

AECOM

**NORTH HARBOUR 2 WATERMAIN
AND NORTHERN INTERCEPTOR IN SHARED CORRIDOR**

**TECHNICAL REPORT D
ASSESSMENT OF ECOLOGICAL EFFECTS**

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**North Harbour 2 Watermain
and Northern Interceptor in Shared Corridor**

**Technical Report D
Assessment of Ecological Effects**

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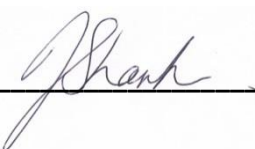
Prepared by: Chris Wedding, MSc. Hons
 Senior Ecologist, Terrestrial



Mark Delaney, MSc. Hons
 Ecologist, Freshwater



Jennifer Shanks, MSc. Hons
 Botanist



Reviewed by: Graham Don, MSc. Hons
 Manager, Bioresarches Group Ltd



Approved by: Graham Don, MSc Hons
 Manager, Bioresarches Group Ltd



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Contents

EXECUTIVE SUMMARY	1
1 INTRODUCTION	4
2 NOR 1, TITIRANGI TO WESTGATE	9
2.1 Terrestrial Ecology	9
2.2 Freshwater Ecology.....	20
2.3 Summary	22
3 NOR 2, EASTERN SIDE OF GREENHITHE BRIDGE TO ALBANY RESERVOIR	23
3.1 Terrestrial Ecology	23
3.2 Freshwater Ecology.....	31
3.3 Summary	33
4 NOR 3, SHARED CORRIDOR FOR NH2 AND NI ALONG SH18	34
4.1 Terrestrial Ecology	34
4.2 Freshwater Ecology.....	40
4.3 Summary	42
5 REFERENCES	44
6 PLATES	45

EXECUTIVE SUMMARY

Bioresearches Group Limited was commissioned by Watercare Services Limited (Watercare) to assess the potential ecological effects related to the construction, operation and maintenance of Watercare's proposed North Harbour 2 Watermain (NH2) and the Northern Interceptor (NI) shared corridor. The NH2 project has been divided into three sections, each a separate Notice of Requirement (NOR). These are: NOR1, Titirangi to Westgate; NOR2, Greenhithe Bridge to Albany Reservoir; and NOR3, the shared corridor for NH2 and NI along SH18.

The ecological assessment provides a description of the terrestrial and freshwater values of the NH2 project for each of the NOR sections. Potential adverse effects of the project for each NOR are discussed and recommendations for avoiding and minimising these are provided.

NOR 1: Titirangi to Westgate

Five sites of interest were identified within the designation of NOR 1, with the highest area of ecological value being recorded at the proposed receiving pit at Shetland Street. This site has the greatest potential for significant adverse effects due to older growth vegetation and important wildlife habitats associated with the Waitakere Ranges. Where any vegetation and fauna habitats may be affected, recommendations are provided to mitigate these through avoidance of the largest trees, revegetation, preclearance surveys and fauna relocation where necessary. These mitigation actions would reduce the effects to minor.

Four other sites are associated with stream crossings where the vegetation is young, planted and generally of low or very low fauna habitat value. While potential effects are considered minor, preclearance surveys for native lizards and nesting birds are recommended to avoid mortality to these species, as they are protected under the Wildlife Act 1953.

Four piped stream crossings are considered to have potential minor adverse effects due to sediment runoff. Standard sediment controls would reduce the potential effects of the proposed works on the watercourses to less than minor.

NOR 2: Greenhithe Bridge to Albany Reservoir

Five sites of ecological interest were identified along the NH2, including four associated with Significant Ecological Areas (SEA, PAUP 2013) along the northern side of SH18 and at the Oteha Stream Crossing / Fernhill Escarpment.

Sites along SH18 are comprised of mixed native and exotic scrub and support potential habitat for indigenous reptiles and birds. However, vegetation at the Oteha Stream Crossing / Fernhill Escarpment consisted of older growth forest.

Where any vegetation and fauna habitats may be affected, recommendations are provided to mitigate these through avoidance of the largest trees, revegetation, preclearance surveys and fauna relocation where necessary. These mitigation actions would reduce the effects to minor.

Any works in close proximity to the Oteha Stream could result in potential minor adverse effects through sediment runoff. Standard sediment controls would reduce the potential effects of the proposed works on the watercourses to less than minor.

NOR 3: Shared corridor for NH2 and NI along SH18

Native vegetation that could be affected includes young restoration planting that was implemented as part of the SH18 motorway development as well as native shrubs associated with works related to the new Hobsonville Pump Station upgrade and the NI pipeline. These areas generally contain only a limited range of common pioneer species such as kanuka, cabbage trees and flax or, in the case of stormwater ponds, common native wetland species.

There is also a small area along the coastal margin of Wallace Inlet, just west of Squadron Drive, which could potentially be used for access. This could result in loss of potential nesting habitat for

banded rail (*Gallirallus philippensis*), a nationally At Risk species. Preclearance surveys for banded rail are recommended to avoid potential adverse effects of vegetation removal on active nests of this species. In addition, preclearance surveys for fauna at the new Hobsonville Pump Station are recommended.

Generally, the potential effects of loss of vegetation along the NOR 3 route would be minor, however preclearance surveys for banded rail and replacement planting are recommended.

The proposed pipelines cross under seven minor open watercourses along SH18. No direct adverse effects are expected on any of these watercourses, however standard sediment control measures would mitigate any potential adverse effects from any works within 10 m of these watercourses to less than minor.

1 INTRODUCTION

Bioresearches Group Limited has been commissioned by Watercare Services Limited (Watercare) to assess the potential ecological effects related to the construction, operation and maintenance of Watercare's proposed North Harbour 2 Watermain (NH2) project between Titirangi and Albany and the land use effects associated with the construction, operation and maintenance of the Northern Interceptor (NI) project between Westgate and Hobsonville, where a shared corridor is proposed for both water and wastewater infrastructure.

The NH2 will convey potable water from storage reservoirs in Titirangi, via west Auckland and North Shore to storage reservoirs in Albany (a length of approximately 33km). Its purpose will be to increase capacity and resilience of the water supply network to western and northern Auckland.

The NH2 project incorporates:

- Pipeline installation, operation and maintenance of a new watermain of 1200 mm (west of Greenhithe Bridge) and 900mm (east of Greenhithe Bridge) nominal diameters (DN);
- Pipeline length of approximately 33km mostly within public road reserve; and
- Other features including valve chambers, scour valves, air valves, line valves, bulk supply points, pipe bridges, and associated works.

Most of the watermain will be constructed by open trenching, micro tunnelling or bored tunnel (the latter two referred to as "trenchless technology") within a typical construction corridor of approximately 12 – 22 m width with additional areas required for erosion and sediment control devices, traffic management, construction yards and storage areas at intervals along the route for construction purposes.

The NI project comprises of a new wastewater pipeline and associated activities to convey flows from north-west Auckland to the Hobsonville Pump Station, and then to the Rosedale Wastewater Treatment Plant (WWTP).

The proposed NI project in the shared corridor begins in the vicinity of Hobsonville Road (West Harbour), near the intersection of the Upper Harbour and North Western Motorways (SH18 and SH16). From this location, the alignment follows the southern side of the SH18, continuing

northeast to the Hobsonville Pump Station. Future phases of the NI project will also include new pipelines between the Hobsonville Pump Station and the SH18 causeway.

Within the shared corridor, the NI project incorporates the following:

- A new 5km wastewater pipeline of 2100mm DN;
- 16 pits / shafts for trenchless technology construction purposes. Five of these will be permanent manholes (MT Pits 2, 7, 11, 13 & 17) while the others (MT Pits 3, 4, 5, 6, 8, 9, 10, 12, 14, 15 and 16) will be temporary only until construction / testing is completed;
- MT Pit 7 will be a drop structure with permanent access, to allow for a future wastewater pipeline connection across SH18;
- A new 50m long wastewater pipeline and manholes connecting the 2100mm ND pipeline to the existing pump station;
- A new 1750 l/s Pump Station with future capacity across the site of 3,500l/s;
- Wastewater storage (within pipeline);
- Two 800m 1500mm DN rising mains (length to the causeway); and
- A 2100mm DN pipe installed by trenchless technology at SH18.

The proposed alignment of NH2 and the location of the NI project are shown in Figure 1 below.

A full description of the proposed works and construction methodology is included in in the North Harbour 2 Watermain and Northern Interceptor in Shared Corridor Assessment of Effects on the Environment (the AEE report) prepared by AECOM Consulting Services (NZ) Ltd (AECOM) and Jacobs New Zealand Limited (Jacobs).

