WAIKATO AND WAIPĀ RIVER RESTORATION STRATEGY

TE RAUTAKI TĀMATA I NGĀ AWA O WAIKATO ME WAIPĀ

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Cover photo: Waikato River.

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TE RAUTAKI TĀMATA I NGĀ AWA O WAIKATO ME WAIPĀ

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Waikato River Authority

Waikato
REGIONAL COUNCIL
Te Kaunihera ā Rohe o Waikato

RESTORATION STRATEGY FOREWORD
HE KUPU WHAKATAKI MŌ TE RAUTAKI TĀMATA

FROM THE PARTNERS
MAI I TE TIRA RANGAPŪ

Tooku awa koiora me oona pikonga
he kura tangihia o te maataamuri.

The river of life, each curve more beautiful than the last.

We are pleased to introduce the *Waikato and Waipā River Restoration Strategy*.

He koanga ngākau o mātou nei ki te whakarewa i te Rautaki Tāmata i ngā Awa o Waikato me Waipā.

This document represents an exciting new chapter in our ongoing work to restore and protect the health and wellbeing of the Waikato and Waipā rivers as we work towards achieving *Te Ture Whaimana o Te Awa o Waikato*, the *Vision & Strategy for the Waikato River*.

E tohu ana te pukapuka nei i tētahi ara hou i a tātau e whai tonu ana kia whakaora, kia haumaru i te oranga me te mauri o ngā awa o Waikato me Waipā, i a tātou e mahi tahi ana hoki ki te whakatutuki i Te Ture Whaimana o Te Awa o Waikato.

Collaboration between passionate groups is crucial for a cleaner river. Through a partnership between the Waikato River Authority, Waikato Regional Council and DairyNZ, we have developed a non-statutory and non-regulatory framework to help with future 'on the ground' activities for restoration in the Waikato River Catchment. This provides a foundation to guide organisations that fund or undertake restoration through identification of specific, technically achievable and prioritised actions. We know this will make a difference.

Ma te mahi tahi ki ētahi rōpū ngākau whiwhita e mauriora anō ai te awa. Ma te noho rangapū a te Ratonga Tiaki i te awa o Waikato, te Kaunihera ā Rohe o Waikato, me DairyNZ, me te whakawhanake i tētahi pou tarāwaho ture ā motu here-kore, ture ā rohe here-kore, ki te hāpai I ngā mahi ringa raupā e haere tonu ana ki te whakaora I Te rohe riu wai o Waikato. He tūāpapa ēnei hei ārahi i ngā rōpū e kōrerotia nei i roto i ā rātou mahi tuku pūtea taunaki, mahi whakaora rānei – mā te āta tirotiro ki ngā mahi e tika ana, i te wā e tika ana. Me te mōhio tonu, ka ea ngā wawata i ēnei mahi.

A great deal of restoration work is already underway in the Waikato and Waipā river catchments. What sets the *Restoration Strategy* apart is the promise to coordinate our efforts in the areas where optimal gain can be made. By working together we can leverage opportunities and focus on projects that will have the biggest positive impact for our catchment.

He rahi rawa ngā mahi whakarauora i tīmata kē ki ngā wai whāngai i ngā awa o Waikato me Waipā. Ko te rerekē o te Rautaki Tāmata ko te oati kia mahi tahi ngā rōpū whai pānga e whakamaua ai te pae tawhiti kia tīnā. Mā te mahi tahi ka tōpūtia ngā pukenga a tēnā, a tēnā – kia tutuki ai ngā mahi e matarahi ai ngā hua ka puta ki te rohe awa whānui.

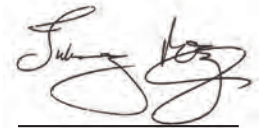
The strategy could not have been developed without the support of mana whenua, landowners and many other stakeholder groups in the catchment, including Waipā District Council and the Department of Conservation and Fonterra Living Water Partnership. To ensure projects were correctly prioritised, we engaged with the people who live and work in our catchment every day. The projects then went through an independent process to determine priorities, one that could not be influenced by one party or stakeholder but had restoration of the greater catchment and achievement of the *Vision & Strategy* at the forefront of thinking.

Mei kore ake te tautoko o te mana whenua, ngā kaipupuri whenua, me te maha noa atu o ngā rōpū e whai pānga ana ki te rohe awa e kōrerotia nei. Ko te Kaunihera takiwā o Waipā tēnā, ko Te Papa Atawhai tēnā, ko Fonterra Living Water Partnership hoki tēnā. I whai wāhi ngā whakaaro o te hau kāinga, me ngā ringa raupā o te rohe kia pai ai te whakarite i ngā kaupapa mahi. Kātahi ka whai i tētahi huarahi motuhake ki te whakatau he aha ngā whakaarotau, tē taea e tētahi rōpū kotahi ngā kaupapa mahi whakamutunga te whakatau, ko te painga o te rohe awa whānui te marau, ā, ko te whakatinanatanga o tirohanga whānui me te rautaki te kaiārahi i ngā whakaaro.

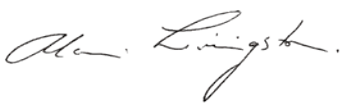
On behalf of the co-authors, we want to thank every person who worked with us to find the best outcomes for our catchment. We hope this strategy will be a tool that everyone can use to guide their restoration work.

Tēnei te whakamānawa i a koutou katoa i mahi tahi me mātou ngā ringatuhi, kia tutuki pai ai ngā mahi, kia whai tātou i te ara tika e puta ai ngā hua ki tō tātou rohe. Ko te manako ia, ka whai take tēnei rautaki hei mahinga mā tātou katoa i roto i ngā mahi whakarauora e haere ake nei.

Jim van der Poel
Chairman, Dairy nz



Hon. John Luxton and Tukoroirangi Morgan
Co-Chairman, Waikato River Authroity



Alan Livingston
Chairman, Waikato Regional Council

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INTRODUCTION

KUPU WHAKATAKI

- The journey to Te Ture Whaimana o Te Awa o Waikato – Vision & Strategy for the Waikato River
- Purpose and scope of the Restoration Strategy
- Scope
- Structure of the Restoration Strategy
- Assumptions
- Existing programmes of work
- Restoration Strategy implementation
- The use of Māori words

INTRODUCTION
KUPU WHAKATAKI

THE JOURNEY TO TE TURE WHAIMANA O TE AWA O WAIKATO – VISION & STRATEGY FOR THE WAIKATO RIVER

Tooku awa koiora me oona pikonga he kura tangihia o te maataamuri.

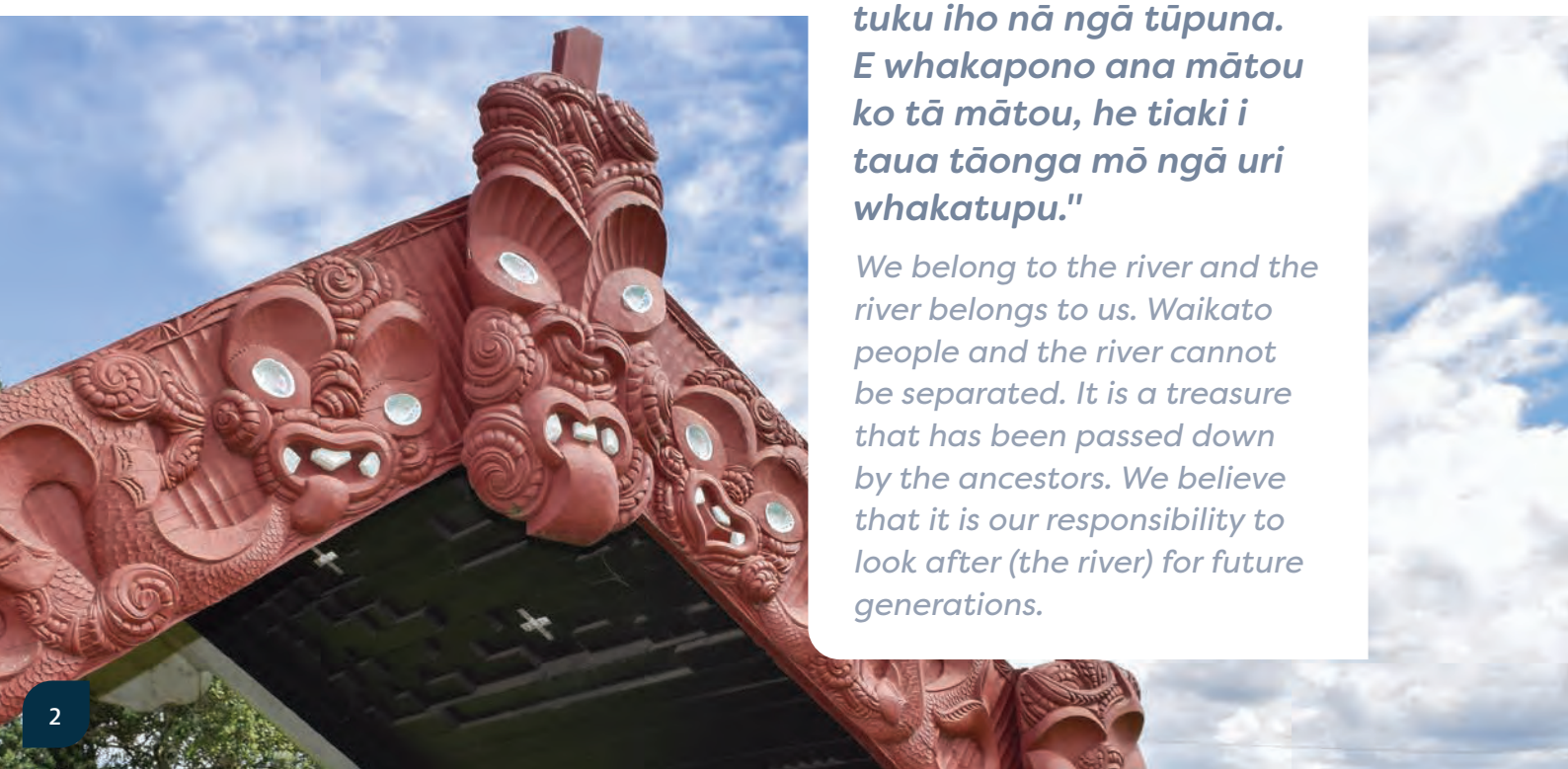
The river of life, each curve more beautiful than the last.

The story of the Waikato River begins with a romance between Taupiri and Pirongia. Taupiri had left her brothers in the central North Island to be with Pirongia, her lover, in the Tainui region. Sadly, the lovers separated and Taupiri became unwell and longed for home. Tongariro sent forth waters from her home to comfort and heal her. However, the young river was curious and traversed widely across the new lands, running towards the coastal sounds of Hauraki before heading to Taupiri, and eventually Te Puuaha o Waikato (Port Waikato). The river has followed its current path ever since. It is said that the river was named 'Waikato' (sprinkling of water) during the whakarite (blessing ceremony) of the baby Wairere, the ancestor of Ngaati Wairere, just north of Raahui Pookeka (now known as Huntly). The river has continued to heal its people, bless our children and sustain communities since time immemorial.

Since the mid 1300s, the Waikato and Waipā rivers and their lands have been home to many iwi (tribes). Marae and communities were established near the safety and provisions of the rivers. The river is like a mother. It nurtures, provides food, heals and comforts, while continuing to create life everywhere its waters reach. The relationship was described by the late Sir Robert Te Kotahi Mahuta as:

"Nō tātou te awa. Nō te awa tātou. E kore e taea te wehe te iwi o Waikato me te awa. He taonga tuku iho nā ngā tūpuna. E whakapono ana mātou ko tā mātou, he tiaki i taua tāonga mō ngā uri whakatupu."

We belong to the river and the river belongs to us. Waikato people and the river cannot be separated. It is a treasure that has been passed down by the ancestors. We believe that it is our responsibility to look after (the river) for future generations.



With the arrival of European settlers, the political and social dynamics of the region rapidly changed. To manage and minimise the impact of the colonialists on Aotearoa, the idea of a Kīngitanga movement was deliberated amongst all tribes nationally. The Kīngitanga movement was established in 1858 in response to the continued loss of lands to new settlers, to prevent wars and to unite the Māori people. The tribes of the Tainui waka, in particular Waikato iwi, were asked to lead the movement with the appointment of Pōtatau Te Wherowhero (the first Māori King). The reign of Te Wherowhero was short and, as his sun set, a new sun arose through the anointing of his son, Taawhiao, who was the head of the movement during the most turbulent times in Aotearoa. The Crown, feeling threatened by the Kīngitanga, gathered all of it's resources to invade the central North Island and subsequently confiscated Waikato lands, forcing the tribe to exile to the King Country. During the forced retreat, the Government assumed the rights to all natural resources and allowed the transfer of lands to private ownership. Subsequent land use activities led to drainage of wetlands, diversion of waters, destruction of forests and desecration of marae, pā and papakāinga.

The act of raupatu (confiscation) and its subsequent effects greatly accelerated the degradation of the Waikato and Waipā rivers, lakes and tributaries. The basis of the 1987 Waikato Treaty claim was to restore these injustices, receive an apology from the Crown for the unjust confiscation of lands, and rebuild the economic, social and cultural aspirations of the iwi. This was partially achieved in the Waikato Raupatu Claims Settlement Act 1995. One of the outstanding matters from the original claim was settlement of the Waikato River. The Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 focused on the health and wellbeing of the Waikato River, to rectify the degradation and mistreatment of the Waikato waters and reinstate the mana or power and prestige of the Waikato River and its people.

Through the Treaty settlement process between Waikato-Tainui and the Crown, the Guardians Establishment Committee was formed with the support of Ngāti Tūwharetoa, Raukawa, Te Arawa river iwi and Maniapoto. In 2009, this committee finalised *Te Ture Whaimana o te awa o Waikato*, otherwise known as the *Vision & Strategy for the Waikato River*.

The Waikato River Authority (WRA) and Waikato River Clean-up Trust (WRCuT) were established under the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 with the purpose of acting as an independent entity on behalf of the river. To reflect the aspiration of co-management, the board of the authority consists of a representative of each of the five river iwi authorities (Tūwharetoa Māori Trust Board, Te Whakakitenga o Waikato-Tainui, Raukawa Settlement Trust, Te Arawa River Iwi Trust and Maniapoto Māori Trust Board) and five Crown representatives.

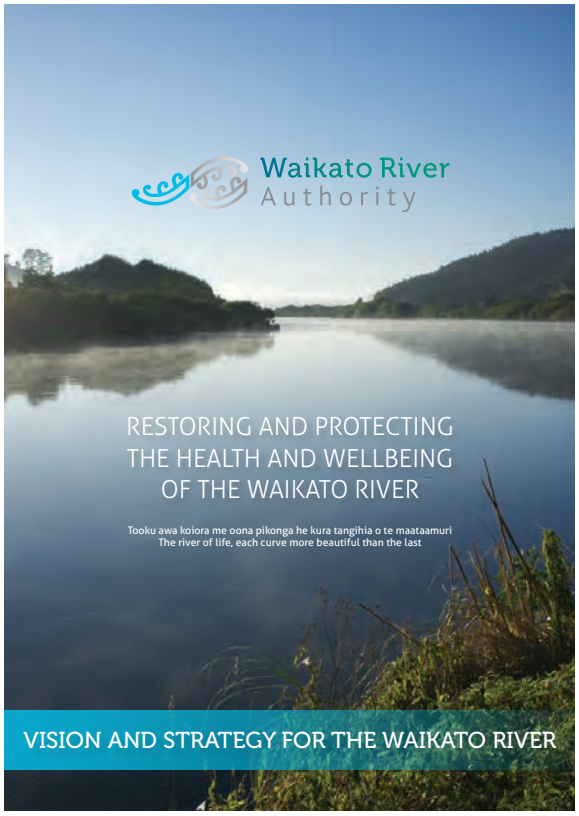
The Ngā Wai o Maniapoto (Waipā River) legislation was enacted in 2012 to include the upper catchment of the Waipā River through to its junction with the Pūniu River. This *Vision & Strategy* now applies to the whole of the Waikato and Waipā river catchments (Figure 1) and represents the primary policy setting document for both rivers and their catchments. It has the status of a National Policy Statement and prevails over any inconsistent provision in Resource Management Act planning documents.

