk” or “Threatened” (Robertson et al. 2012) or keystone species, were considered to be significant, where we identified them within the Project area. A keystone species, such as kereru, is one that plays a crucial role in maintaining ecosystem functions (Mander et al. 1998).

Literature searches were conducted to identify all bird species that could potentially be present within the Project area. This included a summary of all birds recorded in the 10km² grid squares applying to the wider surrounding area from Robertson et al (2007).

All bird species (native and exotic) were recorded that were observed using habitats at Sites 1 to 9 during terrestrial site visits on 29, 30, 31 March, and 1 April 2016. Those sites are identified in **Table 3** and **Figure 2**.

For the RWWTP, regular information on bird populations using the ponds has been collected since 2002 (Bioresearches 2015) and is summarized in **Section 3.3.2.1**. This information was relied upon for assessments of the RWWTP, rather than that obtained for the purposes of this study, due to it being a greater and up to date dataset.



New Zealand dotterel (*Charadrius obscurus*) roost and nest in open coastal areas, generally sandy beaches and shell banks. They are also known to breed inland, on open, short grass areas and are monitored by DoC (DoC approved monitors) on vacant land near the Project area around the Albany commercial area. Blocks of open, short grass areas within the Project area were visited regularly throughout August to October inclusive. Where any dotterels were recorded within the Project area, these were then monitored on a more regular basis to determine frequency of use.

2.3.3 Long-tailed bats / Pekapeka

Some habitats within the Auckland Region are known to support populations of the threatened long-tailed bat (*Chalinolobus tuberculatus*), including the Hauraki Gulf Islands: Kawau, Great Barrier and Little Barrier. On the mainland, the Waitakere and Hunua Ranges support the best-known populations, and recent records indicate populations occur around Riverhead and through the Rodney District (Bioresarches 2014). Because the species is difficult to observe in the wild, the paucity of records around Auckland may only reflect a lack of bat surveys in the region.

Long-tailed bats are highly mobile; they regularly change roost sites (Griffiths 1996) and have very large home ranges (up to 100km²). The closest confirmed record of a long-tailed bat is at Riverhead Forest, some 11 km from the Project area (Bioresarches 2014, and see **Figure 3**). Therefore, while the Project area is within an urban environment, it is feasible that bats may visit parts of the Project area, if only intermittently.

2.3.3.1 Assessment Method

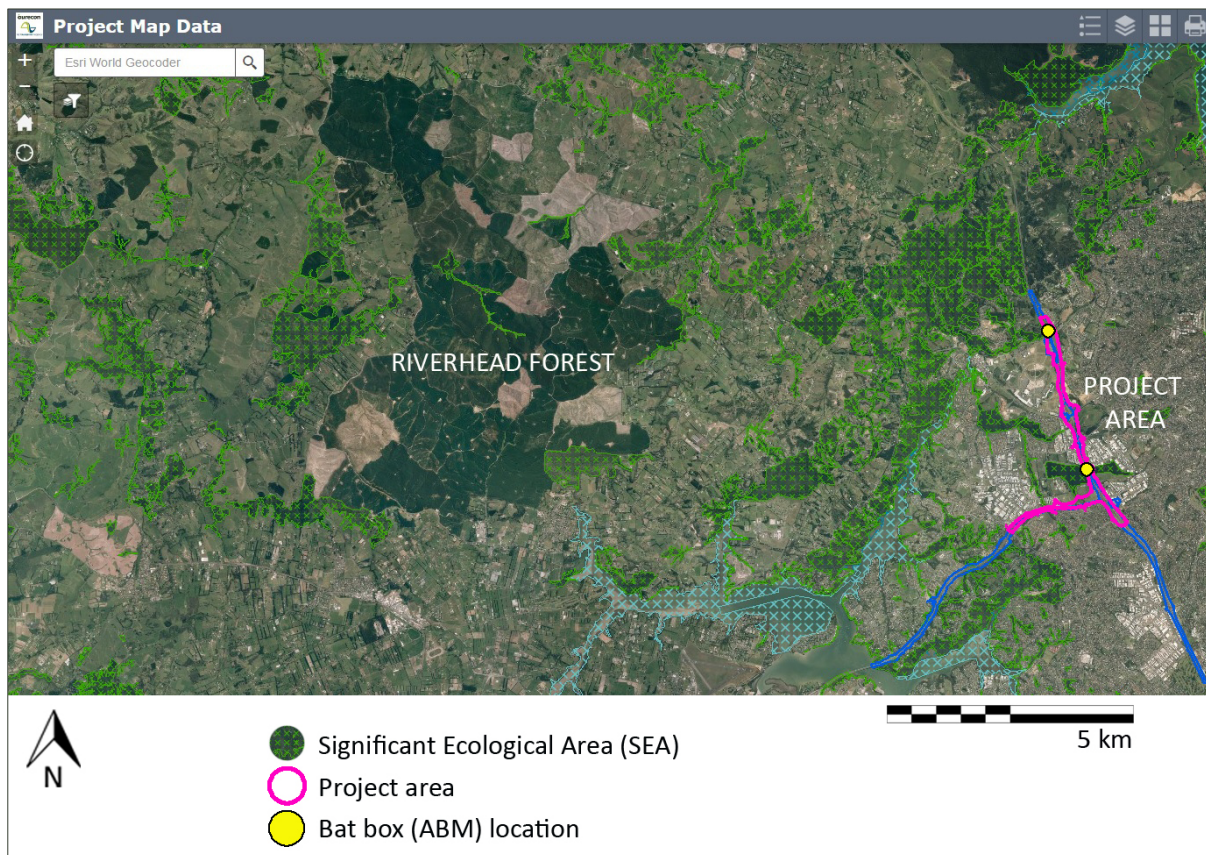
Long-tailed bats were surveyed using two Automatic Bat Monitoring boxes (ABMs) that record ultrasounds created by a bat's echolocation calls (see Sedgeley 2012, DOC best practice manual). ABMs consist of ultrasound sensors, a sound-activated sound recording device, a timer to switch the system on each night, and a rain detector to switch the system off in rain. Ultrasound sensors recorded at 40 kHz, the frequency at which long- bats are best detected.

One ABM was installed at the bottom of the Oteha Valley escarpment, and one near the stormwater pond at the Oteha Valley Road on-ramp, and RWWTP, at the interface of the pine trees and Pond 2. These two locations were considered to be where potential bat encounters within the Project area are most likely. ABMs were set to record from before sunset (1700 hrs) to after sunrise (0700 hrs) from 12 April to 27 April 2016.

Long-tailed bat activity is usually reduced in winter (Sedgeley et al 2012), though generally does not cease completely. Therefore to ensure survey credibility, data from recorded nights were considered 'useable' if the temperature remained above 5°C, there were no strong winds, and more than half the night was rain-free (Sedgeley 2012). While the survey was undertaken just outside the optimal survey period of summer through to autumn /March (Sedgeley 2012), each ABM recorded for a sustained two week period and outside of winter months.



Figure 3 Location of Bat Boxes within the Project Area



Note: The context of the Project area in the surrounding landscape, including SEAs and Riverhead Forest area shown on Figure.

Source: Base image from Auckland Council GIS



3 Existing Environment

3.1 Introduction

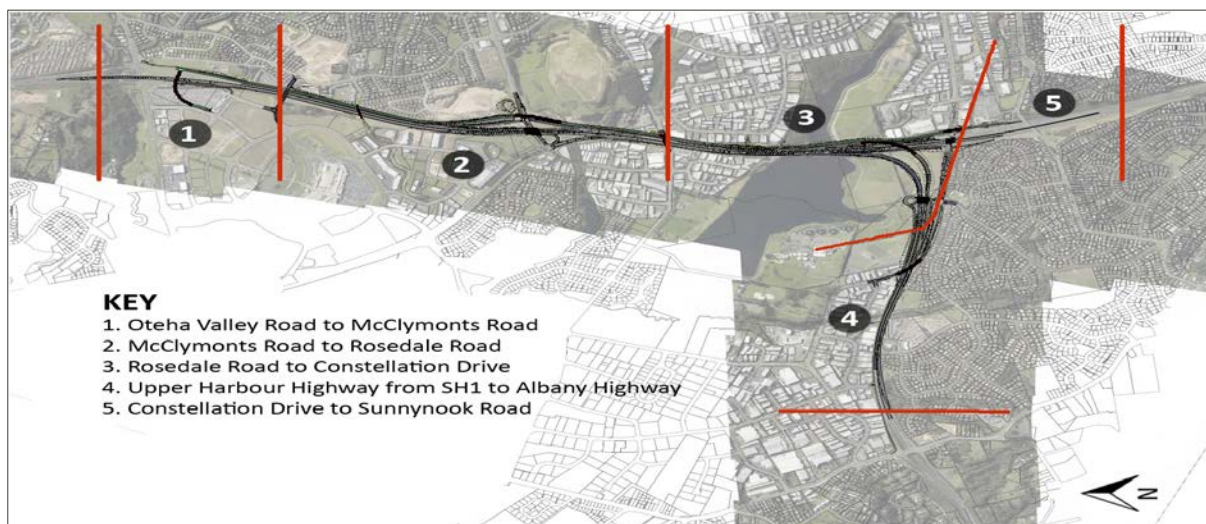
Overall, the existing environment is characterised by an urban, commercial and industrial setting. Consequently the ecological values are generally low. Some areas where ecological values were originally identified during assessments undertaken earlier this year have since been avoided or reduced in scale as a result of amendments to the Project during the development of the final design for lodgement. These sites include the Tawa, Omega and Rook Reserves.