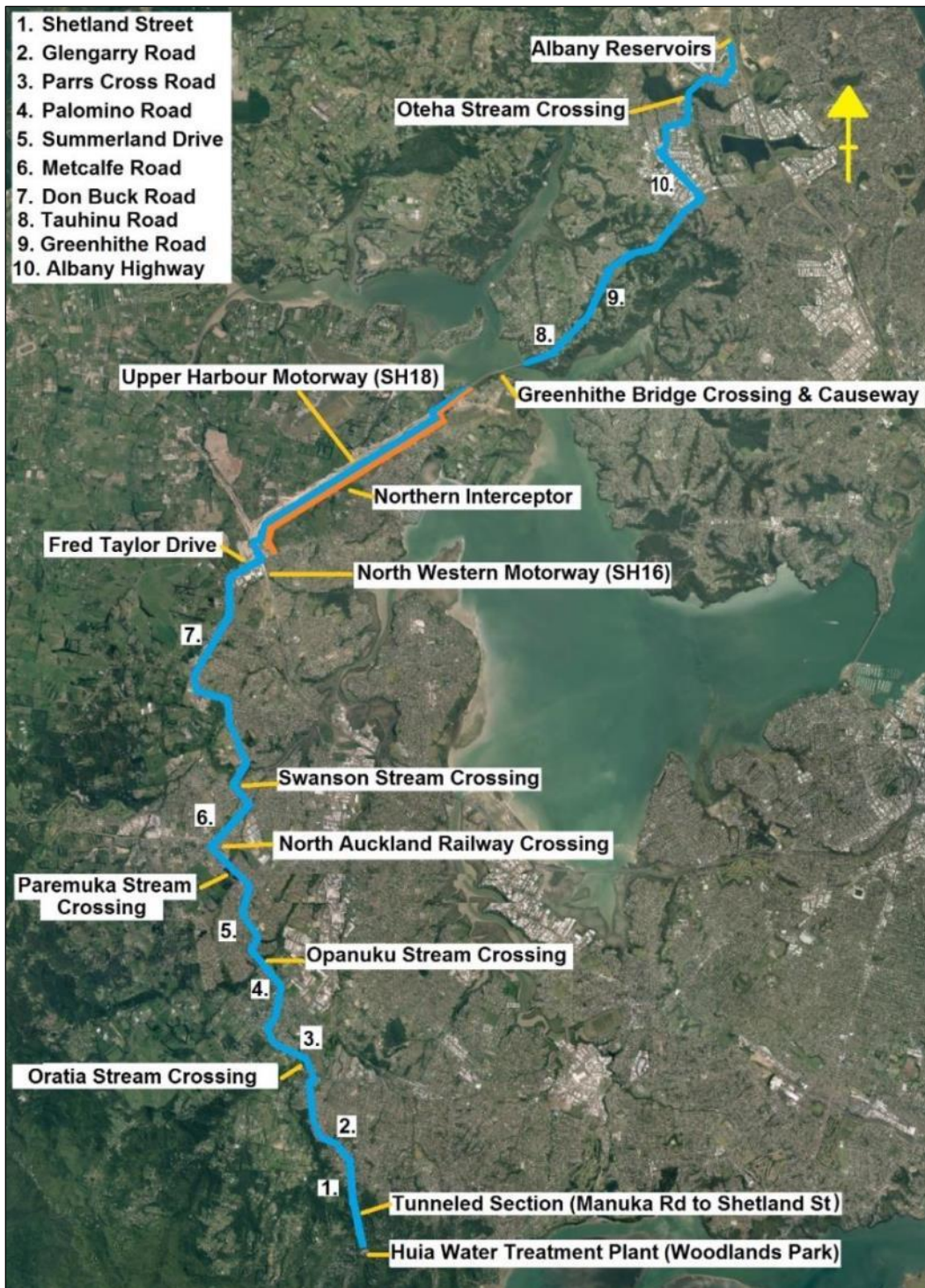


Figure 1. Blue line is the proposed NH2 route and Orange line is NI section within shared corridor

Watercare is proposing to designate land for the NH2 project between Titirangi and Albany and the NI project between Westgate and Hobsonville, and will also be seeking various resource consents for NH2 under the Resource Management Act 1991 (RMA). This technical report provides specialist input for the AEE which supports the Notices of Requirement for designation (NOR) and the resource consent applications. The alignment drawings referred to in this report are contained within Volume 3 of the AEE. Resource consents required for works associated

with the NI project will be sought by Watercare at a later date, nearer to the proposed date of construction. The NH2 project has been sectioned into three NORs;

- NOR 1, Titirangi to Westgate;
- NOR 2, Eastern side of Greenhithe Bridge to Albany Reservoir; and
- NOR 3, Shared corridor for NH2 and NI along SH18 from Westgate to western start of Greenhithe Bridge Watermain Duplication (GBWD) and Causeway project.

This report provides the following:

- A description of the environmental baseline for the particular receiving environment(s) potentially affected by the projects;
- Description of specific aspects of the projects in relation to the ecology;
- Description of the investigations undertaken to assess the actual or potential ecological effects on the environment;
- An assessment of the actual or potential effects on the environment (construction, operation and maintenance). This includes the identification of activities that could result in potential adverse effects and, in turn, identifying design refinements or construction methodologies that could avoid, remedy or mitigate potential adverse effects; and
- Conclusions.

Ecological values referred to in this report are detailed and identified in below.

Table 1. Ecological descriptors and corresponding values and effects (potential and actual).

Vegetation / Habitat / Stream Description	Ecological Value Descriptor	Actual or potential ecological effects of the Projects
Entirely or predominantly exotic pest plants, may have some scattered common natives.		
May support some habitat value to common native fauna, though potential habitats are largely occupied by introduced fauna.	Very Low	Less than Minor
Stream has a combination of very low levels of: shading, hydrologic heterogeneity, aquatic habitat diversity, and riparian integrity. As well as potentially high levels of anaerobic processes.		
Planted young (<20 years) native vegetation comprising common species. Vegetation is generally of small size (<15m tall)		
Potential habitat likely to support some common native fauna.	Low	Minor
Stream has a combination of low levels of: shading, hydrologic heterogeneity, aquatic habitat diversity, and riparian integrity. As well as potentially moderate to high levels of anaerobic processes.		
Naturally regenerating kanuka/ broadleaf forest with understorey or older areas of restoration planting with larger canopy trees and natural regeneration of an understorey occurring. Large planted native trees >15m tall.		
Potential habitat likely to support common native fauna. Some Nationally 'At Risk' species may also occur.	Moderate	Moderate (More than minor)
Stream has a combination of moderate levels of: shading, hydrologic heterogeneity, aquatic habitat diversity, and riparian integrity. As well as potentially moderate to low levels of anaerobic processes.		
Naturally regenerating podocarp broadleaved forest with mature trees.		
Potential habitat likely to support common native and Nationally 'At Risk' or 'Threatened' fauna.	High	Moderate or greater (More than minor)
Stream has a combination of high levels of: shading, hydrologic heterogeneity, aquatic habitat diversity, and riparian integrity. As well as potentially low levels to no anaerobic processes.		

2 NOR 1, TITIRANGI TO WESTGATE



Figure 2. NOR1, Titirangi to Westgate.

2.1 Terrestrial Ecology

2.1.1 Vegetation and Flora

The vegetation and flora assessment identifies ecological botanical features along the proposed route for NOR1 and describes and assesses their general ecological values in relation to works associated with the NH2 project. The vegetation identified was assessed against criteria in the Waitakere City District Plan and the Proposed Auckland Unitary Plan (PAUP). Ecological botanical features of note are typically found within areas identified in the PAUP as SEAs. Individual amenity trees (scheduled for their amenity values) are not generally considered ecologically significant, unless the botanical feature is listed as threatened. Arboricultural and visual amenity values as they relate to the trees are discussed in the Technical Report H – Arboriculture Assessment Report and Technical Report G - Landscape and Visual Assessment Report.

2.1.1.1 Methodology

A specialist botanist assessed the vegetation along the proposed NH2 designation within NOR1 using a combination of desktop and field assessment, particularly noting any areas identified in the PAUP as SEAs and any trees listed as Heritage Trees in the Waitakere City District Plan, Heritage Appendix. The route was driven and key areas such as stream crossings and SEAs were visited where the composition and characteristics of the vegetation were recorded.

An SEA is an area of “significant indigenous vegetation, or of significant habitats for indigenous fauna” (PAUP 2013). The identification of SEAs is an obligation of the Auckland Council under the Resource Management Act 1991 (Section 6c). Although the PAUP is currently notified, the protection of SEAs takes immediate legal effect from notification of the plan under the Resource Management Act (Section 86). SEA areas are shown on the Auckland Council Unitary Plan Viewer GIS website (<http://acmaps.aucklandcouncil.govt.nz>).

2.1.1.2 Results and Description

Vegetation removal associated with the installation of the NH2 tunnel launch pit within the reservoir site will be consented as part of the Huia Water Treatment Plant (WTP) upgrade, as construction of the Huia WTP will precede NH2, thus providing a clear area from which to launch the trenchless technology for the construction of the tunnel. The pipeline will be laid via trenchless technology from the WTP until the proposed receiving pit at Shetland Street and as such should have no adverse ecological effects until the receiving pit. Accordingly, the following ecological assessment begins at the receiving pit at Shetland Street.

At the southern end of Shetland Street (Plate 1) the vegetation is good quality secondary kauri podocarp broadleaved forest and includes two large specimens of hard beech (*Fuscospora truncata*), tawa (*Beilschmiedia tawa*), kahikatea (*Dacrycarpus dacrydioides*) and kanuka (*Kunzea spp.*). Some of this area is designated a SEA (SEA_T_5539). The botanical ecological values within this area are high.