The Waikato-Waipā *Vision & Strategy* envisages a future where a healthy Waikato River sustains abundant life and prosperous communities who in turn are all responsible for restoring and protecting the health and wellbeing of the Waikato River and all it embraces for generations to come.

STRATEGY VISION

The *Vision & Strategy* responds to four fundamental issues as set out below.

1. The degradation of the Waikato River and its catchment has severely compromised Waikato River iwi in their ability to exercise mana whakahaere or conduct their tikanga and kawa.
2. Over time, human activities along the Waikato River and land uses through its catchments have degraded the Waikato River and reduced the relationships and aspirations of communities with the Waikato River.
3. The natural processes of the Waikato River have been altered over time by physical intervention, land use and subsurface hydrological changes. The cumulative effects of these uses have degraded the Waikato River.
4. It will take commitment and time to restore and protect the health and wellbeing of the Waikato River.

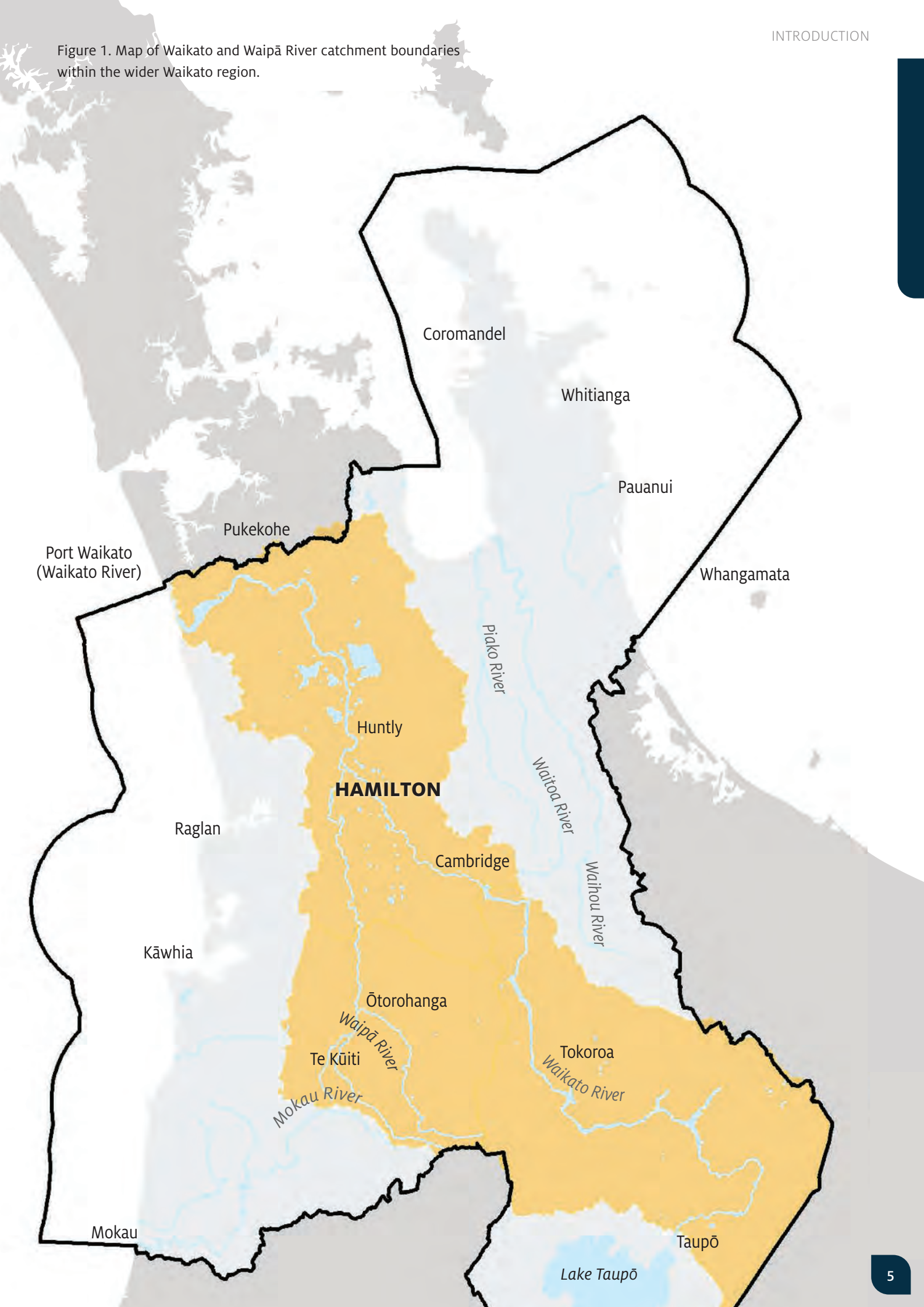


In order to realise this vision, 13 objectives were developed to support the achievement of the *Vision & Strategy* (see Appendix 1). The objectives encompass all people of the Waikato River and their relationships with it through their communities, industries, and environmental, recreational, social and cultural pursuits.

The *Vision & Strategy* is effected through its consideration by, or incorporation into, at least 20 enactments which influence the management and use of the Waikato and Waipā rivers. This includes policies, plans, regulations and/or bylaws where they impact these rivers.

The Waikato River Authority (WRA) was established as an independent entity and given two powerful tools to restore and protect the health and wellbeing of the Waikato River for future generations. Firstly, the *Vision & Strategy* would coordinate and influence all Acts and policy as noted above. Secondly, the Crown allocated $220 million over 30 years to support the clean-up of the rivers. This funding is managed by the Waikato River Clean-up Trust (WRCuT), under the auspices of the WRA, to support and coordinate the restoration efforts of community and iwi. It is in addition to the substantial funding also provided to river restoration activities by central and local government organisations, non-government organisations, iwi, private landowners and others.

Figure 1. Map of Waikato and Waipā River catchment boundaries within the wider Waikato region.



PURPOSE AND SCOPE OF THE RESTORATION STRATEGY

When the WRA and WRCuT were established in November 2010 there was a strong desire from river iwi and community groups to see the funding of river clean-up initiatives commence as soon as possible. Following consultation with river iwi in February 2011, the first funding priorities were established by the authority and the first funding round opened in mid-2011. This added to the significant funds that were already being distributed catchment-wide for a range of non-regulatory restoration activities. As a result, numerous community groups have established and are successfully delivering local restoration initiatives. However, collaboration between the many funding agencies and organisations legislatively tasked to give effect to the *Vision & Strategy* has not been as strong as it could have been. The board of the Waikato River Authority, river iwi and key stakeholders soon realised that an ad-hoc annualised funding approach would not successfully deliver on the *Vision & Strategy*.

The Waikato River Restoration Forum was established in 2014 with a purpose of maximising opportunities to realise the *Vision & Strategy* for the Waikato River catchment. The forum is made up of representatives from the five river iwi, the Waikato River Authority, Waikato Regional Council, DairyNZ, Fonterra, territorial local authorities, Mercury, Genesis Energy and the Department of Conservation. Shortly after the establishment of the River Restoration Forum, the group proposed that a medium-term strategic plan for river restoration initiatives be developed to support a more integrated and coordinated approach to funding and management. This would be a 5-20 year action plan for the Waikato and Waipā rivers and their catchments, developed with wide stakeholder input.

Landowners planning riparian management along the Waipā River.

The purpose of the *Waikato and Waipā River Restoration Strategy* (the *Restoration Strategy*) is to guide future 'on the ground' activities for all organisations funding or undertaking restoration activities throughout the catchment, through the identification of specific, technically achievable and prioritised actions. Key objectives of the *Restoration Strategy* are:

- to inform decision making of River Restoration Forum members engaged in restoration activities and ensure the most appropriate, logical, coordinated, effective and efficient approach to restoration is adopted
- to act as a guide for all groups engaged in delivering restoration initiatives
- to encompass an approach that allows groups much longer planning periods to prepare for funding applications and project implementation
- to further build on the work carried out in 2010 to develop the Waikato River Independent Scoping Study (NIWA, 2010), by focusing on non-regulatory actions and considering the likely available funding
- to identify projects that are likely to make the greatest difference in improving the health and wellbeing of the Waikato and *Waipā rivers*, and reflect the values and goals of the iwi and communities within the catchment.

The *Restoration Strategy* is non-binding and does not in any way fetter the ability of any funder, organisation, iwi or landowner to fund or undertake any project that is a priority for them. However, it does provide direction for funders who are seeking important projects to fund, and to organisations, iwi, communities and individuals who are keen to undertake work and want to deliver high impact results.

The *Restoration Strategy* has been developed to a total budget of $340 million. This is an estimate of the money that will be invested through non-regulatory restoration activities in the catchment over the next 25 years. This is based on $170 million from the WRCuT and $170 million from other funding sources.

While the development of this strategy has been funded by the Waikato River Authority, DairyNZ and Waikato Regional Council, all work and recommended projects underpinning this document have been independently led and developed through engagement with all catchment stakeholders. It is anticipated that the *Restoration Strategy* will be reviewed every five years.

SCOPE

The *Restoration Strategy* covers the combined Waikato and Waipā river catchments as defined by the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010, Ngāti Tūwharetoa, Raukawa, Te Arawa River Iwi Waikato River Act 2010 and Ngā Wai o Maniapoto (Waipā River) Act 2012.

The southernmost extent of catchment is at Huka Falls near Taupō and the northernmost is Te Puuaha o Waikato. The Waipā River, from its source to its connection with the Waikato River, and the tributary catchments of both major rivers are included. All aquatic environments – wetlands, lakes, drains, spring-heads and streams – within the surface water catchments that eventually flow into the Waikato or Waipā rivers were considered in scope.

The strategy covers a wide range of restoration and protection activities in the catchment and focuses on six core work streams.

1. **EROSION AND SEDIMENTATION –** management of hill country and stream/river bank erosion beyond that required by current regulation.

2. **WATER QUALITY –** this focuses on non-regulatory mitigation of nitrogen (N) and phosphorus (P), and consideration of sediment and bacteria run off (i.e. from critical source areas). Development of the *Restoration Strategy* coincided with the formulation of Waikato Regional Council *Healthy Rivers Plan Change 1* (PC1). Although the final outcomes of PC1 are not yet known, the *Restoration Strategy* only includes mitigations that are not considered to be part of PC1 or actions that go beyond the non-regulatory actions currently being worked towards by industry (i.e. Sustainable Dairying Water Accord (DairyNZ, 2013).

3. **BIODIVERSITY –** this focuses on protection and enhancement of biodiversity associated with aquatic environments, as well as connectivity between important ecosystems such as lowland rivers and forested headwater streams. Management of biodiversity not associated with aquatic environments was considered to be out of scope, as was ongoing animal pest control. Whilst management of terrestrial sites – particularly large forested areas – is seen as being critical for protecting water quality and aquatic biodiversity, a number of organisations already have existing responsibilities for this work. In addition, animal pest control was not included in the Waikato River Independent Scoping Study (NIWA, 2010) which estimated costs for achieving the *Vision & Strategy*.

Photo: Martin Sanders

4. **FISH –** protection and restoration of the habitat of all freshwater native fish species and other important freshwater mahinga kai species such as kōura. The management of pest fish was included for lakes where it's considered to be appropriate for water quality or biodiversity benefits. Enhancement of exotic freshwater sports fisheries for recreation was considered out of scope.

5. **ACCESS AND RECREATION –** opportunities for enhancing access to, and experience of, suitable aquatic environments were included. Developing commercial eco-tourism opportunities was out of scope.

6. **CULTURAL VALUES –** physical protection and restoration of sites of significance, mahinga kai sites, aquatic environments associated with marae and recreational sites were all included within the scope. In addition, the protection and restoration of knowledge, stories, traditional practices and ability to act as kaitiaki in relation to the river were also included.

All forms of land tenure were considered in the development of the *Restoration Strategy*, including private, Māori and Crown owned land.

STRUCTURE OF THE RESTORATION STRATEGY

This strategy is divided into three core parts. Part 1 (Chapters 1-3) provides a background to the *Restoration Strategy* and guidance on how it should be used. Part 2 examines general priorities across four key units.

1. **CENTRAL/LOWER WAIKATO** covers the stretch of river from Karāpiro Dam to Te Puuaha and all of the subcatchment tributaries that flow into it.
2. **UPPER WAIKATO** covers the stretch of the river from Huka Falls to Karāpiro Dam and all of the subcatchment tributaries that flow into it. The hydro lakes are included in this unit.
3. **WAIPĀ** covers the waterways from Pekepeke Springs through the main Waipā River and down to the confluence with the Waikato at Ngāruawāhia and all subcatchment tributaries that flow into that stretch.
4. **SHALLOW LAKES** cover lakes greater than 1ha and less than 10m in depth across the entire Waikato-Waipā catchment. Shallow lakes were separated out from other ecosystem types due to their generally poor current state and the unique challenges that they face for restoration.

Each unit is addressed in a separate chapter (Chapters 4 to 7).

Part 3 (Chapters 8-13) examines iwi priorities. These chapters represent the priorities of each of the five river iwi authorities, and lake priorities downstream of Karāpiro.

These chapters include projects related to the cultural values work stream, but also incorporate outcomes relating to the other five work streams. It is important to understand that iwi interests are not restricted to cultural values. Iwi hold a holistic view on the natural environment and therefore the interests of iwi include all work streams identified in the *Restoration Strategy*.

Iwi have overlapping areas within the Waikato and Waipā river catchments, and the area descriptions below should be considered as indicative for the purpose of providing guidance when using this strategy.

- **WAIKATO-TAINUI ROHE (AREA)** extends from Karāpiro to Port Waikato, and the Waipā River from the Puuniu Stream to its junction with the Waikato River. In general, the Waikato-Tainui area is in the lower Waikato and Waipā river catchments.
- **RAUKAWA** extends throughout the upper Waipā and central and upper Waikato rivers.
- **TE ARAWA RIVER IWI TRUST** covers predominantly the upper Waikato River catchment around Orākei Kōrako, Waikite valley, Ohakuri, Ātiamuri and Reporoa areas.
- **NGĀTI TŪWHARETOA**, while generally recognised as being synonymous with Lake Taupō, have marae and interests in the upper Waikato River catchment around Orākei Kōrako, Mokai, Nukuhau and Wairakei.
- **MANIAPOTO** covers the central and upper Waipā River catchment.

ASSUMPTIONS

The projects identified within the *Restoration Strategy* have been conceived and developed by a range of stakeholders and technical and local experts. These include individuals from iwi authorities and marae, central and local government, CRIs, NGOs, industry and members of the community. In most cases, contact has not yet been made with individual landowners about the possible scope of works identified as funding priorities and opportunities. Nor have individual funders been contacted to specifically identify projects that meet their criteria. Therefore, the assumptions that have been made in developing this strategy include:

- Organisations or individuals looking to implement any of the identified projects will undertake all required landowner consultation during their project planning.
- All works are entirely voluntary and non-regulatory, and private landowners are not obliged to provide permission or funding for any proposed works. Inclusion of a project in the *Restoration Strategy* should not be seen as an encumbrance on any landowners.
- Project implementers will be responsible for securing funding for projects that they wish to undertake. In developing the *Restoration Strategy*, no assumptions have been made about who will pay for any particular component of any projects.
- While there are some projects that would require input from particular organisations (as noted in the project assessment forms), it is assumed that any person or organisation could become involved in any of the projects identified. No project is tagged to any specific organisations for undertaking. It is expected that iwi priority projects would be led by iwi but this may be in collaboration with others.

EXISTING PROGRAMMES OF WORK

During the development of the *Restoration Strategy*, several significant existing projects or programmes of work which are ongoing have been identified that are making an important contribution to achieving the *Vision & Strategy*. In selecting priority projects, it was assumed that these programmes would continue to operate under current levels of funding. Therefore, these projects have not been considered for inclusion. However, we wish to highlight the importance of these projects continuing to be maintained at an existing or higher standard. This section provides an outline of each ongoing project or programme of work.

