Assessment of Ecological Effects

Stormwater Discharge Points, Castlecliff Whanganui

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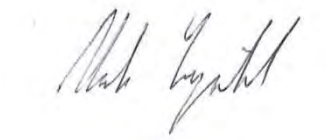

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Contents

List of Figures

List of Tables

1 Executive Summary

Whanganui District Council have proposed a draft plan change for the Outer Castlecliff area. It proposes to rezone the land from Rural lifestyle to Residential. As a result, the higher density housing will require an upgrade of the stormwater network. This network will pick up stormwater and overland flows from the surrounding development that will discharge into Karaka Wetland at two locations: the unnamed stream and the sump at the end of the Kapiti Terrace cul-de-sac. The current rate of discharge is expected to increase at each of these points.

There is a secondary coastal swale where stormwater is also currently discharged. This discharge site will receive more stormwater and is proposed to be upgraded. This site is located off Longbeach Drive in Castlecliff.

The purpose of this report is to identify existing ecological values of the sites, provide an assessment of the anticipated ecological effects of the proposed increase in stormwater discharge and vegetation removal, and propose measures to avoid, remedy and mitigate adverse effects where possible. This report provides supportive information to the plan change and resource consents as required.

This assessment follows on from a desktop review of existing information and field surveys conducted in July 2019.

Guidelines for undertaking Ecological Impact Assessments published by the Environment Institute of Australia and New Zealand have been used to provide a transparent method of assessing ecological impacts of the project.

The proposed increase in stormwater discharge to these systems impacts on habitats and species ranging from Low-High value due to the presence of threatened species. Using the EIANZ guideline approach, the overall effect on all key ecological values impacted by the project ranges from very low through to moderate, this reflects the ecological values of these areas and impact of the proposal. Levels of effects that are low or very low are not typically of concern.

A number of assumptions and recommendations have been made to minimise any potential adverse effects. Assuming implementation of these measures including commissioning of a hydrological report and water quality monitoring it is considered that these effects can be managed.

2 Background

Whanganui District Council have developed a scoping report and draft plan change which considers re-zoning land in Castlecliff to residential, an area of previous low residential growth and demand. The proposed re-zoning will comprise of approximately 115 lots. This will result in the need to upgrade the stormwater network in Castlecliff.

WSP Opus have been contracted by the Whanganui District Council to prepare an assessment of ecological effects of the proposed change to the existing stormwater network. GHD prepared a report in November 2018 which identified that the existing Castlecliff stormwater catchment has insufficient capacity to cope with the stormwater runoff from the current level of development in the catchment (Baugham, 2018). The additional runoff from the Outer Castlecliff proposed development will further exacerbate flooding within the catchment.

Significant upgrades are required to resolve the flooding issues and to accommodate growth associated with the Outer Castlecliff area. It was proposed that additional funding be invested to further upgrade the stormwater network in order to achieve the required level of service for the primary stormwater system. In order for the proposed development not to increase the extent of flooding downstream, hydraulic neutrality in the development will be required.

Currently the stormwater network discharges into Karaka Wetland at two separate locations: the open stream running adjacent to Karaka Wetland, and from a road sump in Kapiti Terrace at the end of the cul de sac into Karaka Wetland.

There is an additional stormwater discharge from Longbeach drive into a coastal swale (separate to Karaka Wetland).

This report identifies the ecological values for these stormwater discharge areas and their context within the surrounding landscape. An assessment of the impact of the proposed stormwater network is given, outlining what values will be affected both positively and negatively. Mitigation and enhancement is proposed where appropriate.

2.1 Purpose and scope

The purpose of this report is to provide an assessment of the ecological effects for the Outer Castlecliff stormwater discharge areas. It will support the plan change as required.

The scope of this report comprises of the following:

- A description of the vegetation, fauna, and ecological features found within the sites;
- As assessment of the existing ecological values;
- An outline of the nature and magnitude of potential adverse effects from the proposed increase in stormwater discharge; and
- Proposed measures to avoid, remedy or mitigate adverse ecological effects, where necessary.

2.2 Site location

The Outer Castlecliff area is located in Whanganui, approximately 5.8km west of Wanganui's town centre (Figure 1).

Figure 1: Location of outer Castlecliff (yellow pin) in relation to Whanganui town centre.

The total area of the proposed residential area can be seen in Figure 2 below. The outer Castlecliff area is currently zoned Rural Lifestyle under the Whanganui District Plan.

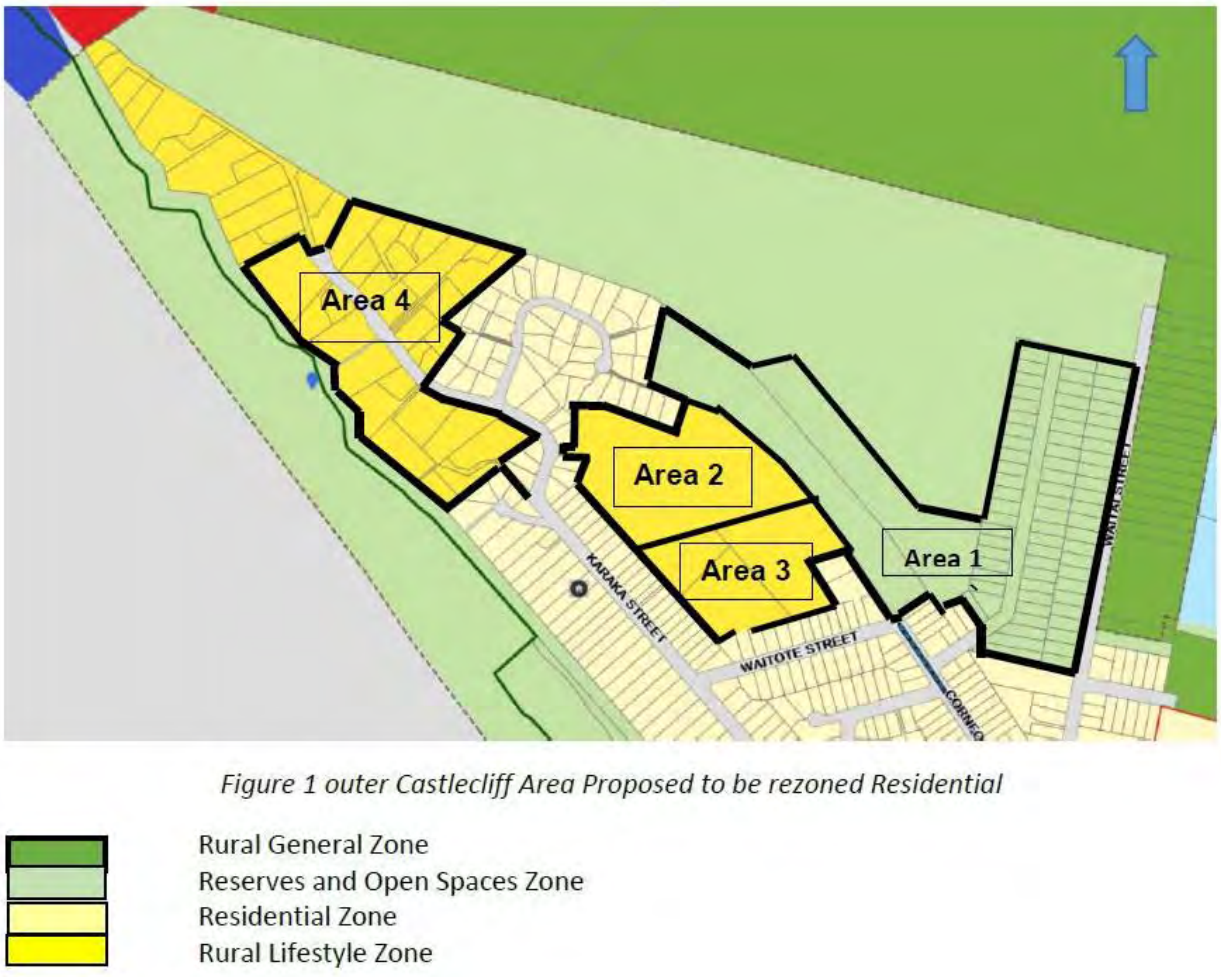


Figure 1 outer Castlecliff Area Proposed to be rezoned Residential

Figure 2: Outer Castlecliff area proposed to be rezoned. (Map retrieved from the Whanganui District Council Plan Change 58).