The pipeline crosses four streams along the NOR1 alignment: Oratia Stream at Parrs Cross Road, Opanuku Stream on Palomino Drive, Paremuka Stream on Summerland Drive and Swanson Stream on Don Buck Road. SEAs apply to the north side of the Oratia Stream, the south side of Paremuka Stream and both sides of Opanuku and Swanson Streams at the stream crossing sites:

- The pipe bridge crossing at Oratia Stream will pass to the south of the road bridge outside the SEA where the riparian vegetation is mainly pasture with a few common poplar trees of no great size (Plate 2). Several large poplars are listed as heritage trees at 79 Parr's Cross Road (CHI 2186) and are shown as being along the riparian margin of stream, however no large trees were noted close to the NH2 designation. The botanical ecological values within this area are very low.
- The pipe bridge across the Opanuku Stream will pass to the east of the road bridge through SEA_T_4870. The riparian vegetation here is a well-established young native restoration planting with kanuka (*Kunzea robusta*), cabbage trees (*Cordyline australis*), houheria (*Houheria populnea*), puriri, rimu, titoki (*Alectryon excelsus*) and karamu (*Coprosma robusta*). Some of these trees are > 6m tall (Plate 3). The botanical ecological values within this area are low.
- The pipe bridge across the Paremuka Stream will pass to the south east of the road bridge through native restoration planting of the riparian corridor. The area is dominated by tree ferns (*Cyathea dealbata*) and other common native species of no great size. Close to the bridge the vegetation is weedy with privet (*Ligustrum lucidum* & *L. sinense*), wattle (*Acacia spp*) and Japanese honeysuckle (*Lonicera japonica*) being dominant (Plate 4). This area is not shown as part of an SEA, although SEA_T_4874 is located on the north western side of the road bridge. The botanical ecological values within this area are low.
- The crossing of the Swanson Stream will pass to the west of the road bridge through SEA_T_4872. The key botanical features of the vegetation that may be affected at this site are a group of five European oaks (*Quercus robur*) in the Don Buck Corner Reserve which are > 10m tall, although they are not especially large or old. The proposed NH2 pipeline passes directly under the oak grove. Root depth of trees vary depending on many factors, including soil type. No adverse effects on tree roots are anticipated if the pipeline runs 7m or more below the ground. Otherwise the vegetation is a mixture of planted young natives such as kanuka up to 6m tall, flax (*Phormium tenax*), karo (*Pittosporum crassifolium*), kapuka (*Griselinia littoralis*), cabbage trees, karamu etc. and exotic trees such as birch (*Betula pendula*), privet, and Mexican white cedar (*Cupressus lusitanica*) (Plate 5). The botanical ecological values within this area are very low.

Street trees along the route generally appear fairly unremarkable and of no great size. Along Border Road and Palomino Drive are exotic melia trees (*Melia azedarach*), some of which are >8m tall and there are reasonably large street trees close to the proposed pipeline as it runs along Parrs Cross Road between Seymour Road and Forest Hill Road. At the junction of Palomino Drive and Summerland Drive a good sized kauri was noted on the western side of Summerland Drive. The only scheduled heritage trees within the designation are two pohutukawa (*Metrosideros excelsa*) trees at 251 Don Buck Road. The botanical ecological values within this area are very low.

Parrs Park on Parr's Cross Road has a small memorial grove of planted trees ("Trees for Babies") which is adjacent to the designation and effects on this will need to be considered when locating the pipeline trench. Within the designation on Don Buck Road there is a strip of native planting just north of Royal Road on the eastern side. There are other scattered large street trees or trees within residential gardens along the designation that may be affected if works are carried out within their root zone. The botanical ecological values within this area are very low.

2.1.1.3 Assessment of Effects

The key effects of the project on the vegetation within NOR1 are expected to be the following:

- The loss of some native trees and the potential for the kauri dieback disease to spread with the construction and soil disturbance associated with the pipe receiving pit at Shetland Street.
- The loss of some of the planted young native trees and tree ferns at the Paremuka, Opanuku and Swanson Stream crossings to allow the construction of monopole columns and their foundations.
- The potential loss, or adverse effects on one or more of the oak trees at the Don Buck Corner Reserve near the Swanson Stream crossing and potential adverse effects on the scheduled pohutukawa trees at 251 Don Buck Road.

Overall the effects of the project on the vegetation within NOR1 are expected to be minor and they can be adequately mitigated to less than minor as described below.

2.1.1.4 Mitigation and Management Recommendations

The following recommendations are made for the management and mitigation of any adverse effects on the vegetation along the NH2 pipeline designation within NOR1:

1. Large trees have a number of important ecological values, such as: the provision of habitat and food for fauna, the uptake of carbon dioxide and the production of oxygen, soil conservation and production, and water cycle regulation. Therefore, it is recommended that large trees (>15cm dbh¹) are avoided. In particular:
 - Works within 30 m of kauri should be avoided because of the risks associated with kauri dieback disease (*Phytophthora agathicida* or PTA). If works within 30m of kauri cannot be avoided then a Kauri Dieback Biosecurity Plan will be required.
 - The hard beech trees at the southern end of Shetland Road should be avoided if practicable at the detailed design stage, as the species is uncommon in the Auckland Region. If the hard beech trees cannot be avoided, then an ecological management plan will need to be prepared prior to their clearance.
2. Any native canopy trees (rimu, kauri, totara, kahikatea, tawa etc.) >15cm dbh that are removed should be replaced at an appropriate site using a suitable ecological compensation ratio that reflects the final design and the site specific details.
3. If a permanent open area is to be created within the forest at the southern end of Shetland Road, edge planting with suitable species should be carried out to re-seal the forest edge. Any temporarily cleared areas of forest should be replanted with appropriate native species post construction.
4. The felling or pruning of any large trees whether native or exotic should be overseen by a qualified arborist, to reduce the adverse effects on the surrounding habitat.
5. In general, areas of native vegetation, particularly within SEAs should be avoided where practicable.

¹ Diameter at Breast Height (1.4m from the base of the tree).

6. Where young natives are removed to allow for the construction of piles for stream crossings, pipe trenching or ancillary structures, replacement planting of similar species should be carried out once the construction works are completed.
7. The pipe trench should be carefully sited to avoid the oak trees at the Don Buck Corner Reserve. If they are not able to be avoided then replacement trees will need to be planted at the reserve once construction is complete.
9. If roadside trees are removed, replacement trees should be planted in suitable locations once construction is complete. It is recommended that these be native rather than exotic trees.
10. Good hygiene protocols should be observed when carrying out any soil disturbing activities within 30 m of any kauri tree. If there is a need to prune or fell kauri this should be done only as a last resort and strict hygiene protocols will need to be followed. A Kauri Dieback Biosecurity Plan will need to be developed for the project by a suitably qualified plant pathologist. This plan must include protocols for the proposed trenchless technology construction between Woodlands Park Drive and Shetland Road.
11. An Ecological Replacement Planting Plan and a Landscaping Plan will need to be developed for the project by a suitably qualified person that addresses points 2, 3, 6 & 9 above.

2.1.1.5 Conclusion

The effects of the project on the native and exotic vegetation along the designation within NOR1 are expected to be minor and with adequate mitigation as set out in Section 2.1.1.4 these will reduce to less than minor. With good ecological replacement planting and landscaping, the overall environmental result can be expected to be positive.

2.1.2 Fauna

2.1.2.1 Methodology

Data was gathered on sites of potential ecological value within the pipeline route using desktop investigations and visual assessments during a site visit.

Database searches for native fauna, including invertebrates, lizards, birds and bats were undertaken and these records were then compiled for locations along the route where their habitats were potentially present.

Fauna considered in this assessment included all those that are protected by the Wildlife Act 1953 (all native lizards, birds and bats) and particular note was given where species with a conservation rating of nationally “At Risk” or higher, were present. Presence of such species was considered to trigger greater significance under the RMA (Section 6C).

2.1.2.2 Results and Description

Vegetation removal associated with the installation of NH2 tunnel launch pit within the reservoir site will be consented as part of the Huia W upgrade, as construction of the Huia WTP will precede NH2, thus providing a clear area from which to launch the trenchless technology for the construction of the tunnel. The pipeline will be laid via trenchless technology from the WTP until the proposed receiving pit at Shetland Street and as such should have no adverse ecological effects until the receiving pit. Accordingly, the following ecological assessment begins at the receiving pit at Shetland Street.

1. Shetland Street- Selwyn Avenue

Description: Secondary podocarp forest. This area is nearby the Waitakere Ranges Regional Park, which has very high ecological values, including a number of threatened species. The area is designated an SEA under the PAUP and is also within the Waitakere Ranges Heritage Act (2008) Area, which requires particular consideration of ecological values and potential impacts.

Fauna: The Site contains some large trees that could support roosts for long-tailed bats (*Chalinolobus tuberculatus*), a threatened species.

The proximity of the site to the Ark in the Park Restoration Project indicates that the site could also support At Risk and Threatened bird species, including kaka and kokako.