3.2 Vegetation and Flora

The results of the vegetation survey are presented in the following sectors along the Northern Motorway system (**Figure 4**). In addition, provided at **Appendix A** is an Arboricultural Statement which provides a review of the vegetation affected by the Project.

1. Oteha Valley Road to McClymonts Road;
2. McClymonts Road to Rosedale Road;
3. Rosedale Road to Constellation Drive;
4. Upper Harbour Highway from SH1 to Albany Highway; and
5. Constellation Drive to Sunnynook Road.

Figure 4 Location of Sectors referred to in Vegetation Descriptions



Source: Base image from Aurecon NZ Ltd

3.2.1 Oteha Valley Road to McClymonts Road

This sector includes part of the Hooten Reserve and the Albany Bus Station for the Northern Busway. The Auckland Unitary Plan Operative in Part (15 November 2016) (AUP) shows a Significant Ecological Area (SEA_T_8297) occupying the steep south-facing scarp above Lucas Creek. Part of this SEA extends along the western side of the northbound on-ramp within the Project area. This SEA qualifies as being significant under three criteria (representativeness, threat status and rarity, diversity)



and is one of the few natural connections running under the motorway. No work is proposed in this area as part of the Project.

Stormwater wetlands are planned for the southern side of Oteha Valley Road within open grassland close to the motorway interchange. A new motorway on-ramp will be constructed from the busway station over the motorway to the eastern side and the motorway will be widened on the northern side of Oteha Valley Road on the northbound side. These areas are outside the SEA.

3.2.1.1 Vegetation on the northern side of Oteha Valley Road

There is a considerable amount of native vegetation surrounding the Northern Motorway in this area. The key botanical feature is the SEA vegetation alongside the northbound on-ramp which consists of tall kanuka (*Kunzea robusta*), tanekaha (*Phyllocladus trichomanoides*), rewarewa (*Knightsia excelsa*) and kahikatea (*Dacrydium dacrydioides*) over an understorey of silver tree fern (*Cyathea dealbata*), pate (*Schefflera digitata*), mapou (*Myrsine australis*), mahoe (*Melicope ramiflorus*) and karamu (*Coprosma robusta*).

The riparian vegetation by Lucas Creek and on the lower slopes is mainly native with the canopy being 20 – 25m tall (**Figure 5**). This vegetation type is best described as regenerating podocarp broadleaved forest. Further up the steep slope there are elements of kanuka scrub such as akepiro (*Olearia furfuracea*), razor sedge (*Gahnia xanthocarpa*), kumerahou (*Pomaderris kumeraho*) and prickly mingimingi (*Leptocophylla juniperina*) on the bush edges. Large radiata pines (*Pinus radiata*) and wattle (*Acacia spp*) trees were observed in the canopy amongst the native trees further upslope and a number of weeds including woolly nightshade (*Solanum mauritianum*), brush wattle (*Paraserianthes lophantha*) and patches of tradescantia (*Tradescantia fluminensis*) and alligator weed (*Alternanthera phytoloxeroides*). In general the riparian vegetation along the stream is of good quality with moderate to high botanical values, while the SEA vegetation further up the slope is weedier with a significant component of exotic trees and moderate to low botanical values.

As Lucas Creek flows westwards under the motorway, similar native riparian vegetation to that in the SEA occurs along its banks and this was originally contiguous with the SEA prior to construction of the motorway. The botanical values of this vegetation are moderate as it is fragmented. However, it does provide a corridor of native riparian habitat from the SEA on the western side of the motorway to the eastern side of the motorway. No works are planned for this area or for the vegetation within SEA_T_8297.

Riparian vegetation on the eastern side of the motorway is sparse and fragmented. There is at least one large mature rimu (*Dacrydium cupressinum*) between the western on-ramp and SH1 and other native trees are of good size. Other native vegetation associated with the motorway is predominantly restoration plantings of kanuka of various ages, mostly less than 4m tall, with low botanical value. A new culvert will extend from the northern end of the shared use path under the motorway through a grassed area and drain to Lucas Creek between the southbound off-ramp and the motorway. It will pass through mainly young planted vegetation of low botanical value surrounding the existing stormwater pond and riparian vegetation on the southern side of Lucas Creek.

The vegetation in the vicinity of the existing stormwater ponds comprises wetland plants such as tussock swamp twig rush (*Machaerina juncea*), pukio (*Carex secta* and *C. virgata*), giant umbrella sedge (*Cyperus ustulatus*), fan flowered rush (*Juncus sarophorus*) and oioi (*Apodasmia similis*) within the ponds. Surrounding the ponds are flax (*Phormium tenax*) and common trees and shrubs such as karamu, tarata (*Pittosporum eugenioides*) and kohuhu (*P. tenuifolium*) lacebark (*Houheria populnea*), kanuka and coastal kowhai (*Sophora chathamica*). All of this vegetation is part of restoration planting



which is well established with the tallest shrubs and trees reaching 4m to 6m in height. Its botanical values are currently low. No works are planned within either of these ponds.

Figure 5 Tall Regenerating Podocarp Broadleaved Forest within the SEA on the Northern Side of Lucas Creek



Source: Bioreserches

3.2.1.2 Vegetation on the southern side of Oteha Valley Road

There is little vegetation of note on the southern side of Oteha Valley Road. Within the Albany Busway site there is a strip of restoration planting between the carpark and the motorway that comprises common shrubs and trees such as cabbage trees (*Cordyline australis*), kanuka, karo (*Pittosporum crassifolium*), flax, lacebark, karamu, kohuhu, oioi and carex species. Scattered amongst this vegetation are specimens of exotic laurel magnolia (*Magnolia grandiflora*) which are still small shrubs. Some minor areas of earthworks will cut into the edges of this vegetation. This revegetation extends along the edge of the northbound bus off-ramp as far as McClymonts Road on the western side of the motorway. None of this vegetation is of significant size or age and its botanical values are low. Two stormwater ponds will be constructed on either side of SH1 south of Oteha Valley Road and these will be located in predominantly grassed areas with a slight encroachment into young restoration planting for the western pond.

Across on the eastern side of the motorway there is no native vegetation within the Project area. Scattered mature wattle trees are found on the corner of Oteha Valley Road and the southbound on-ramp and further south is a line of young Lawson's cypress at the top of the motorway cutting. The botanical values here are very low.



3.2.2 McClymonts Road to Rosedale Road

There is little vegetation of note in this sector which includes the Rosedale Closed Landfill.

Investigation of the vegetation on the corner of McClymonts Road and the southbound motorway on-ramp found that wattles, gorse (*Ulex europaeus*), and macrocarpa (*Cupressus macrocarpa*) occupy the site with standard motorway revegetation (see **Section 2.2**) on both sides of the on-ramp. Just to the south of this is a group of eucalypts (*Eucalyptus sp.*). A new wetland is proposed just south of McClymonts Road on the western side of the motorway amongst grass and exotic conifers. Botanical values in this area are generally low to very low.

3.2.2.1 Albany Expressway scrub western side of SH1

At the Greville Road interchange a stormwater pond lies just outside the existing designation, immediately south-east of the carpark at 39 Corinthian Drive. Another stormwater pond is proposed within the designation adjacent to this, to the east. South of these ponds is a proposed construction yard on vacant land. West of the proposed construction yard mixed exotic and native vegetation surrounds a small stream gully. The vegetation in the small stream gully is a mixture of two relatively young stands of radiata pine at the top and bottom of the gully with kanuka, karamu, silver tree fern, black ponga (*Cyathea medullaris*), mahoe and karo in the midsection. The construction yard will avoid this gully. There are several small groups of native plants, mainly cabbage trees amongst open grassland to the east towards SH1. The botanical values of this area are low.