Maungatautari Ecological Island Restoration Project

This project established an ecological island by enclosing the perimeter of Maungatautari mountain with a 47km pest-proof fence and creating a 3400ha reserve. Predator control has removed mammalian pests from within the fenced area and ongoing maintenance is being undertaken to provide a pest-free sanctuary. A range of species have been re-introduced to the maunga, including kiwi, kākā, kōkako, takahē, hihi (stitchbird), kākāriki, tīeke (saddleback), Mahoenui giant wētā and endangered native fish species such as giant and banded kōkopu.

Maungatautari Ecological Island

Department of Conservation management of forest parks and reserve areas

The Department of Conservation (DOC) manages a large number of forest parks and nature reserves. Many of these were identified as being significant areas that should continue to be managed with the same or increased level of funding and resources. These areas include:

- Pureora Forest
- Ruakuri Bush Scenic Reserve
- Forest remnants surrounding Lake Rotokotukutuku in the Mangaokewa Scenic Reserve
- Mt Pirongia
- Te Kopia scenic reserve
- Rangitoto Range (headwaters of Mangatutu and Pūniu Rivers)

Eel transfer programme

The New Zealand Eel Enhancement Company carries out a voluntary programme to transfer elver eels from below Karāpiro Dam to upstream habitat areas. Many of the priority projects identified in the *Restoration Strategy* assume the continuation of this trap and transfer programme.

Waikato Regional Council priority possum control areas

Waikato Regional Council has implemented a large number of possum control schemes within the Waikato Catchment. The *Restoration Strategy* assumes continuation of these schemes, particularly those located at:

- Te Tapui Reserve
- Te Miro-Whitehall
- Northwest Waikato North
- Northwest Waikato Central
- Northwest Waikato South
- Mount Pirongia North Buffer
- Mount Pirongia
- Ngutunui
- Waipā Pūniu II
- Honikiwi
- Waikite Valley – Te Kopia Section 2
- Waikite Valley – Te Kopia Section 1
- Mount Pirongia West Buffer
- Arohena Section 1
- Arohena Section 2
- Waotu

Elver (juvenile eel)

Waikato Regional Plan Change 1 – Healthy Rivers/Wai Ora

During the development period of the *Restoration Strategy*, Waikato Regional Plan Change 1 was going through its development phase. As there is uncertainty around what the final set of those rules will require, the *Restoration Strategy* does not make any assumptions that works will be required by regulation. Decisions regarding the funding of restoration activities, whether regulatory or not, are at the discretion of individual funders.

However, it is acknowledged that the implementation of PC1 plays an important role in achieving the *Vision & Strategy* for the Waikato River catchment over the long term and as such will be complementary to many of the projects identified in the strategy.

Craters of the Moon – Wairakei Tourist Park

Craters of the Moon is a geothermal area managed by the Craters of the Moon Charitable Trust. It was identified as a high priority in the Upper Waikato due to its biodiversity values. Existing management includes both environmental management (e.g. plant pest control) and management of the recreational facilities.

Wetland sites within forestry areas managed by Hancock Forest Management

There are a number of significant wetland areas within forestry blocks in the general vicinity of Tokoroa in the Upper Waikato catchment. These are currently well managed by Hancock Forest Management (HFM) for their biodiversity values.

Tunawaea Project

The 1991 Tunawaea landslide in the south of the Waipā catchment is a specific erosion issue requiring long term priority management. The landslide occurred in the gorge in the lower reach of the Tunawaea Stream and an estimated 500,000 cubic metres of material dammed the Tunawaea Stream for approximately one year. It subsequently failed in a small flood event when the 'dam' was overtopped. Waikato Regional Council has implemented a specific project to stabilise the material from the landslide in the upper Waipā Gorge and to provide a stable channel along the valley floor to prevent erosion of the terraces and help the river move its bedload through the system. The continuation of this project is an important part of the overall goal of reducing erosion and sedimentation in the catchment.

Tunawaea slip

RESTORATION STRATEGY IMPLEMENTATION

Although implementation of *Restoration Strategy* projects is non-statutory and therefore not required of any organisation, the intention is that a coordinated and consistent approach be followed. We anticipate that the Waikato River Restoration Forum members will utilise the *Restoration Strategy* to more effectively coordinate their restoration programmes, including through aligning resources, funding and technical expertise. It is intended that the forum will meet and discuss projects and priorities on a regular basis.

The Waikato River Authority will provide staff time and resources to lead the Restoration Forum. They will also actively promote strategically important projects, engage with funding organisations and interested stakeholders, promote the funding and implementation of projects, track implementation of the *Restoration Strategy* and, where possible, quantify the impact of restoration initiatives.

THE USE OF MĀORI WORDS

The *Restoration Strategy* has had input and contributions from many iwi associated with the Waikato and Waipā rivers, who have subtle differences in dialects and spelling variations, in particular the use of macrons or double vowels. The spelling variations throughout the *Restoration Strategy* have been purposefully included to reflect the preferred directive of each iwi, including the naming of places (lakes, lands, waterbodies) within their area. In general, the reader should note the following.

- Waikato-Tainui prefer the use of double vowels e.g. waahi, ngaati, roopu, hapuu. This is reflected in the Waikato-Tainui iwi priorities, quotes provided from Waikato-Tainui kaumatua and also sites within the Waikato-Tainui area, e.g. Lake Waahi, Te Puuaha o Waikato. It should also be noted that references to *Te Ture Whaimana* (*Vision & Strategy*) and its objectives use double vowels as the initial wording of the *Vision & Strategy* was established and empowered from the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act.
- Ngati Tahu-Ngati Whaoa do not use double vowels or macrons.
- Ngāti Tūwharetoa, Raukawa, Te Arawa river iwi and Ngāti Maniapoto all use macrons in their Māori words.

DEVELOPMENT OF THE RESTORATION STRATEGY
TE WHAKAWHANAKE I TE RAUTAKI TĀMATA

APPROACH

The process for developing the *Restoration Strategy* is outlined in Figure 2.

Technical experts were involved in all stages of the development of the *Restoration Strategy* with more than 20 organisations making staff available to contribute to the process. A project technical advisory group was established at the beginning of the project to oversee technical input and ensure that data and modelling used to inform decisions was relevant and robust. This group contained experts in water quality, freshwater ecology, soils, catchment management, freshwater fish, economics, catchment modelling and mātauranga Māori, and included representatives of each of the five river iwi. Due to the specific nature of the challenges and mitigations relating to shallow lakes, a lakes working group was also established to provide technical advice on the shallow lakes work stream.

Iwi and a wide range of stakeholders were involved in the development of strategy goals and in the prioritisation of projects. These included representatives of the following:

- river iwi trusts
- marae
- landowners (drystock, forestry and dairy sectors)
- Waikato Regional Council – staff and governors
- Department of Conservation
- territorial local authorities – staff and governors
- industry groups (farming and forestry)
- energy companies
- community groups and restoration trusts
- catchment committees
- non-government organisations.

Further detail on the methods used to develop the *Restoration Strategy*, and all Project Assessment Forms (PAFs), can be found in the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018). The methodology used to determine cost benefit scores was the Investment Framework for Environmental Resources (INFFER) (Pannell et al., 2012).

Iwi priorities for the *Restoration Strategy* were developed by Waikato and Waipā river iwi. They represent the aspirations of whānau, marae and hapū to restore and protect ngā wai (waters) under the korowai (cloak) of each iwi. These priorities were developed under the principle of mana whakahaere and were developed by iwi for iwi. The iwi-led approach recognises the historic and intrinsic relationship between iwi and their natural resources and also as Treaty partners bound to the land and waters. The work identifying iwi priorities was led by Waikato-Tainui College for Research and Development (the College) in collaboration with the river iwi. The iwi priorities stand alone in the *Restoration Strategy*, recognising the intricate associations of each iwi with their natural resources. It should be noted, however, that the general restoration priorities in Chapters 4-7 are also of significant value and interest to iwi.

GOALS DEVELOPED FOR EACH UNIT

Existing plans and strategies reviewed to identify common non-regulatory goals for restoration of the Waikato and Waipā rivers.

- Goals considered in scope were summarised into the six core work streams.
- Workshops with iwi and stakeholders held to review goals and refine these for the strategy

POTENTIAL PRIORITY PROJECTS IDENTIFIED

A range of methods were used to identify potential priority locations and projects to give effect to the goals:

- Modelling
- Wānanga
- Technical investigations
- Workshops with technical experts
- Outputs of previous research and technical reports
- Iwi and stakeholder engagement
- Interviews with key experts within councils, community groups and other organisations

POTENTIAL PRIORITY PROJECTS FILTERED

Potential projects were filtered against four 'filtering' questions and only those that met the criteria progressed to the next stage (PAF development).

PAFS (PROJECT ASSESSMENT FORMS) DEVELOPED

Project assessment forms were prepared for each candidate project. This involved compiling specific information about each project, including (but not limited to):

- the environmental feature the project aims to protect and restore
- the desired state the feature would be in to achieve the *Vision & Strategy*
- project goals
- priority works for funding
- estimated costs
- risks to project success.

COST BENEFIT ANALYSIS

For each unit of the *Restoration Strategy,* a joint iwi, stakeholder, landowner and technical expert hui was held to determine selected cost benefit scores for each project.

- The remaining cost benefit scores were agreed by the technical advisory group.
- Projects with a cost benefit score less than 1 were excluded from the *Restoration Strategy*.
- Iwi priority projects were prioritised directly by iwi and did not go through this cost benefit process.

PRIORITIES CATEGORISED

Projects included in the *Restoration Strategy* were categorised as **very high**, high or medium priority depending on their cost benefit score.

Figure 2. Process for development of the Restoration Strategy.

The following general approach was undertaken by iwi to identify and confirm restoration of priorities for iwi:

- hui to determine the most appropriate pathway for engagement with the iwi
- multiple wānanga with iwi, hapū and marae ensuring all geographic areas of the iwi had an opportunity to participate
- interviews with key knowledge holders in each iwi
- researching archival documents held by iwi authorities, iwi and their affiliates.

IWI PROJECT ASSUMPTIONS

Each of the iwi were advised by tribal members and marae of the following key points with respect to the iwi projects:

1. The iwi projects should ideally be led by iwi, hapū or marae within the project area, e.g. upper Waipā iwi projects would preferably be led by Maniapoto iwi, hapū or marae.
2. Education of iwi members is a priority. Where possible, projects should improve the capability and capacity of tribal members through funding of education opportunities and training associated with the project. This may include:
    - postgraduate studies such as doctorate or master's thesis
    - qualifications in restoration related fields
    - internships and cadetships
    - school related activities, e.g. school planting days.
3. All projects must consider the cultural health and safety of any person associated with the project. This will require discussions with the iwi, hapū and marae.

ESTIMATING COSTS

For each project included in the *Restoration Strategy*, an estimated cost has been provided for implementing the recommended works. Estimated costs are based on current market rates and actual costs incurred by similar projects and are intended as a guide only. Where there was a range of market rates for a particular action, the highest rate was used. Appendix 2 contains a table detailing the standard cost assumptions used throughout the *Restoration Strategy*.

Projects that address erosion and sedimentation issues are based on modelling, and a set of assumptions were used to estimate the mitigations required within each of the three catchments (e.g. Waipā, Upper Waikato, Central/Lower Waikato). Detail around these assumptions can be found in the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018). The quantities of work required for each project were identified from a range of sources, including experts and/or people with local knowledge of the site, aerial photography, GIS modelling and works required for similar projects at other sites.

Prior to any project being undertaken, it is expected that a detailed assessment of the work required should be completed by the project team, including detailed costings.

Maniapoto, Raukawa ki wharepuhunga and Waikato hapū planning Pūniu River project.

USING THE STRATEGY

TE WHAKAMAHI I TE RAUTAKI

STRUCTURE AND CONTENT

For each of the unit chapters in the *Restoration Strategy,* the project structure is presented as follows:

- Overview map of the geographical area of the catchment with project locations identified and numbered. For many of the iwi projects, specific sites are yet to be identified and therefore overview maps are not included.
- Project summaries providing a brief overview of each project, including the name, number, description of location, summary of proposed actions and estimate of total project cost. These also include the priority category for the project. There are three categories – very high, high and medium.

Full project assessment forms (PAFs) are found in Appendices 5-14 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018). The PAFs provide more detailed and technical information on each feature and project, and are intended to assist project implementers in selecting projects and planning works.

Works for each project are limited to specific activities addressing the issues identified as having the highest priority for that site. They do not include everything that could be done if funding was unlimited. This recognises that funding of non-regulatory activities needs to be invested in the highest priority actions and in projects with the greatest potential gain in order to best give effect to the *Vision & Strategy* with available resources.

INFORMATION FOR IMPLEMENTERS OF RESTORATION PROJECTS

This section sets out information for parties who are interested in implementing restoration projects (or parts of restoration projects) identified in the *Restoration Strategy*. Figure 3 outlines the process implementers should follow, and further information on each step is provided later in the section.

CHOOSE A PROJECT

1) Go to the overview map for the catchment/rohe you are interested in.
2) Record the project numbers for the projects that you think may interest you.
3) Go to the project summary tables and look up the project numbers that you are interested in to find more information about the recommended projects.

If you are interested in undertaking works included in a project summary you will also need to read the full PAF for that project. These can be found in Appendices 5-14 of the *Waikato and Waipā River Restoration Strategy Technical Report* (waikatoriver.org.nz).

DETERMINE THE SIZE OF YOUR PROJECT

Projects included in the *Restoration Strategy* often cover large areas or lengths of waterway, and you may only wish to carry out a portion of the project. Identify the project area and scope of works you would like to undertake.

CONSULT

As you start to plan your project you should initiate discussions with interested and affected parties such as iwi/hapū/marae, landowners, potential funders, councils and others.

CONFIRM PROJECT PARTNERS

A project that collaborates with multiple parties is often looked upon more favourably by project funders.

1) Confirm who your project partners are and determine what their contributions to the project will be.
2) Obtain this commitment in writing.

DEVELOP A FULL PROJECT PLAN AND BUDGET

The individual project information within the project summary tables and PAFs provides guidance on the type of work that is considered a priority for funding. This can be used to help with project planning.

APPLY FOR FUNDING

Many funders require co-funding for projects. Therefore it is recommended that you seek at least two sources of funding for your project.

Figure 3. Process diagram for parties interested in implementing restoration projects.

CHOOSING A PROJECT

Many organisations or individuals wishing to undertake river restoration projects will have already identified a general location of interest. This may be as broad as an entire catchment or as focused as a stream behind a marae or within an individual farm boundary. The first step in using the *Restoration Strategy* is to go to the chapter that best matches your general area of interest (catchment and/or rohe) and view the overview map for projects that have been identified in that area. Each project number on the map corresponds to a project summary within this document and a project assessment form (PAF) within the Appendices of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018).

Take note of the project numbers that are near or within your area of interest and go to the corresponding project summary table within that catchment chapter to find a brief overview of the priority works for funding. This summary describes the nature and quantity of the work that has been recommended for this location. For the majority of projects, we suggest that the work can either be undertaken in its entirety or as cumulative, smaller pieces of work. For example, if the project identifies 20km of stream fencing and planting, this could be done as a single project or as multiple projects with different project leads. Project implementers can propose to undertake all or just a percentage of the work.

Once a project that matches the interests and skills of your organisation, group or whānau has been identified, more detailed information about the environmental feature and project is available in the PAF within the relevant appendix of the technical report (Waikato Regional Council, 2018). The information in the PAF should provide a good basis for putting together a project proposal, plan and applications for funding. If the chosen project is within one of the general priorities sections (Chapters 4-7), you should check for alignment with iwi priority projects (Chapters 8-13) for the same geographical area and vice versa. Project partnerships are strongly encouraged, especially where multiple outcomes can be achieved.

For the projects that fall into the four general sections – Upper Waikato, Central/Lower Waikato, Waipā and Shallow Lakes – it is anticipated that these works could be carried out by organisations, groups, landowners, marae and/or hapū. For projects identified as iwi priorities, it is anticipated that these projects would be either led by iwi or carried out with iwi as a partnership. The *Restoration Strategy* does not specify who can be contracted to undertake aspects of project delivery. However, for all projects, local delivery is encouraged wherever possible. This helps to give effect to *Vision & Strategy* objectives relating to the restoration and protection of the relationship of iwi and communities to the rivers, including their economic, social, cultural and spiritual relationships.