At least six lizard species are known to occur in forest in the Waitakere Ranges, and five of these are classified as Nationally 'At Risk'. Those species are listed as potentially present at Woodland Park Road Reservoir Connection Point. These species are:

Copper skink, <i>Oligosoma aeneum</i>	Not Threatened
Ornate skink, <i>Oligosoma ornatum</i>	At Risk- declining
Striped Skink, <i>Oligosoma striatum</i>	Data deficient
Forest gecko, <i>Mokopirirakau granulatus</i>	At Risk- declining
Elegant gecko, <i>Naultinus elegans</i>	At Risk- declining
Pacific gecko, <i>Dactylocnemis pacificus</i>	At Risk- Relict

One species, the striped skink, is known from only two records in the Waitakere Ranges and is therefore classified as Data Deficient. The most recent record was from Titirangi in 2013.

The ecological values associated with native fauna within this area are high.

2. Oratia Stream Overland Crossing

Description: Rank grass along the banks of the Oratia Stream.

Fauna: The particular site has very low potential habitat values for native fauna. Native copper skink and ornate skink may be present in the grass. The ornate skink is nationally At Risk (Hitchmough et al. 2013).

The ecological values associated with native fauna within this area are very low.

3. Opanuku Stream Overland Crossing

Description: Planted margins along the banks of the Opanuku Stream. The banks are terraced, with the lower parts being submerged during high flow.

Fauna: The particular site has low habitat values for native fauna. Native copper skink and ornate skink may be present in the grass, though submergence during high flows would greatly reduce the habitat quality. The ornate skink is nationally At Risk (Hitchmough et al. 2013). Planted trees and shrubs also have some potential to support forest gecko and

elegant gecko, though, given the relatively recent plantings (c. 10-15 years), the location would not be considered to support significant numbers of native lizards. Forest and elegant geckos are both nationally At Risk (Hitchmough et al. 2013).

The planted vegetation has potential to support roosting and nesting habitat for a range of common native bird species.

The ecological values associated with native fauna within this area are low.

4. Paremuka Stream Overland Crossing

Description: Planted and naturally regenerating margins along the banks of the Paremuka Stream.

Fauna: The vegetation is weed infested, however may provide suitable habitat for copper or ornate skinks. Forest gecko may be present in the tree fern, however this habitat is low quality for these species.

The vegetation has potential to support roosting and nesting habitat for a range of common native bird species.

The ecological values associated with native fauna within this area are low.

5. Swanson Stream Overland Crossing

Description: Planted margins along the banks of the Swanson Stream. Vegetation in between planted flax and kanuka is patchy.

Fauna: The vegetation is entirely planted, however may provide potential habitat for copper or ornate skinks. The potential presence of other native lizard species is unlikely.

The vegetation has potential to support roosting and nesting habitat for a range of common native bird species.

The ecological values associated with native fauna within this area are very low.

2.1.2.3 Assessment of Effects

1. Shetland Street - Selwyn Avenue

Removal of vegetation and fauna habitats could result in moderate or greater adverse effects on native fauna and their habitats. This effect could be moderate or greater due to the potential presence of several At Risk and Threatened species.

3. Oratia Stream Overland Crossing

Removal of vegetation and potential fauna habitats would result in less than minor to minor adverse effects.

4. Opanuku Stream Overland Crossing

Removal of vegetation and potential fauna habitats would result in minor adverse effects.

5. Paremuka Stream Overland Crossing

Removal of vegetation and potential fauna habitats would result in minor adverse effects.

6. Swanson Stream Overland Crossing

Removal of vegetation and potential fauna habitats would result in minor adverse effects.

2.1.2.4 Mitigation and Management Recommendations

Preclearance surveys for bats and nesting birds should be undertaken prior to any vegetation clearance at Woodland Park Reservoir Connection Point, and between Scenic Drive and Selwyn Avenue. A Lizard and Frog Management Plan should be prepared to minimise any adverse effects on lizard or frog populations that could be affected by vegetation clearance from these areas. The management plan should address the results of preclearance fauna surveys as well as the details of any fauna relocations and post construction habitat restoration as necessary.

Common native lizards or nesting birds that may be present within vegetation at the overland stream crossings are protected by the Wildlife Act 1953. It is recommended that preclearance surveys are undertaken to avoid mortality of these species.

2.1.2.5 Conclusion

Only one site, Shetland Street to Selwyn Avenue, was identified as having high ecological value and where effects on fauna could be high. In addition to the proposed mitigation to manage the effects on the vegetation, preclearance surveys for bats and nesting birds should be undertaken and a lizard and frog management plan should be prepared prior to any vegetation clearance in these areas to help manage the adverse effects on native fauna to a less than minor level.

Other areas consisted of overland stream crossings where the vegetation was young, planted and generally poor or of marginal habitat value. Unmitigated clearance of vegetation in these areas would have less than minor adverse effects. Preclearance surveys for native lizards and nesting birds are recommended to avoid mortality of these species, as they are protected under the Wildlife Act 1953.

2.2 Freshwater Ecology

2.2.1 Context and Scope

The proposed NH2 route will cross multiple watercourses along the planned route for NOR1. Works associated with NH2 are not anticipated to occur within any watercourses and this will be confirmed at the detailed design stage.

Although no physical works are proposed to occur within the stream channels, surrounding works may have an effect on the freshwater ecology of the watercourses.

The freshwater assessment describes the watercourses found along the proposed route for NOR1 and assesses their general ecological values in relation to the works.

2.2.2 Methodology

Prior to the field survey a map of the site was created using the overland flow paths and underground services from the Auckland Council GIS viewer to determine the locations and general aspects of the watercourses that the proposed NH2 route will cross.

On 5 November 2015 a field survey was undertaken. During the field survey the presence and extent of water was noted, notes were made on the quality of the instream habitats and reference photos taken.

2.2.3 Results and Description

Four main watercourse crossings were identified, these were: the Oratia Stream, the Opanuku Stream, the Paremuka Stream and the Swanson Stream. All of the main streams had road bridge crossings running parallel with the proposed NH2 route.

The freshwater ecological values for these streams are low.

Three minor watercourse crossings were also identified. The approximate locations of these were: 15 Palomino Drive, 72 Parris Cross Road and 334 Glengary Road. All of the minor watercourses have been previously piped or culverted under the road.

The freshwater ecological values for these streams are very low.

2.2.4 Assessment of Effects

Pipe bridges are proposed for all four main watercourse crossings. Construction of the pipe bridges could result in sediment runoff into the associated streams, which would result in potential minor adverse effects on the streams.

No direct adverse effects on the minor watercourses are expected, as these sections of the watercourses have already been piped or culverted. Although, during open trenching around the minor watercourses, sediment runoff may occur.

2.2.5 Mitigation and Management Recommendations

Any construction or earthworks in close proximity to a watercourse (within 10 m) should be timed to avoid predicted heavy rain and should incorporate standard sediment controls (TP90 – Erosion and Sediment Control: Guidelines for Land Disturbing Activities in the Auckland Region), as a minimum, to prevent sediment runoff into any watercourses.

All bare ground exposed by site works should be stabilised and replanted with appropriate vegetation as soon as practicable.

Although no physical works within watercourses are proposed to occur, any unanticipated works within any watercourses will require a full ecological assessment of effects. Unanticipated works within any watercourses may also require a fish recovery and relocation management plan.

2.2.6 Conclusion

By using standard sediment controls the environmental effects from the proposed works on the freshwater ecology can be appropriately mitigated and any adverse effects would be less than minor.

2.3 Summary

Table 2 Summary of the key NOR 1 ecological values, potential effects and proposed mitigation.

Receiving Environment		Current Ecological Value	Potential adverse effects without mitigation	Proposed Mitigation	Potential adverse effects with mitigation
Shetland Street to Selwyn Avenue	Vegetation	High	Moderate or greater	Avoidance any of large native trees, replacement planting	Less than minor to minor
	Fauna	High	Moderate or greater	Fauna Management Plan and preclearance surveys	Less than minor to minor
	Aquatic	NA	NA	NA	NA
Oratia Stream Overland Crossing	Vegetation	Very low	Minor	Replacement planting	Less than minor
	Fauna	Very low	Less than minor to minor	Preclearance fauna surveys	Less than minor
	Aquatic	Low	Minor	Standard sediment control measures, bank stabilisation and revegetation	Less than minor
Opanuku Stream Overland Crossing	Vegetation	Low	Minor	Replacement planting	Less than minor
	Fauna	Low	Minor	Preclearance fauna surveys	Less than minor
	Aquatic	Low	Minor	Standard sediment control measures, bank stabilisation and revegetation	Less than minor
Paremuka Stream Overland Crossing	Vegetation	Low	Minor	Replacement planting	Less than minor
	Fauna	Low	Minor	Preclearance fauna surveys	Less than minor
	Aquatic	Low	Minor	Standard sediment control measures, bank stabilisation and revegetation	Less than minor
Swanson Stream Overland Crossing	Vegetation	Very low	Minor	Replacement planting	Less than minor
	Fauna	Very low	Minor	Preclearance fauna surveys	Less than minor
	Aquatic	Low	Minor	Standard sediment control measures, bank stabilisation and revegetation	Less than minor
Minor Watercourse Crossings	Vegetation	NA	NA	NA	NA
	Fauna	NA	NA	NA	NA
	Aquatic	Very Low	Less than minor	Standard sediment control measures	Less than minor

Note: NA stands for 'not applicable'.

