

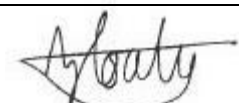

**34 & 36 Sandspit Road, Warkworth:
Ecological Assessment of Effects
April 2022**



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Executive Summary

This report describes the existing ecological values of the terrestrial and freshwater areas on the subject site and assesses the potential effects of the land use and subdivision development proposal to implement the outcomes that will be enabled by proposed Private Plan Change (PPC) on those values. In conjunction with the resource consent there is a private plan change request being processed by Auckland Council to rezone the site from Future Urban Zone to Residential – Mixed Housing Urban zone under the Auckland Unitary Plan Operative in part.

The potential adverse effects on the natural environment of future residential development within the plan change area, can be effectively managed through the existing planning provisions and policy framework within the AUP. Adverse effects can also be effectively mitigated through appropriate stormwater mechanisms, fauna management plans, restoration plantings, legal protection, maintenance programmes and esplanade reserves.

Consistent with the relevant policy documents, the proposal provides opportunities to maintain and enhance ecosystem services, indigenous biodiversity and areas of contiguous indigenous vegetation cover, while providing for the appropriate subdivision, use and development of urban land.

The overall effects on ecological values of the project are considered to be low. We recommend riparian margins within the site are appropriately protected, enhanced, and managed, lizard values are managed through a lizard management plan, and weed and pest control be undertaken in the existing SEA.

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1. INTRODUCTION

The Kilns Ltd is in the process of developing a residential subdivision at 34 and 36 Sandspit Road, Warkworth (the Site, Figure 1). As part of the development earthworks will be undertaken to facilitate development of residential lots, roads, underground infrastructure and a walkway/pathway. necessitating the removal of vegetation within an identified Significant Ecological Area (SEA). The area is currently zoned Future Urban and a private plan change request is being processed by Council seeking Residential – Mixed Housing Urban zone be applied to the land. Vegetation outside of the SEA can be removed as a permitted activity, while removal of vegetation within the SEA is a restricted discretionary activity. In addition, subdivision of the site will yield an esplanade reserve around the east, west and southern boundaries. The reserve will generally be located 20m from the watercourses with the exception of a small area in the south east where the width will be reduced to approximately 10m.

This report describes the existing ecological values of the terrestrial and freshwater areas and assesses the potential effects of the proposed activities on those values.



Figure 1. *The Site (yellow polygon) at 34 and 36 Sandspit Road, Warkworth.*

2. METHODOLOGY

Site assessments were undertaken by an experienced ecologist on the 3rd of February, 14th April and 1st July, 2021, to assess the ecological values within the Site. Prior to the field survey, a map of the site was created from Auckland Council Geomaps, which defined the overland flow paths of the watercourses, contours of the property and any ecological overlays. Assessments of freshwater habitats, vegetation and potential fauna habitats were noted during the site visit and photographs of the site were taken. These notes and photographs were used to assess the ecological values of the terrestrial and freshwater ecosystems. A desktop analysis of relevant databases was also undertaken.

2.1 Terrestrial Ecology

A site walkover was undertaken to assess the vegetation and terrestrial fauna values within the property. Botanic values recorded included native and exotic vascular vegetation and notes were made on the quality and extent of vegetation present on site. Broad vegetation cover was determined based on the site visit and aerial imagery.

No formal fauna surveys were undertaken. Fauna habitats were assessed on site, considering the quality and extent of habitat potentially suitable for indigenous lizards, birds, and bats. A desktop analysis considered local records of bats¹ and herpetofauna² from specific databases.

2.2 Freshwater Ecology

During the site assessment, the presence and extent of streams and wetlands within the Site were noted and the quality of any freshwater habitat was visually assessed.

Watercourses were classified under the Auckland Unitary Plan (AUP) to determine, in accordance with the definitions in these plans, the ephemeral, intermittent or permanent status of these watercourses.

Any potential areas that contained hydrophytic vegetation or hydrology were assessed, following the Ministry for the Environment's wetland delineation protocols³, including vegetation assessments, hydric soils, and wetland hydrology, to determine whether the areas meet the definition of a 'natural wetland' under the National Policy Statement for Freshwater Management 2020 (NPS-FM).

The quality of the aquatic habitat was assessed, noting ecological aspects such as channel modification, hydrological heterogeneity, riparian vegetation extent, substrate type and any fish or macroinvertebrate habitat observed. Riparian and catchment information was also reviewed in addition to local native fish records⁴.

¹ Auckland Council and Bioresearches records

² DOC BIOWEB Herpetofauna database

³ Ministry for the Environment (2020). Wetland Delineation Protocols.

⁴ New Zealand Freshwater Fish Database

3. EXISTING ENVIRONMENT

3.1 Background and Ecosystem Classification

The Site is bounded on the west, east and south by two streams and a river, with the Viponds Creek to the west, an unnamed tributary to the east and the tidally influenced Mahurangi River to the south. The site is bound to the north by Sandspit Road. Currently, the eastern, western, and southern boundaries of the site are covered by mixed vegetation.

Historically, the Site would have likely comprised of the ecosystem type; pūriri, taraire forest (WF7-2; Singers *et al.*, 2017). The characteristic native flora would have typically comprised of a mixed broadleaved forest commonly dominated by pūriri, karaka, kohekohe and, locally, taraire. This ecosystem type would have supported a diverse range of invertebrates, amphibians, reptiles, birds and bats. However, the majority of the site has been cleared for at least sixty years and has remained largely unchanged since 1963 (Figure 2). It is understood that, from 1859 until 1880s, the site was used as a lime quarry, with three kilns, a rail line and a quarry area present in the southern portions of the site.



Figure 2. Aerial image of the Site (yellow polygon) in 1962 (historical image sourced from Retrolens).

The vegetation along the eastern boundary of the Site (0.5 ha), adjoining an unnamed tributary of the Mahurangi River, is subject to a Significant Ecological Area overlay (SEA_T_6684, Figure 3). SEA_T_6684 covers a total area of approximately 8.5 ha and the wider area was assessed as an SEA by

Auckland Council based on all five factors/criteria; 'Representativeness', 'Threat Status and Rarity', 'Diversity', 'Stepping-Stones, Migration Pathways and Buffers' and 'Uniqueness or Distinctiveness'.



Figure 3. Aerial image of the Site (yellow polygon) with the SEA overlay (green hatch).