CULTURAL HEALTH AND SAFETY

It is important that persons or organisations that intend to deliver a project within the Waikato River catchment dedicate some time and resources to considering cultural health and safety. Cultural health and safety upholds the 'tapu' quality of all things natural by doing things the right way, under the principles of 'tikanga'. Therefore, when undertaking a project, we aim to achieve two things:

1. Ensure the safety of people within the natural spaces they are working in.
2. Respect the whole of nature to protect its fertility.

The Waikato and Waipā river catchments hold a richness in history that should be protected, acknowledged and respected. Māori occupation of the region shaped papatūānuku (earth mother) through the creation of pā (fortification), papakāinga (communal village), rua kai (food pits), mahinga kai (cultivation areas) and other physical constructions to support iwi, hapū and marae. Marae were generally established near water bodies and natural resources to sustain the iwi and provide them with energy to protect, care for and live with one another. Many of these physical attributes of the community are no longer visible on the landscape. However, the pūrākau (legends), taonga tuku iho (treasures gifted) and presence of these areas will never be lost. It is highly likely that within the tīnana (body) of papatūānuku (earth mother), many of these treasures or artefacts, and possibly kōiwi (human bones), are still resting with the potential for discovery. As well as the physical and tangible aspects of the historic landscape, there are also spiritual and metaphysical worlds and beings to be aware of and respectful to. Whatukura (male spiritual beings), māreikura (female spiritual beings), taniwha (spiritual kaitiaki), patupaiarehe (fairies) and other beings continue to live amongst our natural resources. Cultural guidance, to consider these spiritual spaces, will be required from marae associated within the project area.

It is the duty of the project manager of each project to take responsibility for consulting with relevant iwi to understand the significance of the place they are protecting or restoring. These aspects of the land are extremely significant to iwi. It is vital that the location of known significant sites are understood and have appropriate management mechanisms in place to ensure the safety of the site, and the people associated with the project.

Further advice provided in the section *Engagement with iwi, hapu and marae* is a guide only, to assist in discussions. The decisions reached between the project manager and iwi, hapū and marae hold precedence.

CONSULTATION

Once a project of interest is identified we recommend that preliminary consultation with affected and interested parties is undertaken. The PAF will sometimes make suggestions about who should be included as part of this and may include administrators of Crown land or community groups who have a history of working at that site. However, be aware that the PAFs do not list everyone who needs to be consulted. In general, at a minimum, consultation should include:

- Landowners (private/iwi or Crown) – if there is a small number of landowners involved then it is recommended that they are all approached prior to going any further with the project planning. Projects will not be able to proceed without their support. If there is a large number of landowners (e.g. for long reaches of waterways, large wetlands, subcatchments) then it may not be necessary to talk to everyone prior to planning the project, but it is advisable to speak to some key landowners, a community board or catchment committee to get some advice on likely interest. Each PAF contains an estimate of anticipated uptake of work and some of the challenges that may exist in this.
- Iwi – more detailed information on iwi consultation during project planning, implementation and closure is provided in the section *Engagement with iwi, hapū and marae*. Even if your proposed project is small and on your own private land, many funders will want to see that you have discussed the work with the local marae and have their support.
- Waikato Regional Council and your territorial local authority – each PAF identifies where it is expected that resource consent for works will be required. However, it is always advisable to check with the regional and local council if your proposed project involves earthworks or disturbance of the bed of a waterbody (including willow removal along streams and within wetlands). The councils may also be aware of other works that are being undertaken in the area that might align with or impact on your project. You will also be able to discuss potential funding options with council staff. If your proposed work is in a high priority site for Waikato Regional Council they may have a catchment management officer available to assist with a project or farm plan.
- Community groups – if you have an active community group in your area it is advisable to talk to them about any work they may have planned or whether they may be interested in being involved in your project. Community groups have a wide range of skills and potential access to volunteers and other resources.
- Research institutions – if your project involves a research or monitoring component it is recommended that you make contact with relevant research institutions to see if there is similar work currently being undertaken or new opportunities to partner with these organisations.

PLANNING A PROJECT

The project summary tables and PAFs provide guidance on the type of work that is considered a priority for funding and this can be used to help with project planning. They also provide recommended standards and estimate quantities of works required to maximise benefits. These standards are considered an important component of cost-effective project delivery. However, as part of individual project planning it is important to ground truth the proposed actions. This section provides some advice on doing this for some of the more commonly identified works. If you are intending to undertake a project identified in the *Restoration Strategy*, then you may also be able to get project planning advice from your iwi trust or your local Waikato Regional Council catchment management officer.

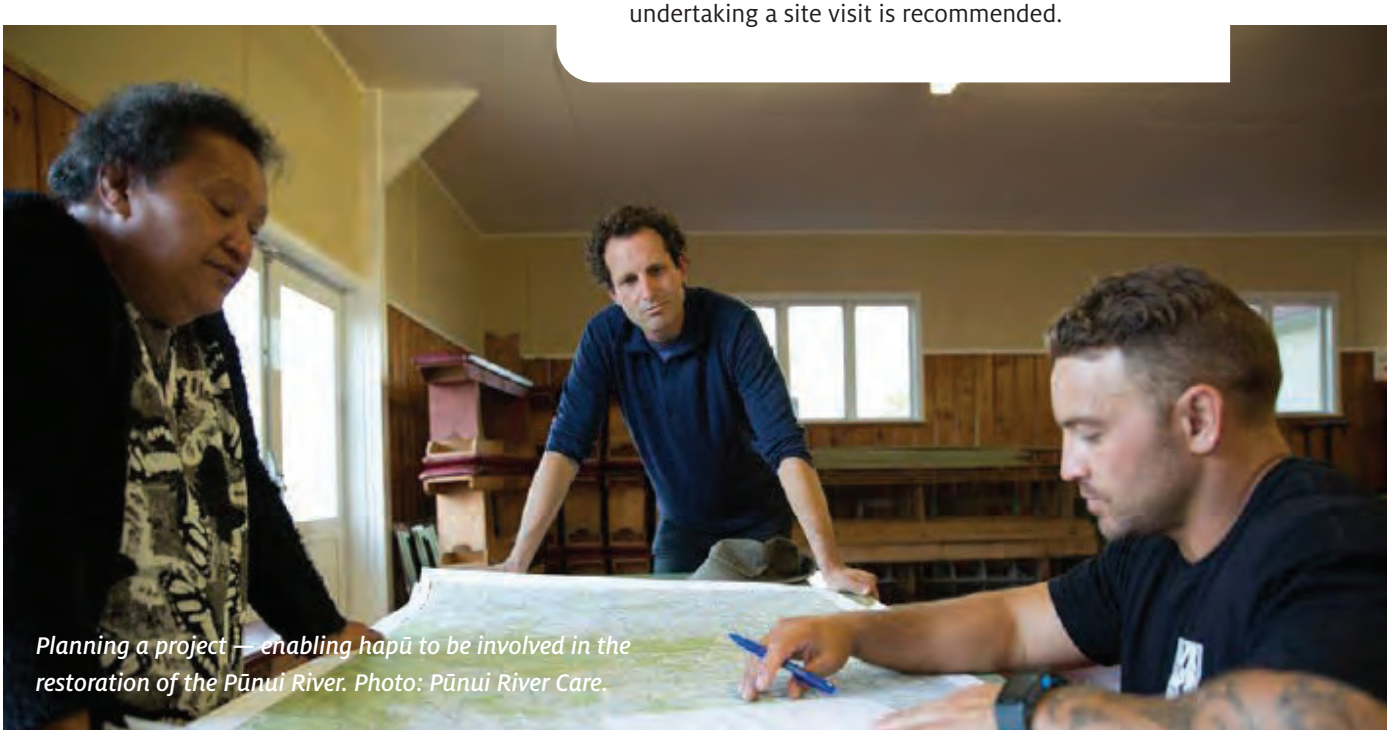
Restoration plan

Some projects will require a restoration plan, management plan or design work to be completed prior to undertaking works. Where this is required it has been included as a project cost in the project summary table and PAF. It is anticipated that this would be undertaken by an appropriately qualified and experienced expert such as ecologist, engineer or mātauranga Māori knowledge holder.

Fencing

Within the *Restoration Strategy*, riparian fencing setbacks are set at 5m for streams and 10m for the main channels of the Waipā and Waikato rivers. There should be flexibility on this when working with landowners to ensure that fence lines are sensible, and therefore these distances should be viewed as average setbacks. The standard of fencing recommended is generally 5 wire (2 electric) or 7 wire depending on the nature of the work. These are commonly required standards for many funders, particularly where native planting is proposed behind the fencing. Where fence damage caused by flooding is a significant issue a 3-wire electric fence is generally accepted. Note that the proposed *Healthy Rivers Plan Change 1* requires a 1m fence setback from permanently flowing waterways in areas where the terrain is flat and a 3m setback where slope is greater than 15 degrees. Works that do not exceed regulatory minimum will not generally be eligible for non-regulatory funding; however, it is recommended this is checked with each funder prior to making an application.

Unless otherwise noted, estimates of fencing lengths included in the project summary tables and PAFs are based on modelled information or examination of aerial photographs. We recommend that more accurate estimates are obtained as part of project planning. If working with a small number of landowners then jointly examining an aerial photo or undertaking a site visit is recommended.



Planning a project – enabling hapū to be involved in the restoration of the Pūnui River. Photo: Pūnui River Care.

Planting and plant maintenance

Opinions vary on methods and standards for planting wetlands, riparian margins and hill country. For riparian and wetland plantings the recommendations included in the *Restoration Strategy* come from best professional judgement and are generally based on 4444 plants per hectare (1.5m spacing) and five releasing events. When planning your project you may need to adjust these figures depending on the site. For example, you may need to factor in undertaking additional releasing events in places where plant growth is low or where problematic weed density is high, or alter spacing depending on the nature of the site. Further guidance on plant selection and spacing can be found in various guides such as Waikato RiverCare (2014) and the DairyNZ Riparian Planner (***riparian-planner.dairynz.co.nz***). Your project plan should note the reasons you have chosen your plant densities and maintenance schedule.

Management and prevention of erosion

Project summary tables and PAFs estimate the quantities of fencing, plants and erosion control structures that are anticipated to have value for preventing and remediating erosion in each particular area. These have been based on modelled information and so should be treated as an overall estimate for the subcatchment. On-the-ground works will be farm specific and need to be developed with interested landowners. There should be a flexible approach taken to this that considers the best overall plan for addressing erosion and sedimentation on farm. However, if you are planning to apply for funding to undertake works not included in the *Restoration Strategy* (e.g. water reticulation, stock crossings, dams), you should check with the funding organisations as to the kind of works that meet their criteria. If a farm plan has already been developed for a property then this should provide a further guide to potential management options and quantities of works.

Project management/staffing/ incidentals

Estimates of project management costs have been provided for all projects. These are broad and are based on the anticipated requirements for overseeing works, procurement and contract management, consulting with landowners, iwi and stakeholders and preparing farm or riparian planting plans. They also cover overheads such as administration, financial management and project reporting, and incidentals including fuel costs, office expenses and professional fees (see Appendix 2 for assumptions). It is important when planning your own project to treat these as a guide and to more accurately estimate the costs of these components for your work. If you are only undertaking a small part of a project, it may be that there is very limited landowner consultation required (e.g. there is one landowner and they are already supportive). Most funders will want to see some justification for your project management, staffing and incidentals costs.

Photo: Pūnui River Care.

APPLYING FOR FUNDING

When you have completed your project plan and estimated the project costs, you will need to consider which components of the work can be carried out in kind through volunteer labour or advice and which components will require funding. The *Sources of funding and support* section outlines some of the funders within the Waikato catchment that regularly fund river restoration projects. Each funder has different criteria and requirements for funding. However, most will require the project to have other sources of funding attached. You should look at the criteria of funders within your area of interest to determine whether you need to apply to one or more sources for funding.

When applying for funding to undertake a project identified within the *Restoration Strategy* you should emphasise this in your application, and note the priority category that the project sits in (very high, high or medium). Most funders are keen to know if a project has already been through a rigorous prioritisation process.

PROJECT DELIVERY AND REPORTING

Once you have secured funding for your project and have begun project implementation, you will need to ensure you keep a detailed record of all project expenses along with evidence of these expenses. It is essential to keep all supplier invoices and record in-kind hours spent on your project (e.g. volunteer hours, project management hours).
Many funding organisations will require you to provide supplier invoices as evidence of expenditure before they release funding. They may also require a project report detailing information such as in-kind contributions, other cash contributions, photos of progress, monitoring results and any other project information you can provide.

Your final progress report should detail, at a minimum, your achievements against your goals and a summary of outputs including kilometres of fencing, hectares of planting and hectares of land retired.

Photo points are a cost-effective method of demonstrating project outcomes (Turitea Stream before and after planting).

ENGAGEMENT WITH IWI, HAPŪ AND MARAE

Project planning

As you develop your project and begin to prepare applications for funding, it is important that you initiate discussions with the relevant iwi authority as early as possible. They will provide guidance on further engagement requirements, which may including discussions with hapū and marae. Locations and names of marae are displayed on all project maps in Appendices 5 to 14 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018).

It is also important to be thoroughly prepared before meeting with iwi, hapū and/or marae.

- Clearly identify the intended project area and scope of activities/works.
- Read and consider the relevant sections of the appropriate iwi environmental plan to familiarise yourself with iwi matters. For example, projects in the lower Waikato River must consider the *Waikato-Tainui Environmental Plan*. These plans, and more, can be found on the Waikato Regional Council website, ***waikatoregion.govt.nz/Community/Your-community/iwi/Tangata-Whenua-Management-Plans***
- Relevant sections may include:
  - Engagement with iwi, hapū and marae
  - Sites of significance
  - Customary activities
  - Accidental discovery protocols.
- Contact the relevant iwi authority, hapū or marae to initiate discussion on the following:
  - the most appropriate manner of engagement
  - the project concept, location, objectives and time frames
  - identifying cultural expectations for the project, including tikanga (protocols) required prior to the commencement of the project, during the project and at its completion — this may also include incorporating iwi aspirations into the project
  - protocols for archaeological discovery, kōiwi (bones) discovery, sites of significance and communication
  - providing for cultural induction of agreed protocols with all staff. This may include marae members providing historical and cultural context to the project area.
  - costs associated with iwi, hapū and marae engagement. All projects within the *Restoration Strategy* have factored in estimated costs for engagement with iwi and landowners. Actual costs will depend on the scope of the project and should be agreed with the iwi, hapū and marae prior to commencement.