3 NOR 2, EASTERN SIDE OF GREENHITHE BRIDGE TO ALBANY RESERVOIR

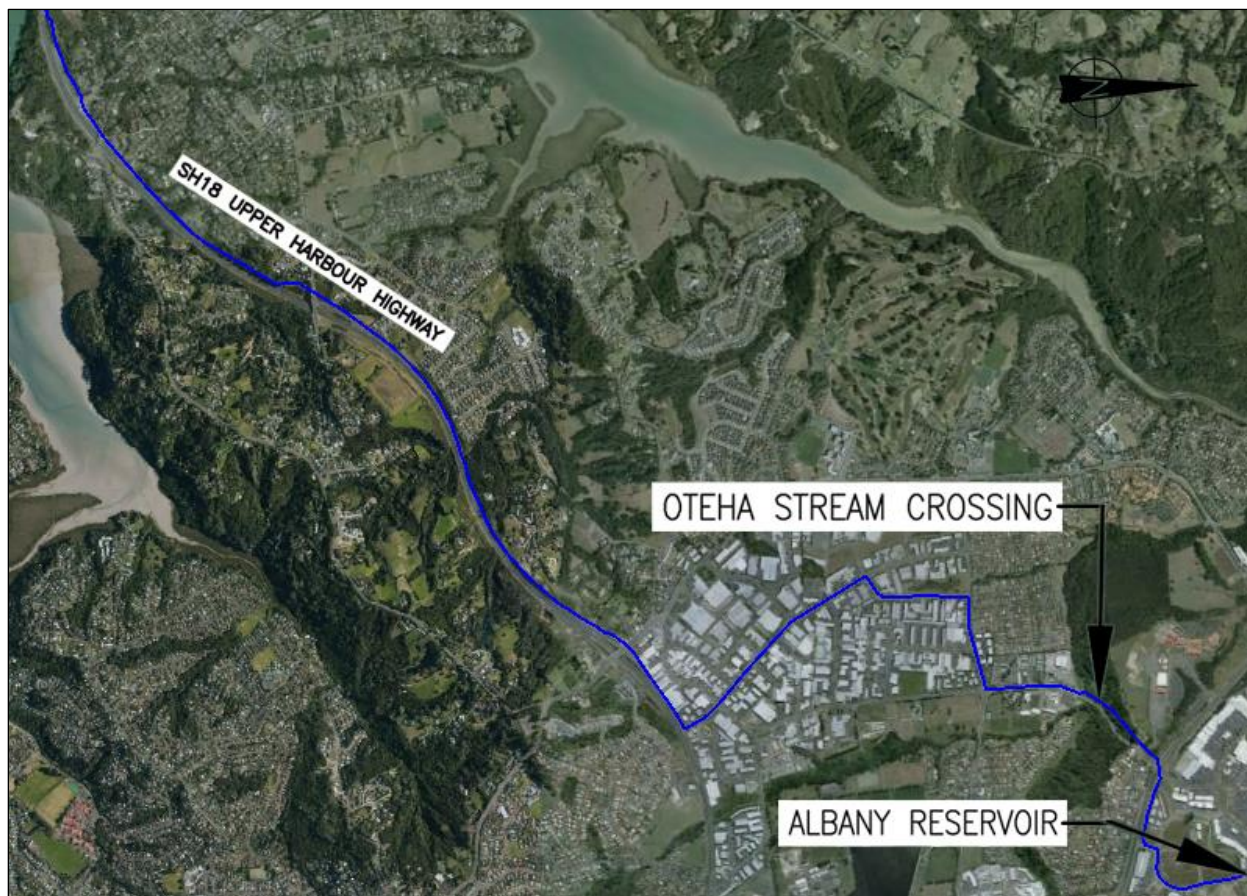


Figure 3. NOR 2, Eastern side of Greenhithe Bridge to Albany Reservoir.

3.1 Terrestrial Ecology

3.1.1 Vegetation and Flora

The vegetation and flora assessment identifies botanical features along the proposed route for NOR2 and describes and assesses their general ecological values in relation to works associated with the NH2 project. The vegetation identified was assessed against criteria in the Waitakere City District Plan and the PAUP. Ecological botanical features of note are typically found within areas identified in the PAUP as SEAs. Individual amenity trees are not generally considered ecologically significant, unless the botanical feature is listed as threatened.

3.1.1.1 Methodology

A specialist botanist assessed the vegetation along the proposed NH2 designation within NOR2 using a combination of desktop and field assessment, particularly noting any areas identified in the PAUP as SEAs and any trees listed as Heritage Trees in the Waitakere City District Plan,

Heritage Appendix. The route was driven and key areas such as stream crossings and SEAs were visited where the composition and characteristics of the vegetation were recorded.

At the Fernhill Escarpment a rangefinder with laser capability was used to measure the distance of the larger riparian trees from the road.

3.1.1.2 Results and Description

On the eastern side of the Upper Harbour Bridge the designation runs through the southern edge of SEA_T_8319 known as “The Knoll” that extends around the coast to the north. The proposed pipeline route will run through the edge of this SEA on the northern side of the SH18 for some 500m, much of it within the State Highway designation. The SEA vegetation along this edge is a combination of vegetation types including an open grassed area, tall pine trees (*Pinus radiata*), wattle, karamu, tanekaha (*Phyllocladus trichomanoides*), cabbage tree and kanuka on the ridge, and further to the east an area of native restoration planting just west of Tauhinu Road. The botanical ecological values within this area are low.

The proposed pipeline designation running northeast along SH18 passes through a number of areas of young native restoration planting that have been implemented as part of the motorway development and skirts the edges of several SEA areas to the north of the motorway. These areas generally contain only a limited range of common pioneer species such as kanuka, cabbage trees and flax, or in the case of stormwater ponds, common native wetland species. These SEA areas include:

- SEA_T_8020 between Dressage Lane and the motorway;
- Greenbough Reserve between Greenbough Lane and the motorway;
- SEA_T_8355C between Wicklam Lane and the motorway (Greenhithe Upper Harbour Reserve); and
- The Fernhill Escarpment south east of the Massey University campus along Bush Road.

The botanical ecological values within these areas are low.

SEA_T_8020 has pine trees and native restoration planting within the pipeline designation. While much of Greenbough Reserve is within the designation, the proposed pipeline route does not impact upon it, remaining as proposed alongside the motorway. The vegetation within the reserve is manuka (*Leptospermum scoparium*) / kanuka scrub with areas of tree ferns (*Cyathea*

dealbata & *C. medullaris*) and a scattering of mature pine trees. Greenhithe Upper Harbour Reserve (SEA_T_8355C) is unlikely to be impacted as the pipeline skirts the very edge of it through restoration planting.

The key vegetation likely to be affected by the installation of NH2 is that within the Fernhill Escarpment Reserve to the north west of Bush Road. The NH2 designation takes in part of the steep south east facing escarpment above the Oteha Stream. The vegetation on the escarpment is mainly good quality kauri podocarp broadleaved forest with large totara (*Podocarpus totara*), kahikatea, tanekaha and kauri forming much of the canopy. There are some large totara and a very large kahikatea tree (Plate 6) near the stream. These riparian trees are generally 10 -12m away from the edge of the road, although further up Bush Road are two large totara that are right on the edge of the road. Other canopy trees include abundant kanuka and scattered titoki. The understorey is composed of kanono (*Coprosma grandifolia*), mahoe (*Meliclytus ramiflorus*), silver tree fern and other ground cover ferns and sedges. This is a good quality forest stand; however the best trees are generally more than 10m from the road and the roadside vegetation consists mainly of younger vegetation (Plate 7). Near the top of Bush Road the NH2 designation runs through an area of younger native vegetation and some mature pine trees on the upper edge of the reserve. The botanical ecological values within this area are high. Three options are proposed for the stream crossing and pipeline through the reserve and the effects of these are discussed below.

3.1.1.3 Assessments of Effects

The key effects of the project on the vegetation within the NH2 designation for NOR2 are expected to be the following:

- Loss of a small amount of vegetation in a narrow strip along the southern edge of the Knoll Reserve, including, pine trees, some tall kanuka and other mainly young native vegetation.
- Loss of a small amount of young native restoration planting along the edges of SEA_T_8021 and the Greenhithe Upper Harbour Reserve.
- There will be no effects on the Greenbough Reserve under the current pipeline if works are not within 30 m of any kauri.