3.2 Terrestrial Ecology

3.2.1 Vegetation

Currently, the Auckland Council Geomaps classifies the vegetation within the Site and subject to the SEA overlay as either Exotic Scrub (ES, 0.17 ha), Kahikatea Forest (MF4, 0.32 ha) and Kānuka scrub/forest (VS2, 23 m²) (Figure 5). The remaining area of the Site, including the existing vegetation adjacent to the Mahurangi River and Viponds Creek, does not have a current ecosystem classification as per the Auckland Council Geomaps.

Based on a site visit and aerials, Bioresearches classified and mapped the vegetation cover. Three main vegetation types were identified; regenerating native vegetation, exotic scrub and lawn and amenity/garden planting (Figure 5).



Figure 4. Aerial image of the Site (yellow polygon) with the Auckland Council Geomaps 'Current Ecosystems Extents Overlay'.

3.2.1.1 Regenerating Native Vegetation

The areas classified as regenerating native vegetation included areas of vegetation where native canopy and/or understorey comprised >50% coverage (Photos 1-4). Native species diversity was low, primarily consisting of common native species, such as; kānuka, tōtara, karaka (*Corynocarpus laevigatus*) māhoe (*Melicytus ramiflorus*), māpou (*Myrsine australis*), tree fern (*Cyathea dealbata*), karamū (*Coprosma spp.*), flax (*Phormium tenax*), and cabbage tree (*Cordyline australis*). Native species present were generally of low stature with only few individuals (restricted to kānuka and tōtara) considered as large trees (>15 m). With the exception of a few young karaka, no characteristic 'MF4' species, such as kahikatea (*Dacrycarpus dacrydioides*) and taraire (*Beilschmiedia tarairi*), were identified.

The regenerating native vegetation had a high abundance of exotic plants, including infestations of listed pest plant species⁵ (Photo 5-8). Exotic species dominated the understorey, inhibiting natural regeneration of natives. Identified exotic species are presented in Table 1.

Due to low abundance, low complexity and the generally low stature of native trees, as well due to the high abundance of exotic species including pest plant species, the regenerating native vegetation within the Site was considered of low botanical ecological value.

⁵ Auckland Regional Pest Management Plan 2020 - 2030



Figure 5. Aerial image of the Site (yellow polygon) with the ground truth vegetation types and extents.



Photo 1. Regenerating native vegetation along the eastern boundary.



Photo 2. Regenerating native vegetation along the southern boundary.



Photo 3. Regenerating native vegetation at the southern most point.



Photo 4. Regenerating native vegetation along the south-western boundary.



Photo 5. Exotic species along the eastern boundary which extends into the native vegetation.



Photo 6. Exotic species within native vegetation along the southern boundary.



Photo 7. Exotic species within native vegetation along the western boundary.



Photo 8. Exotic species within native vegetation along the north-western boundary.

3.2.1.2 Exotic Scrub

The exotic scrub within the site was characterised by having >10% native species and a dominance of pest plant species (Table 1). The exotic scrub was largely limited to understorey species, with large specimens restricted to Monterey cypress, Australian blackwood, willow, and tree privet.

Due to the lack of complexity, general low stature and very-low native diversity, the exotic scrub within the Site was considered of negligible botanical ecological value.

Table 1. Identified exotic species within the Site.

Scientific name	Common name	Listed pest plant
<i>Acacia melanoxylon</i>	Australian blackwood	✘
<i>Arundo donax</i>	Giant reed	✓
<i>Asparagus scandens</i>	Climbing asparagus	✓
<i>Cortaderia selloana</i>	Pampas	✓
<i>Cotoneaster sp.</i>	Cotoneaster	✓
<i>Crataegus monogyna</i>	Hawthorn	✓
<i>Crocsmia x crocosmiiflora</i>	Montbretia	✓
<i>Eriobotrya japonica</i>	Loquat	✓
<i>Hedera helix</i>	Ivy	✓
<i>Hedychium gardnerianum</i>	Wild ginger	✓
<i>Ipomoea indica</i>	Blue morning glory	✓
<i>Jasminum polyanthum</i>	Jasmine	✓
<i>Ligustrum lucidum</i>	Tree privet	✓
<i>Ligustrum sinense</i>	Chinese privet	✓
<i>Lonicera japonica</i>	Japanese honeysuckle	✓
<i>Cupressus macrocarpa</i>	Monterey cypress	✘
<i>Pinus radiata</i>	Pine	✘
<i>Rubus fruticosus agg.</i>	Blackberry	✓
<i>Salix sp.</i>	Willow	✓/✘
<i>Solanum mauritianum</i>	Woolly nightshade	✓
<i>Syzygium smithii</i>	Monkey apple	✓
<i>Tradescantia fluminensis</i>	Tradescantia	✓
<i>Ulex europaeus</i>	Gorse	✓

3.2.1.3 Lawn and amenity/garden planting

The remainder of the Site, outside of the exotic scrub and regenerating native vegetation consisted of lawn and garden amenity plantings. Due to the lack of complexity, very low stature and very-low native diversity, the lawn and garden amenity plantings was considered of negligible botanical ecological value.



Photo 9. Exotic scrub within the north-eastern section.



Photo 10. Exotic scrub within the north-eastern section.



Photo 11. Exotic scrub along the western boundary.



Photo 12. Exotic scrub along the western boundary.

3.2.2 Connectivity and Ecological Function

Connectivity between areas of vegetation is important to facilitate ecological function. Edge communities are heavily influenced by increased exposure to light, drying winds and competitive weeds. This ‘edge effect’ restricts some native flora and fauna to forest interiors. Patch fragmentation increases the edge effect and decreases the availability of habitat for interior species. Loss of ecological connectivity can also impair reproductive function for both flora and fauna.

The native vegetation along the eastern boundary within the site (approximately 0.3 ha) forms part of a larger SEA (8.5 ha) which extends to the east and south. This 0.3 ha area of native vegetation is contiguous with the majority of the remaining native vegetation within the site, forming an area of approximately 1 ha. The Site is also in very close proximity to relatively large SEAs to the north and west. As such, the native vegetation functions as a buffer to the SEA extending to the east and south and forms part of an ecological corridor for this SEA. However, due to its relatively narrow width the native vegetation within the Site is subject to high edge effects.