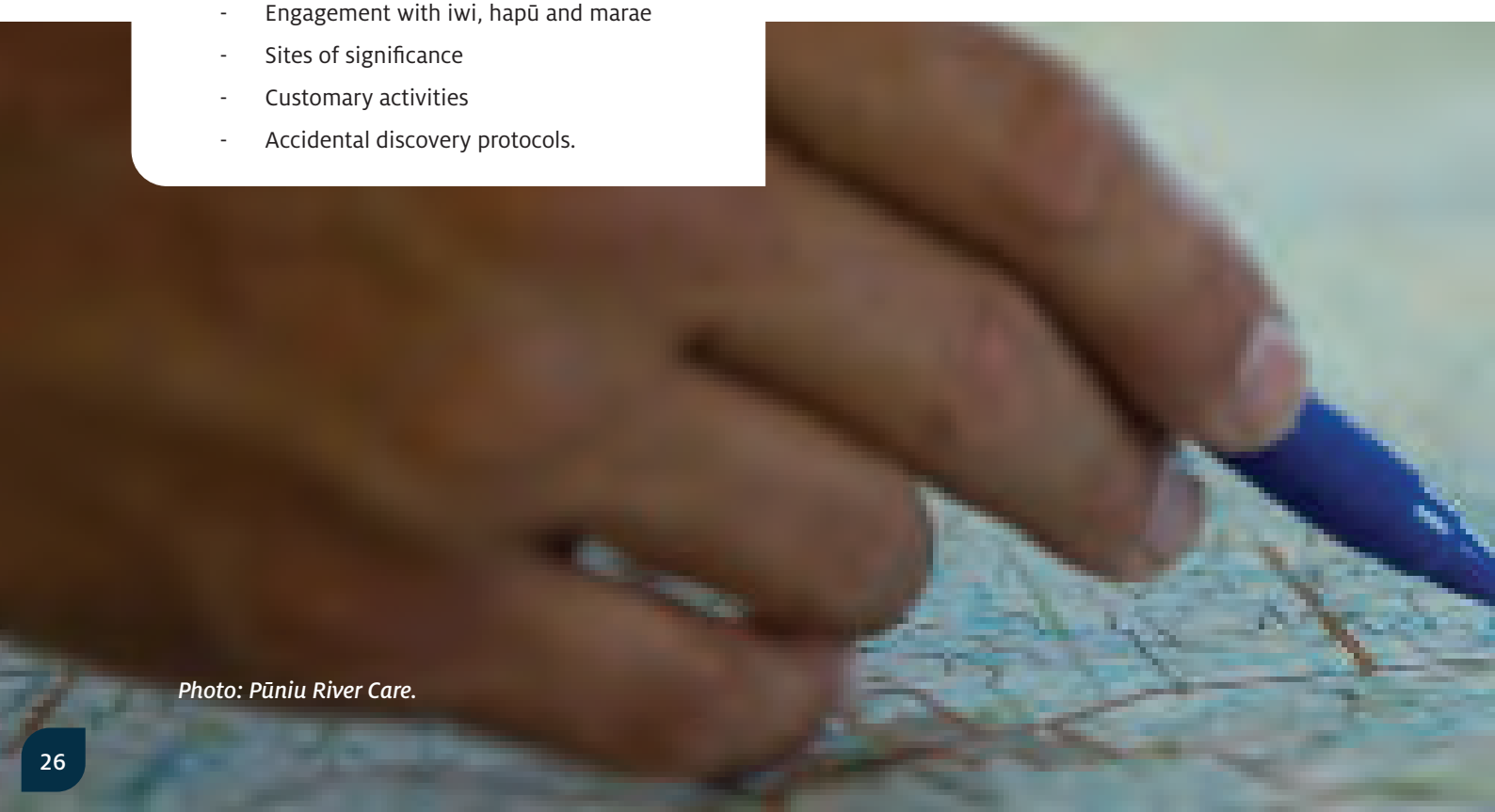


Photo: Pūniu River Care.

Project implementation

It is advisable to re-establish engagement with iwi, hapū and marae prior to and during project implementation. This may include:

- implementing cultural safety requirements as agreed with iwi, hapū and marae, e.g. karakia with all staff present prior to turning the soil, followed by a hākari (feast) together
- maintaining regular contact to provide updates and build relationships
- holding cultural induction training for new staff members or contractors as required. This is particularly important for projects that are likely to include, or impact, the following:
  - stream diversions
  - sites of significance
  - major earthworks near historic settlements
  - establishing mahinga kai
  - traditional water areas for swimming or drinking.

Completion of project

- Implement cultural safety requirements as agreed with iwi, hapū and marae, e.g. karakia to close the project, with all staff present followed by a hākari (feast) together.
- Depending on the size and scope of the project, you may hold a final workshop to review progress against the initial objectives agreed with the parties.
- Provide a final project report to each of the parties as a record and resource for future generations.

Iwi authority contact details can be found on the Waikato River Authority website, in the links section: ***waikatoriver.org.nz/contact-us/***

INFORMATION FOR FUNDERS

Organisations who fund river and catchment restoration and enhancement, cultural enhancement and capacity building of iwi in restoration are advised to review the *Restoration Strategy* to identify projects that are likely to be in scope for funding. This could be through the following ways:

- Geographically – each of the unit chapters contain all priority projects within that unit area.
- Work stream – the map at the start of each chapter contains an overview of projects. Projects are coloured by work stream type, enabling easy identification of projects relating to erosion and sedimentation, water quality, fish, biodiversity and access/recreation.
- Iwi priorities – these are presented as a chapter for each iwi and then an overall chapter on iwi priorities associated with lakes.

Funders are encouraged to reference *Restoration Strategy* projects that meet their funding criteria within their lists of priorities for funding.

Costings

Project summary tables and PAFs contain quantities of work and associated costings that are based on best available information at the time of *Restoration Strategy* preparation. Funders are encouraged to assess these against their own standards and seek evidence from applicants that they have undertaken more detailed planning and costings where required.

Project reporting

Organisations that provide funding for implementation of projects identified in the *Restoration Strategy* are recommended to ask recipients to include commentary on achieving strategy deliverables as part of their final reporting. The Waikato River Authority will maintain a record of progress against the *Restoration Strategy* and report on this annually through the Waikato and Waipā River Restoration Forum.

SOURCES OF FUNDING AND SUPPORT

Organisations and individuals looking to undertake projects identified in the *Restoration Strategy* are advised to seek funding from a range of sources and collaborate with iwi, agencies, organisations and the community where possible.

Within the Waikato catchment there are a range of agencies and organisations that have funding available for environmental restoration and enhancement projects. Funding organisations that regularly fund the kinds of projects identified in the *Restoration Strategy* are listed below. More detail about each funder and their funding criteria can be found in Appendix 3.

- Waikato River Clean-up Trust (WRCuT)
- Waikato Catchment Ecological Enhancement Trust (WCEET)
- Afforestation Grants Scheme (AGS)
- Trust Waikato
- Ngā Whenua Rāhui
- Ministry for the Environment – Freshwater Improvement Fund
- Ministry for the Environment – Community Environment Fund
- Waikato Regional Council – Integrated Catchment Management Directorate
- Waikato Regional Council – Natural Heritage Fund
- Queen Elizabeth II National Trust
- Iwi authorities – Te Arawa River Iwi Trust, Raukawa Charitable Trust, Maniapoto Māori Trust Board, Tūwharetoa Māori Trust Board and Waikato Raupatu River Trust.

PRIORITY LOCATIONS AND PROJECTS

NGĀ WĀHI ME NGĀ KAUPAPA MATUA

- Central and Lower Waikato
- Upper Waikato
- Waipā
- Shallow Lakes

CENTRAL AND LOWER WAIKATO
MAI TE PUKU KI TE TONGA O WAIKATO

CURRENT STATE AND PRESSURES

INTRODUCTION

The central and lower Waikato River catchment covers approximately 347,757ha and extends from Karāpiro Dam in the south for 150km to Te Puuaha (Port Waikato) in the north (Figure 4). The catchment represents almost 25 per cent of the total Waikato River catchment (Waikato Regional Council, 2011; 2012). The dominant features in the catchment are the Waikato River main channel and its associated lakes and wetlands.

From Karāpiro Dam, the Waikato River flows within a relatively steep sided and incised channel through the towns of Cambridge and Hamilton and on to Ngāruawāhia. At Ngāruawāhia, the Waipā River joins the Waikato River and the Waikato River becomes wider and slower flowing. This was once a large flood plain ecosystem dominated by lakes and peat wetlands formed by alluvial dams. Today, the area is still characterised by large lakes and wetlands but a substantial proportion of the land has been drained for agricultural production. Remaining lakes and wetlands are smaller than they were historically and are largely disconnected from the river by the flood levees and floodgates of the Lower Waikato-Waipā Flood Control Scheme (Waikato Regional Council, 2011; 2012).

Below Tūākau, the river widens further and branches into a delta system with many small channels and islands. It then enters Maioro Bay and flows through a narrow and shifting channel at Port Waikato to join the Tasman Sea. This section of the river is influenced by daily tidal cycles and has an internationally significant wetland complex that is home to a wide range of native bird and fish species (Collier et al., 2010).

Waikato River at Ngāruawāhia.

CULTURAL IMPORTANCE

To Waikato-Tainui, the river is significant in a cultural, historic and spiritual sense. It is a tuupuna which holds mana and represents the mana and mauri of the people. The tribal name 'Waikato' is derived from the awa tuupuna.

> ***"The river is a being, a mother, a complete and whole body comprising the water, the bed and the banks from its source to the sea. The life of the river and thus of the tribe is in its intactness – no limb struck from its body or the head separate from the heart."***
>
> *– the late kaumātua Kamira Henry Haggie (Deed of Settlement in relation to the Waikato River, 2009)*

> ***"Ngaa awa itiiti e pa ana ki te wai o Waikato, ko ngaa uaua o to taatou awa. To taatou awa he manawa."***
>
> *All the little streams and rain that flow into the Waikato River are like the veins of the body. The river is our heart.*
>
> *– the late Sir Robert Te Kotahi Mahuta of Waahi Marae (Deed of Settlement in relation to the Waikato River, 2009)*

The central and lower Waikato River and lakes are populated with marae drawn to the resources which sustain the people and enable catering for manuwhiri (visitors). The wide corridors of the river provided an ideal highway for movement by waka. Historically, this encouraged trade and establishment of purposeful communities. Waikato-Tainui are well recognised for their ability to feed thousands of manuwhiri as demonstrated each year at the anniversary of the coronation of Te Kiingi Māori. Like all iwi Māori, there is an inherent duty to care for your waters and fulfil your obligations as kaitiaki (guardians).

Stabilisation of the river bank near the access ramp for waka at Turangawaewae.

LOWER WAIKATO-WAIPĀ FLOOD CONTROL SCHEME

The Lower Waikato-Waipā Flood Control Scheme is a comprehensive river control scheme designed to provide flood protection and drainage within the flood plains of the lower Waikato and Waipā rivers. The scheme consists primarily of stopbanks, pump stations, floodgates and main river channel works. Scheme construction was commenced in 1961 and completed in 1982. The original area of low lying land in the lower Waikato, comprising the floodplains of the Waikato River, its tributaries and substantial areas of wetland, was approximately 36,400ha. Today, approximately 17,200ha of this area is directly protected by flood protection scheme works, including the main access route between Auckland and the rest of New Zealand (State Highway 1) and the main trunk railway line. An additional 16,500ha of land is also protected from flooding through works designed to control ponding areas. Within the Mangawara River Valley, the scheme provides protection to approximately 8300ha of rural land (Waikato Regional Council, 2011).

To iwi, the flood control scheme has significantly impacted the natural functions of Whangamarino and Waikare catchments. The ability of marae to access mahinga kai (food gathering area) and fresh drinking water and enjoy the river's waters have been limited. Lake Waikare, Lake Whangape, Lake Koopuera and the Whangamarino are synonymous with the invasion and bloodshed of Rangiriri. The lands and beds of the lakes now hold the kōiwi (bones) of Māori. General Cameron's forces broke through the trenches at Rangiriri to access the central North Island resources and lands, which triggered a string of events leading to the confiscation of Waikato ancestral lands. This area is historically significant in the darker side of the Government invasion of Waikato.

For the purpose of the strategy, the Lower Waikato-Waipā Flood Control Scheme infrastructure (e.g. floodgates, pump stations, drains, levees) has been considered part of the future environment and priority projects have been developed with this in mind.

Mawhitiwhiti Floodgate in the Lower Waikato.

WATER QUALITY

Water quality within the central and lower Waikato River is poor compared to the upper catchment (Vant, 2010). Concentrations of nitrogen, phosphorous and sediment increase as water flows downstream. Increases in nutrient concentrations from the upper catchment to lower catchment are likely to be the result of intensification of land use within the Waikato River catchment (Vant, 2010). Higher contaminant levels also result from other inputs, including urban stormwater run off and sewage treatment plants (Waikato Regional Council, 2017a). Using data from 2007, the Ministry for the Environment ranked the state of all sites in NIWA's National River Water Quality Network. When the nitrate, total nitrogen, dissolved reactive phosphorus and total phosphorus were combined, the Waikato River at Hamilton ranked poorly at 60 out of 77 sites, while at Rangiriri it ranked 70 (NIWA, 2010).

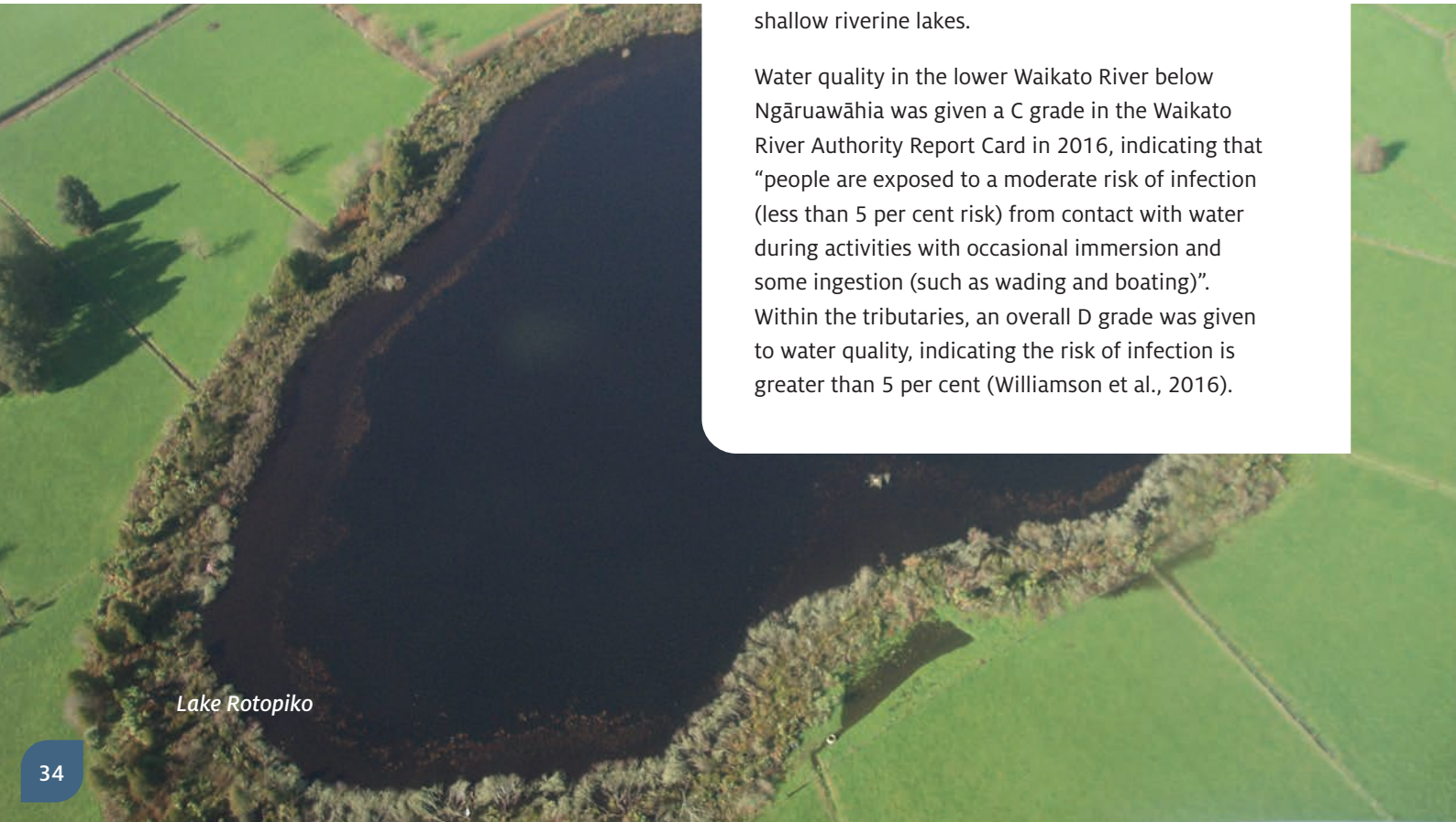
Hydro dams on the Waikato River have been shown to contribute to the growth of phytoplankton (Gibbs et al., 2015). Before the dams were built it took approximately six days for water to reach the sea from Lake Taupō. It now it takes several weeks. The increased time that water is held in dams allows for the growth of phytoplankton, especially during summer (Waikato Regional Council, 2017a).

Water clarity is also reduced by sediment inputs as the river travels north, and this is particularly noticeable in the lower part of the Waikato River downstream of Ngāruawāhia. High loads of sediment enter the Waikato River from the Waipā River at the confluence at Ngāruawāhia. Water clarity samples from 2012-2014 showed water clarity between Karāpiro and Ngāruawāhia to have a median of 1.5m. This reduced to 0.73m downstream of Ngāruawāhia (Williamson et al., 2016).