Outer-Castlecliff has a morphology typical of its near coastal setting, it is located approximately 0.4km from the sea. It is characterised by mixed grasses, planted exotic and native trees and shrubs associated with a rural/rural-residential setting.

When Karaka Street and Seafront Road were formed there were no dunes or wetlands present. Seafront Road was on the sea front. Starting in the late 1800s the North and South Moles were constructed at the mouth of the Whanganui River to deepen the harbour entrance and remove the bar of sediment accumulating offshore which limited the passage of ships. The North Mole stabilised the moving sand at Castlecliff and the beach built up over time to its present size creating the coastal system that exists today.

2.3 Proposed works

The Whanganui District Council Infrastructure team are currently proposing to increase the rate of stormwater discharge to the open stream that runs along the edge of Karaka Wetland, and to upgrade two further stormwater discharge points upstream of this to allow for the increase in stormwater due to the proposed rezoning/development of the outer Castlecliff area.

The proposed works include the re-zoning of the area from Rural lifestyle to Residential. The reduction in lot sizes will facilitate development of the area including establishment of an upgraded stormwater network. The GHD scoping report (Baugham, 2018) assumed that the catchment could be split into two separate sub-catchments at the intersection of Taupata Street

and Seafront Road by utilising the nearby open unnamed stream that discharges directly to the sea (Figure 3a). The upgrades described below are upstream of this point (Figure 3b&c).

The relevant proposed upgrades to the existing stormwater network include upgrading the Kapiti Terrace discharge point (Figure 3b): an increase from 675mm to 900mm diameter gravity main, which is 228m long, and increasing the 750mm and 825mm upgrade to 900mm diameter gravity main, 103m long. This would involve open trenching in order to upgrade pipes and associated vegetation removal at some sites.

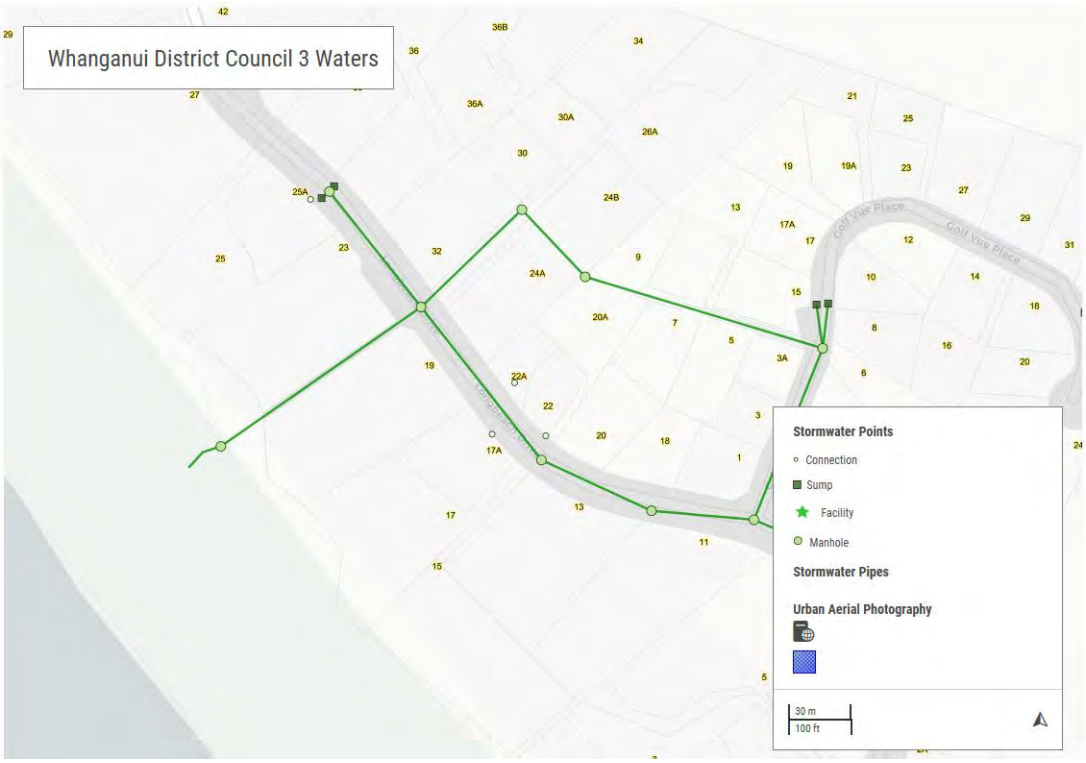
The rough estimate of flow increases are as follows. The approximate catchment area of Kapiti Terrace is 6411.3m^2. Based upon NZS4404:2010 and a 10-year 10-minute (13.3mm) storm event and an approximate run-off coefficient of 0.65 the flow from the sumps would be 0.0924 m^3/s (pers. comm. Damien Wood, Land Development Engineer, Whanganui District Council).

The Taupata Street (Figure 3a) outfall is also to be upgraded and an engineered swale is proposed on council owned land to attenuate/treat the stormwater before it enters Karaka Wetland. The existing flow rate for a 1 in 10 ARI is nil and the post-development peak flow will increase to 1.786m^3/s.

Upgrades are also proposed on Longbeach Drive include: an upgrade from 300mm to 535mm diameter gravity main (309m long) and upgrades from 375mm to 525m diameter gravity main (133m long). The outfall is also to be upgraded. The existing pre-development flow is 0.784m^3/s and the post development peak flow will be 1.152m^3/s (Figure 3c).

A. Location of existing stormwater discharge into Karaka Wetland, this is proposed to receive a greater discharge following the rezoning of the outer Castlecliff area.

B. Location of existing stormwater sumps and pipes at the Kapiti Terrace end of Karaka Wetland. These are also proposed to be upgraded.



C. Location of existing stormwater discharge point at Longbeach Drive, this is proposed to be upgraded as per the above description.

Figure 3a-c: Location of existing stormwater infrastructure to be upgraded in relation to the streetscape of outer Castlecliff.

This report identifies the ecological values for these stormwater discharge areas and their context within the surrounding landscape.

3 Methodology

3.1 Desktop and field survey methodology

3.1.1 Desktop review

The desktop assessment included the following:

- A review of aerial photographs;
- A review of the Regional Planning Maps and Schedules.
- Review of existing reports on Karaka Wetland
- Review of eBird database
- Review of Department of Conservation bat bioweb database

3.1.2 Vegetation, stream and terrestrial fauna field survey

The vegetation, stream and terrestrial fauna survey was carried out during a site visit on the 1st-3rd of July 2019 by Melanya Yukhnevich (Intermediate Ecologist, WSP Opus). The survey recorded vegetation/habitat types and plant species. A description of the characteristics of the stream/watercourses. Birds heard or observed during the visit were also noted. The potential of the habitat to support bats was assessed based on known habitat preferences and local species distribution.