The native vegetation also acts as an important stepping stone and partial corridor in relation to the surrounding SEAs (Figure 6). Additionally, the native vegetation provides freshwater ecological functions for the associated streams and river, namely; high shading, bank stability, organic input and surface water filtration.

Overall, the native vegetation within the site was considered to have high value ecological connectivity and function.

In regards to the exotic scrub, while this vegetation is connected to the native vegetation, due to its low stature it is not acting as an effective buffer against edge effects. In fact, contrarily, this vegetation provides a significant source of pest plant species to the adjacent native vegetation and wider SEAs. As such, overall the exotic scrub was considered to have a very low amount of ecological connectivity and functioning and is expected to contribute to the further degradation of the native vegetated areas, if left unchecked.

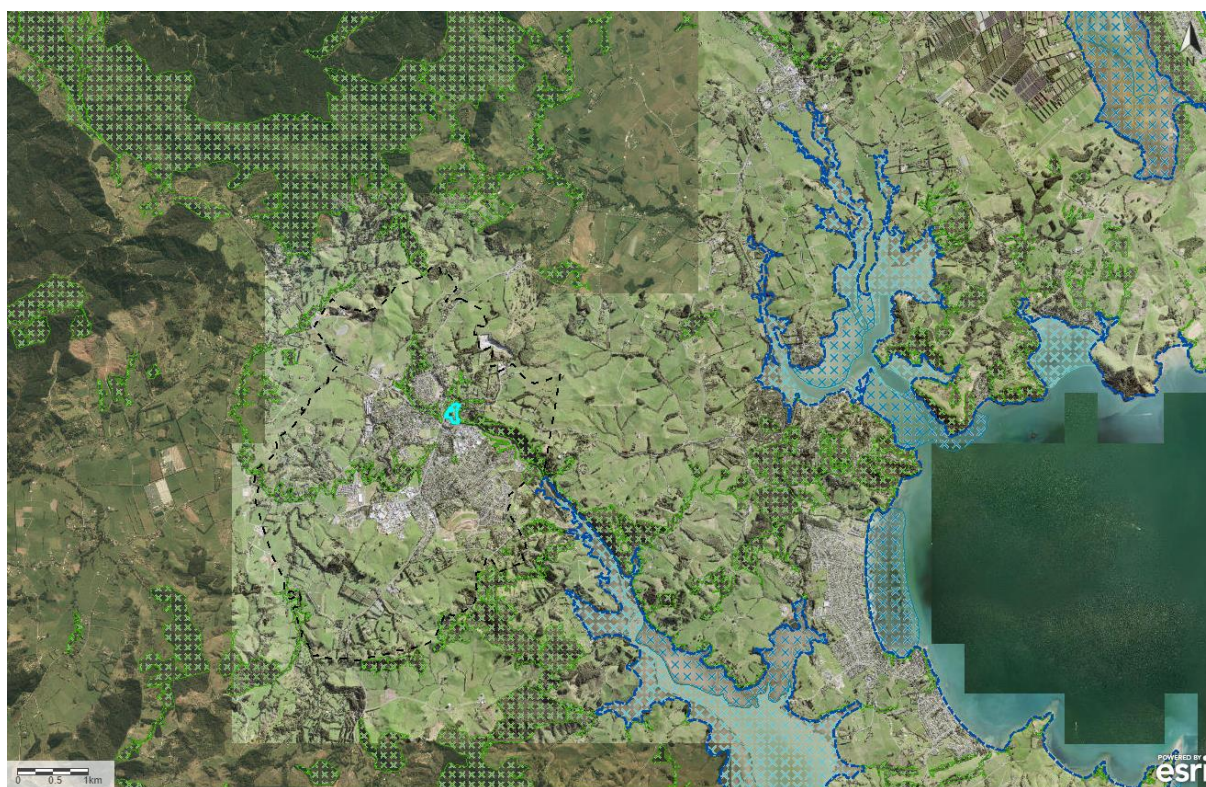


Figure 6. The site (blue polygon) was in close proximity to multiple terrestrial SEAs (green hatch) in all directions and likely acts as a corridor/stepping stone between these areas.

3.2.3 Avifauna

For native birdlife, it is important to have a healthy, dense and diverse range of native vegetation present to provide year-round sources of food and habitat. The native avifauna that occurred on the property was not directly surveyed. However, it is expected that non-threatened native species would frequently and potentially permanently utilise the property, such as; tūī (*Prosthemadera novaeseelandiae*), kingfisher (*Todiramphus sanctus*), morepork (*Ninox novaeseelandiae*), grey warbler (*Gerygone igata*), fantail (*Rhipidura fuliginosa placabilis*), pukeko (*Porphyrio melanotus*), kererū

(*Hemiphaga novaeseelandiae*), shinning cuckoo (*Chrysococcyx lucidus*) and silvereye (*Zosterops lateralis*).

The only large tree within the Site was the pine tree located along the eastern boundary, which may provide foraging habitat for kaka (*Nestor meridionalis*), which are a 'Threatened' species. However, due to the isolated nature of this tree, the occurrence of kaka is unlikely.

The low abundance, low complexity and the generally low stature of vegetation, as well the high edge effects, lowers the avifauna habitat value of the Site. However, the ecological connectivity, which the vegetation provides, helps to increase the avifauna habitat value. Overall, the vegetation within the Site was considered of low-moderate avifauna habitat value.

3.2.4 Herpetofauna

Herpetofauna (reptiles and amphibians) comprise a significant component of New Zealand's terrestrial fauna. There is currently 104 endemic herpetofauna taxa recognised in New Zealand (Hitchmough et al., 2016) and more than 80% are considered 'Threatened' or 'At Risk'. All indigenous reptiles and amphibians are legally protected under the Wildlife Act 1953, and vegetation and landscape features that provide significant habitat for native herpetofauna are protected by the Resource Management Act 1991. Statutory obligations require management of resident reptile and amphibian populations where they or their habitats are threatened by disturbance such as land development.

No formal herpetofauna surveys were undertaken. However, a review of historic lizard records from within 10 km of the project area indicated that four indigenous lizard species occur within the wider landscape (DOC BIOWEB Herpetofauna database; accessed August 2021; Table 2).

Due to the abundance of kānuka (and to a lesser extent tōtara), the connectivity to the contiguous and wider SEAs, the stream margin habitat present, and the presence of 'At Risk – Declining' indigenous herpetofauna within the wider area, the herpetofauna habitat value of the native vegetation was considered high.