Water quality is not always satisfactory for swimming in the central and lower Waikato River due to high bacterial counts. Downstream of Hamilton city, levels of ***E. coli*** bacteria are often above the level considered safe for contact recreation (Waikato Regional Council, 2017b). ***E. coli*** comes from the dung of farm animals and wildlife such as pigs, goats and waterfowl. Human sources from treated sewage are generally a minor proportion of the total load of bacteria to rivers. In the Waipā River, farm animals are the likely dominant source of ***E. coli*** (Waikato Regional Council, 2017a).

Potentially toxic blue-green algae (cyanobacteria), which can dominate the phytoplankton assemblage in the lower river during summer months, may also pose a risk to public health when biomass is high (Waikato Regional Council, 2017a). High cyanobacteria biomass in the lower river originates mostly from blooms in the upstream hydro lakes or shallow riverine lakes.

Water quality in the lower Waikato River below Ngāruawāhia was given a C grade in the Waikato River Authority Report Card in 2016, indicating that "people are exposed to a moderate risk of infection (less than 5 per cent risk) from contact with water during activities with occasional immersion and some ingestion (such as wading and boating)". Within the tributaries, an overall D grade was given to water quality, indicating the risk of infection is greater than 5 per cent (Williamson et al., 2016).



Lake Rotopiko

Concentrations of nitrogen and phosphorus can exceed Waikato Regional Council standards for supporting aquatic flora and fauna (ecological health) in this part of the catchment. Water quality data from 2007-2011 presented on Waikato Regional Council's website showed that approximately 30 per cent of water quality samples taken in the lower Waikato River over this time were unsatisfactory for ecological health (Waikato Regional Council, 2017b).

Iwi have also noted the significant decline in water quality in the lower river, which in turn impacts the health of iwi. Iwi generally associate water quality with the health of the waterbody. "If the wairua of the river is violated, the river suffers, becomes sick and, if ignored, will die," said the late kaumatua Pumi Taituha (Deed of Settlement in relation to the Waikato River, 2009).

EROSION AND SEDIMENTATION

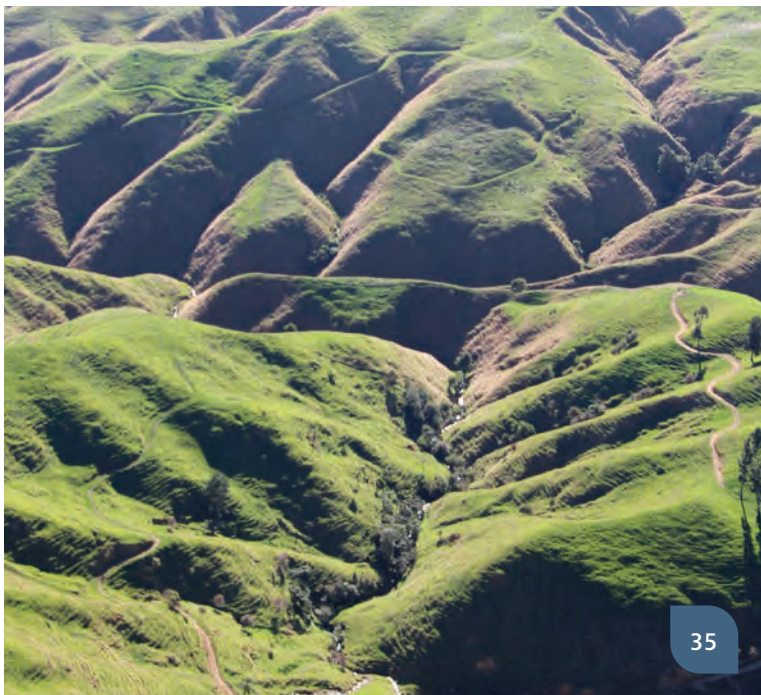
Much of the Central/Lower Waikato catchment consists of erodible soils derived from volcanic materials. Erosion is particularly significant on stream beds, banks and terraces throughout the catchment and collectively this has a significant impact on water clarity in the lower river. In the upper part of this catchment, erosion is limited mostly to the catchments east of Cambridge such as Karāpiro and the Mangaonua (Waikato Regional Council, 2012). Despite declining visual water clarity as the Waikato River flows downstream, the suspended sediment load entering the central Waikato River is lower than it would have been historically due to the settling of sediment caused by the slowing of flow behind the hydro dams (Hicks and Hill, 2010).

The lower Waikato catchment is geologically diverse with a combination of volcanic materials, alluvial and unconsolidated sediments, greywacke or argillite, peat and sandstone/mudstone (Waikato Regional Council, 2011). Approximately two-thirds of the sediment load to the lower river comes from the Waipā catchment via the Waipā River and this is now the main contributor to the turbidity in the lower Waikato main stem. Conversely, it is estimated that approximately two-thirds of the sediment yield from the Matahuru, Mangatangi and Whangamarino rivers is deposited in Lake Waikare and the Whangamarino Wetland and does not reach the Waikato River (Duncan, 1999, cited in Hicks and Hill, 2010).

During the 1960s-1980s, soil conservation works were implemented on properties across the Lower Waikato catchment. Many of these works are now at or near replacement. Significant works have also been undertaken both historically and recently to remediate and prevent streambank erosion issues in the tributaries of the Waikato River. This includes fencing, planting and construction of rock revetments and groynes (Waikato Regional Council, 2011).

Waikato Regional Council's *Lower Waikato Zone Plan* identifies eight priority catchments for hill country and riverbank erosion. Across these catchments, 13,133ha (21 per cent) are identified as having severe erosion potential. Palmer et al. (2015) identified evidence of historic slope failures in the Lower Waikato catchment, but concluded that present day erosion is mainly in the form of surficial erosion such as soil creep, rilling and mobilisation of sediment through stock trampling. SedNetNZ modelling identified relatively high erosion rates (>1000t/km^2/yr) in the southeast of the Lower Waikato catchment.

Palmer et al. (2015) concluded that although there wasn't substantial active hillslope erosion evident, the streams draining the upper catchments appear to have a high suspended sediment load. They also noted that valley floors in general were not well fenced and that stock are likely to contribute to disturbance and remobilisation of streambank sediments. Hicks and Hill (2010) concluded that the banks of the Waikato River main stem contributed minimal sediment to the river.



FISH

Nineteen species of native fish and 13 species of introduced freshwater fish are known to inhabit the Waikato River. Some of these fish species are fished recreationally and commercially and provide an important traditional source of kai for river iwi (NIWA, 2010).

Many fish species travel between headwaters and the sea or large lakes to complete their lifecycles so their survival depends on their ability to move unimpeded through catchment waterways. It is likely that the natural barrier that was once the Maungatautari Falls (now submerged beneath a hydro lake) was a significant barrier to upstream passage of most fish species, although many pre-European observations indicate that small numbers of eels were able to move upstream as far as Huka Falls (David and Speirs, 2010).

There has been a significant reduction in the abundance, diversity and distribution of native fish throughout the central and lower Waikato catchment over time. A number of factors have caused this, including (i) impediments to fish passage (e.g. floodgates, dams and perched culverts); (ii) introductions and transfers of introduced species (e.g. koi carp); and (iii) the loss of substantial areas of stream and wetland habitat caused by wetland drainage and clearance of bush-covered catchments for farming (David and Speirs, 2010).

One example of such a decline is the size of the whitebait catch in the lower Waikato River. Within the Waikato, whitebait is comprised of two main species: īnanga and banded kōkopu (with smaller numbers of giant kōkopu). In the 1930s and 1940s, the whitebait catch in the Waikato River was estimated at 46 tonnes per year. This had reduced to approximately 10 tonnes per year by the 1980s and in 2000 was only 3 tonnes (NIWA, 2010).

Tuna (eel) consist predominantly of two species – shortfin and longfin. These are regarded by iwi as a taonga species. Not only were they recognised as a staple food, but in some instances they are recognised as taniwha. Tuna is another example of a fishery species in decline. The Waikato River supports New Zealand's most productive tuna fishery but during the last 30 years the numbers of edible-sized tuna have declined. The commercial catch of tuna from the Waikato River has reduced by approximately 75 per cent since 1980 (NIWA, 2010).

The central and lower Waikato catchments' rivers and lakes are now home to a number of introduced fish species including koi carp, brown bullhead catfish and goldfish. These are the three most abundant invasive fish species in the Waikato region and impact waterways in a range of ways, including:

- increasing nutrients through excretion
- decreasing water clarity through stirring up of bottom sediment during feeding or selective consumption of large zooplankton, which results in more phytoplankton in the water column
- other modifications to the food-web through predation on other species
- disturbance of submerged macrophytes (plants)
- direct competition with native fish species for food and habitat (Collier and Grainger, 2015).

Koi carp account for up to 70 per cent of the total fish biomass in the lower Waikato River and commonly inhabit slow, turbid water, shallow lakes and wetlands (Hicks et al., 2010). A recent study at Lake Ohinewai indicates that koi carp could be impacting on tuna (eel) populations. The study used a barrier to prevent adult koi carp from entering the lake following large-scale invasive fish removal over a six-month period. Five years later, a follow-up study found that the mean weight of both shortfin and longfin eels had increased significantly following the removal. The study also found there was an increased proportion of larger eels following the exclusion of koi carp (Tempero and Hicks, 2017).

BIODIVERSITY

The central and lower Waikato catchment is well known for its network of lakes and wetlands. Many of the freshwater wetlands and lakes are important nationally and internationally for a range of factors, including their unique vegetation, nationally threatened and indigenous flora and fauna, game bird populations and ecosystem services (Department of Conservation, 2014).

Freshwater wetlands are often located in areas that have been and still are highly desirable for farmland or other activities such as sand extraction. Consequently, many have been drained, converted to pasture and irreversibly altered (Beard, 2010). Wetlands within the Waikato region have reduced in extent by more than 75 per cent over the last 160 years (Leithwick et al., 1995). Drainage in the Lower Waikato has led to the direct loss of many small lakes and reduced hydrological connectivity and the filtering function of wetlands. Stock access to margins of streams and lakes has contributed to direct habitat disturbance and contributed nutrients and sediments (Clayton, 2002). Introduced plants that became weeds (such as yellow flag iris, alligator weed and woolly nightshade) have also been a major contributor to the degradation of native forest and wetland ecosystems (Clayton, 2002).

Wetlands are havens for biodiversity, providing spawning and nursery grounds for fish and breeding grounds and habitat for a diverse range of birds, reptiles, insects and plants, many of which only occur within wetland habitats. Some 31 species of birds have been recorded as inhabiting the central and lower Waikato wetlands, including Australasian bittern, grey duck, New Zealand dabchick, North Island fernbird and spotless crake (Beard, 2010).

The wetlands and lakes of the Lower Waikato are extremely important to Waikato-Tainui with the mauri of wetlands linked to the overall ecological health and wellbeing of their whakapapa. The indigenous plant and animal species found within and around them are valuable cultural resources (Waikato-Tainui, 2013). The massive loss of wetland area has impacted the wellbeing of the people and limited the transfer of knowledge in relation to the uses of wetland flora and fauna species for cultural purposes.

An example of the decline in the extent of wetlands in the central and lower Waikato is observed in lowland kahikatea forest. Historically, this wetland species covered 42,800ha of the catchment. Today, only 1.3 per cent remains (GIS analysis undertaken by Waikato Regional Council, Daniel Tait pers. comm.).

Of the remaining Lower Waikato wetlands, the Whangamarino Wetland, Opuatia Wetland and the tidally influenced lower portion of the Waikato River (from Rangiriri downstream to Port Waikato) are of particular significance. The Whangamarino Wetland is approximately 7200ha in size and is the second largest bog and swamp complex in New Zealand and the largest wetland connected to the Waikato River. This wetland provides habitat for more than 50,000 waterfowl and several rare and endemic bird species (Beard, 2010). It has one of the largest populations of North Island fernbird and is home to approximately 25 per cent of the remaining Australasian bittern population. Plant diversity is also significant at this site, with 60 per cent of the 239 species recorded being indigenous to New Zealand. Many of these are rare, including swamp helmet orchid, which is not known to occur anywhere else, and giant cane rush, known to occur naturally in only three other locations (Beard, 2010).

Whangamarino Wetland

The Opuatia Wetland is approximately 950ha and contains diverse habitats, including a small lake, a river, mineralised margins and surrounding peat bog. It contains several rare and endangered plants and is habitat for threatened animal species (Beard, 2010).

The 56km stretch of the lower Waikato River from Rangiriri downstream to Port Waikato passes through mineralised swamp areas and swampy islands before entering the diverse delta habitat near Port Waikato. Some of the islands retain significant areas of kahikatea forest and collectively the lower Waikato River islands form an internationally significant wetland complex. The sandspit and tidal flats at Port Waikato are important for migratory wading birds such as dotterel, wrybill and bar-tailed godwit, and support both estuarine and freshwater plants and animals (Beard, 2010).

The report card for the Waikato River gave the section of river below Ngāruawāhia and its tributaries an overall grade of C for ecological integrity. This indicates that it delivers on some but not all of the *Vision & Strategy* aspirations for a healthy Waikato River. This reflects that the lower river has diverse native fish (e.g. whitebait and tuna) but pest fish are prevalent and extensive drainage and flood control degrades ecological integrity (Williamson et al., 2016).

RECREATION

The central and lower Waikato River is valued for the many recreational activities that occur along its length. It is popular for waka, motor boats, kayaking, rowing, fishing, walking, cycling and swimming when conditions are safe.

The freshwater wetlands and lakes in the catchment provide for a range of recreation opportunities, including game bird hunting, walking, wildlife viewing and fishing (angling and bow hunting). However, public access to many sites is limited, with permission often required to cross private land. Recreation in and around other catchment waterways is also limited, due to access issues or lack of facilities. Improving access to lakes, wetlands and tributary waterways and developing new recreational opportunities such as walking tracks and picnic areas would increase visitor numbers to these areas (Williamson et al., 2016).

GOALS

The following goals were developed by iwi, stakeholders and community representatives for the Central/Lower Waikato catchment:

	1	2	3
WATER QUALITY	Wetlands are protected, enhanced, created and able to perform their water purification role.	The mauri/life supporting capacity of fresh water is protected and restored for aquatic species.	Water quality enhancement projects consider aspirations that provide for swimming, fishing, drinking and cultural values.
EROSION AND SEDIMENTATION	Highly erodible land is effectively managed, including through native or exotic reforestation and retirement of marginal lands.	Sediment inputs to wetlands and waterbodies are reduced by 50 per cent.	Riverbank and river island erosion is minimised whilst maintaining the natural character, habitat and cultural values of the river.
FISH	Aquatic habitats, including spawning grounds, are protected, enhanced, restored and accessible to native fish.	Pest/exotic fish are controlled or eradicated at priority sites.	The abundance of native fish, including taonga species, is restored and protected.
BIODIVERSITY	Wetlands are protected, enhanced and, where feasible, expanded and re-established.	Ecosystems, forest fragments and ecological corridors associated with aquatic environments are protected, enhanced and expanded.	
RECREATION	Places that provide for safe recreational activities are identified and accessible.	Connections between significant places are provided for.	Tribal and community histories proudly inform recreational users.