3.2.2.2 Tawa Reserve

A small part of the eastern end of Tawa Reserve lies within the Project area. The western end of this reserve on the northern side of the stream is shown as an SEA, however the western end within the designation is not within the SEA. This area is mostly young revegetation planting next to the Greville Road Motorway off-ramp. The usual palette of native plants has been used including kanuka, cabbage trees, kohuhu, flax and karamu. The area has quite a weedy character with pampas (*Cortaderia selloana*), gorse, climbing dock (*Rumex sagittatus*) and watsonia (*Watsonia meriana*) present. Two culverts will discharge to the stream in this part of the Reserve. The quality of the vegetation is better further to the west, outside the designation, where the plants are older and better established. The botanical values of this part of the Reserve are generally low to very low.

3.2.2.3 Rosedale Closed Landfill

Areas A to E (**Figure 6**) are described for completeness, however, only small parts of areas B and D are within the Project area.

On the southwest facing slopes to the north of the gas works are several blocks of planted vegetation estimated to be no more than 15 years old. The plantings are a mixture of exotic and native vegetation with exotic species being dominant.

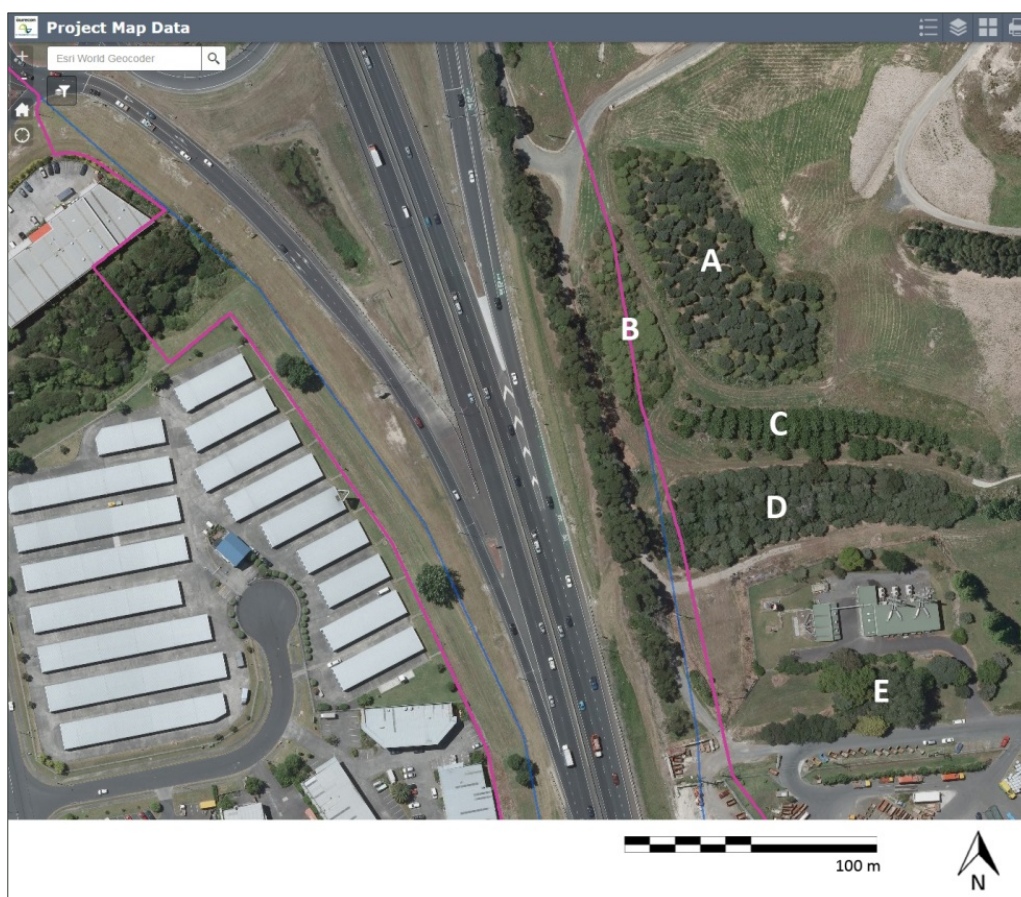
The southern edge of a revegetated area to the east of the stormwater pond on the corner of Greville Road and SH1 is also within the Project area. This consists of some small eucalypts, karamu, cabbage trees, flax, manuka, ngaio (*Myoporum laetum*) and the like.

The vegetation within Area A (**Figure 6**) is 8 -10m tall Tasmanian blackwood (*Acacia melanoxylon*) above ngaio (6m to 8m) with karo, flax, mahoe, karamu and puka (*Griselinia littoralis*) on the edges. Beneath the canopy there is no understorey. Area A has low botanical values.



Area B is predominantly ngaio with a few young karaka and totara to 6m tall. Area C is exotic plane trees (*Platanus sp.*). Area D is Tasmanian black wood with a few pohutukawa (*Metrosideros excelsa*), karo, puka and akeake (*Dodonaea viscosa*) scattered around the edges. Also present are a few alders (*Alnus glutinosa*) and woolly nightshade (*Solanum mauritianum*). Alongside the motorway on the south western edge the line of trees are Tasmanian blackwood to 3m with Chinese privet (*Ligustrum sinense*), young eucalypts, and brush wattle. All of these areas have low to very low botanical values. The Project footprint only includes the western side of Area B and the western tip of Area D. All of the vegetation within the Rosedale Closed Landfill has low to very low botanical values.

Figure 6 Vegetation Areas A-E within the Project Area at the Rosedale Closed Landfill



Source: Base image from Auckland Council GIS

3.2.3 Rosedale Road to Constellation Drive

This sector includes the RWWTP and Constellation Bus Station.

The RWWTP area is subject to two SEAs (SEA T 8364 covers Pond 1 while SEA T 8365 applies to Pond 2 and some adjacent land). Criteria met are 2B- threatened species and 4C- part of a network of sites that cumulatively provide important habitat for indigenous fauna or when aggregated make an important contribution to the provision of a particular ecosystem in the landscape. The key construction works planned for this site are motorway widening and additional lanes and connections to the Upper Harbour Motorway. A stormwater pond will be constructed to the east of SH1, adjacent to Arrenway Reserve and Pond 2 and another stormwater pond will be situated just south of Pond 1 on the western side of the motorway.



The stormwater pond within the Arrenway Reserve will be situated adjacent to the eastern treatment pond (Pond 2) amongst vegetation that is designated SEA. The vegetation here is predominantly radiata pines and open grassland and there is little in the way of an understorey present (**Figure 7**). Adjacent to SH1 is young revegetation planting consisting mainly of kanuka. This vegetation has low to very low botanical values. The stormwater pond south of Pond 1 is located in an open grassed area.

Figure 7 RWWTWP: Site of the Proposed Stormwater Pond adjacent to Arrenway Reserve and Pond 2



Source: *Bioresearches*

Two further stormwater ponds are proposed for the area south of Pond 1 on the western side of SH1 as part of additional connecting lanes and interchanges to the SH18. A large construction yard will be located on the corner of SH1 and SH18 on the northern side. The vegetation in this area is mainly open grassland with some wetland areas that are sparsely planted with native tree species such as kahikatea, puriri, kowhai, titoki and kanuka to c. 6m tall (**Figure 8**). Flax and cabbage trees also feature in wetter areas. A slightly denser planting of similar species is located to the east in an area that has a sign at the gate saying “Treated effluent irrigation trial field A” and these trees are 8 -10m tall. Much of this vegetation is in the footprint of the proposed works. The majority of this vegetation will be lost, however the botanical values of the vegetation in this area are generally low.