Due to the lack of suitable habitat for native lizards outside of the native vegetation, the herpetofauna habitat value within the rest of the Site was considered low. However, it should be noted that copper skinks may utilise the exotic scrub.

Table 2. Herpetofauna of the Auckland Region (mainland taxa only), including conservation threat status (Hitchmough et al. 2021) and potential occurrence in the project area

Species	Threat Category	Threat Status	Potential occurrence on-site	Distance to nearest record
Copper skink (<i>Oligosoma aeneum</i>)	At Risk	Declining	✓	<5 km
Shore skink (<i>Oligosoma smithi</i>)	At Risk	Naturally Uncommon	x	
Moko skink (<i>Oligosoma moco</i>)	At Risk	Relict	x	
Ornate skink (<i>Oligosoma ornatum</i>)	At Risk	Declining	✓	<10 km
Tatahi skink (<i>Oligosoma aff. smithi</i> “Three Kings, Te Pahi, Western Northland”)	At Risk	Declining	x	
Striped skink (<i>Oligosoma striatum</i>)	At Risk	Declining	x	
Forest gecko (<i>Mokopirirakau granulatus</i>)	At Risk	Declining	✓	<5 km
Pacific gecko (<i>Dactylocnemis pacificus</i>)	At Risk	Relict	✓	<10 km
Elegant gecko (<i>Naultinus elegans</i>)	At Risk	Declining	✓	<2.5 km
Muriwai gecko (<i>Woodworthia aff. maculata</i> “Muriwai”)	Nationally Critical		x	
Plague skink (<i>Lampropholis delicata</i>)	Introduced and Naturalised; Unwanted Organism (MPI)		✓	
Hochstetter's frog (<i>Leiopelma hochstetteri</i>)	At Risk	Declining	✓	<5 km
Bell frogs (<i>Litoria spp.</i>)	Introduced and Naturalised		✓	<10 km

3.2.5 Bats

Long-tailed bats (LTBs; *Chalinolobus tuberculatus*) are classified as ‘Nationally Vulnerable’ in the North Island (O’Donnell et al., 2013). This classification is given the qualifier “Data Poor” which indicates that there is low confidence in the rating due to poor data available on the species populations and distribution (Townsend et al., 2008). LTBs have large home ranges of up to 5,629 ha (O’Donnell 2001).

No formal surveys were undertaken for LTBs. However, LTBs are known to occur at several sites across the Auckland Region with scattered records through the Rodney District, including records to the west (4.7 km) and north (5.6 km) (Figure 7). As such, the Site is well within the flight range of known LTB habitat.

The lone large pine tree within the Site, may support roosting or nesting habitat (cavities, large sections of flaking bark) for LTBs, however, due to its isolation and exposure it is unlikely that this tree is utilised by LTBs. The remaining vegetation provided no suitable habitat for bats and as such the Site was considered of low bat habitat value.



Figure 7. Aerial image of the Site (yellow polygon) with the location of bat detection records (green dots).

3.3 Freshwater Ecology

The Site is bounded on the west, east and south by two streams and a river, with an unnamed tributary to the east, the Viponds Creek to the west, and the tidally influenced Mahurangi River to the south (Figure 8).



Figure 8. Aerial image of the Site (yellow polygon) with the identified freshwater habitat of the Site.

3.3.1 Unnamed tributary

Upstream of the Site, the unnamed tributary flows from east to west before turning south within the Site for a relatively short distance and then joins the Mahurangi River just below the main weir.

The stream has a natural channel with a predominately bedrock substrate and additional boulder and cobble features. The average width of the channel is likely greater than three metres. Hydrologic heterogeneity and aquatic habitat diversity and abundance was generally high with pools, chutes, cascades and woody debris present.

Stream banks were steep on both sides, restricting floodplain connectivity. The riparian margin on the true right bank (within the Site) generally extended between 10 and 20 m. On the true left bank, the riparian margin extended further than 20 m. Riparian vegetation consisted of a closed canopy, which provided high amounts of shading, organic input and bank stability. Within the unnamed tributary a concrete weir is located near the mouth of the stream, which likely acts as a significant fish migration barrier.

The unnamed tributary was considered to have a high ecological value, predominately due to the extent of the riparian margins as well as the abundance and diversity of habitat features present.

3.3.2 Viponds Creek

Upstream of the Site, Viponds Creek flows south west, from a quarry to the north, before flowing under Sandspit Road and entering the Site. Within the Site Viponds Creek flows for a relatively short distance before joining the Mahurangi just below the main weir.

The stream has a natural channel with a predominately bedrock substrate and additional boulder and cobble features. The average width of the channel is highly likely greater than three metres. Hydrologic heterogeneity and aquatic habitat diversity and abundance was generally high with pools, chutes, cascades and woody debris present.

Stream banks were steep on both sides, restricting floodplain connectivity. The riparian margin on the true right bank (within the Site) generally extended between 10 and 20 m. On the true left bank, the riparian margin extended further than 20 m. Riparian vegetation consisted of a closed canopy, which provided high amounts of shading, organic input, and bank stability.

Viponds Creek was considered to have a high ecological value, predominately due to the extent of the riparian margins as well as the abundance and diversity of habitat features present.



Photo 13. Unnamed tributary looking upstream from mouth.

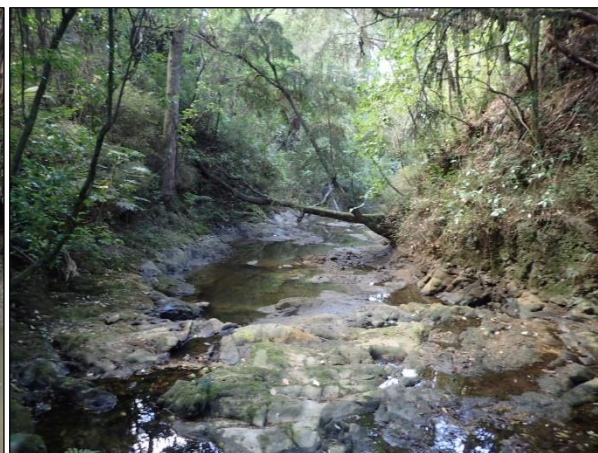


Photo 14. Viponds Creek, mid reach looking downstream.