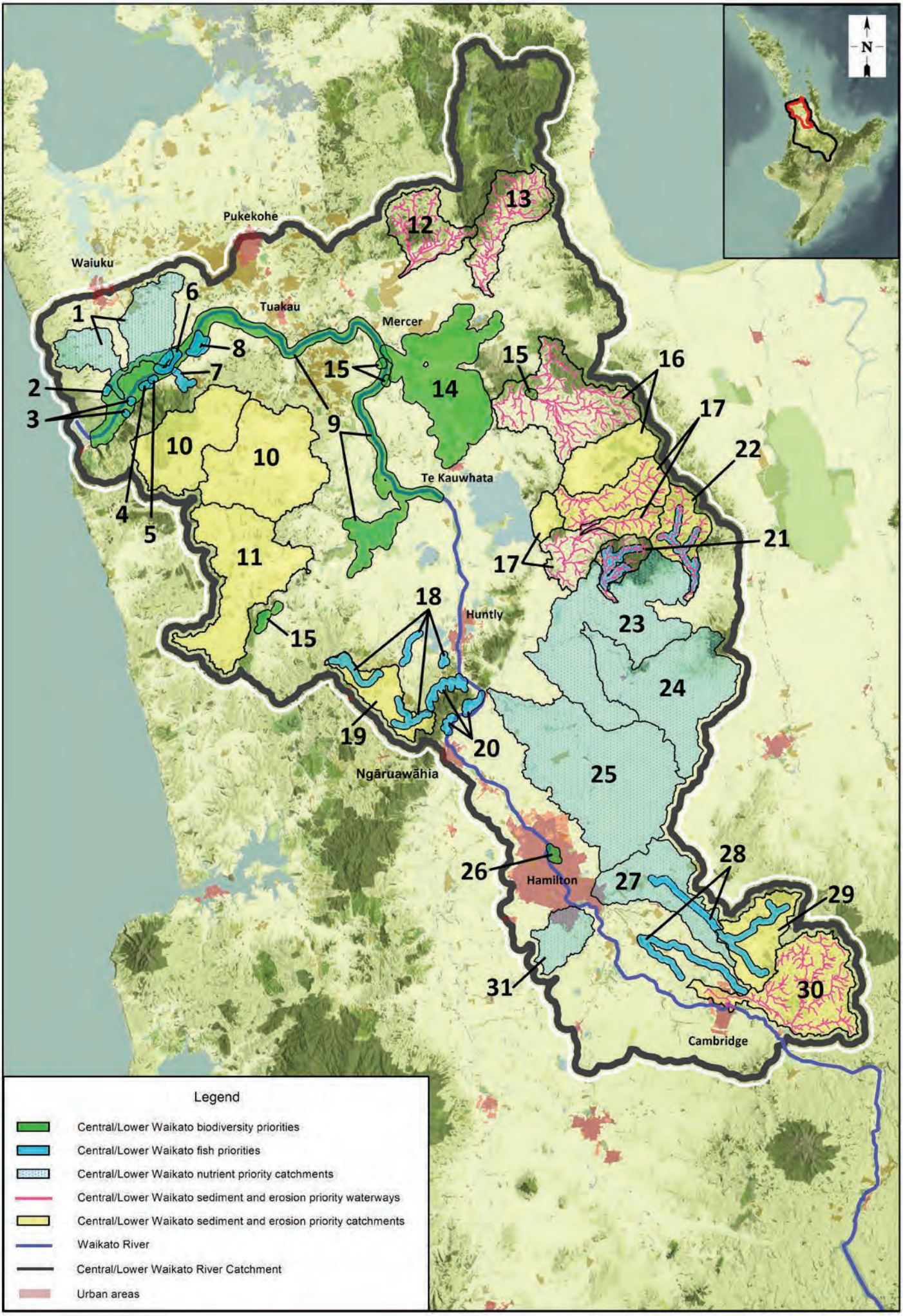


Figure 4. Location of priority projects in the Central/Lower Waikato catchment

PRIORITY PROJECTS

Thirty-one projects in the central/lower Waikato catchment scored a favourable cost benefit score and have been included in the *Restoration Strategy*. These are illustrated in Figure 4. Projects are listed in order from lower catchment to upper catchment and their priority ranking is provided in the summary tables that follow. Appendix 5 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018) contains more detailed information on each project, including recommended management actions and estimated costs.

Total project value is estimated at almost $116 million. Funding priorities include 690km of riparian/wetland fencing, 385ha of riparian revegetation, stabilising up to 7350ha of LUC class 6e land and 1800ha of LUC class 7 land, and more than 900km fencing of plantings, sidelings, seeps and existing vegetation in hill country. Additionally, remediation of nearly 30 barriers to native fish passage are included.

SUMMARY TABLES OF PRIORITY PROJECTS

HIGH PRIORITY

WATER QUALITY IMPROVEMENT IN THE AKA AKA CATCHMENT	CLW 1

Location: Wetlands greater than 0.1ha and ephemeral streams within the Aka Aka catchment.

Summary of priority works

- Fencing wetlands and ephemeral streams (55km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $550,000

Fencing is recommended to exclude stock from this potential īnanga spawning area.

HIGH PRIORITY

ĪNANGA SPAWNING HABITAT REHABILITATION – HILLS DRAIN	CLW 2

Location: A 2ha section of streambank adjacent to Hills Drain at the end of Fisherman Road, on the northern bank of the Waikato River near Otaua.

Summary of priority works

- Develop restoration plan
- Fencing (640m)
- Weed control
- Native planting (50% of site at 0.75m spacing)
- Project management/staffing/incidentals (15%)

Total estimated cost: $179,458

HIGH PRIORITY

ĪNANGA SPAWNING HABITAT REHABILITATION – TŪĀKAU BRIDGE-PORT WAIKATO ROAD: SITE 3

CLW 3

Location: Two unnamed tributary streams feeding into the true left of the lower Waikato River near Port Waikato.

Summary of priority works

- Develop restoration plan
- Fencing (1,140m)
- Weed control
- Native planting
- Project management/staffing/incidentals (20%)

Total estimated cost: $211,977

An example of glyceria growing along a stream margin and preventing īnanga spawning.

HIGH PRIORITY

ĪNANGA SPAWNING HABITAT REHABILITATION – TŪĀKAU BRIDGE-PORT WAIKATO ROAD: SITE 2

CLW 4

Location: A 750m long section of an unnamed tributary stream and associated wetland along the true left margin of the lower Waikato River near Te Kohanga.

Summary of priority works

- Develop restoration plan
- Fencing (670m)
- Weed control
- Native planting (60% of site at 0.75m spacing)
- Project management/staffing/incidentals (20%)

Total estimated cost: $842,270

MEDIUM PRIORITY

ĪNANGA SPAWNING HABITAT REHABILITATION – TŪĀKAU BRIDGE-PORT WAIKATO ROAD: SITE 1

CLW 5

Location: A 2.1ha section of streambank consisting of one unnamed tributary stream entering the true left margin of the Waikato River near Port Waikato.

Summary of priority works

- Develop restoration plan
- Fencing (350m)
- Weed control
- Native planting (50% of site at 0.75m spacing)
- Project management/staffing/incidentals (20%)

Total estimated cost: $188,096

A waterway where fencing is recommended to exclude stock and enable spawning.

HIGH PRIORITY

ĪNANGA SPAWNING HABITAT REHABILITATION – ISLAND ADJACENT TO MAWHITIWHITI ROAD

CLW 6

Location: A 188ha area of island adjacent to Mawhitiwhiti Road along the true right margin of the Waikato River near Aka Aka.

Summary of priority works

- Develop restoration plan
- Native planting over 60% of a 94ha area (at 0.75m spacing)
- Weed control
- Project management/staffing/incidentals (20%)

Total estimated cost: $8,863,878

VERY HIGH PRIORITY

FISH HABITAT REHABILITATION ON WHAUWHAUTAHI STREAM — CLW 7

Location: Whauwhautahi Stream (a short stream approximately 5km long), flowing from hill country near Te Kohanga under Tūākau Bridge - Port Waikato Road and into the Waikato River near Motutieke Island.

Summary of priority works

- Fencing (10km)
- Planting (10ha)
- Weed control
- Investigation and remediation of fish barriers
- Project management/staffing/incidentals (20%)

Total estimated cost: $440,122

HIGH PRIORITY

ĪNANGA SPAWNING HABITAT REHABILITATION – WETLAND OPPOSITE ELBOW HILL — CLW 8

Location: A 140ha wetland along the true left margin of the lower Waikato River at the end of Kohanga Store Road, Te Kohanga.

Summary of priority works

- Develop restoration plan
- Fencing (4km)
- Weed control
- Native planting (60% of site at 0.75m spacing)
- Project management/staffing/incidentals (20%)

Total estimated cost: $13,799,040

VERY HIGH PRIORITY

INCREASED CONTROL OF YELLOW FLAG IRIS AND ALLIGATOR WEED WITHIN THE LOWER WAIKATO RIVER CATCHMENT — CLW 9

Location: Waikato River between Rangiriri and Port Waikato, Lake Whangape and Opuatia Wetland.

Summary of priority works

- Ground and water based herbicide control of yellow flag iris and alligator weed
- Project management/staffing/incidentals (20%)

Total estimated cost: $842,400

Alligator weed in the lower Waikato.

MEDIUM PRIORITY

UPPER AND MIDDLE OPUATIA CATCHMENT HILL COUNTRY EROSION PROTECTION AND REMEDIATION

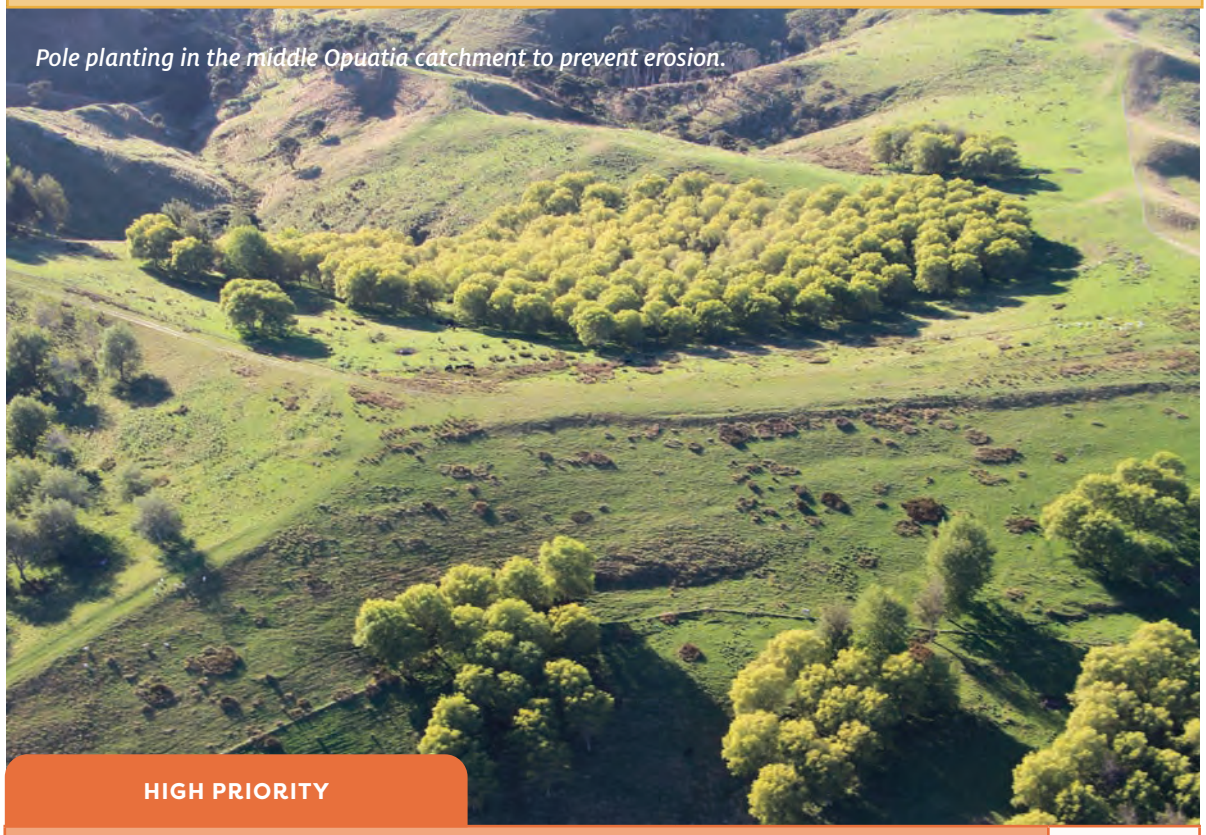
CLW 10

Location: Upper and middle Opuatia catchments. This part of the catchment is 18,251ha in size and extends from the Port Waikato Hills (Klondyke Road) southeast to where SH22 crosses the Opuatia Stream.

Summary of priority works

- 1259ha LUC 6e land managed with pole planting
- 1259ha LUC 6e land managed with plantation species (pine or mānuka)
- Fencing managed LUC 6e land (225km)
- 319ha LUC 7 land managed with plantation species
- Fencing managed LUC 7 land (36km)
- Reducing sediment outside LUC 6e, 7 and 8 land (8ha)
- Fencing existing indigenous vegetation (54km)
- Goat control on treated 6e and 7 land
- Project management/staffing/incidentals (30%)

Total estimated cost: $21,550,340



Pole planting in the middle Opuatia catchment to prevent erosion.

HIGH PRIORITY

NAIKE CATCHMENT HILL COUNTRY EROSION PROTECTION AND REMEDIATION

CLW 11

Location: Naike catchment – a 10,608ha catchment that extends from the west at the Lower Waikato catchment divide and in the north at Matakitaki Road and travels east down to where the Maire Stream crosses under SH22 and becomes the Awaroa Stream.

Summary of priority works

- 730ha LUC 6e land managed with pole planting
- 730ha LUC 6e land managed with plantation species (pine or mānuka)
- Fencing managed LUC 6e land (133km)
- 392ha LUC 7 land managed with plantation species
- Fencing managed LUC 7 land (47km)
- Reducing erosion outside LUC 6e, 7 and 8 (3ha) land
- Fencing existing indigenous vegetation (38km)
- Goat control on treated 6e and 7 land
- Project management/staffing/incidentals (30%)

Total estimated cost: $14,437,654

VERY HIGH PRIORITY

MIDDLE MANGATAWHIRI STREAM EROSION PROTECTION AND REMEDIATION — CLW 12

Location: This 4305ha section of the Mangatawhiri catchment extends from the DOC reserve boundary in the headwaters, southwest and down to where the stream becomes stopbanked.

Summary of priority works

- Riparian fencing (27km)
- Riparian willow/poplar pole planting (2369 poles)
- Native riparian planting (10ha)
- Erosion control structures
- Project management/staffing/incidentals (20%)

Total estimated cost: $776,619

Eroding banks on the Mangatawhiri Stream requiring erosion control works.

VERY HIGH PRIORITY

NORTHERN MANGATANGI STREAM EROSION PROTECTION AND REMEDIATION — CLW 13

Location: The 5200ha northern Mangatangi catchment extends southwest from the DOC reserve on the southern side of the Hunua Ranges at Workman Road to the Maramarua River at SH2.

Summary of priority works

- Riparian fencing (37km)
- Riparian willow/poplar pole planting (3325 poles)
- Native riparian planting (14ha)
- Erosion control structures
- Project management/staffing/incidentals (20%)

Total estimated cost: $1,101,931

HIGH PRIORITY

BIODIVERSITY ENHANCEMENT OF WHANGAMARINO WETLAND — CLW 14

Location: Whangamarino wetland – a 7290ha wetland located between Meremere and Te Kauwhata.

Summary of priority works

- Fencing (35km)
- Native planting (25ha)
- Project management/staffing/incidentals (20%)

Total estimated cost: $1,840,560

HIGH PRIORITY

BIODIVERSITY ENHANCEMENT OF SELECTED LOWLAND FOREST FRAGMENTS WITH STRONG CONNECTIONS TO WATERWAYS — CLW 15

Location: Three forest fragments ranging in size from 0.5ha to 36ha as follows:

- a cluster of kahikatea remnants near Meremere located in close proximity to each other (45ha in total)
- two neighbouring kahikatea remnants at Naike (16ha)
- kahikatea remnants at the end of Jefferis Road, Waerenga (6ha).

Summary of priority works

- Fencing (13.5km)
- Native planting (4ha)
- Weed control
- Possum control
- Project management/staffing/incidentals (20%)

Total estimated cost: $476,050

HIGH PRIORITY

WAERENGA CATCHMENT HILL COUNTRY AND STREAMBANK EROSION PROTECTION AND REMEDIATION — CLW 16

Location: Waerenga catchment – a 13,672ha catchment originating in the northern Hapuakohe Range. The main waterway is the Waerenga Stream, which extends northwest down the catchment and joins the Whangamarino River at Jefferis Road. The Taniwha Stream lies on the western boundary of the catchment and is a tributary to the Waerenga.