Figure 8 **RWWTP: Planted Native Vegetation in the Southern part of the Site in the vicinity of the Proposed Motorway Interchange on SH18**

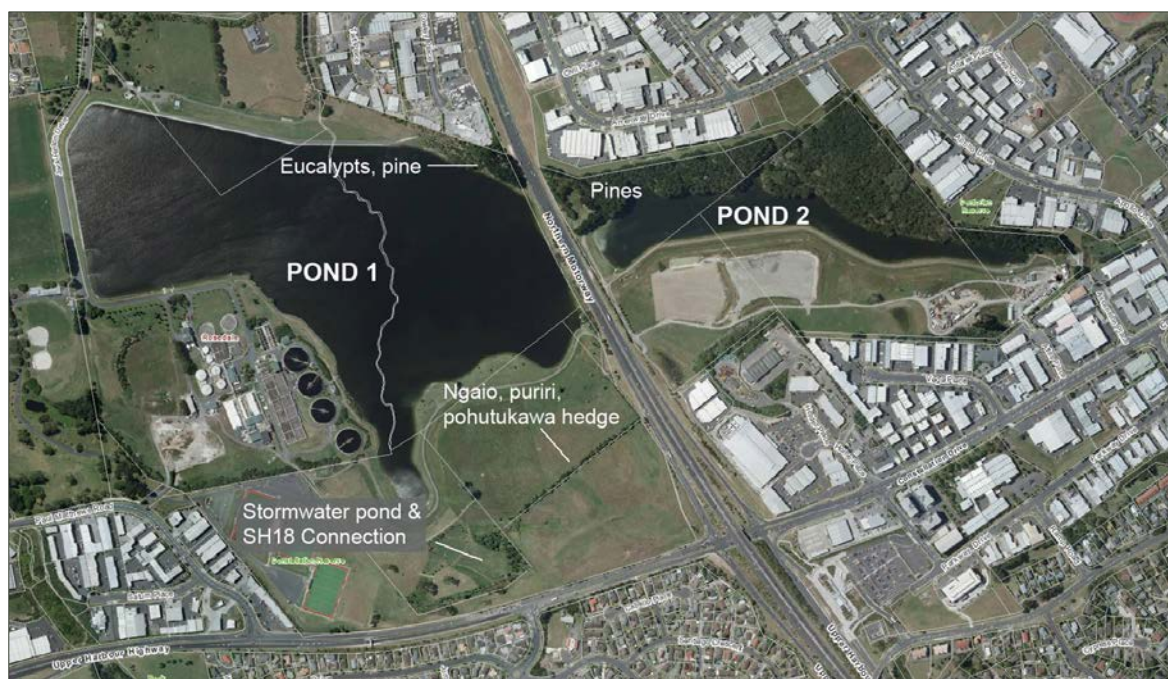


Source: Biosearches

Several clumps of mature pine trees are also scattered about the general area and a hedge/shelterbelt of tall ngaio (c. 10m), pohutukawa and puriri runs east north east to SH1. The hedge borders the northern side of the proposed construction yard and is likely to be retained.

Other areas of vegetation within the Project area at the RWWTP include a few pines, eucalypts and other exotic trees and some young planted natives on the western side of the motorway opposite the Arrerway Reserve (**Figure 9**). The botanical values of all of this vegetation are low to very low.

Figure 9 **Key Vegetation features of the RWWTP Site**



Source: Base image from Auckland Council GIS



3.2.4 Upper Harbour Highway from SH1 to Albany Highway

The Project area in this sector includes parts of the Omega Reserve, Rook Reserve and Bluebird Reserve.

A stormwater pond will be constructed in Rook Reserve within an open lawn area where there is no native vegetation. A second stormwater pond within Bluebird Reserve has been identified as an alternative option to Rook Reserve. Only one of these options will be constructed.

Within the Bluebird Reserve, a retaining wall will also be constructed along the outer edge of the motorway lanes and this will encroach into the edge of the reserve. A short connecting ramp will run from the pedestrian path within Omega Reserve to the shared use pathway along the motorway. Existing culverts within these reserves will be retained. The vegetation within the Project area is described below.

3.2.4.1 Omega Reserve

Most of this reserve is designated SEA (SEA_T_8084) in the AUP. The AUP states that this area meets criterion 2 in terms of threat status and rarity although it is also be an important ecological corridor and stream buffer (criterion 4) within this urban setting.

This area consists of planted and remnant native revegetation surrounding a section of the Alexandra Stream. At the south end of the reserve adjacent to the motorway the vegetation is youngest, probably less than 10 years old and this is not within the SEA. The proposed connecting ramp will be constructed within this young vegetation outside the SEA. There are a few weeds present such as Japanese honeysuckle and woolly nightshade but otherwise it is a good quality area of young native vegetation. Botanical values of the vegetation within the designation are currently low due to its young age. No works are proposed within the SEA.

3.2.4.2 Rook Reserve

The northern end of Rook Reserve has some well-established older kanuka (8 -10m tall) and tree ferns along the Alexandra Stream as well as younger established mahoe, karamu, cabbage trees and the like located south of the pedestrian walkway. The western side of the stream has numerous large old wattle trees, with Chinese privet and pampas amongst planted natives. The southern part of the Reserve becomes quite weedy with tradescantia along the stream and other pest plants forming a significant component of the vegetation. Rook Reserve is not a SEA under the AUP. No works are proposed within the area of native vegetation. The botanical values of the open grassed area where the stormwater pond will be situated are very low.

3.2.4.3 Bluebird Reserve

Bluebird Reserve within the Project area is predominantly kanuka revegetation surrounding a tributary of the Alexandra Stream. Other native shrubs such as silver tree fern, wheki ponga (*Dicksonia squarrosa*) karamu, mahoe and kohuhu are also present. Some large wattles, pines, and macrocarpa are also scattered through with occasional brush wattle and Chinese privet. Along the edge of the reserve next to the motorway is young planted native vegetation with a number of wattles, privet and other pest species amongst it. This area of planting will be the location of the proposed retaining wall. The proposed wetland/ stormwater pond will be located in the grassed area to the east of the native vegetation. All of the vegetation that will be affected by the retaining wall and stormwater pond is of low to very low botanical value.



In summary, all of these reserves are typical of urban reserves that have received native restoration planting. All have some botanical values, however these are generally low. Although much of Omega Reserve is a SEA, the proposed works will only affect a small portion of the southern end outside the SEA where the vegetation is generally of lower quality.

3.2.5 Constellation Drive to Sunnynook Road

The vegetation within this sector is all young revegetation planting with low botanical values. Revegetation planting along the motorway will not be affected except for the small area described below.

3.2.5.1 Constellation Bus Station

There are various small areas of typical native restoration planting within the existing bus station site, however none of these are of any significant age or size and their botanical values are low. A small area of this planting will be removed just to the east of the existing busway ramp to allow construction of a new busway ramp and shared use path.

3.3 Fauna

3.3.1 Lizards / Mokokoko

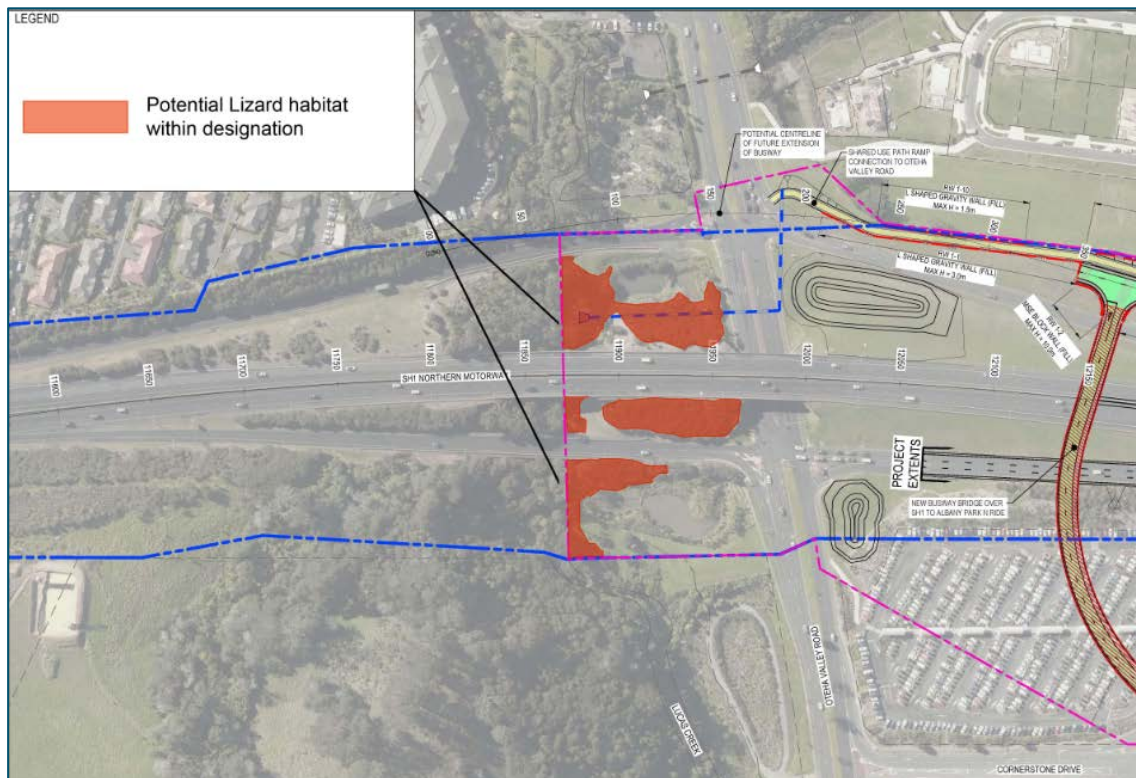
Desktop analysis indicated nine sites (**Table 3, Section 2.3.1.1**) within the Project area that support potential lizard habitat.