3.2 Assessment of Effects Methodology

3.2.1 EIANZ Guidelines

Guidelines for undertaking Ecological Impact Assessments (EcIA) published by the Environment Institute of Australia and New Zealand (Roper-Lindsay et al, 2018) have been used to aid in assessing the ecological impacts of the Project. The guidelines assist in assessing values and effects in a consistent and transparent way. However, sound professional judgement is still required when applying the framework and matrix approach.

The approach involves assigning values for vegetation, habitats or species using the criteria in Table 1 and then assigning a magnitude of effects rating using the criteria in Table 2. An overall level of effects is then determined by combining the value of an ecological feature or attribute with the rating for the magnitude of effect using the matrix (Table 3).

3.2.2 Assessment of Ecological Values

The first step of the EcIA guidelines approach requires ecological values of each feature to be assigned on the scale given in Table 1. Species were assigned a value according to their conservation status; those 'At Risk' or 'Threatened' were valued at a higher level than those classified as 'Not Threatened'. Threat classifications have been sourced as follows: birds (Robertson et al., 2017); fish (Dunn et al. 2018), bats (O'Donnell et al. 2018), and plants (de Lange et al., 2018).

Horizons Regional Council One Plan identifies Schedule F habitats of Indigenous biological diversity, that are rare, threatened or at-risk habitats, this has also been taken into account.

Table 1 Assignment of values within the site to vegetation, habitats and species (adapted from Roper-Lindsay et al, 2018)

VALUE	SPECIES VALUE REQUIREMENTS	VEGETATION/HABITAT VALUE REQUIREMENTS
Very High	Nationally 'Threatened' species occur or expected to occur within the Project footprint on a permanent or seasonal basis.	Meets the majority or all of the ecological criteria outlined in Regional Policy Statement for the Manawatu-Wanganui region (Policy 6).
High	Nationally 'At Risk - Declining' species occur or expected to occur on a permanent or seasonal basis.	Meets some of the ecological criteria outlined in the Regional Policy Statement for the Manawatu-Wanganui region (Policy 6).
Moderate	Species listed in any other category of 'At Risk' occur or are expected to occur in the project area on a permanent or seasonal basis, this includes locally uncommon or distinctive species.	Habitat does not meet the ecological criteria outlined in the Regional Policy Statement for the Manawatu-Wanganui region (Policy 6) but does provide locally important ecosystem services (e.g. erosion and sediment control, and landscape connectivity).
Low	No species present that are Nationally Threatened, At Risk, locally uncommon or rare, or considered keystone species occur or are expected to occur within the project area seasonally or permanently, including nationally and locally common indigenous species.	Nationally or locally common habitat that does not provide locally important ecosystem services.
Negligible	Exotic species, including pests, and species with recreational values occur or are expected to occur within the project area either permanently or seasonally.	Limited ecological values other than as a local habitat.

3.2.3 Magnitude of Effects

In determining a rating for the magnitude of effects on each ecological value consideration was given to the scale of habitat loss relative to the size of the available resource, duration of the effect, likely effect at population level with respect to individual species and degree to which the Project was likely to impact on the sustainability of the ecosystem and associated species. The magnitude of the effects are described in Table 2. In considering the magnitude of effect, the timescale of potential effects must be considered, whether effects are permanent, long-term, or temporary.

The magnitude of an effect is determined based on best practise in terms of minimising effects and post construction restoration.

Table 2 Criteria for describing the magnitude of effects (Roper-Lindsay et al, 2018)

MAGNITUDE	DESCRIPTION
Very high	Total loss of, or very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally change and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature.

MAGNITUDE	DESCRIPTION
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population.

3.2.4 Overall Level of Effects

The last step in the effects assessment process was to determine the overall level of effect using the EIANZ matrix (Roper-Lindsay et al, 2018)

Table 3 Criteria for describing the level of effects (Roper-Lindsay et al, 2018).

MAGNITUDE	ECOLOGICAL VALUE				
	Very High	High	Moderate	Low	Negligible
Very High	Very High	Very High	High	Moderate	Low
High	Very High	Very High	Moderate	Low	Very Low
Moderate	High	High	Moderate	Low	Very Low
Low	Moderate	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low
Positive	Net Gain	Net Gain	Net Gain	Net Gain	Net Gain

The level of effect or risk posed on ecological values ranges from very high/high to low/very low. Moderate level effects or greater, typically require measures to avoid, remedy or mitigate effects, while Low to Very low effects are not normally of concern, although care may be required to minimise effects through design, construction and operation.

4 Ecological description

4.1 Overview

4.1.1 Karaka Wetland

Castlecliff is located approximately 5.8km west of Wanganui's town centre. The area is characterised by residential properties on a beach front setting. Karaka Wetland sits between Karaka Street and the sea. Karaka Wetland is part of a series of natural dune wetlands extending 4.2km along the coast from the end of Seafront Road.

Karaka Wetland is a large wetland located at Castlecliff beach (Figure 4), boarded by an access track and unnamed stream. It is composed of numerous residential sections and crown land administered by both the Department of Conservation and Whanganui District Council (McQueen, 2016).

This wetland is fed by groundwater flowing under the suburb of Castlecliff. The water collected in the channel exits the wetland through a modified unnamed stream flowing out to sea. The existing stormwater network currently discharges into Karaka Wetland at two separate locations: the open stream running adjacent to Karaka Wetland, and from a road sump in Kapiti Terrace at the end of the cul de sac into Karaka Wetland. The proposal is to upgrade the existing stormwater infrastructure and increase the existing discharge levels.

The groundwater which feeds the wetland has a high concentration of dissolved iron collected as the water flows through the iron sands under Castlecliff. When the groundwater emerges, this

dissolved iron is converted into ochre, which is the distinctive rust coloured mud present in the channel (McQueen, 2016).

Paru is a fine black mud which is high in iron and is found in at least one part of the wetland. It is highly valued by Māori weavers who use it to make traditional black dyes (McQueen, 2016).

Karaka Wetland is dominated by raupo (*Typha orientalis)*, flax (*Phormium tenax),* cabbage trees (*Codryline australis)* and taupata (*Coprosma repens)*. These species are intermingled with woody pest plant species (described in more detail below). Banded Kokopu (*Galaxias fasciatus*) have also been observed in the wetland.

4.1.2 Longbeach Drive discharge point

There is a secondary coastal area where stormwater is currently being discharged, this is located off Longbeach Drive in Castlecliff. The proposal is to increase the quantity of stormwater being discharged (currently 0.784m^3/s to a post development rate of 1.152m^3/s) from Long beach drive into a coastal swale (separate to Karaka Wetland).

Currently this discharge area is located within a dune swale. It is dominated by common exotic plant species and the fauna present at this site is commonly found throughout Castlecliff as a whole. This site will be discussed in greater detail below.

4.2 Karaka Wetland

'Wetland' is described in the Resource Management Act *as 'including permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions'.*

Schedule F of the Horizons Regional Council One Plan identifies indigenous biological diversity habitats that are rare, threatened or at risk. There is a set of criteria that a habitat must meet to be classified as a Schedule F habitat.

Following the site visits Karaka Wetland has been identified as a Dune Slack Wetland which is identified as a rare habitat type in Schedule F of the Horizons One Plan.

Figure 4: looking down on Karaka Wetland from Kapiti Terrace. The different vegetation types can be clearly seen in this figure. The canopy vegetation is seen on the escarpment, the raupo reedland is the central component of the wetland and the unnamed stream runs between the raupo reedland and the adjacent sand dunes.

Figure 5: A) Karaka Wetland outlet to the sea. B) the open stream that runs adjacent to the dunes and Karaka Wetland.