- Loss of areas of young native restoration planting associated with SH18 where trenching for the pipeline and installation of ancillary structures such as scour valves and air valves will occur.
- A variety of effects on the Fernhill Escarpment SEA are possible depending on the particular option chosen for installing the pipeline through the forest.
- Option 1: Installation by trenchless technology under the Oteha Stream and up under the forest to the intersection of Bush Road and Albany Expressway. This option involves trenchless installation of the pipeline beneath the forest and the installation of a tunnel launch pit and tunnel reception pit at either end. The pits can be installed within grassed areas and therefore should not cause damage to the native vegetation within the SEA. Some damage to the roots of large riparian forest trees may occur depending on the depth of the pipe since the proposed pipeline route tracks under some of the larger trees in the reserve. In particular the route appears to pass close to the large kahikatea tree shown in Plate 6 and damage to the roots of this tree is highly undesirable as it is a large old tree that may be significantly damaged by destabilisation of its root system. There is also potential for the soil disturbance to spread kauri dieback disease, if works are within 30 m of any kauri.
- Option 2: A pipe bridge over the Oteha Stream and conventional open trenching along the edge of Bush Road. This option will require the construction of monopole columns and their foundations to support the pipe bridge within the riparian vegetation. These sites should be able to be located to avoid the large riparian trees or at least minimise effects on them. Open trenching along Bush Road would mainly affect younger native vegetation within the SEA with the exception of two larger totara trees close to the road as described in Section 3.1.1.2. These two trees may be lost if Option 2 is preferred. Since most of the larger trees are further than 10m from the road the effects on the better quality trees within the SEA could potentially be minimised through the selection of this option.
- Option 3: Combination of Option 1 and Option 2 with a pipe bridge across the stream and then installation of the pipe using trenchless technology construction from the northern side of the Oteha Stream up under the escarpment forest. This option would have similar effects to Option 1, but in addition there would be a need to install

a tunnel launch pit within the riparian forest on the north side of the stream, with potential effects on some of the large riparian totara and kahikatea here.

3.1.1.4 Mitigation and Management Recommendations

The following recommendations are made for the management and mitigation of any adverse effects on the vegetation along the NH2 pipeline designation within NOR2:

1. Careful consideration should be given to the three different options for taking the pipeline along Bush Road adjacent to or within the Fernhill Escarpment SEA. Further investigations are necessary to determine the least damaging option for the forest and what is practicable. At this stage Option 2 appears to result in the least damage and disturbance as it will keep to the edge of the SEA rather than boring a tunnel under the larger trees further up the escarpment. Further information on the potential effects of trenchless technology construction on tree root systems is needed from an experienced arborist. Once the preferred option has been determined, a more detailed assessment of effects on the forest can be carried out and suitable mitigation determined.
2. Good hygiene protocols should be observed when carrying out any soil disturbing activities within 30m of any kauri tree. If there is a need to prune or fell kauri this should be done only as a last resort and strict hygiene protocols will need to be followed. A Kauri Dieback Biosecurity Plan will need to be developed for the project by a suitably qualified plant pathologist. This plan must include protocols for any proposed trenchless technology construction under the Fernhill Escarpment SEA.
3. Any native canopy trees (rimu, kauri, totara, kahikatea, tawa etc.) >15cm dbh that are removed should be replaced at an appropriate site using a suitable ecological compensation ratio taking in to regard the site specific details.
4. If a permanent open area is to be created within the forest in the Fernhill Escarpment SEA, (for example around a pipe bridge or tunnel launch pit) edge planting with suitable species should be carried out to re-seal the forest edge. Any temporarily cleared areas of forest should be replanted with appropriate native species post construction.
5. In general, areas of native vegetation, particularly within SEAs, should be avoided where possible.

6. Where young native trees within restoration planting areas are removed to allow for the construction of piles for stream crossings, pipe trenching or ancillary structures, replacement planting of similar species should be carried out once the construction works are completed.
7. The removal or pruning of any large trees whether native or exotic should be overseen by a qualified arborist.
8. Large street trees should also be avoided as they have a higher ecological value wherever possible when determining the detailed plans for the pipeline trench. This includes the avoidance of soil disturbance within the drip line of trees. A suitably qualified arborist will need to be consulted in this regard.
9. An Ecological Replacement Planting Plan and a Landscaping Plan will need to be developed for the project by a suitably qualified person that addresses points 3, 4, 6 & 9 above.

3.1.1.5 Conclusion

The effects of the project on the native and exotic vegetation along the designation within NOR2 are expected to be minor and with adequate mitigation as set out in Section 2.1.1.4, these will reduce to less than minor. With good ecological replacement planting and landscaping the overall environmental result can be expected to be positive.

3.1.2 Fauna

3.1.2.1 Methodology

Data was gathered on sites of potential ecological value within the pipeline route using both desktop investigations and visual assessments during a site visit.

Database searches for native fauna, including invertebrates, lizards, birds and bats were undertaken and these records were then compiled for locations along the route where their habitats were potentially present.

Fauna considered in this assessment included all those that are protected by the Wildlife Act 1953 (all native lizards, birds and bats) and particular note was given to species with a

conservation rating of nationally “At Risk” or higher. Presence of such species was considered to have greater significance under the RMA.

3.1.2.2 Results and Description

The following locations were identified as providing potential habitat for protected or threatened species:

1. Four SEAs along the northern side of State Highway 18

These areas are:

1. SEA_T_8319 at The Knoll, Greenhithe: Upper Harbour Bridge Connection;
2. SEA_T_8020 between Dressage Lane and the motorway;
3. Greenbough Reserve between Greenbough Lane and the motorway; and
4. SEA_T_8355C between Wicklam Lane and the motorway (Greenhithe Upper Harbour Reserve).

The vegetation within these areas is mixed native and exotic scrub which provides suitable habitat for at least five native lizard species, four of which have a threat classification of “At Risk” (Hitchmough et al. 2013). These species are:

Copper skink, <i>Oligosoma aeneum</i>	Not Threatened
Ornate skink, <i>Oligosoma ornatum</i>	At Risk- declining
Forest gecko, <i>Mokopirirakau granulatus</i>	At Risk- declining
Elegant gecko, <i>Naultinus elegans</i>	At Risk- declining
Pacific gecko, <i>Dactylocnemis pacificus</i>	At Risk- Relict

It is noted that the forest gecko, copper skink and ornate skink have been recorded from SEA_T_8319 and SEA_T_8355C.

The vegetation also has potential to support roosting and nesting habitat for a range of common native bird species.

The ecological values associated with native fauna within this area are moderate.

2. Oteha Stream Crossing and Fernhill Escarpment

Description: Secondary podocarp forest. This area is designated SEA under the PAUP. The site has high ecological values, including importance as an ecological corridor.

The site contains some large trees that could support a high diversity of at least six native lizard species. Five of these are nationally 'At Risk'. The vegetation also has the potential to support roosting and nesting habitat for a range of common native bird species, including kereru, a keystone species (Mander et al. 1998). A keystone species, such as kereru, is one that plays a crucial role in maintaining ecosystem functions (e.g. seed dispersal). Keystone species are considered to trigger higher ecological value than other non-threatened species.

3.1.2.3 Assessment of Effects

Removal of vegetation and fauna habitats at the Knoll, Greenhithe and Fernhill Escarpment could result in moderate adverse effects on native fauna and their habitats. This effect could be significant due to the potential presence of several At Risk species.

3.1.2.4 Mitigation and Management Recommendations

Any vegetation clearance required at the four locations along the northern side of SH18, Greenhithe and Fernhill Escarpment should avoid the largest trees, where practicable, and require preclearance surveys for lizards and nesting birds. A Lizard Management Plan should be prepared to address the potential presence of geckos and skinks within these areas. Where any vegetation clearance is mitigated in accordance with these recommendations, the potential effects would be minor.

3.2 Freshwater Ecology

3.2.1 Context and Scope

The proposed NH2 route will cross multiple watercourses along the planned route for NOR2. Works associated with NH2 are not anticipated to occur within any watercourses and this will be confirmed at the detailed design stage.

Although no physical works are proposed to occur within the stream channels, surrounding works may have an effect on the freshwater ecology of the watercourses.

The freshwater assessment describes the watercourses found along the proposed route for NOR2 and assesses their general ecological values in relation to the works.

3.2.2 Methodology

Prior to the field survey a map of the site was created using the overland flow paths and underground services from the Auckland Council GIS viewer to determine the locations and general aspects of the watercourses that the proposed NH2 route will cross.

On 5 November 2015 a field survey was undertaken. During the field survey the presence and extent of water was noted, notes were made on the quality of the instream habitats and reference photos taken.

3.2.3 Results and Description

The Oteha Stream was the only watercourse identified which the proposed NH2 watermain pipeline crossed. The proposed pipeline runs parallel with Bush Road which bridges over the Oteha Stream. The freshwater ecological values for this stream based on a visual assessment are moderate to high.

3.2.4 Assessment of Effects

Three options are proposed for the crossing of Oteha Stream, these are a pipe installation via trenchless technology, a pipe bridge or a combination of the two. No physical works are proposed to occur within the stream channel.

Construction of a pipe bridge could result in sediment runoff into the Oteha Stream, which would result in potential minor adverse effects on the streams. No direct effects are expected for use of a trenchless technology. Sediment runoff into the watercourses may occur from works in close proximity.