3.3.3 Mahurangi River

Mahurangi River is a high order, lowland stream which drains to a tidal estuary. The catchment is approximately 4,800 ha, with predominantly rural land use. However, the immediate catchment surrounding the Site, is comprised of residential and commercial properties. The river is evidently wider than three metres.

The Mahurangi River is a significant feature of Warkworth and provides a diverse range of ecological functions and as such is considered to have a very high ecological value. Just upstream of the site a weir has been constructed across the river. The weir has historical significance.

Approximately 500 m downstream of the Site, a section of the Mahurangi River is subject to Natural Stream Management Area overlay; defined as “stream reaches with high natural character and high

ecological values” with “an unmodified river or stream bed with existing indigenous riparian vegetation on both sides” (AUP OP, D4.1).



Photo 15. Mahurangi River, looking downstream from main weir. **Photo 16. Mahurangi River, looking upstream From Viponds Creek.**

3.3.4 Wetlands

No hydrophytic vegetation or other wetland features were identified within or near the Site. As such, it was assessed that no ‘natural wetlands’, as per the NPS-FM, are located within or near the Site. Additionally, the Site is not subject to any Wetland Management Areas Overlay (AUP).

3.3.5 Freshwater Fauna

No formal fish survey was undertaken. Aquatic fauna from surrounding stream catchments was extracted from the NIWA New Zealand Freshwater Fish Database (NZFFDB), to determine the likely presence of aquatic fauna (fish, crustaceans, and bivalves) on-site. The database records are presented in Figure 9.

No records have been submitted for the unnamed tributary. The concrete weir within the stream is likely acting as a significant fish migration barrier, as such, fauna diversity is likely limited to eels (*Anguilla spp.*), banded kōkopu (*Galaxias fasciatus*), resident bullies (*Gobiomorphus spp.*) commonly found in the wider catchment, kōura (*Paranephrops planifrons*) and freshwater shrimp (*Paratya curvirostris*).

Viponds Creek has records for shortfin eel (*A. australis*), common bully (*G. cotidianus*), kōura, freshwater shrimp and īnanga. However, it is highly likely that other species are present including; longfin eel (*A. dieffenbachii*), banded kōkopu, Cran’s bully (*G. basalis*) and redfin bully (*G. huttoni*).

Within the immediate reach of the Mahurangi River, the NZFFDB has records for longfin and shortfin eels, freshwater shrimp, Cran’s bully, common bully, redfin bully and giant bully (*G. gobioides*). However, the river is likely to have a higher diversity particularly in the upper catchments and also acts as the main migration pathway for all migratory species.



Figure 9. Aerial image of the Site (yellow polygon) with local NZFFDB records.

4. ASSESSMENT OF ECOLOGICAL EFFECTS

Under rule E15.4.1 (A19) vegetation removal within 10m of an urban stream is restricted discretionary. All other vegetation removal, with the exception of that within the designated SEA, is a permitted activity (E15.4.1 (A22A)). Vegetation removal within the SEA is considered to be a discretionary activity under E15.4.2 (A43).

Under E38.7.3.2, Any subdivision involving the creation of sites less than 4 hectares and where the proposed site adjoins a river or stream three metres or more in width must provide a minimum 20-metre-wide esplanade reserve in accordance with section 230 of the Resource Management Act 1991. The reduction/waiver of an esplanade strip or reserve during subdivision is considered to be a discretionary activity under E38.4.1 (A10).

4.1 Vegetation removal

4.1.1 Within the SEA

The effects of the loss of the vegetation within the SEA are expected to a negligible effect on ecological values.

Approximately 970m² of SEA vegetation is required to be removed in order to undertake earthworks informed by the geotechnical investigations (Figure 10). This represents approximately 20% of the SEA within the site itself, and approximately 0.0001% of the SEA as a whole.

Of the 970m², approximately 750m² is dominated by weedy exotic species with negligible botanical value and limited habitat value. Removing this area is expected to have a positive effect on the remainder of the SEA through removing a source of invading weed species. The remaining 220m² is edge effected native dominated SEA, the removal of which will have negligible effects on the botanical values of the SEA and the habitat the SEA provides to native fauna.

Any adverse effects associated with the loss of the 220m² of native SEA vegetation will be compensated for through the development of the esplanade reserve to be vested as part of the subdivision. This will result in a gain of approximately 6785m² of vegetation protected by esplanade rules. The esplanade will be subject to enhancement as necessary and ongoing pest and weed management. Approximately 3,500m² of predominantly native shrubby planting, along with additional specimen trees will be provided through the landscaping for the project. The Landscape Plan is appended in Appendix 1.

4.1.2 Within the riparian zone

No significant vegetation will be removed within 10m of any watercourse, however a small number of trees may need to be removed within 10m of Viponds Creek to facilitate the development of the pathway. Tree removal is minor, and the remaining vegetation within 10m of Viponds Creek will be unaffected. Therefore, there will be no adverse effect on the riparian zone as a result of vegetation removal.



Figure 10: Vegetation within the SEA to be remove

4.2 Vegetation connectivity and ecological function

There will be an overall positive effect on ecological function and connectivity.

The removal of 970m² of SEA vegetation is not expected to result in a loss of connectivity, as the remainder of the SEA will stay intact, and contiguous along its length. The areas to be removed are all dominated by exotic weedy species on the edge of the SEA and will not result in fragmentation. There will be edge effects resulting from the removal, however these will be localised to areas immediately adjacent to the removed areas. It is recommended weed management is ongoing throughout the site which will mitigate the effects of weed invasion into the new edges. There will be some changes in composition of these areas as light availability will be difference from what is currently experienced. Overall, however, these changes are not expected to adversely affect the functioning of the SEA either within the site itself, or as a whole. Removal of weeds is expected to result in positive ecological outcomes through the removal of the weeds themselves, as well as removal of a seed source for invasion into the remainder of the SEA.

Ecological connectivity will be improved through the provision of the esplanade strip around the three watercourses. Ongoing maintenance and pest plant and animal management are recommended to ensure the establishment of the vegetation in the area. Once established, there will be an increase in habitat within the site and the planting will provide further buffering measures for both the SEA vegetation, and the three watercourses within the site.

4.3 Esplanade reduction

The effect of not including the minimum esplanade width within the site on ecological values is considered to be low.