3.3.1.1 Site 1 (north of Oteha Valley Road)

ARDS database investigations indicated that vegetation contiguous with, and within 3 km of Site 1 (north of Oteha Valley Road) is known to support at least five indigenous lizards, including copper skink, ornate skink, forest gecko, elegant gecko and pacific gecko. In particular, At Risk forest gecko have been recorded in maturing NZTA kanuka plantings alongside SH1 near Lonely Track Road, north of the designation (Boffa Miskell 2011). Qualitative assessment of the Site 1 area also confirmed that the vegetation at this site could support any of these species, including forest gecko. The potential area is illustrated on **Figure 10**.



Figure 10 Potential Lizard Habitat at Site 1 (North of Oteha Valley Road)



Source: Base image Aurecon NZ Ltd

3.3.1.2 Site 2

Vegetation within Site 2 was weedy, dominated by rough grass, gorse and pine. Habitat quality was patchy, with some areas of scrub closer to and within an area of riparian vegetation west of a proposed construction yard at Greville Road West, being of potentially moderate value to skinks. No works are proposed in the riparian vegetation, and other parts, including patchy grass within the proposed construction yard and a stormwater pond north of this, is of very low habitat value.

3.3.1.3 Site 3 (Tawa Reserve)

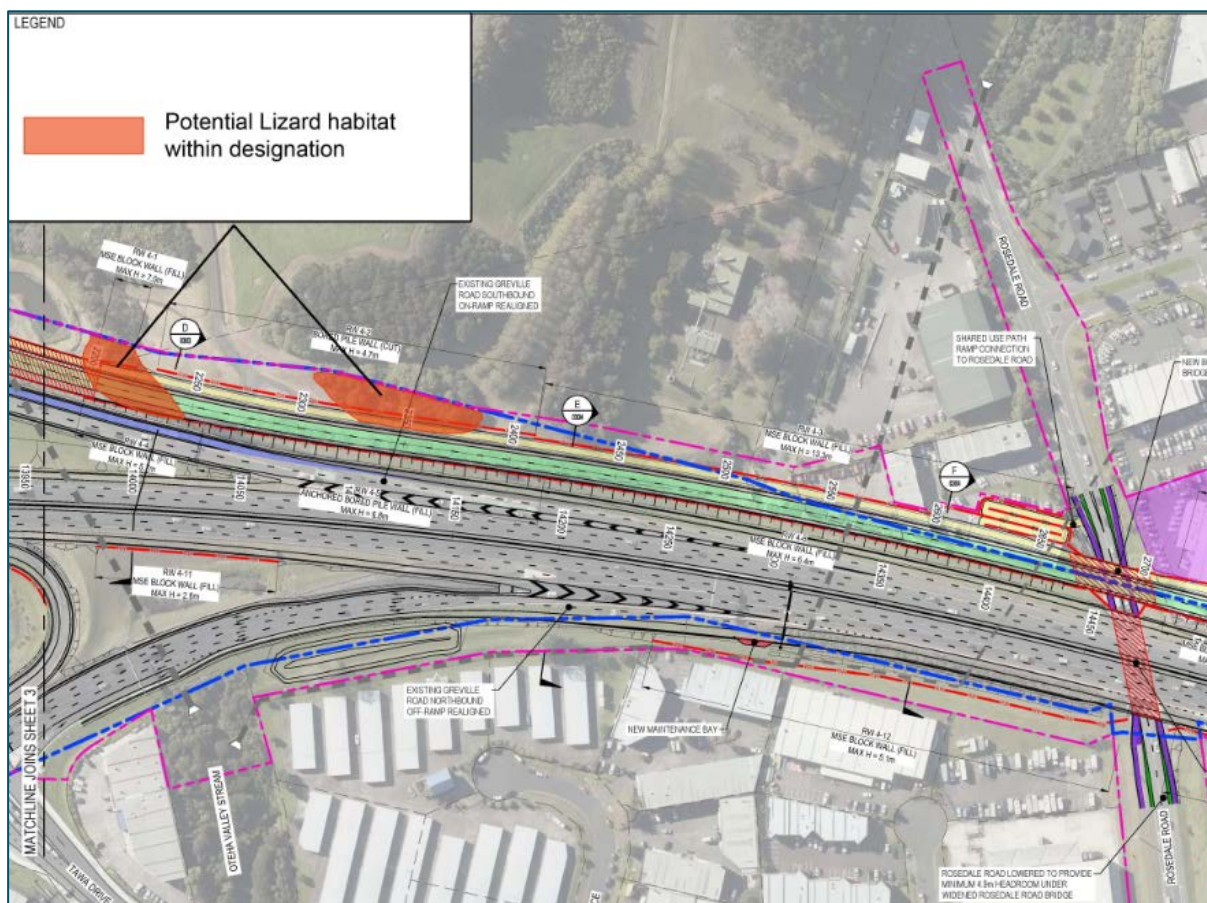
Vegetation within Site 3 is contiguous with vegetation that supports elegant gecko and copper skink. However, the area that could be affected within the Project area at this site is of marginal habitat quality for both skinks and geckos due the young and establishing nature of the plantings (c. 10 years old) where a thin layer of woodchip is still present on the ground. Native lizards are unlikely to be present in this vegetation, although skinks and geckos may be present within the nearby older, established vegetation where no works are proposed. No other sites were recorded as being associated with indigenous lizard records (lizards present, or lizards present in contiguous vegetation) within this area.

3.3.1.4 Site 4 (Rosedale Closed Landfill)

At site 4, rough grass and planted scrub immediately south of a stormwater pond supported some low to moderate value potential habitat for native skinks. The scrub would have moderate ecological value if it supported ornate skinks, and this species has the potential to be present given its presence at nearby locations (ARDS accessed April 2016). The potential area is illustrated on **Figure 11**.



Figure 11 Potential Lizard Habitat at Site 4 (Rosedale Closed Landfill)



Source: Base image Aurecon NZ Ltd

3.3.1.5 Site 5 (RWWTTP pines)

Site 5 was of poor to marginal value for native lizards, being a pine plantation with sparse understorey and few searchable logs that might otherwise support retreats for skinks.

3.3.1.6 Site 6 (RWWTTP grass)

Site 6 supported no searchable logs or other ground cover, and areas of rough grass were generally sodden, or subject to occasional grazing or mowing. These areas were considered to have very low habitat value.

3.3.1.7 Sites 7, 8 & 9 (Rook, Omega and Bluebird Reserves)

At Sites 7, 8 and 9, no native lizards were recorded from either habitat searches or funnel traps. Searchable habitat at these sites was limited to rubbish debris and some tree fern logs. Logs often provide important retreat sites for native lizards, as well as providing a natural invertebrate food source during their gradual decomposition, an important ecosystem process. Sites 7, 8 and 9 typically had sparse understorey vegetation, and areas of bare ground were common. Bare ground does not provide any habitat of value to native lizards and habitat quality for native skinks was generally low at those sites.



3.3.2 Birds / Manu Māori

A total of 22 species were recorded from the nine sites over the survey period, comprising 13 native species (**Table 4**). None of those species recorded are classed as At Risk or Threatened, although the RWWTP survey dataset indicates that at least eight At Risk or Threatened species are resident in or visitors to that area. This more detailed analysis is set out in **Section 3.3.2.1** below.

Kereru was only recorded at Oteha Valley Road on-ramp. Other native species not recorded, but likely to be at least periodically present at that site, include Australasian harrier (*Circus approximans*), morepork (*Ninox novaeseelandiae*) and shining cuckoo (*Chrysococcyx lucidus*).

Two New Zealand dotterel were observed at the proposed construction yard alongside Elliot Rose Avenue on three occasions in August. However, no birds were observed at the site during seven subsequent visits through September and October.