3.2.5 Mitigation and Management Recommendations

Any works in close proximity to a watercourse (within 10 m) should be timed to avoid predicted heavy rain and should incorporate standard sediment controls (TP90 – Erosion and Sediment Control: Guidelines for Land Disturbing Activities in the Auckland Region), as a minimum, to prevent sediment runoff into any watercourses.

All bare ground exposed by site works should be stabilised and replanted with appropriate vegetation as soon as practicable.

Although no physical works within watercourses are proposed to occur, any unanticipated works within any watercourses will require a full ecological assessment of effects. Unanticipated works within any watercourses may also require a fish recovery and relocation management plan.

3.2.6 Conclusion

By using standard sediment controls the environmental effects from the proposed works on the freshwater ecology can be appropriately mitigated and any adverse effects would be less than minor.

3.3 Summary

Table 3 Summary of the key NOR 2 ecological values, potential effects and proposed mitigation.

Receiving Environment		Current Ecological Value	Potential adverse effects without mitigation	Proposed Mitigation	Potential adverse effects with mitigation
SEA_T_8319 at The Knoll, Greenhithe: Upper Harbour Bridge Connection	Vegetation	Low	Minor	Replacement planting	Less than minor
	Fauna	Moderate	Moderate	Fauna Management Plan and preclearance surveys	Less than minor
	Aquatic	NA	NA	NA	NA
SEA_T_8020 between Dressage Lane and the motorway	Vegetation	Low	Minor	Replacement planting	Less than minor
	Fauna	Moderate	Moderate	Fauna Management Plan and preclearance surveys	Less than minor
	NA	NA	NA	NA	NA
Greenbough Reserve between Greenbough Lane and the motorway	Vegetation	Low	Minor	Replacement planting	Less than minor
	Fauna	Moderate	Moderate	Fauna Management Plan and preclearance surveys	Less than minor
	Aquatic	NA	NA	NA	NA
SEA_T_8355C between Wicklam Lane and the motorway (Greenhithe Upper Harbour Reserve).	Vegetation	Low	Minor	Replacement planting	Less than minor
	Fauna	Moderate	Moderate	Fauna Management Plan and preclearance surveys	Less than minor
	Aquatic	NA	NA	NA	NA
Oteha Stream Overland Crossing	Vegetation	High	Minor	Avoidance any of large native trees, replacement planting	Less than minor
	Fauna	High	Moderate	Fauna Management Plan and preclearance surveys	Less than minor
	Aquatic	Moderate to high	Minor	Standard sediment control measures, bank stabilisation and revegetation	Less than minor

Note: NA stands for 'not applicable'.

4 NOR 3, SHARED CORRIDOR FOR NH2 AND NI ALONG SH18

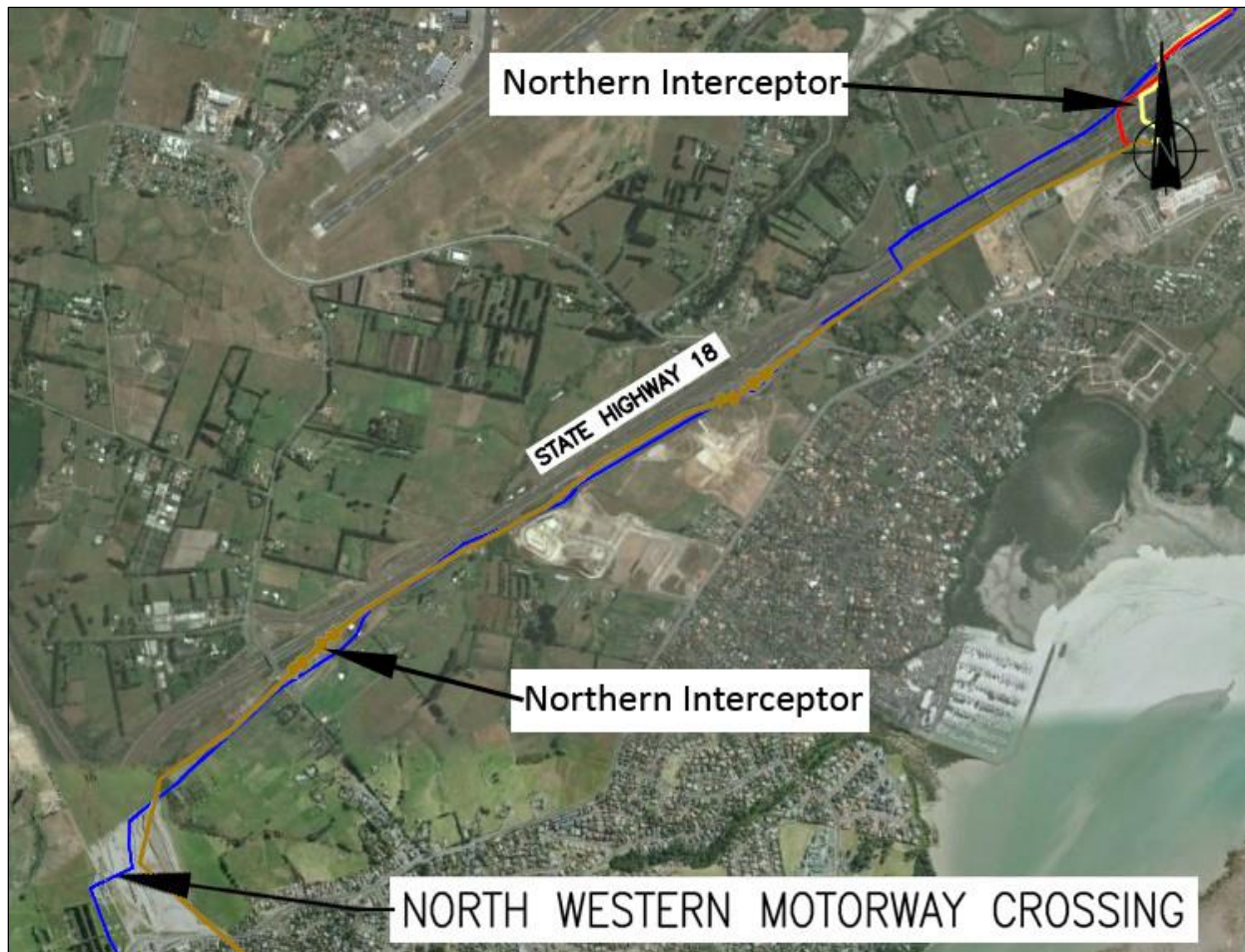


Figure 4. NOR 3, Shared corridor for NH2 (blue) and NI (red) along SH18 from Westgate to western start of GBWD and Causeway widening project.

4.1 Terrestrial Ecology

4.1.1 **Vegetation and Flora**

The vegetation and flora assessment identifies botanical features along the proposed route for NOR3 and describes and assesses their general ecological values in relation to works associated with the NH2 and NI projects. The vegetation identified was assessed against criteria in the Waitakere City District Plan and the PAUP. Ecological botanical features of note are typically found within areas identified in the PAUP as SEAs. Individual amenity trees are not generally considered ecologically significant, unless the botanical feature is listed as threatened.

4.1.1.1 Methodology

A specialist botanist assessed the vegetation along the shared NH2 / NI designation within NOR3 using a combination of desktop and field assessment, particularly noting any areas identified in

the PAUP as SEAs and any trees listed as Heritage Trees in the Waitakere City District Plan, Heritage Appendix. The route was driven and key areas such as stream crossings and SEAs were noted.

4.1.1.2 Results and Description

The shared corridor runs along SH16 and SH18 between Fred Taylor Drive at Westgate and the western side of the Upper Harbour Bridge. In general, apart from the new Hobsonville Pump Station, the only vegetation that will be affected is areas of young planted native vegetation that have been implemented as part of the motorway development. These areas generally contain only a limited range of common pioneer species such as kanuka, cabbage trees and flax, or in the case of stormwater ponds, common native wetland species. The designation crosses Trig Stream and Rawiri Stream close to SH18 just north east of number 27 SH18 as the stream culverts emerge from under SH18. The vegetation along these two streams within the designation is either rank pasture grasses, young restoration planting or mixed native and exotic vegetation with a weedy character. The NH2 pipeline skirts a small area of mixed native and exotic vegetation containing mainly pine trees and kanuka at the upper end of a small estuary just north east of 30 Ockleston Landing. The designation does not cross any SEA areas or include any Heritage Trees as listed in the Heritage Appendix of the Waitakere City District Plan. No other large trees or significant areas of native vegetation within these areas are expected to be affected. The botanical ecological values within this area are low.