4.2.1 History

When Karaka Street and Seafront Road were formed there were no dunes or wetland. Seafront Road was literally on the sea front. Starting in the late 1800s the North and South Moles were constructed at the mouth of the Whanganui River to deepen the harbour entrance and remove the bar of sediment accumulating offshore which limited the passage of ships. The North Mole stabilised the moving sand at Castlecliff and the beach built up over time to its present size (McQueen, 2016).

As the beach grew, groundwater emerging under Karaka Street pooled at the base of the cliffs. By 1930 this formed a 'lagoon' where children would learn to swim. Later the dunes rose in front of the lagoon creating a more sheltered environment which favoured the establishment of wetland and coastal plants (McQueen, 2016).

The Seafront Road extension was formally developed in the early 1980s as an emergency vehicle access track. At the same time the channel was dug alongside the track to trap and redirect water seeping under the dunes and thus protecting access to the site (McQueen, 2016).

There are 8 existing private footbridges and culverts over the unnamed stream which were constructed in 2002. Prior to these residents had informal accessways connecting their properties to the beach. The current accessways primarily consist of a 900mm concrete pipe surrounded by either concrete blocks or boulders. The pipes on the Council owned portion of the land are 1200mm diameter (McQueen, 2016).

4.2.2 Flora

Karaka Wetland is a naturally formed dune slack wetland, located between a residential environment and the coast. An access track (predominantly for beach access and emergency vehicles runs adjacent to the unnamed stream along the margin of the wetland (Figure 5b and 6a).

Following the recent site visits Karaka Wetland has been identified to contain three distinct plant communities (Figure 4 & 7). Karaka Wetland consist of an area of canopy vegetation which is located on the dune below the houses on Karaka Street and Kapiti Terrace, this area of vegetation is dominated by exotic species with many planted residential garden plants intermingled with native species (Figure 6 A-F).

A. Photo taken from one of the private accessways looking NW of Karaka Wetland.

B. Private accessway across Karaka Wetland and landscaped area.

C: One of the many existing culverts conveying the unnamed stream under private accessways.

D: Private accessway through the raupo reedland habitat zone.

E: Landscape planting zone – located on a private accessway within Karaka Wetland.

F: The location of the beach access in relation to Karaka Wetland.

Figure 6: A-F different private uses and access ways located throughout Karaka Wetland.

The central zone through the wetland is dominated by raupo reedland and the stream zone is dominated by areas of open (sometimes flowing) water and scattered vegetation. This stream flows out to the sea. The species found in each habitat type are listed below in table 4 and photos showing the plant composition of each zone can be seen in Figure 8a-c.

Figure 7: Karaka Wetland habitat areas on a 2019 aerial photograph.

A. Raupo Reedland habitat zone.

B. Reedland and canopy zones of Karaka Wetland.

C. Looking from the canopy zone across the reedland and out to the sea.

Figure 8: plant composition of each habitat zone.

Table 4: Plant species found in each habitat type (denotes an exotic species and ** denotes an At Risk, Declining species).*

HABITAT TYPE	SPECIES LIST
Canopy Vegetation	• Willow species* (*Salix sp.)* • Toetoe (*Austoderia toetoe)* • Exotic grass species* • Wandering jew* (*Tradescantia fluminensis)* • Arum lily* (*Zantedeschia aethiopica)* • Karamu (*Coprosma lucida)* • Wire vine (*Muehlenbeckia complexa)* • Flax (*Phormium tenax)* • Taupata (*Coprosma repens)* • Cabbage tree (*Cordyline australis)* • Coastal wattle* (*Acacia sophorae)* • Agapanthus* (*Agapanthus praecox)* • Bracken (*Pteridium esculentum)* • Pepper tree (*Piper excelsum)* • Cape ivy* (*Senecio angulatus)* • Pine* (*Pinus sp)* • Norfolk Island pine* (*Araucaria heterophylla)* • Coastal mahoe (*Melicytus novae-zelandiae)* • Small leaved milk tree (*Streblus heterophyllus)* • Red hot poker* (*Kpiphofia uvaria)* • Karo (*Pittosporum crassifolium)* • Ivy* (*Hedera helix)* • Broadleaf (*Griselinia littoralis)*

	• Yellow flag iris* (*Iris pseudacorus)* • Hebe (*Veronica stricta)* • Onion weed* (*Allium triquetrum)* • Macrocarpa* (*Cupressus macrocarpa)* • Wheki (*Dicksonia squarosa)* • Lacebark (*Hoheria sexstylosa)* • Karaka (*Corynocarpus laevigatus)* • Kanono (*Coprosma grandifolia)* • Pink ragwort* (*Senecio glastifolius)* • Creeping groundsel* (*Senecio angulatus)* • Unidentified fern (*Blechnum sp)* • Tree lupin* (*Lupin arboreus)* • 7-finger (*Schefflera digitata)* • 5-finger (*Pseudopanax arboreus)* • Boxthorn* (*Lycium ferocissimum)* • Hydrangeas* (*Hydrangea macrophylla)* • Manuka** (*Leptospermum scoparium)* • Kowhai (*Sophora microphylla)* • Rengarenga lily** (*Anthropodium bifurcatum)* • Nightshade* (*Solanum sp)* • Leatherleaf fern (*Pyrosia elaeagnifolia)* • Shining spleenwort (*Asplenium oblongifolium*) • Pukatea (*Laurelia novae-zelandiae)* • Puriri (*Vitex lucens)* • Titoki (*Alectryon excelsus)* • Ngaio (*Myoporum laetum)* • Golden akeake (*Olearia paniculata*) • Cape honey flower* (*Melianthus major)*
Raupo Reedland	• Raupo (*Typha orientalis)* • Exotic grass species* • Toetoe (*Austroderia toetoe)* • Lupin* (*Lupinus spp.)* • Arum lily* (*Zantedeschia aethiopica)* • Willow species* (*Salix sp.)* • Wire vine (*Muehlenbeckia complexa)* • Flax (*Phormium tenax)* • Ivy* (*Hedera helix)* • Onion weed* (*Allium triquetrum)* • Karo (*Pittosporum crassifolium)* • Cape ivy* (*Senecio angulatus)* • Pukio (*Carex secta)* • Fennel* (*Foeniculum vulgare)* • Inkweed* (*Phyolscca octanndra)* • Pine* (*Pinus sp)* • 5-finger (*Pseudopanax arboreus)* • Pukio (*Carex virgata)* • Cabbage tree (*Cordyline australis)* • Giant umbrella sedge (*Cyperus ustulatus*) • Sweet pea* (*Polygala myrtifolia)* • Coastal wattle* (*Acacia sophorae)* • Yellow flag iris* (*Iris pseudacorus)* • Hinau (*Elaeocarpus dentatus)* • Elephant ear* (*Alocasia brisbanensis)* • Honeysuckle* (*Lonicera japonica)*

	• Sphagnum (*Sphagnum perichaetiale)* • Bamboo* (*Bambusa glaucescens)* • Knobby clubrush (*Ficinia nodosa*) • Marram* (*Ammophila arenaria*) • Nightshade* (*Solanum sp)* • Lancewood (*Pseudopanax crassifolius)* • Sand coprosma** *(Coprosma acerosa)* • Spinifex (*Spinifex sericeus*)
Stream	• Willow weed* (*Persicaria maculosa)* • Azolla (*Azolla rubra)* • Fennel* (*Foeniculum vulgare)* • Inkweed* (*Phyolscca octanndra)* • Knobby clubrush (*Ficinia nodosa*) • Marram* (*Ammophila arenaria*) • Raupo (*Typha orientalis)* • Watercress* (*Nasturtium officinale)* • Water celery* (*Apium nodiflorum)* • Onion weed* (*Allium triquetrum)* • Clover* (*Trifolium repens)* • Mint* (*Mentha spicata)* • Honeysuckle* (*Lonicera japonica)* • Buttercup* (*Rannunculus repens)* • Karo (*Pittosporum crassifolium)* • Pink ragwort* (*Senecio glastifolius)* • Monkey musk (*Erythrane guttata)*

4.2.3 Fauna

The bird fauna is typical of a modified residential/coastal setting. The birds noted at the time of the site visit are listed in Table 5 below:

Table 5: Bird species observed during the site visit and associated conservation ratings (Robertson et al. 2017).