Table 4 Birds Recorded from field Surveys (March to April 2016)

Common name	Species name	Site								
		1	2	3	4	5	6	7	8	9
Blackbird	<i>Turdus merula</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓
Black swan	<i>Cygnus atratus</i>						✓			
Canada goose	<i>Branta canadensis</i>						✓			
Eastern rosella	<i>Platycercus eximius</i>	✓					✓		✓	
Fantail / piwakawaka	<i>Rhipidura fuliginosa placabilis</i>	✓	✓	✓	✓		✓	✓	✓	✓
Grey warbler / riroriro	<i>Gerygone igata</i>	✓			✓			✓	✓	✓
House sparrow	<i>Passer domesticus</i>			✓	✓	✓	✓	✓	✓	✓
Kereru	<i>Hemiphaga novaeseelandiae</i>	✓								
Kingfisher / kotare	<i>Todiramphus sanctus vagans</i>	✓				✓	✓		✓	
Paradise shelduck / putangitangi	<i>Tardorna variegata</i>						✓			
Pukeko	<i>Porphyrio melanotus</i>			✓	✓	✓	✓			✓
Little shag / kawau paka	<i>Phalacrocorax melanoleucos</i>	✓			✓	✓	✓			
Magpie	<i>Gymnorhina tibicen</i>	✓				✓	✓			
Mallard	<i>Anas platyrhynchos</i>							✓	✓	
Myna	<i>Acridotheres tristis</i>	✓			✓		✓	✓	✓	
Song thrush	<i>Turdus philomelos</i>	✓	✓		✓		✓	✓	✓	
Spotted dove	<i>Streptopelia chinensis</i>	✓				✓	✓	✓		
Spur-winged plover	<i>Vanellus miles novaehollandiae</i>		✓			✓	✓			
Silvereye / tauhou	<i>Zosterops lateralis</i>	✓		✓	✓	✓	✓	✓	✓	✓
Tui	<i>Prosthemadera novaeseelandiae</i>	✓							✓	
Welcome swallow	<i>Hirundo tahitica neoxena</i>	✓			✓	✓	✓			✓
White faced heron / matuku moana	<i>Ardea novaehollandiae</i>	✓	✓	✓	✓	✓				
Total Diversity		15	4	5	11	11	17	9	11	7
Native Diversity		9	1	3	7	7	10	3	5	5



3.3.2.1 RWWTP Pond Birds

The RWWTP Ponds are a significant (high value) habitat for indigenous fauna on the basis that they are used by Threatened and At Risk species. Data summarized here are based on regular data collected since 2002 (Bioresarches 2016).

Diversity

The key species using the RWWTP ponds is the New Zealand dabchick (*Poliocephalus rufopectus; weweia*), a Threatened endemic grebe that is rated as 'Nationally Vulnerable'. It has a moderate-sized, stable population (1900 to 2000 individuals) with a fragmented distribution (Robertson et al. 2013).

In the latest survey (2015 to 2016) the November to June (standard survey period) Pond 1 average was 8.5 individuals per survey (S.E = 1.7) and that average has been consistent since 2007 to 2008. The 2015-16 maximum was 17 individuals but has ranged from 15-23 individuals over the 2005 to 2016 period. Breeding occurred on Pond 2 in 2016 with two fledged juveniles recorded on 19 September 2016.

New Zealand dabchick is most common on Pond 1 especially at the western inlet end but was recorded using Pond 2 in the 2014-15 survey. Breeding occurred at both Ponds, including NE of Pond 1 (specific location unknown) in 2014-15 with juveniles recorded in November and March.

The average number of species using Pond 1 was 12.5.0 (S.E = 0.3) in 2015-16 with 7.5 species on Pond 2 (S.E = 1.1).

A total of 27 species have been recorded in 14 years (**Table 5**). Some of these, such as brown teal and common sandpiper, have only been recorded once or twice whereas others (e.g. Canada goose, black swan, NZ dabchick, little shag) are constant, resident species. Overall, the Ponds provide suitable habitat for a relatively high diversity of birds.

The only habitat changes over that time have been a decrease in aquatic plants, as a result of the introduction of grass carp, and the maintenance of higher water levels that reduces edge feeding habitats at times. The removal of aquatic weeds from Pond 1 resulted in a decrease in black swan from a maximum of 149 in 2007-08 to 18 in 2015-16 but an increase in Canada goose from 43 in 2007-08 to a maximum of 578 in 2015-16. Higher water levels decrease habitat used by pied stilt and white-faced heron in particular.

Abundance

The December to May average number of individuals at Pond 1 in 2015-16 was 255 (rounded) individuals per survey and an average of 65 at Pond 2. The abundance on both Ponds has remained relatively stable despite changes in the composition of the population.

Table 5 Species recorded using the RWWTP Ponds (2002 to 2015)

Common names	Species name
Australasian little grebe	<i>Tachybaptus novaehollandiae</i>
Australasian shoveler / kuruwhengi	<i>Anas rhynchos</i>
Australasian coot	<i>Fulica atra</i>
Black-backed gull / karoro	<i>Larus dominicanus</i>
Black shag / kawau •	<i>Phalacrocorax carbo</i>
Black swan / kakianau	<i>Cygnus atratus</i>



Common names	Species name
Brown teal / pateke •	<i>Anas chlorotis</i>
Canada goose	<i>Branta canadensis</i>
Common sandpiper	<i>Tringa hypoleucos</i>
Feral goose	<i>Anser</i>
Grey teal / tete moroiti	<i>Anas gracilis</i>
Kingfisher / kotare	<i>Todiramphus sanctus</i>
Little black shag / kawau tui •	<i>Phalacrocorax sulcirostris</i>
Little shag / kawau paka	<i>Phalacrocorax melanoleucos</i>
Mallard / grey duck (hybrids)	<i>Anas spp.</i>
NZ dabchick / weweia †	<i>Poliiocephalus rufopectus</i>
NZ scaup / papango	<i>Aythya novaeseelandiae</i>
Paradise shelduck / putangitangi	<i>Tardorna variegata</i>
Pied shag / karuhiruhi †	<i>Phalacrocorax varius</i>
Pied stilt / poaka •	<i>Himantopus</i>
Pukeko	<i>Porphyrio melanotus</i>
Red-billed gull / tarapunga •	<i>Larus novaehollandiae</i>
Spotted dove	<i>Streptopelia chinensis</i>
Spur winged plover	<i>Vanellus miles</i>
Welcome swallow	<i>Hirundo neoxena</i>
White faced heron / matuku moana	<i>Egretta novaehollandiae</i>
White fronted tern / tara •	<i>Sterna striata</i>
At Risk •	
Threatened †	

3.3.3 Long-tailed bats / pekapeka

The ABMs recorded 15 useable nights each (total useable ABM nights = 32). No bats were recorded over the survey period. Overnight minimum temperatures for the period ranged (rounded) from 10°C to 13°C.



4 Effects Assessment: Construction Activities

4.1 Vegetation and Flora

The vegetation within the Project area is predominantly native motorway planting using a palette of common native shrubs and trees. This vegetation is generally less than 20 years old and under 15m in height. These areas have low botanical values. Areas of mixed exotic and native vegetation or stands of common exotic species generally have very low botanical values. Ecological effects of the loss of mostly small areas of this vegetation would generally be minor to less than minor.

The only area where the vegetation has moderate to high values is within the SEA (SEA_T_8297) north of Oteha Valley Road where regenerating podocarp broadleaved forest is found surrounding Lucas Creek and late successional kanuka forest is found further upslope. The fragmented forest extending along Lucas Creek as it passes under SH1 and the associated access ramps is also considered to have moderate botanical values. The proposed design avoids effects on this vegetation. Vegetation within the SEA at the RWWTP is plantation radiata pines and native revegetation of low quality. No other vegetation within an SEA will be affected.

The overall effects of the project on vegetation within the project area will be minor, reducing to less than minor once mitigation and enhancement planting as detailed in the Landscape Mitigation and Enhancement Plan is implemented.

4.2 Fauna

4.2.1 Lizards / Mokonoko

No lizards were recorded from all habitat searches and funnel trapping. The habitat quality was low to marginal at most sites investigated. Vegetation at Sites 1, 2 and 4 provided the greatest potential to support lizard habitat.

4.2.1.1 Site 1 (north of Oteha Valley Road)

Works involves a proposed culvert and apron that passes through planted and naturally regenerating vegetation to Lucas Creek. While the scale of vegetation removal is small, the potential presence of a high diversity of native lizards, including At Risk species, presents a potentially moderate effect where the vegetation is naturally regenerating.