On the southeastern boundary, the esplanade reserve will be approximately 10m from the unnamed tributary of the Mahurangi River instead of the 20m required under E38.7.3.2 of the AUP – OP (Figure 11). Policy E38.3 (25) states subdivision should *“Avoid reducing the width of esplanade reserve or strip, or the waiving of the requirement to provide an esplanade reserve or strip, except where any of the following apply: (b) the maintenance and enhancement of the natural functioning and water quality of the adjoining sea, river or other water body will not be adversely affected; (c) the land and water-based habitats on, and adjoining, the subject land area will not be adversely affected.”*

In this part of the property, there is existing established native vegetation extending approximately 10m from the banks of the unnamed tributary. This vegetation is within the SEA and will not be altered by the proposal. It provides established habitat that will act as a buffer between the development and the stream and as such, no negative effects are anticipated from not establishing the 20m esplanade. Effects of construction activities on the waterways, including the unnamed tributary are addressed below.

The remainder of the site will have an esplanade reserve with a width of 20m established around the three watercourses. The reserve will be planted, with the exception of the area around the kilns (boundaries to be determined by a heritage expert), and any areas where public access/pathways will be established.



Figure 11: Proposed esplanade

4.4 Effects on fauna

The effects on fauna are considered to be moderate, mitigated to low.

The site presents habitat for common native birds and lizards. Earthworks and vegetation removal required for the establishment of the site will result in disturbance to fauna during construction, and the loss of some habitat.

Construction noise and vehicle movements is likely to result in disturbance to birds. However, there is significant unaffected vegetation within the site and in the immediate vicinity and it is expected birds will simply move to an un-impacted part of their range while disturbance is occurring. It is recommended vegetation clearance occur outside the bird nesting season (September-February inclusive) to mitigate the effects of loss of nests, chicks, and fledglings. Vegetation to be removed from the site (much of which can occur as a permitted activity) is minimal in the context of the wider landscape and habitat available. The loss of a very small area will not affect available habitat, or populations of native birds.

Native lizard species are considered likely to be present on site. It is recommended a lizard management plan (LMP) be prepared and all vegetation clearance be undertaken as guided by the LMP. Providing works occur under the LMP, it is expected the effects on lizards can be mitigated to low.

4.5 Freshwater habitats

The effects of the works on freshwater ecological values are considered to be moderate, mitigated to low.

There will be no direct works within any of the watercourse bordering the site. There will be very minor removal of vegetation within 10m of Viponds Creek to allow for the pathway to be constructed. Vegetation removal will not result in any significant changes to shading or organic matter input, as the remainder of the trees will be unaffected, including the canopy forming trees. There are no wetlands either within the site or within 100m of the site.

As part of the construction of the pathway in Sandspit Road/Millstream Place corner with the development, Viponds Creek will need to be crossed. At this stage, plans for the crossing are still in the preliminary design phase but will not include structures placed in the stream. All footings, foundations and supports will be outside of the stream channel. Providing final design maintains fish passage and does not impede or alter flow regime, the effects of the crossing are expected to be low. It is recommended final design is completed in conjunction with a suitably qualified freshwater ecologist to ensure ecological function is maintained. If construction of the crossing is required to occur 'in the dry' it is recommended a fish management plan is prepared detailing how fish will be captured and relocated from the channel prior to/as it drains.

The main effect on freshwater will be from sediment generated during earthworks. Sediment can result in habitat degradation through reduced light penetration, smothering of food resources and can affect aquatic biota. Aquatic environments are adapted to periodic natural high inputs of sediment resulting from rainfall, however long-term ongoing inputs of high sediment will have detrimental effects on the freshwater environment.

It is recommended an erosion and sediment control plan be prepared and implemented by an appropriately qualified person to current industry best practice. No earthworks should occur until measures to control sediment are in place. Measures should be inspected prior to forecast heavy rain to ensure they are operating as expected and should also be inspected following heavy rain and repaired as necessary before any works can proceed.

4.6 Effects summary

Overall, the adverse effects on ecological values are considered to be low to negligible, providing recommended mitigation is enacted. There will be an overall increase in native vegetation, and therefore habitat for native fauna, once the esplanade has been established. The increase in native vegetation and the removal of weed and pest species are considered to be positive effects. There will be no direct effect on freshwater values and no wetlands are present on site or within 100m of the site.

5. RECOMMENDATIONS

The following recommendations are provided to avoid and minimise any potential adverse effects to the ecological value of the terrestrial and freshwater environments during the undertaking of earthworks, and development activities, on the Site.

- An Erosion and Sediment Control Plan should be prepared and submitted to Auckland Council prior to any earthworks or vegetation removal commencing and remain in place until the completion of construction activities. Stringent sediment control measures should be in place near the downstream receiving environment, including progressive stabilisation of the open areas near to the stream. Earthworks should be timed to avoid heavy rain and the relevant management and procedures in GD05 should be utilised as a minimum standard.
- Vegetation clearance should occur outside of the bird nesting season (September to February) to minimise any disturbance risk that vegetation removal would have on nesting birds. If vegetation clearance is unavoidable during nesting season, an experienced ecologist should inspect all vegetation proposed for removal within 24 hours of felling. Should any nesting be identified, a 10 m buffer should be required to remain around the nest site until the ecologist has confirmed that the nest has failed or the chicks have fledged.
- Final design of the Viponds Creek pathway crossing should not include any structures in the stream itself.
- If construction of the crossing over Viponds Creek requires works to be completed 'in the dry' or will result in temporary impacts on fish passage, a fish management plan (FMP) should be prepared and implemented by a suitably qualified and experienced freshwater ecologist prior to works commencing. The FMP should include methods to block fish passage during construction, to catch and relocate fish from the works area, and any reporting requirements.
- The esplanade strip should be enhanced with appropriate, ecosourced native species. The strip should be maintained until plants have established. Ongoing weed management is recommended.
- It is recommended that a site-wide lizard and habitat management plan (LHMP) be prepared and implemented by a suitably qualified and experienced herpetologist prior to any works associated with the project, including vegetation removal. Because of the potentially presence of lizards within the site, the LHMP Plan shall be designed so as to achieve the following two objectives:
 - The population of each species of native lizard present on the site at which vegetation clearance is to occur shall be maintained or enhanced, either on the same site or at an appropriate alternative site; and
 - The habitat(s) that lizards are transferred to (either on site or at an alternative site, as the case may be) will support viable native lizard populations for all species present pre-development.
 - The LHMP shall address the following:
 - Credentials and contact details of the ecologist / herpetologist who will implement the plan;
 - Timing of implementation of the LHMP;