Common Name	Scientific Name	Conservation Status
Welcome Swallow	*Hirundo neoxena*	Native - Not Threatened
Eurasian Blackbird	*Turdus merula*	Introduced and naturalised
House Sparrow	*Passer domesticus*	Introduced and naturalised
Common Redpoll	*Carduelis flammea*	Introduced and naturalised
European Greenfinch	*Carduelis chloris*	Introduced and naturalised
Eurasian skylark	*Alauda arvensis*	Introduced and naturalised
Swamp Harrier	*Circus approximans*	Native - Not Threatened
Silvereye	*Zosterops lateralis*	Native - Not Threatened
New Zealand Fantail	*Rhipidura fuliginosa*	Endemic - Not Threatened

Tui	*Prosthemadera novaeseelandiae*	Endemic - Not Threatened
Common Pheasant	*Phasianus colchicus*	Introduced and naturalised

The area is likely to provide habitat for other common native species not observed during the survey. It is possible that Karaka Wetland supports At Risk or Threatened bird species (particularly marsh crake and spotless crake) an extensive bird survey looking for these species was not conducted at this time, however; the site does contain suitable habitat for these species. There are no site-specific records found on eBird for the site. A detailed survey looking for marsh crake or spotless crake may be required, depending on the outcomes of the hydrological report.

Both possums and ferrets are known pests in the area. Some residents conduct trapping on their own properties. There is no co-ordinated pest management occurring at this site.

No bat records were recorded in close proximity to the site during desktop assessments. The closest records from the Department of Conservation bioweb bat database were long tailed bats (*Chalinolobus tuberculatus*) observed approximately 24km north-west of the site. There is potential that the large pine trees may provide roost trees for long tailed bats, however, as no large trees will be disturbed/felled by the proposal this has not be considered further in this report.

A number of lizard species may inhabit these areas. A lizard survey or habitat assessment was not conducted on site. There is potential that lizards may inhabit/utilise habitats associated with vegetation removal and therefore may be impacted by the proposed works.

4.2.4 Unnamed Stream

The unnamed stream running along the border of Karaka Wetland was found to have variable depths (0.3m-1.2m) and was approximately 1-1.5m wide. The stream substrate was dominated by silt, which is likely the result of the dense macrophyte growth found throughout the bed of the stream which reduces the stream flow and traps sediment. There are many culverts within the stream which also appear to restrict water flow. The stream was found to have permanent water during the site visit in winter. The stream appears to have be highly modified and straightened. There is a lack of a shading riparian margin, with the stream margins being dominated by exotic grasses.

No fish survey was undertaken and there are no records in the New Zealand Freshwater Fish Database in close proximity to the site. However, there are existing records of banded kokopu (*Galaxias fasciatus*), inanga (*Galaxias maculatus)*, longfin eels (*Anguilla dieffenbachii)*, shortfin eels (*Anguilla australis)* and redfin bully (*Gobiomorphus huttoni)* being present within the stream in Karaka Wetland (McQueen, 2016). Of these species it is important to note that longfin eels, and inanga are At Risk - Declining species (Dunn et al. 2018).

The stream has no Schedule B values under the Horizons Regional Council One Plan.

As the site visit was conducted during winter high flows, a survey during summer low flows will be required to assess the permanent/intermittent nature of the stream.

4.3 Longbeach Drive Stormwater Discharge Point

This area is located within an existing dune slack. This site meets the One Plan Schedule F definition of Active Duneland which is classified as a rare habitat.

This dune slack is dominated by exotic species (listed below). At the time of the site visit this site was relatively dry and was found to not support common wetland species. This site is typical of other coastal dune hollows in the surrounding area which are vegetated by common exotic plant species.

The existing stormwater discharge point had a small area of ponded water approximately <0.5m^2 (Figure 10c). It appears that the existing stormwater discharge is readily absorbed into the existing environment.

The proposal will result in an increased stormwater discharge from the pre-development peak flow of 0.784m^3/s to the post development peak flow of 1.152m^3/s.

Figure 9: Longbeach Drive stormwater discharge point, the stairs in the background show the location of the access track from Longbeach Drive.

A. The poles mark the location of the existing discharge point.

B. Existing habitat at secondary stormwater discharge point.

C. Existing area of open water found at this site.

D. Marginal edge zone of this area, dominated by coastal wattle.

Figure 10: Longbeach Drive Stormwater Discharge point.

4.3.1 Flora

The Longbeach Drive stormwater discharge point is located in a naturally formed dune slack, located between a residential environment and the coast. An access track for beach access runs down the escarpment from Longbeach Drive to the coast.

Following the recent site visits this area has been identified to contain four distinct plant communities (Figure 11). Longbeach Drive consist of an area of vegetation on the escarpment, there is a central low-lying vegetation zone, the scrubby marginal edge zone and the vegetated buffer that runs parallel to the beach access track. Table 6 lists the plants found in each zone.