4.2.1.2 Site 2

No works are proposed at Site 2, where some riparian vegetation that could support native skinks, including At Risk ornate skink, occurs within the designation but west of a proposed construction yard (Greville Road West).

4.2.1.3 Site 3 (Tawa Reserve)

Two proposed stormwater outfalls pass through planted vegetation, where habitat values are 'marginal'. Because the potential habitat has been assessed as being of low quality, and the area of vegetation clearance is small, the potential effects of construction at this site will be less than minor and no mitigation measures are necessary.



4.2.1.4 Site 4 (Rosedale Closed Landfill)

Construction activities at Site 4 would require clearance of planted flax and scrub within rough grass that has low to moderate value potential habitat value for native skinks. Clearance of this vegetation would have a potentially moderate level effect, due to the potential presence of ornate skink.

4.2.1.5 Sites 5 and 6 (RWWTP)

Site 5 (RWWTP pines): This area does not support suitable native lizard habitat.

Site 6 (RWWTP grass): Areas of rough grass were generally sodden, or subject to grazing or mowing. These areas were considered to have very low habitat value and therefore there is not likely to be any adverse effects on lizards from construction activities at this site.

4.2.1.6 Sites 7, 8 & 9 (Rook, Omega and Bluebird Reserves)

No native lizards were recorded from either habitat searches or funnel traps and habitat quality was low at these sites. A stormwater outfall is proposed at each of Rook and Omega Reserves, as well as a shared use path at Omega Reserve that would pass through small areas of planted vegetation. Similarly, planted vegetation along the southern edge of Bluebird reserve would be removed to accommodate a proposed retaining wall. Given the small scale of removal of vegetation, and the low habitat quality for native lizards, there are unlikely to be any potential adverse effects on lizards at this site.

4.2.2 Birds / Manu Māori

Overall, vegetated areas within the Project area comprise predominantly young and replanted native scrub or planted exotic stands which would provide foraging, roosting and nesting habitat for common native and exotic birds. Only parts of any of these areas would be removed, and those that are affected by construction, are small and of low quality. Therefore, the overall effects of any loss of these areas, on birdlife, will be no more than minor.

Naturally regenerating vegetation within Site 1 (north of Oteha Valley Road) supports a greater diversity of older vegetation and this was the only site where kereru was recorded. As with proposed works at other areas where avifauna habitat may be affected, works at Site 1 are limited to a small area of mostly planted vegetation associated with a proposed stormwater culvert and associated rip-rap apron. Therefore, the potential adverse effects associated with vegetation removal in this area would be negligible.

Small areas of potential roosting or nesting habitat for common native birds within the Project area at Tawa, Rook, Omega and Bluebird Reserves is largely planted and young (10 to 20 years). Younger vegetation generally provides lower quality habitat, such as suitable roosting and nesting opportunities, and is therefore of lower value to native passerine birds. The potential effects of vegetation removal or disturbance (noise, vibration, dust) within the Project area at each site are negligible.

4.2.2.1 Birds at RWWTP

There is some potential for parts of the Project area around the RWWTP to be used for nesting by At Risk or Threatened birds, such as dabchick, from July to December inclusive. These areas include the northern sides of Ponds 1 and 2 (including the pines) and these areas may also be used for nesting by other native waterfowl, including New Zealand scaup or Australasian shoveler. Construction effects that result in nest destruction or abandonment would be a significant adverse effect. These effects



would best be avoided by discouragement of birds from nesting in these areas prior to works, during June or early July, when birds are nest-site prospecting. Once established, vegetation around constructed stormwater ponds around the RWWTP would likely have a habitat enhancement effect.

Removal of pond-side vegetation, including the pines, from the part of the RWWTP within the Project area from March-July, prior to construction works, would ensure that no active nests are present in vegetation that would be removed, and that no nests are established within the project area during construction. The network of stormwater ponds around the RWWTP, and their associated plantings, would provide suitable nesting habitat for waterfowl in the long term, and may have an overall habitat enhancement effect.

4.2.2.2 New Zealand Dotterel

New Zealand dotterel were recorded roosting and foraging on short grass in the Project area at the proposed construction yard at Elliot Rose Avenue on three occasions in August, though not during site inspections through September and October. Given these birds are known to roost, forage and breed on vacant land at the nearby Albany commercial block (adjacent to the proposed designation), dotterel may choose to roost or nest at the construction yard at Elliot Rose Avenue and potentially in other similar parts of the Project area during construction if they are not discouraged from nesting within the works areas.

New Zealand dotterel are a threatened, conservation dependent species and loss of important nesting habitat, nest destruction or abandonment as a result of construction activities would be a significant adverse effect. Such potential effects should be avoided by discouragement of birds from nesting in these areas prior to and during works from June-July, when birds are setting up territories and nest-site prospecting.

The Transport Agency has produced a guidance document which sets out methods to manage and avoid the potential risks associated with dotterel nesting on construction sites, as well as managing nesting birds and chicks onsite or where appropriate relocating the nests to an alternative location (Guidance in Relation to New Zealand Dotterels on NZTA Land, 2012). The methods outlined in **Table 6** can be used to deter dotterels from the construction sites prior to nesting from July onwards.

Table 6 Methods for Deterring Prospecting Dotterels

Method	Description	Suitable for:	Success	Comments
Dog	Walk a dog on a leash and disturb adult dotterels	All sites	Success	Walk dog throughout the day for a number of days
False Hawk	Use a 'false hawk' to circle the area	Where it won't interfere with traffic or overhead lines.	Unsuccessful	Worked for a short time and then birds got used to it.



Method	Description	Suitable for:	Success	Comments
Long grass	Allow grass to grow long so not considered by dotterels to be a good place to lay eggs.	Sites that will be worked a some point during breeding season that have existing grass	Success	Grass has to be long. It should be left to grow from at least April before earth works season.
Machinery	Park machinery close to wear dotterels are showing interest. Start the engine from time to time.	Construction sites with large machinery.	Moderate	Machinery cannot be left for long periods or the birds may get used to it.
Silt fences	Erect shade cloth at knee height. Place in rows. Space at 5-10 m.	All sites	Success	The block the birds' view. Hay bales could also potentially be used.
Metallic tape	Tape / streamers that flutter when there is wind.	All sites	Moderate	It worked for three weeks then birds got used to it.

Source: C. Bannock, NZ Transport Agency

4.2.3 Long-tailed Bats / Pekapeka

None of the ABMs recorded long-tailed bats and it is considered very unlikely that bats use any of the environments within the Project area, even on an intermittent basis. Accordingly, construction of the Project is not expected to affect bats.



5 Effects Assessment: Operation of Project

5.1 Vegetation and Flora

No adverse effects on vegetation or flora are expected as a result of the operation of the Project.

5.2 Fauna

5.2.1 Lizards / Mokonoko

Grass mowing as ongoing maintenance may be a potential but negligible effect. No other effects on lizards are expected as a result of the operation of the Project.

5.2.2 Birds / Manu Māori

The RWWTPs provide a significant habitat for a wide range of species including NZ dabchick and were utilized for breeding – in 2015-16 by Australasian shoveler, black swan, Canada goose, mallard/grey duck hybrids, NZ dabchick, NZ scaup, paradise shelduck and pukeko. A relatively large population of birds is typically present, especially when numbers of Canada goose are high. The population has acclimated to industrial activities at the RWWTP, farming activities and motorway works and operation, together with overflights of helicopters using the adjacent Helitrans heliport. The probability of the population being adversely affected by the operation of the Project is negligible.

It is considered that the networks of stormwater ponds and associated vegetation may have a habitat enhancement effect, particularly for waterfowl that currently use RWWTP.

5.2.3 Long-tailed Bats / Pekapeka

None of the ABMs recorded long-tailed bats, despite the presence of potential roosting and foraging habitat. Although the survey was not undertaken during the peak activity period for long-tailed bats (October to March), bat activity does not cease completely, and temperatures remained well within the suitable range for bat activity (>10° C overnight low). It is therefore very unlikely that native bats use any of the environments within the Project area, even on an intermittent basis.

5.2.3.1 Potential Bat Flight Paths

The Oteha Valley Road escarpment provides the greatest contiguity with vegetation and other environments that could support foraging, commuting and roosting habitat for bats from their nearest known locations. However, surveys of those surrounding landscapes, including through Coatesville, Paremuremo and Albany Heights, which are closer to the Riverhead and north- Auckland records, have not recorded bats (Bioresearches 2012, 2013, 2014).