In regards to the new Hobsonville Pump Station, approximately 0.5ha of vegetation to the west of the existing pump station on 437 Hobsonville Road will be lost. In addition, the NI pipeline will run from the Hobsonville Pump Station across SH18 where it then approximately follows the route of the NH2 pipeline. The vegetation within the new Hobsonville Pump Station area is largely exotic with a canopy of tall pine trees and eucalypts (*Eucalyptus* spp), privet and wattle. In the understorey are pampas (*Cortaderia selloana*) and common native shrubs such as karamu and mapou (*Myrsine australis*). It is assumed that all of the vegetation within the footprint of the new Hobsonville Pump Station would be cleared to allow for construction. To the east of the Pump Station, at 4 & 7 Buckley Avenue, is the Duke Esplanade Reserve which surrounds a stormwater pond and, while generally similar to the vegetation that will be lost, it contains a greater component of native plants and is of better quality. Although this Reserve will not be

affected by the proposed new Hobsonville Pump Station, the NI pipeline runs within the edge of this vegetation. The NI pipeline will be located well below ground level and installed via trenchless technology, so with the exception for where pit access shafts and work areas will be located, existing vegetation and trees along the NI route are not anticipated to be disturbed. It is expected though, that vegetation clearance is required where pit access shafts and work areas are located for the NI pipeline within the new Hobsonville Pump Station area. The botanical ecological values within this area are very low.

4.1.1.3 Assessment of Effects

The key effects of the projects on the vegetation within NOR3 are expected to be the following:

- Loss of areas of young native restoration planting associated with SH18 where trenching for the pipeline and installation of ancillary structures, such as scour valves and air valves, will occur;
- Loss of a small amount of low quality riparian vegetation associated with Trig Stream and Rawiri Stream where the pipeline crosses these streams; and
- Loss of low quality vegetation dominated by exotic weedy tree species and pest plants associated with works related to the Hobsonville Pump Station upgrade and the NI pipeline. The loss of this small area of low quality vegetation will result in negligible effects on the environmental values of the area.

4.1.1.4 Mitigation and Management Recommendations

Where deemed practicable and necessary through detailed assessment, the NH2 construction activity and pipeline route should be adjusted to avoid or minimise disturbance to native vegetation. Where it is impracticable to avoid areas of young planted native vegetation, this vegetation should be re-instated post construction using the same diversity of plants that were originally there. Much of the disturbance to vegetation caused by the trenching will be temporary and therefore re-instatement is the most sensible option.

In regards to the works associated with the new Hobsonville Pump Station and the related NI pipeline, mitigation can be readily carried out to ensure the botanical values of the locality are maintained and enhanced by landscape planting. This planting should consist of native plants and particularly those listed in the Auckland Council Hobsonville Peninsula Native Plant List

(Ferkins 2015). In addition any pest plants such as pampas, gorse or wilding phoenix palms (*Phoenix canariensis*) occurring on the Watercare property adjacent to the Duke Esplanade Reserve should be removed.

4.1.1.5 Conclusion

The effects of the project on the native and exotic vegetation along the designation within NOR3 are expected to be minor and with adequate mitigation as set out in Section 2.1.1.4 these will reduce to less than minor.

4.1.2 Fauna

4.1.2.1 Methodology

Data was gathered on sites of potential ecological value within the pipeline route using both desktop investigations and visual assessments during a site visit.

Database searches for native fauna, including invertebrates, lizards, birds and bats were undertaken and these records were then compiled for locations along the route where their habitats were potentially present.

Fauna considered in this assessment included all those that are protected by the Wildlife Act 1953 (all native lizards, birds and bats) and particular note was given where species with a conservation rating of nationally “At Risk” or higher, were present. Presence of such species was considered to have greater significance under the RMA.

4.1.2.2 Results and Description

Wallace Inlet

Description: Small areas of the coastal marine boundary at Wallace Inlet.

Fauna: The coastal marine boundary at Wallace Inlet has potential foraging and nesting habitat for banded rail (*Gallirallus philippensis*), a nationally At Risk species (Robertson et al. 2012).

The ecological values associated with native fauna within this area are low.

Hobsonville Pump Station

Description: Largely exotic canopy with weedy understorey and some native shrubs.

Fauna: The particular site has poor habitat values for native fauna (lizards and birds). Native copper skink and ornate skink may be present. The ornate skink is nationally At Risk (Hitchmough et al. 2013). The vegetation may support some nesting habitat for native birds.

The ecological values associated with native fauna within this area are very low.

4.1.2.3 Assessment of Effects

Removal of vegetation along the coastal margins of Wallace Inlet could result in mortality or loss of foraging or nesting habitat of banded rail. At a population level, this effect would be minor, however habitat loss and nesting failure are important contributors to this species' ongoing decline.

Removal of vegetation associated with the new Hobsonville Pump Station upgrade and the NI pipeline could result in some loss of habitat for native lizards and birds. Given the poor quality of this potential habitat, the effect would be minor.

4.1.2.4 Mitigation and Management Recommendations

Preclearance surveys for banded rail should be undertaken where any vegetation is required to be removed at Wallace Inlet (Figure 5). All vegetation that requires removal from within this area should be replaced. Where vegetation removal is required, there is an opportunity for a biodiversity gain through planting rush grass (*Apodasmia similis*) along the southern edge of the Wallace Inlet. Rush grass is an important nesting habitat for banded rail in estuarine areas. Where a banded rail nest is identified within affected vegetation, clearance should not be undertaken until nesting is complete (i.e. chicks have fledged).



Figure 5. Designation boundary (red) within the vicinity of Wallace Inlet

It is noted that common native lizards or nesting birds that may be present within vegetation at the new Hobsonville Pump Station are protected by the Wildlife Act 1953. It is recommended that preclearance surveys are undertaken to avoid mortality of these species.

Where any habitat loss is mitigated in accordance with these recommendations, the potential effects would be less than minor.

4.2 Freshwater Ecology

4.2.1 Context and Scope

The proposed NH2 and NI route will cross multiple watercourses along the planned route for NOR3. Works are not anticipated to occur within any watercourses and this will be confirmed at the detailed design stage.

Although no physical works are proposed to occur within the stream channels, surrounding works may have an effect on the freshwater ecology of the watercourses.

The freshwater assessment describes the watercourses found along the proposed route for NOR3 and assesses their general ecological values in relation to the works.

4.2.2 Methodology

Prior to the field survey a map of the site was created using the overland flow paths and underground services from the Auckland Council GIS viewer to determine the locations and general aspects of the watercourses that the proposed NH2 route will cross.

On 5 November 2015 a field survey was undertaken. During the field survey the presence and extent of water was noted, notes were made on the quality of the instream habitats and reference photos taken.

4.2.3 Results and Description

Seven minor open watercourses were identified along SH18 which the proposed NH2 watermain pipeline will cross. The freshwater ecological values for these watercourses are very low.

4.2.4 Assessment of Effects

The proposed NH2 watermain will be constructed under existing watercourses within the NOR3 section. As a result no direct adverse effects are expected on any existing watercourses. Sediment runoff into the watercourses may occur from works in close proximity.

4.2.5 Mitigation and Management Recommendations

Any works in close proximity to a watercourse (within 10 m) should be timed to avoid predicted heavy rain and should incorporate standard sediment controls (TP90 – Erosion and Sediment Control: Guidelines for Land Disturbing Activities in the Auckland Region), as a minimum, to prevent sediment runoff into any watercourses.

All bare ground exposed by site works should be stabilised and replanted with appropriate vegetation as soon as practicable.

Although no physical works within watercourses are proposed to occur, any unanticipated works within any watercourses will require a full ecological assessment of effects. Unanticipated works within any watercourses may also require a fish recovery and relocation management plan.

4.2.6 Conclusion

By using standard sediment controls the environmental effects from the proposed works on the freshwater ecology can be appropriately mitigated, and any adverse effects would be less than minor.

4.3 Summary

Table 4 Summary of the key NOR 3 ecological values, potential effects and proposed mitigation.

Receiving Environment		Current Ecological Value	Potential adverse effects without mitigation	Proposed Mitigation	Potential adverse effects with mitigation
Restoration Plantings alongside SH18	Vegetation	Low	Minor	Replacement planting	Less than minor
	Fauna	Very Low	Less than minor	NA	Less than minor
NA	Aquatic	NA	NA	NA	NA
Hobsonville Pump Station	Vegetation	Very Low	Less than minor to minor	Replacement planting	Less than minor
	Fauna	Very low	Less than minor to minor	Preclearance surveys	Less than minor
	Aquatic	NA	NA	NA	NA
Wallace Inlet	Vegetation	Low	Minor	Replacement planting	Less than minor
	Fauna	Low	Minor	Preclearance surveys	Less than minor
	Aquatic	NA	NA	NA	NA
Minor Watercourse Crossings	Vegetation	NA	NA	NA	NA
	Fauna	NA	NA	NA	NA
	Aquatic	Very low	Less than minor	Standard sediment control measures	Less than minor

Note: NA stands for 'not applicable'.

5 REFERENCES

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6 **PLATES**



Plate 1 View of forest at the southern end of Shetland Street with hard beech trees in the middle background



Plate 2 View of proposed stream crossing at the Oratia Stream



Plate 3 View of proposed stream crossing at the Opanuku Stream showing young planted natives



Plate 4 View of the stream crossing at the Paremuka Stream showing tree ferns and weedy area adjacent to the bridge



Plate 5 View of stream crossing at the Swanson Stream adjacent to the Don Buck Corner Reserve with a young oak tree on the northern (true left) bank



Plate 6 Large kahikatea tree close to the stream within the Fernhill Escarpment SEA



Plate 7 Vegetation along the edge of Bush Road within the Fernhill Escarpment SEA