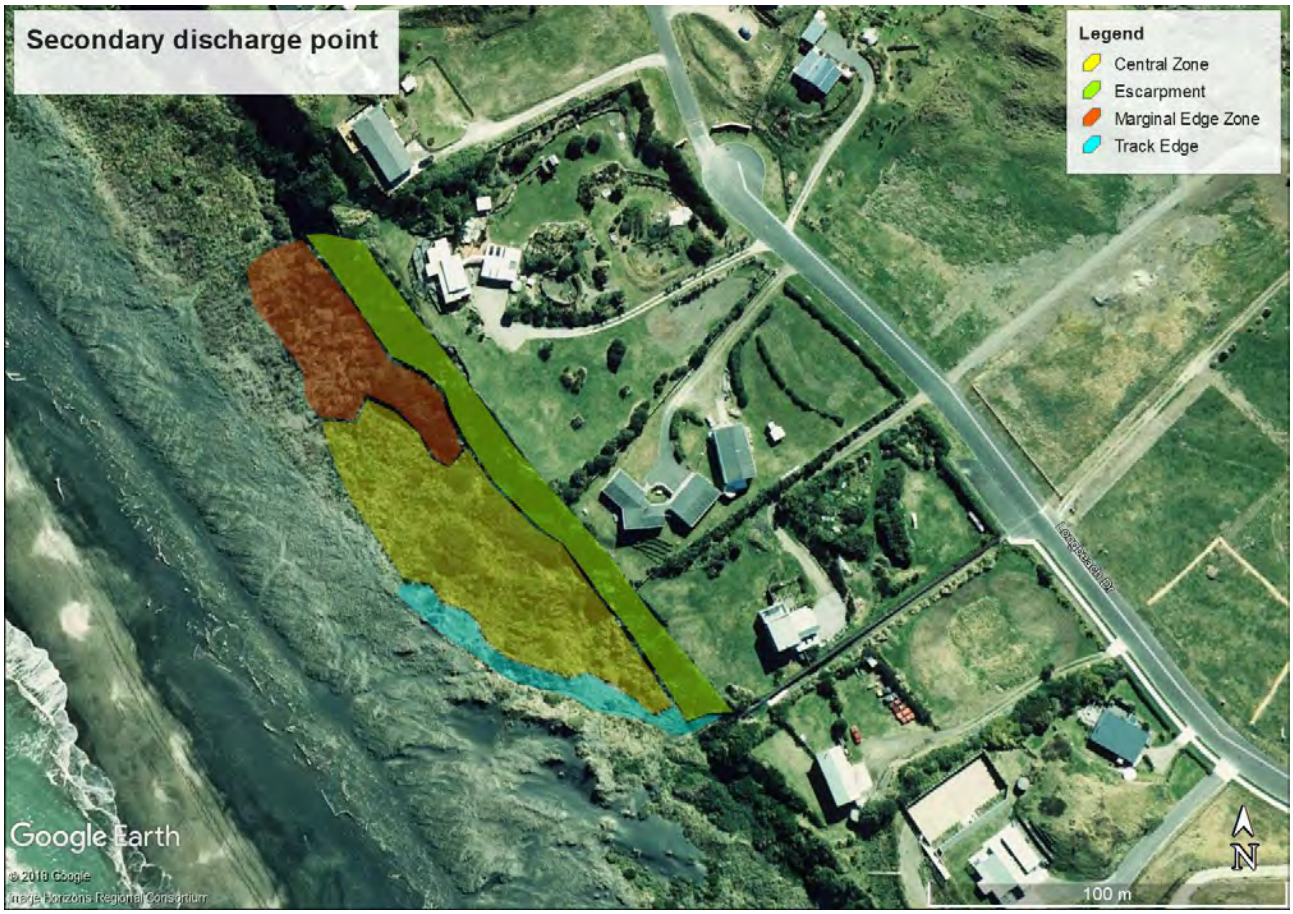


Figure 11: Longbeach Drive stormwater discharge point habitat areas on a 2019 aerial photograph.

Table 6: Plant species found in each habitat type (denotes an exotic species and ** denotes an At Risk, Declining species).*

HABITAT TYPE	SPECIES LIST
Marginal edge zone	• Coastal wattle* (*Acacia sophorae)* • Boxthorn* (*Lycium ferocissimum)* • Wire vine (*Muehlenbeckia complexa)* • Broadleaf (*Griselinia littoralis)* • Karo (*Pittosporum crassifolium)* • Sand coprosma** *(Coprosma acerosa)* • Shore bindweed (*Convolvulus soldanella)* • Exotic grass species* • Lupin* (*Lupinus spp.)* • Marram* (*Ammophila arenaria)* • Knobby clubrush (*Ficinia nodosa*) • Onion weed* (*Allium triquetrum)* • Ivy* (*Hedera helix)* • Fennel* (*Foeniculum vulgare)*
Escarpment	• Boxthorn* (*Lycium ferocissimum)* • Broadleaf (*Griselinia littoralis)* • Exotic grass species* • Nightshade* (*Solanum sp)* • Arum lily* (*Zantedeschia aethiopica)*

	• Cape ivy* (*Senecio angulatus)* • Hounds tongue fern (*Microsorum pustulatum)* • 5-finger (*Pseudopanax arboreus)* • Tree lupin* (*Lupin arboreus)* • Karo (*Pittosporum crassifolium)* • Red hot poker* (*Kpiphofia uvaria)* • Cape honey flower* (*Melianthus major)* • Flax (*Phormium tenax)* • Agapanthus* (*Agapanthus praecox)* • Shore bindweed (*Convolvulus soldanella)* • Ivy* (*Hedera helix)* • Knobby clubrush (*Ficinia nodosa*) • Toetoe (*Austroderia toetoe)*
Central Zone	• Onion weed* (*Allium triquetrum)* • Ivy* (*Hedera helix)* • Wire vine (*Muehlenbeckia complexa)* • Knobby clubrush (*Ficinia nodosa*) • Pink ragwort* (*Senecio glastifolius)* • Creeping groundsel* (*Senecio angulatus)* • Karo (*Pittosporum crassifolium)* • Coastal wattle* (*Acacia sophorae)* • Marram* (*Ammophila arenaria)* • Agapanthus* (*Agapanthus praecox)* • Exotic grass species* • Buttercup* (*Rannunculus repens)* • Shore bindweed (*Convolvulus soldanella)* • Cape ivy* (*Senecio angulatus)* • Broadleaf (*Griselinia littoralis)* • Knobby clubrush (*Ficinia nodosa*) • Flax (*Phormium tenax)* • Fennel* (*Foeniculum vulgare)* • Boxthorn* (*Lycium ferocissimum)* • Bracken (*Pteridium esculentum)* • Nightshade* (*Solanum sp)*
Track Edge	• Wire vine (*Muehlenbeckia complexa)* • Exotic grass species* • Marram* (*Ammophila arenaria)* • Karo (*Pittosporum crassifolium)* • Pink ragwort* (*Senecio glastifolius)* • Broadleaf (*Griselinia littoralis)* • Ivy* (*Hedera helix)* • Spinifex (*Spinifex sericeus)* • Small leaved milk tree (*Streblus heterophyllus)* • Shore bindweed (*Convolvulus soldanella)* • Clover* (*Trifolium repens)* • Fennel* (*Foeniculum vulgare)* • Lupin* (*Lupinus spp.)* • Hebe (*Veronica stricta)* • Oxalis* (*Oxalis chnoodes)*

4.3.2 Fauna

The bird fauna found at the Longbeach Drive stormwater discharge point is similar to that found at Karaka Wetland. The birds noted at the time of the site visit are listed in Table 7 below:

Table 7: Bird species observed during the site visit and associated conservation ratings (Robertson et al. 2017).

Common Name	Scientific Name	Conservation Status
Welcome Swallow	*Hirundo neoxena*	Native - Not Threatened
Eurasian Blackbird	*Turdus merula*	Introduced and naturalised
House Sparrow	*Passer domesticus*	Introduced and naturalised
Song Thrush	*Turdus philimelos*	Introduced and naturalised
Eurasian skylark	*Alauda arvensis*	Introduced and naturalised
Swamp Harrier	*Circus approximans*	Native - Not Threatened
New Zealand Fantail	*Rhipidura fuliginosa*	Endemic - Not Threatened

The area is likely to provide habitat for other common native species not observed during the survey. It is unlikely that the Longbeach Drive site supports At Risk or Threatened bird species with any regularity due to the residential setting and large distances to suitable high value habitats.

Large exotic trees have potential to support roost sites for long tailed bats (*Chalinolobus tuberculatus*), however, these trees will not be removed as part of the proposed works so have not been considered further in this assessment

4.3.3 Fish

There is a discharge site (at the outlet) with a small 50cm diameter area of ponded water present (Figure 10C). This area is highly unlikely to contain any fish species. There are also no streams associated with this site and there is no existing outflow.

5 Assessment of ecological values

5.1 Karaka Wetland

Based on the desktop and field assessments the main ecological value for Karaka Wetland was its distinctive wetland vegetation, and the habitat that these areas provide for flora and fauna.

Karaka Wetland is dominated by common native vegetation, the presence of manuka and sand coprosma is notable as these species are classified as At Risk -Declining (de Lange et al, 2018). The predominance of raupo and flax around the areas of open water provides good quality habitat throughout the site. Karaka Wetland has a moderate diversity of plant species and is dominated by native species. Overall the wetland itself has a high intrinsic value.

Karaka Wetland is connected via the unnamed stream to the sea and is known to be home to banded kokopu (*Galaxias fasciatus*), inanga (*Galaxias maculatus)*, longfin eels (*Anguilla dieffenbachii)*, shortfin eels (*Anguilla australis)* and redfin bully (*Gobiomorphus huttoni).* Of these

species the longfin eels, and inanga are At Risk - Declining species (Dunn et al, 2017). It is therefore considered that the value of Karaka Wetland as an aquatic habitat is High. As Karaka Wetland is fed via both natural groundwater flow and two stormwater discharges, the wetland has a modified hydrology and as such may have compromised water quality.