RWWTP Ponds provide a suitable potential foraging site, with low lighting and a small plantation of pines (Pond 2) that could support some roosting habitat for individual bats. However, none of the pine trees are large enough to support any communal roosts, and any bats using this area would need to cross urban and / or industrial landscapes to access these areas. While some long-tailed bats have been recorded around peri-urban fringes in Auckland (Bioresearches 2013), built-up and brightly lit urban or industrial landscapes probably present a barrier that bats would not cross.

Accordingly, it is very unlikely that operation of the Project will have any effects on bats.



6 Mitigation Measures

6.1 Vegetation and Flora

Loss of established vegetation within reserves and at sites containing higher ecological values has been minimised through adjustments to the Project area at Oteha Valley Road, Tawa, Rook, and Omega Reserves, and riparian scrub alongside Albany Expressway (Site 2). These areas are no longer affected by any works to be constructed as part of the Project.

Much of the planted native vegetation on the RWWTP site to the south of Pond 1 will be removed in the footprint of the stormwater ponds and new lane connections between SH1 and SH18. This vegetation is all of low botanical value. Extensive replanting is proposed for this area as set out in the Landscape Mitigation and Enhancement Plan attached to the Assessment of Landscape and Visual Effects. Removal of plantation radiata pines adjacent to Arrenway Reserve on the northern side of Pond 2 (SEA T 8365) will have negligible botanical effects and no mitigation is proposed for this other than standard landscape planting.

Measures should be implemented to protect native vegetation where it lies adjacent to the construction works where practicable. This would take the form of securely fencing it off and ensuring no spoil or other material is deposited within the fenced off areas. Where avoidance is not practicable, mitigation for the loss of native vegetation rated “low” to “very low” should take the form of reinstatement or replacement planting on a “like for like” basis once the proposed works are completed. The purpose of this is to ensure there is no net loss of native biodiversity as detailed in the Landscape Mitigation and Enhancement Plan.

The Project design avoids vegetation of moderate to high botanical value within SEAs. The only possible effects on more mature native vegetation would be on riparian vegetation on the southern side of Lucas Creek at Oteha Valley Road where a proposed the culvert from the base of the shared use path will enter Lucas Creek. If care is taken to avoid mature native trees in the riparian zone of the creek, the effects of this outfall are expected to be less than minor. Any disturbed areas of the riparian zone should be replanted with appropriate native shrubs and trees as set out in the Landscape Mitigation and Enhancement Plan.

6.2 Fauna

6.2.1 Lizards / Mokonoko

The potential effects of construction at Sites 1 (north of Oteha Valley Road) and 4 (Rosedale Closed Landfill) are moderate due to potential presence of ‘At Risk’ lizard species within small areas of vegetation. A herpetologist should supervise machine clearance to capture and relocate any native and ‘At Risk’ lizard species into adjacent habitats in accordance. A lizard management plan is recommended which should contain details of the capture and relocation programme.

6.2.2 Birds / Manu Māori

No mitigation is recommended with respect to common native passerines and their other than replacement planting as recommended in Section 6.1. It is noted however, that landscape and replacement plantings would provide opportunities for enhancing avifauna habitat connectivity within the Northwest Wildlink, particularly between the Hellyer Creek (Greenhithe) and Lucas Creek



(Paremoremo-Albany) corridors. However, there is potential for construction works to cause significant disturbance to breeding activity for Threatened and At Risk species at both the RWWTP (waterfowl) and at proposed construction yards (dotterel).

Recommendations are provided in **Section 4.2.2** and **Table 6** to avoid any adverse effects on nesting activity in the first instance. Dotterels did not nest within the Project area in 2016, however, a management plan is recommended to provide instruction on the identification and deterrence of dotterels from using areas proposed for use as construction support areas (CSA), prior to and during construction, in general accordance with the NZ Transport Agency's Guidance in Relation to New Zealand Dotterels on NZTA Land (Bannock 2012).

6.2.3 Long-tailed Bats / Pekapeka

No mitigation is recommended with respect to long-tailed bats.



7 Summary and Conclusions

Overall, the terrestrial ecological values within the Project area are low, being predominantly planted areas. The exception is vegetation within SEA_T_8297, at the Oteha Valley Road on-ramp, which will not be affected by the Project. **Table 7** provides a summary of the potential adverse effects of the Project on terrestrial flora and fauna and proposed mitigation measures.

Vegetation and potential habitat values are generally low and this is unsurprising given the surrounding urban, commercial and industrial landscape. Moderate to high value vegetation or habitats were identified at Site 1 (vegetation and potential lizard habitat) and the RWWTP (avifauna habitat). In addition, the close proximity of the Project area to declining habitats of threatened New Zealand dotterel and their intermittent use of a proposed construction yard at Elliot Rose Avenue by two birds also increase potential of construction yard use during the breeding season.

Methods should be implemented to deter nesting by dotterels within proposed construction. Similarly, removal of vegetation within the Project area on the northern side of the ponds at RWWTP from March to late June (prior to nesting season) would avoid potential adverse effects associated with nesting by native and threatened birds during construction.

Two small areas of vegetation, north of Oteha Valley Road and alongside Rosedale Closed Landfill, may support native lizards, including At Risk ornate skink, and therefore would present a potentially moderate adverse effect. These areas would be effectively managed to minimise potential effects to less than minor during vegetation clearance with an onsite herpetologist to enable the capture and relocation of any native and 'At Risk' lizard species into adjacent habitats in accordance with a native lizard relocation plan.

All ecological effects of the Project can be mitigated such that the adverse effects of the Project will be negligible.



Table 7 Summary of Potential Adverse Effects and Proposed Mitigation

Receiving environment		Ecological aspect	Value	Potential adverse effects without mitigation	Proposed mitigation	Potential adverse effects with mitigation								
Oteha Valley to McClymonts Road	Oteha Valley Road On Ramp / Lucas Creek	Vegetation	Low to Moderate-	Minor	Reinstatement/ replacement planting of riparian vegetation and planted native vegetation	Negligible								
		Fauna (lizards)	Moderate	Moderate	Herpetologist-supervised vegetation clearance	Negligible								
	Southern side of Oteha Valley Road	Vegetation	Very Low	Minor	Reinstatement/ replacement planting for planted native vegetation	Negligible								
		Fauna (Dotterels)	High	Significant	Discourage nesting onsite / seek ecology and DOC advice if dotterels observed at Construction yard	Negligible								
McClymonts Road to Rosedale Road	Albany Expressway Scrub	Vegetation	Low	Minor	Reinstatement/ replacement planting for planted native vegetation.	Negligible								
		Fauna	Low	Negligible	None	N/A								
	Tawa Reserve	Vegetation	Low	Minor	Reinstatement/ replacement planting for planted native vegetation	Negligible								
		Fauna	Low	Negligible	None	N/A								
	Rosedale Landfill	Vegetation	Very Low	Minor	Reinstatement/ replacement planting for planted vegetation.	Negligible								
		Fauna	Moderate	Moderate	Herpetologist-supervised vegetation clearance	Negligible								
Rosedale Road to	Rosedale WWTP	Vegetation	Low	Minor	Reinstatement/ replacement planting for planted native vegetation	Negligible								



Receiving environment		Ecological aspect	Value	Potential adverse effects without mitigation	Proposed mitigation	Potential adverse effects with mitigation								
Constellation Drive		Fauna (waterfowl)	High	Significant	Discourage nesting onsite (vegetation clearance prior to breeding season)	Negligible								
	Constellation Bus Station	Vegetation	Low	Minor	Reinstatement/ replacement planting for planted native vegetation	Negligible								
		Fauna	Low	Negligible	None	N/A								
Upper Harbour Highway from SH1 to Albany Highway	Rook Reserve/ Alexander Stream south	Vegetation	Low	Minor	Reinstatement/ replacement planting for planted native vegetation	Negligible								
		Fauna	Low	Negligible	None	N/A								
	Omega Reserve / Alexander Stream north	Vegetation	Low	Minor	Reinstatement/ replacement planting for planted native vegetation	Negligible								
		Fauna	Low	Negligible	None	N/A								
	Bluebird Reserve	Vegetation	Low	Minor	Reinstatement/ replacement planting for planted native vegetation	Negligible								
		Fauna	Low	Minor	None	N/A								



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Appendices





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Appendix A

Aboriginal Statement



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PEERS BROWN MILLER
arboricultural & environmental consultants

Aurecon New Zealand Ltd
Level 4, 139 Carlton Gore Rd
Newmarket Auckland 1023
PO Box 9762
Newmarket Auckland 1149
New Zealand

T +64 9 520 6019
F +64 9 524 7815
W aurecongroup.com