- A description of methodology for survey, trapping and relocation of lizards rescued including but not limited to: salvage protocols, relocation protocols (including method used to identify suitable
- relocation site (s)), nocturnal and diurnal capture protocols, supervised habitat clearance / transfer protocols, and opportunistic relocation protocols;
- A description of the relocation site(s); including discussion of:
 - Provision for additional refugia, if required e.g. depositing salvaged logs wood or debris for newly released native skinks that have been rescued;
 - Any protection mechanisms (if required) to ensure the relocation site is maintained (e.g.) covenants, consent notices etc;
 - Any weed and pest management, including fencing from stock, to ensure the relocation site is maintained as appropriate habitat;
- Monitoring methods, including but not limited to: baseline surveying within the site, baseline surveys outside the site to identify potential release sites for salvaged lizard populations and lizard monitoring sites; ongoing annual surveys to evaluate relocation success; pre and post-relocation surveys; and monitoring of effectiveness of pest control and / or any potential adverse effects on lizards associated with pest control; and
- A post vegetation clearance search for remaining lizards.
- Prior to any vegetation clearance an appropriate Planting and Maintenance Plan (PMP) for the site should be prepared by a suitably qualified person. The PMP should, as a minimum, include the following details:
 - Esplanade Reserve/Riparian areas
 - Area to be planted (excluding any areas required for protection of the kilns/other historic areas, and areas identified for future paths/public access)
 - Native species selection (including grade and spacing) and their appropriateness for the site
 - Maintenance regime to ensure the successful establishment of the planting including provision for pest plant and pest animal control
 - Protection mechanism (e.g. covenant) if appropriate
 - Existing SEA
 - Methods to remove and control weed species including ongoing management
 - Recommended enhancement planting as necessary


APPENDIX 1: LANDSCAPE PLANS


Key


--- Site boundary


Hardscape

 Entrance/ wayfinding signage with materiality which responds to local urban and native environments.


 Primary vehicular access with Sett pavers to break up expanse of asphalt surfacing


 JOAL vehicular access with Sett pavers to break up expanse of concrete surfacing


 Pedestrian pathways defined by coloured concrete to reflect clay materiality.

 Gravel pathways bordered by native planting enhancement

 Outdoor living space 01 - Patterned conc.


 Outdoor living space 02 - Timber wide board decking


 >1.2m Fencing


 <1.2m Fencing


 Proposed entrance retaining wall


Softscape

 Avenue Pin Oak specimen trees to line the primary vehicular access route

 Specimen trees to screen development from Sandspit road

 Low rooted shrub planting above service lines

 Native shrub planting to enhance Sandspit road frontage and to replace/enhance pedestrian access points to the site

 On-lot shrub planting with predominately native species mixes





Code	Name	Common Name	PB	Spacing
QP	<i>Quercus palustris</i>	iron oak	95	Marked
PC	<i>Podocarpus costata</i>	karaka	95	Marked
AK	<i>Urtica dioica</i>	stinging nettle	18	1000mm
CA	<i>Cordyline australis</i>	ti kouka	40	Marked
CY	<i>Cyathea medullosa</i>	harakeke	40	Marked
RI	<i>Phoradendron australe</i> 'Pill Island'	pill island rakau	95	Marked
TO	<i>Podocarpus totara</i>	tōtara	95	Marked
PL	<i>Pseudopanax laetevirens</i> 'Coffin Wood'	houpara	28	Marked
CT	<i>Carex lasiocarpa</i>	orange carex	3	800mm
LD	<i>Lonicera chrysantha</i> 'Burgundy'	honeysuckle	8	800mm
MA	<i>Muehlenbergia australis</i>	pothaefus	3	800mm
BR	<i>Phormium tenax</i>	black flax	5	800mm
FT	<i>Ficus</i>	fig	12	800mm
GG	<i>Gonolobus</i>	porokoro	18	800mm
GL	<i>Galium aparine</i>	weed	18	700mm
MB	<i>Chrysanthemum</i>	mexican orange blossom	12	700mm
JM	JOAL Mix			
50%	<i>Muehlenbergia australis</i>	pothaefus	3	500mm
50%	<i>Ficus</i>	fig	3	500mm
FY	Front yard 01			
50%	<i>Carex lasiocarpa</i>	orange carex	3	800mm
50%	<i>Lonicera chrysantha</i>	honeysuckle	3	500mm
FYM	Front yard 02			
25%	<i>Carex lasiocarpa</i>	orange carex	3	800mm
40%	<i>Ficus</i>	fig	8	800mm
40%	<i>Phormium tenax</i>	black flax	8	800mm
FSM	Front yard 03			
20%	<i>Carex lasiocarpa</i>	orange carex	3	800mm
40%	<i>Ficus</i>	fig	5	800mm
40%	<i>Lonicera chrysantha</i>	honeysuckle	3	800mm
RY	Rear yard mix			
10%	<i>Blechnum</i>	fern	12	800mm
10%	<i>Coprosma</i>	coprosma	3	800mm
40%	<i>Lonicera chrysantha</i>	honeysuckle	3	800mm
40%	<i>Phormium tenax</i>	black flax	3	800mm
RV	Revegetation mix			
15%	<i>Austrobaileya</i>	totara	5	1000mm
15%	<i>Carex lasiocarpa</i>	orange carex	3	800mm
15%	<i>Coprosma</i>	coprosma	3	800mm
20%	<i>Muehlenbergia australis</i>	pothaefus	3	800mm
40%	<i>Phormium tenax</i>	black flax	3	800mm
RG	Revegetation mix			
30%	<i>Carex lasiocarpa</i>	orange carex	3	800mm
40%	<i>Ficus</i>	fig	3	500mm
30%	<i>Phormium tenax</i>	black flax	3	800mm