All birds noted at the time of the survey (July) were common native and exotic species however, it is likely that Karaka Wetland is also used by other birds as they are passing through the area. It is possible that Karaka Wetland is home to spotless crake and/or marsh crake as they are cryptic species often found in raupo dominated areas, but an extensive bird survey would need to be undertaken to determine if they are present on site.

The main types of habitat the wetland and its associated vegetation provides for birds are:

- Riparian and wetland vegetation for shelter, roosting, and potentially nesting;
- Small areas of open water habitat for dabbling species;
- Open grassed areas for grazing and roosting; and
- Areas of open water for feeding

A bat survey was not conducted due to the lack of suitable habitat. Karaka Wetland is also known to be a suitable habitat for possums and stoats, some trapping is done in the surrounding area although there is no co-ordinated approach. The value of Karaka Wetland for birdlife is considered to be low.

5.2 Longbeach stormwater discharge point

The Longbeach Drive stormwater discharge point is dominated by common exotic and native species. It is located within a dune swale of a stabilised dune field. No Threatened or At-Risk plant species were observed. This site is considered to have a low intrinsic vegetation value.

There is no significant area of open water at this site, therefore no value has been assigned for aquatic habitat.

The birdlife found at this site comprises of common native and exotic species. It is unlikely that this site supports any At Risk or Threatened bird species with any regularity. This ecological value for this site is considered to be low.

5.3 Ecological value

Table 8: Assignment of value to habitat.

Vegetation/Habitat/Species	Value	Comments
Karaka Wetland Vegetation	High	Karaka Wetland meets the criteria of a Schedule F threatened habitat and meets the criteria in Policy 6 (of the Horizons One Plan). The vegetation present is dominated by common native species, some of which are threatened or locally distinctive. There is potential to further restore Karaka Wetland through an effective management plan, plantings and further community involvement.
Vegetation removal for pipe upgrades	Low	The vegetation is predominantly common native and exotic species.
Unnamed stream	Moderate	The open water habitat of Karaka Wetland is of moderate value, due to the presence longfin eels, and inanga which are an At Risk, Declining species. The

		stream itself is modified and there are many culverts present to provide for private accessways.
Karaka Wetland Birds	Low	No At Risk or Threatened species of bird were noted to be present within the Karaka Wetland. It is unlikely that Karaka Wetland supports any Threatened or At Risk bird species with any regularity. However, it is worth noting that this site may still be important for a diversity of native species.
Longbeach drive swale habitat	Moderate	The Longbeach drive swale habitat meets the criteria of a Schedule F threatened habitat and meets the criteria in Policy 6 (of the Horizons One Plan). The vegetation present is typical of that in a coastal environment and is dominated by a mixture of common native and exotic species. If additional stormwater was likely to pond at this site there is potential to develop this area into a dune slack wetland.
Longbeach Drive swale birds	Low	No at risk or threatened species of bird were noted to be present within the Longbeach Drive discharge point. It is unlikely that this site supports any Threatened or At risk bird species with any regularity.

6 Assessment of ecological effects

The Whanganui District Council Infrastructure team are currently proposing to increase the rate of stormwater discharge to the open stream that runs along the edge of Karaka Wetland, and to upgrade two further stormwater discharge points upstream of this to allow for the increase in stormwater due to the proposed rezoning/development of the outer Castlecliff area. Details of the proposal are provided in earlier sections of this report. A summary of the proposal is provided in table 9 below.

Table 9: Pre and Post Development flows at each stormwater discharge location.

Discharge Location	Pre-Development Peak Flow (m^3/s)	Post-Development Peak Flow (m^3/s)
Kapiti Terrace	0	0.0924
Taupata Street	0	1.786
Longbeach Drive	0.784	1.152

Potential ecological effects include those from the proposed construction of the stormwater infrastructure upgrades, and resulting increase in stormwater discharges (two into Karaka Wetland and one further discharge into the Longbeach Drive discharge area) are:

- Loss of vegetation and habitat for fauna
- Disturbance to flora and fauna
- Release of suspended sediments contaminants

- Aquatic effects

6.1 Loss of vegetation and habitat for fauna

There is potential for there to be small areas of vegetation removal due to the construction works required to upgrade the existing stormwater system which will be restricted to the sites of the proposed stormwater upgrades. This loss is anticipated to be contained to a small area (to be confirmed upon receipt of designs) and the plant species to be removed are common exotic and native species which are found throughout New Zealand. It is assumed these areas will be revegetated at completion of earthworks.

Birds may be displaced temporarily whilst the earthworks are occurring, however, these works are anticipated to be of short duration. Following the construction of the upgraded stormwater network they will likely return to the area. More disruption is likely to occur during the residential development of the outer Castlecliff area, than the stormwater system upgrades. It is possible that higher water levels in the wetland areas will encourage a more diverse bird population at these sites.

6.2 Disturbance to flora and fauna

Under certain circumstances substantial noise increases may reduce the likelihood of birds finding mates and maintaining territory. In this case the period of increased noise will be limited to the construction period and the specific construction site/s.

Short duration noise events are most likely to temporary displace birds away from the construction zone whilst the works are occurring. The impact on birdlife is expected to be temporary and unlikely to cause long-term effects as there are likely to be few breeding birds in the Karaka Wetland or the Longbeach Drive discharge point.

It is recommended that works occur outside of bird nesting season where possible (September to December inclusive) and that the duration of works is as short as possible to minimise any potential adverse effects

6.3 Release of suspended sediments contaminants

Earthworks involved in the construction of the stormwater network involve excavating areas of existing dunes. This work has the potential to generate substantial volumes of sediment, which if not dealt with correctly could potentially have downstream effects, impacting on Karaka Wetland the associated unnamed stream and the Longbeach drive discharge point.

Assuming implementation of best practise sediment and erosion control methods, and monitoring of construction works, mobilised sediment should adequately be contained minimising potential effects of sediment. This will likely result in negligible effects from sediment to the ecology of the surrounding area.

6.4 Aquatic effects

6.4.1 Water quality

There is un-certainty around the water quality of the current and proposed stormwater discharge sites. This report assesses the ecological effects of increased stormwater discharge in isolation from the activities resulting in the increase in the discharge e.g. residential development. Increases in stormwater have the potential for reduced water quality as they can contain contaminants such as heavy metals, hydrocarbons and sediment which can all have adverse effects on the receiving environment. For example, hydrocarbons include a range of adverse effects on the fish and macroinvertebrates which can affect the development and functioning,

and in some situations can lead to death, with smaller organism (e.g. benthic invertebrates) less tolerant than larger organisms (e.g. large fish).

Activities resulting in the increased stormwater should be treated appropriately onsite. For example, runoff from road should be directed into swales, and runoff from residential development should be treated via wetlands prior to being discharged into the stormwater network. It is recommended that baseline water quality monitoring take place to understand the current state of the water quality in order to measure changes over time to ensure there are no adverse effects from reduced water quality with the increased discharge.

Assuming the water quality for the proposed stormwater discharge remains the same as that of the existing discharge it can be assumed that there will be no further adverse effects on the ecology.

6.4.2 Karaka Wetland

The proposed stormwater network will convey greater levels of stormwater, the impact of these is not currently understood as no hydrological report has been undertaken. A hydrological study will be required to determine residence times of the greater flow of water into Karaka Wetland. Provided the Karaka Wetland outlet to the sea stays open the additional water is not likely to have a long residence time in Karaka Wetland.

The additional flow of water into Karaka Wetland (assuming it is not contaminated) may have positive effects if correctly managed. The higher water levels in the wetland may result in less raupo present, increasing the areas of open flowing water and providing better habitat for birds and fish.

6.4.2.1 Increased flow

The increase in the rate and quantity of the stormwater discharges could have effects on washing out the existing sediment in the unnamed stream adjacent to Karaka Wetland. This may result in a decreased macrophyte dominance in the stream

There is also potential for erosion of the stream banks due to the increased rate of discharge at these sites. It is recommended a hydrological assessment is undertaken to better understand the hydrology of the sites with the increase in stormwater discharge.

6.4.3 Longbeach drive discharge point

There has been no hydrological study to determine how this system will handle the additional stormwater. There will be an additional 0.368m^3/s discharged to the site than what is currently discharged.

This additional water may result in the formation of a dune swale wetland and if this is the result careful management of this site will be required. At the time of the site visit very little water was present on site and what was present was not flowing. The additional discharge may result in a larger ponded area.

The hydrological effects need to be understood to understand the effect on the system. Greater levels of water in a dune system may have erosion effects and may impact the flora and fauna communities present at the site.

6.5 Magnitude of effects summary

Table 10 summarises the magnitude of effects on the key ecological features of the site and assigns a magnitude of effects rating to effects on habitat, construction processes, and the aquatic environment.

Table 10: magnitude of effects on the key ecological features of the site.

Vegetation/Habitat/Species	Magnitude	Comment
Karaka Wetland Vegetation	Low	The proposed works are considered to have very little effect on Karaka Wetland, other than the effects of the raised water levels. If the above recommendations are followed the overall level of effects are likely to be minimal. Some raupo may be lost due to increased water levels which could even have a positive overall effect on the ecology.
Vegetation removal for pipe upgrades	Low	The vegetation is found to be of low quality, dominated by common native and exotic species. Only small areas will be affected compared to the wider area resulting in a low magnitude of effect. The overall effects are low and could potentially provide a net gain in the long term with successful revegetation planting.
Unnamed stream	Moderate	The hydrological effects and water quality of the proposed discharge are not well known as no hydrological study or baseline water quality monitoring has been conducted. Therefore, there is a level of uncertainty around the effects of the increase in discharge to the stream. Assuming the water quality of the discharge is the same this effect is not of huge magnitude. It is likely that the increased stormwater discharge to the unnamed Stream will alter the existing baseline conditions of the stream. These effects have the potential to be positive; providing greater areas of open water habitat for aquatic species present (assuming the water is clean, filtered and that during flood flows the increased flow doesn't wash out the existing habitat).
Karaka Wetland Birds and wider area	Low	There will be no construction and noise effects in the wetland, therefore the effects on birds during the construction are considered to be low. No hydrological assessment and has been undertaken to understand the water levels in the wetland with increased flow. Assuming there will be no significant changes in water levels and no decrease in water quality the ecological effects are considered to be low. Birds within the area may be temporarily displaced during the construction of the stormwater network upgrades. However, the creation of greater areas of open water habitat and potentially a new stormwater detention area may in fact provide additional habitat for birdlife and increase the

		biodiversity of birds found in the vicinity of Karaka Wetland.
Longbeach drive swale habitat	Moderate	The hydrological effects of the proposal are not well known. It is likely that the increased stormwater discharge will increase the area of open water present at this site. Due to the levels of uncertainty more thought may be required regarding erosion protection at this site.
Longbeach Drive swale birds	Low	Birds within the area may be displaced during the construction of the stormwater network upgrades resulting in short term effects on birds. However, in the long term the proposal may result in a greater area of open water and may in fact provide additional habitat for birdlife and increase the biodiversity of birds found in the Longbeach swale – coastal environment.

7 Effects minimisation

A summary of the recommended measures proposed to minimise the effects of the project are given below. These measures address disturbance to wildlife during the construction period, and mitigation for the mobilisation of sediment, measures to reduce mortality of birds, and measures to reduce impacts of the additional stormwater on these sites.

- A qualified ecologist should undertake further assessments of site specific areas where vegetation removal will take place to ensure that no rare or threatened plant species or lizards will be impacted by works.
- Consideration should be given to construction works occurring outside of the main bird nesting season which is September-December inclusive.
- Dedicated surveys of 'Threatened' marsh crake and spotless crake should be undertaken, if the hydrological report states that the proposal will alter existing water levels in the wetland.
- Any areas of exposed earth (as a result of construction) will be revegetated to minimise sediment loss as soon as is practicable.
- Preparation and implementation of an erosion and sediment control plan should be a condition of consent. This should take into account best practice and principles set out in the Horizons Regional Council One Plan.
- A hydrological assessment should be undertaken to better understand the hydrology of the proposed increase in stormwater at the receiving environments (e.g. wetland, stream and sand dunes) and associated effects. Following receipt of the hydrological report further mitigation measures for the increase in stormwater can be recommended.
- This report assesses the ecological effects of increased stormwater discharge in isolation from the activities resulting in the increase in the discharge e.g. residential development. Activities

resulting in the increased stormwater should be treated appropriately onsite. For example, runoff from road should be directed into swales, and runoff from residential development should be treated via wetlands prior to being discharged into the stormwater network.

- Baseline water quality monitoring of the existing stormwater discharge should take place to understand the current state of the water quality in order to measure changes over time to ensure increase in stormwater discharges does not result in reduced water quality.
- Both Karaka Wetland and the Longbeach detention area have potential to be enhanced through further planting, and through pest plant and animal control. These areas could provide greater recreational and amenity values to the Outer Castlecliff area. There is an existing management plan for Karaka Wetland (McQueen, 2016), the recommendations within this report if followed could greatly enhance the values of Karaka Wetland as a whole and provide greater habitat for the threatened plants and aquatic species within this site.

8 Overall level of effects rating

Table 11 (below) provides an overall level of effects rating based on the EIANZ matrix shown in Table 3. Ecological values have been taken from Table 8 and the magnitude of effects from Table 10. This assumes that the effects minimisation measures above are implemented.

Table 11: overall level of effects rating based on the EIANZ matrix.

Vegetation/Habitat/Species	Ecological value	Magnitude of effect	Level of effect
Karaka Wetland Vegetation	High	Low*	Low
Unnamed stream	Moderate	Low*	Low
Karaka Wetland Birds	Low	Low	Very low
Longbeach drive swale habitat	Moderate	Moderate*	Moderate
Longbeach Drive swale birds	Low	Low	Very low

*There is a level of uncertainty until the hydrological report has been completed.

The overall effects rating for the key ecological attributes and features impacted by the project ranges from very low through to moderate, this reflects the ecological values of these areas and impact of the proposal.

9 Conclusion

Whanganui District Council have developed a scoping report and draft plan change which considers re-zoning land in Castlecliff to residential, an area of previous low residential growth and demand. The proposed re-zoning will comprise of approximately 115 lots. This will result in the need to upgrade the stormwater network in Castlecliff.

This report looks into the effects of the upgraded stormwater network as a result of the above proposal. The proposed upgrades will result in a number of potential ecological effects. These impacts include loss of habitat, wildlife disturbance, effects of sediment discharge to Karaka Wetland and the Longbeach drive coastal swale and aquatic effects.

The overall effects rating for the key ecological attributes and features impacted by the project ranges from very low through to moderate, this reflects the ecological values of these areas and the environmental impacts of the proposal.

Karaka Wetland and Longbeach Drive are both habitats which meet the criteria in Schedule F of the One Plan, meaning they are threatened habitats. Discharging greater levels of stormwater to these systems has the potential to result in adverse ecological effects. A number of assumptions and recommendations have been made to minimise any potential adverse effects. Assuming implementation of these measures including commissioning of a hydrological report and water quality monitoring it is considered that these effects can be managed.

In general, the underlying character and composition of these sites is expected to remain similar to the predevelopment circumstances. Any effects in the known populations/range of plant and animal species found in these sites will likely be minor.

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