NOTE: QP *Quercus palustris* to be crown lifted





Code	Name	Common Name	PB	Spacing
QP	<i>Quercus palustris</i>	rain oak	95	Marked
PC	<i>Podocarpus costata</i>	karaka	95	Marked
AK	<i>Acrocomia acrostachya</i>	aka aka	18	1000mm
CA	<i>Cordyline australis</i>	ti kouka	40	Marked
CV	<i>Cyathea medeolae</i>	manuka	40	Marked
NI	<i>Podocarpus nivalis</i> 'Pill Island' / 'Pill Island nikau'	pill island nikau	95	Marked
TO	<i>Podocarpus toka</i>	toka	95	Marked
PL	<i>Pseudopanax laetevirens</i> 'Cym Watson'	houpara	28	Marked
CT	<i>Carex lasiocarpa</i>	orange carex	3	600mm
LO	<i>Compositum divaricatum</i> 'Burgundy'	komipalumu	8	600mm
MA	<i>Maschkebeckia axillaris</i>	kohuhua	3	600mm
BR	<i>Phormium 'Black Roper'</i>	black fax	5	600mm
FT	<i>Panicum luteum</i>	pusip	12	600mm
GG	<i>Gerardia 'Queen's Green'</i>	coroona	18	600mm
CL	<i>Cassipouira venusta</i> 'Little John'	dwarf totipotua	18	700mm
MB	<i>Chrysia anomala</i>	mexican orange brodiaea	12	700mm
JM	JDAL Mix			
50%	<i>Maschkebeckia axillaris</i>	kohuhua	3	500mm
50%	<i>Panicum nodosum</i>	whi	3	500mm
FY	Front yard 01			
50%	<i>Carex vulgata</i>	purei	3	600mm
50%	<i>Liberia vicioides</i>	akauku	3	500mm
FYM	Front yard 02			
20%	<i>Carex vulgata</i>	purei	3	600mm
40%	<i>Habe 'Wid' Star'</i>	habe mini star	8	600mm
40%	<i>Phormium 'Strata aurka'</i>	wharangi	8	
FSM	Front yard 03			
20%	<i>Carex lasiocarpa</i>	orange carex	3	600mm
40%	<i>Habe 'Aspirata'</i>	habe	5	600mm
40%	<i>Liberia pernyihamia</i>	akauku	3	600mm
RY	Rear yard mix			
15%	<i>Baccharis dioica</i>	koriko	12	600mm
15%	<i>Lythrum salicaria</i> 'Pillar Knight'	puipua	3	600mm
40%	<i>Liberia pernyihamia</i>	akauku	3	600mm
40%	<i>Phormium cookianum</i>	wharangi	3	600mm
RV	Revegetation mix			
15%	<i>Austroblechnum laetevirens</i>	tokeo	5	1000mm
15%	<i>Carex vulgata</i>	purei	3	600mm
15%	<i>Lythrum salicaria</i> 'Pillar Knight'	puipua	3	600mm
20%	<i>Maschkebeckia axillaris</i>	kohuhua	3	600mm
40%	<i>Phormium tenax</i>	NZ fax	3	600mm
RG	Revegetation mix			
30%	<i>Carex stricta</i>	purei	3	600mm
40%	<i>Panicum nodosum</i>	whi	3	500mm
30%	<i>Phormium 'Emerald Green'</i>	NZ fax	3	600mm

NOTE: QP *Quercus palustris* to be crown lifted



RG
Carex stricta



RG
Panicum nodosum



RG
Phormium 'Emerald Green'





Code	Name	Common Name	PB	Spacing
QP	<i>Quercus palustris</i>	pin oak	95	Marked
PC	<i>Podocarpus costalis</i>	lawsonia	95	Marked
AK	<i>Dodonaea viscosa</i>	tree ake	18	1000mm
CA	<i>Cordyline australis</i>	ti kouka	40	Marked
CY	<i>Cyathea medullosa</i>	harakeke	40	Marked
NI	<i>Rhopalostylis sapida 'Pit Islands'</i>	pit islands nikau	95	Marked
TO	<i>Podocarpus totara</i>	totara	95	Marked
PL	<i>Pseudopanax lessonae 'Cyril Watson'</i>	houpara	28	Marked
CT	<i>Carex lasiocarpa</i>	orange carex	3	600mm
LO	<i>Lomoloma chinensis 'Bungundy'</i>	longstalk lily	8	600mm
MA	<i>Muehlenbeckia australis</i>	populartree	3	600mm
BL	<i>Phormium 'Black Flag'</i>	black flax	5	600mm
PT	<i>Ficus tiliifolia</i>	fig	12	600mm
GG	<i>Cornus 'Greeny's Green'</i>	cornus	18	600mm
CL	<i>Callistemon verticillatus 'Little John'</i>	dwarf bottlebrush	18	700mm
MB	<i>Chrysanthemum 'Mexican Orange Blossom'</i>	mexican orange blossom	12	700mm
JM	JDAL Mix			
	50% <i>Muehlenbeckia australis</i>	populartree	3	600mm
	50% <i>Panicum nodosum</i>	whiri	3	600mm
FY	Front yard 01			
	50% <i>Carex lasiocarpa</i>	orange carex	3	600mm
	50% <i>Lobelia telekii</i>	bluebell	3	600mm
FYM	Front yard 02			
	20% <i>Carex lasiocarpa</i>	orange carex	3	600mm
	40% <i>Hebe 'Well Made'</i>	hebe with mist	8	600mm
	40% <i>Phormium 'Bronze Surf'</i>	wharariki	8	600mm
FSM	Front yard 03			
	20% <i>Carex lasiocarpa</i>	orange carex	3	600mm
	40% <i>Hebe 'Aspirans'</i>	hebe	5	600mm
	40% <i>Lobelia telekii</i>	bluebell	3	600mm
RY	Rear yard mix			
	10% <i>Baccharis distachya</i>	huckle	12	600mm
	10% <i>Carpinus rugosa 'Rear Insights'</i>	huckle	3	600mm
	40% <i>Lobelia telekii</i>	bluebell	3	600mm
	40% <i>Phormium 'Cookianum'</i>	wharariki	3	600mm
RV	Revegetation mix			
	15% <i>Austroblechnum bledsoe</i>	blechno	5	1000mm
	15% <i>Carex lasiocarpa</i>	orange carex	3	600mm
	10% <i>Carpinus rugosa 'Rear Insights'</i>	huckle	3	600mm
	20% <i>Muehlenbeckia australis</i>	populartree	3	600mm
	40% <i>Phormium tenax</i>	NZ flax	3	600mm
RG	Rear garden mix			
	30% <i>Carex lasiocarpa</i>	orange carex	3	600mm
	40% <i>Panicum nodosum</i>	whiri	3	600mm
	30% <i>Phormium 'Limevald Green'</i>	NZ flax	3	600mm

NOTE: QP *Quercus palustris* to be crown lifted