Summary of priority works

- 287ha LUC 6e land managed with pole planting
- 287ha LUC 6e land managed with plantation species (pine or mānuka)
- Fencing managed LUC 6e land (50km)
- Fencing existing indigenous vegetation (13km)
- Riparian fencing (101km)
- Riparian willow/poplar pole planting (7466 poles)
- Native riparian planting (38ha)
- Erosion control structures
- Project management/staffing/incidentals (30%)

Total estimated cost: $7,459,261

HIGH PRIORITY

MATAHURU CATCHMENT HILL COUNTRY AND STREAMBANK EROSION PROTECTION AND REMEDIATION

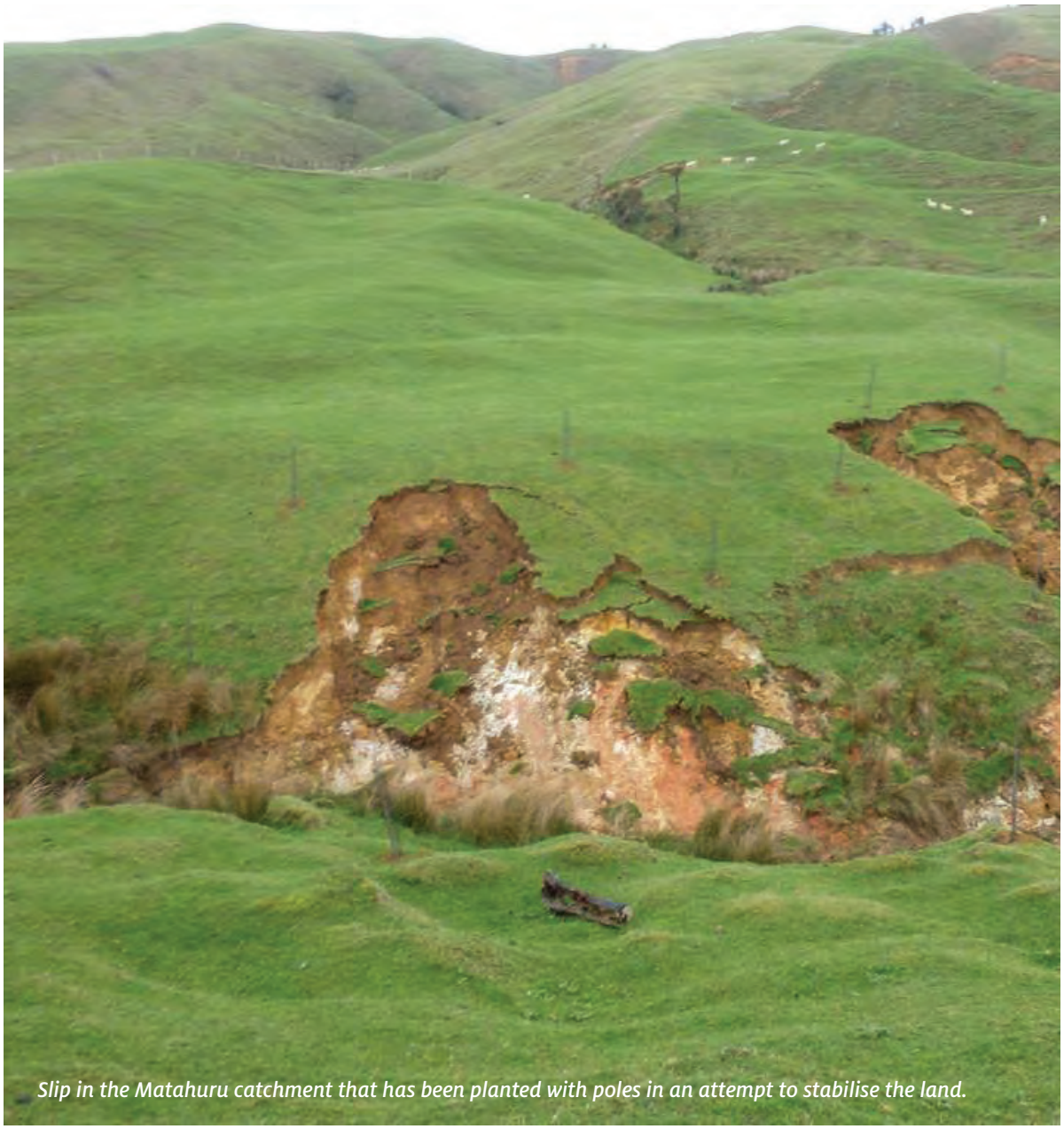
CLW 17

Location: Matahuru catchment and selected tributaries to Lake Waikare. The total area of these catchments is approximately 9971ha.

Summary of priority works

- 452ha LUC 6e land managed with pole planting
- 452ha LUC 6e land managed with plantation species (pine or mānuka)
- Fencing managed LUC 6e land (76km)
- 655ha LUC 7 land managed with plantation species
- Fencing managed LUC 7 land (51km)
- Erosion control outside LUC 6e, 7 and 8 land (12ha)
- Fencing existing indigenous vegetation (18km)
- Riparian fencing (120km)
- Riparian willow/poplar pole planting (12,436 poles)
- Native riparian planting (44ha)
- Erosion control structures
- Project management/staffing/incidentals (30%)

Total estimated cost: $15,319,709



Slip in the Matahuru catchment that has been planted with poles in an attempt to stabilise the land.

HIGH PRIORITY

REHABILITATION OF BANDED KŌKOPU HABITAT ON SELECTED INFLOWS TO LAKE PUKETIRINI AND LAKE WAAHI

CLW 18

Location: Selected inflows to Lake Puketirini and Lake Waahi:

- Awaroa Stream from Waikokowai Road (near Rotowaro Coal Mine) to Lake Waahi (4.5km).
- Waitawhara Stream: flowing from rugged hill country southwest of Lake Waahi, it then flows alongside Rotowaro Road to join Awaroa Stream near Rotowaro Coal Mine
- Mangakotukutuku Stream: flowing from Hakarimata Range downstream for approximately 2km where it enters the Rotowaro Mine site
- 4.5km length of an unnamed tributary to Lake Puketirini immediately west of Hillside Heights Road and flowing under Rotowaro Road to Lake Puketirini.

Summary of priority works

- Fencing (23km)
- Native planting (6ha)
- Weed control
- Remediation of fish barriers
- Project management/staffing/incidentals (25%)

Total estimated cost: $653,640

HIGH PRIORITY

UPPER AWAROA (WAAHI) CATCHMENT HILL COUNTRY EROSION PROTECTION AND REMEDIATION

CLW 19

Location: Upper Awaroa catchment in the headwaters above Lake Waahi – a 3536ha area extending from the west at the Lower Waikato catchment divide northeast down to the confluence with Te Wha Stream.

Summary of priority works

- 153ha LUC 6e land managed with pole planting
- 153ha LUC 6e land managed with plantation species (pine or mānuka)
- Fencing managed LUC 6e land (29km)
- Goat control on treated 6e and 7 land
- Erosion control outside LUC 6e, 7 and 8 land (7ha)
- Fencing existing indigenous vegetation (6km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $2,329,610

VERY HIGH PRIORITY

REHABILITATE FISH HABITAT IN STREAMS FLOWING FROM HAKARIMATA RANGE TO THE WAIKATO RIVER

CLW 20

Location: A selection of mostly short streams flowing from the steep forested headwaters of the Hakarimata Range to the Waikato River.

Summary of priority works

- Fencing (18km)
- Planting (8.5ha)
- Remediation of barriers to native fish
- Project management/staffing/incidentals (25%)

Total estimated cost: $616,490

MEDIUM PRIORITY

MANGATEA STREAM INTEGRATED CATCHMENT PROGRAMME — CLW 21

Location: Mangatea catchment – a 2,086ha catchment extending from the west of the Hapuakohe summit downstream to its confluence with the Mangawara River.

Summary of priority works

- Riparian fencing (13km)
- Riparian willow/poplar pole planting (1200 poles)
- Native riparian planting (5ha)
- Erosion control structures
- Remediation of barriers to native fish
- Project management/staffing/incidentals (20%)

Total estimated cost: $526,276

MEDIUM PRIORITY

UPPER MANGAWARA INTEGRATED CATCHMENT PROGRAMME — CLW 22

Location: The upper Mangawara catchment – a 2086ha area lying at the southern end of the Hapuakohe Range and along the eastern boundary of the Lower Waikato catchment. The upper catchment is estimated to have an approximately 50km stream network including the Mangawara Stream itself.

Summary of priority works

- 124ha LUC 6e land managed with pole planting
- 124ha LUC 6e land managed with plantation species (pine or mānuka)
- Fencing managed LUC 6e land (30km)
- 145ha LUC 7 land managed with plantation species
- Fencing managed LUC 7 land (20km)
- Reducing sediment outside LUC 6e, 7 and 8 land (4ha)
- Fencing existing indigenous vegetation (17km)
- Riparian fencing (17km)
- Riparian willow/polar pole planting (1478 poles)
- Native riparian planting (6ha)
- Erosion control structures
- Remediation of fish barriers
- Project management/staffing/incidentals (30%)

Total estimated cost: $4,319,905

VERY HIGH PRIORITY

WATER QUALITY IMPROVEMENT IN THE MIDDLE MANGAWARA CATCHMENT — CLW 23

Location: Wetlands and ephemeral streams in the middle Mangawara catchment. The middle Mangawara Stream catchment covers 14,219ha and drains the Mangatea, upper Mangawara and Tauhei catchments.

Summary of priority works

- Fencing wetlands and ephemeral streams (11km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $110,000

HIGH PRIORITY

WATER QUALITY IMPROVEMENT IN THE TAUHEI CATCHMENT

CLW 24

Location: Wetlands and ephemeral streams within the Tauhei catchment. The Tauhei catchment extends over 11,600ha from west of Morrinsville and drains into the Mangawara Stream at Orini.

Summary of priority works

- Fencing wetlands and ephemeral streams (8km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $80,000

Idealised fencing of a seepage wetland.

HIGH PRIORITY

WATER QUALITY IMPROVEMENT IN THE KOMAKORAU AND MANGATOKETOKE CATCHMENTS

CLW 25

Location: Wetlands and ephemeral streams within the Komakorau and Mangatoketoke catchments. This large catchment covering 19,143ha lies east of Hamilton and Ngāruawāhia with streams entering the Waikato River at Taupiri.

Summary of priority works

- Fencing wetlands and ephemeral streams (44km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $440,000

MEDIUM PRIORITY

BIODIVERSITY ENHANCEMENT OF KUKUTĀRUHE STREAM AND ASSOCIATED GULLY ECOSYSTEM

CLW 26

Location: Kukutāruhe Stream and associated 23ha gully ecosystem (from Fairfield College to the Waikato River).

Summary of priority works

- Develop a restoration plan
- Walkway construction
- Development and installation of signage
- Weed control
- Native revegetation
- Remediation of fish barriers
- Possum control
- Project management/staffing/incidentals (30%)

Total estimated cost: $775,973

Area requiring weed control in the Kukutāruhe gully.

VERY HIGH PRIORITY

WATER QUALITY IMPROVEMENT IN THE LOWER MANGAONUA STREAM CATCHMENT

CLW 27

Location: Wetlands and ephemeral streams in the lower Mangaonua Stream catchment. The Mangaonua is an 11,346ha catchment that lies southeast of Hamilton city. The lower catchment makes up 6615ha of this.

Summary of priority works

- Fencing wetlands and ephemeral streams (23km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $230,000

MEDIUM PRIORITY

REHABILITATION OF FISH HABITAT IN THE MANGAONUA, MANGAONE AND MANGAOMAPU STREAMS

CLW 28

Location: Mangaonua, Mangaone and Mangaomapu streams:

- Mangaonua Stream upstream of State Highway 1B near Matangi (approximately 22km) and a 7km tributary
- Mangaomapu Stream between Racecourse Road (near Cambridge), downstream to its confluence with Mangaone Stream – approximately 7km in length
- Mangaone Stream from its headwaters near St Kilder, Cambridge, to the confluence with Mangaomapu Stream near Tamahere.

Summary of priority works

- Riparian fencing (68km)
- Riparian planting (93ha)
- Remediation of fish barriers
- Resource consent
- Project management/staffing/incidentals (30%)

Total estimated cost: $2,663,086

A reach of Mangaone Stream where riparian planting is recommended (and a wider fenced margin in some places).

MEDIUM PRIORITY

UPPER MANGAONUA CATCHMENT HILL COUNTRY EROSION PROTECTION AND REMEDIATION

CLW 29

Location: The upper Mangaonua catchment – an 11,346ha catchment that lies southeast of Hamilton city, containing the Pukemoremore and Te Miro areas.

Summary of priority works

- 210ha LUC 6e managed with pole planting
- 210ha LUC 6e managed with plantation species (pine or mānuka)
- Fencing managed LUC 6e land (40km)
- Fencing existing indigenous vegetation (13km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $3,231,250

MEDIUM PRIORITY

KARĀPIRO CATCHMENT HILL COUNTRY AND STREAMBANK EROSION PROTECTION AND REMEDIATION

CLW 30

Location: Karāpiro catchment – an 8920ha catchment containing a 150km stream network. The headwaters arise southeast of Cambridge in the vicinity of Whitehall and the catchment extends northward toward Te Miro.

Summary of priority works

- 460ha LUC 6e land managed with pole planting
- 460ha LUC 6e land managed with plantation species (pine or mānuka)
- Fencing managed LUC 6e land (80km)
- 303ha LUC 7 land managed with plantation species
- Fencing managed LUC 7 land (40km)
- Reducing sediment outside LUC 6e, 7 and 8 land (4ha)
- Fencing existing indigenous vegetation (20km)
- Riparian fencing (52km)
- Riparian willow/poplar pole planting (5,528 poles)
- Native riparian planting (19ha)
- Stream erosion protection structures
- Project management/staffing/incidentals (30%)

Total estimated cost: $10,982,146

MEDIUM PRIORITY

WATER QUALITY IMPROVEMENT IN THE MANGAKŌTUKUTUKU CATCHMENT

CLW 31

Location: Wetlands and ephemeral streams in the lower Mangakōtukutuku Stream catchment. The 2644ha Mangakōtukutuku catchment lies south of Hamilton city, originating in agricultural land before entering the suburbs of Glenview, Bader, Melville, Sunnyhills and Fitzroy.

Summary of priority works

- Fencing wetlands and ephemeral streams (6km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $60,000

UPPER WAIKATO
WAIKATO KI TE RAKI

CURRENT STATE AND PRESSURES

INTRODUCTION

The upper Waikato River catchment covers an area of 436,000ha and extends from the Kaingaroa Plateau in the east to the Pureora and Rangitoto Range in the west. It includes the eight hydro dams and lakes of Aratiatia, Ohakuri, Ātiamuri, Whakamaru, Maraetai, Waipapa, Arapuni and Karāpiro (Waikato Regional Council, 2014b). These were constructed between 1929 and 1964.

Much of the area is characterised by erosion prone soils including Taupō pumice, which makes up 68 per cent of the land area. The remainder is made up of other volcanic materials, including tephra and muds from the Rotorua Volcanic Centre. The catchment has a strong forestry and pastoral farming economy and in recent years there has been a marked increase in dairy conversions and intensification. Energy production (hydroelectricity and geothermal) is also a strong economic driver in the catchment (Waikato Regional Council, 2014b).

CULTURAL IMPORTANCE

The upper Waikato River and its catchment are of immense cultural, historical, traditional and spiritual significance to the people of Waikato-Tainui (Ngāti Koroki-Kahukura, Ngāti Hauā), Raukawa, the Te Arawa river iwi affiliates (Ngāti Tahu-Ngāti Whaoa, Ngāti Kearoa-Ngāti Tuarā and Tuhourangi-Ngāti Wāhiao) and Ngāti Tūwharetoa, who have lived along its banks for many centuries.

Tangata whenua historically used the river (and nearby wetlands) for spiritual and material needs, sustenance, a source of cleansing and healing, and a network for trade, travel and communication. The river was also an abundant source of food such as tuna (eel), kanae (mullet), pōrohe (smelt), īnanga (whitebait), kōura (freshwater crayfish) and watercress.

Unveiling of kohatu at Orākei Kōrako.

The upper Waikato River holds many stories of battles, romance, exploration and spiritual encounters. The relationship between iwi and its waters cannot be underestimated or described with as much reverence and passion as by the kaumātua and kuia of each iwi. The relationship is well referenced in oratory occasions every day, waiata (songs) sung by tamariki (children) and in karakia (prayer).

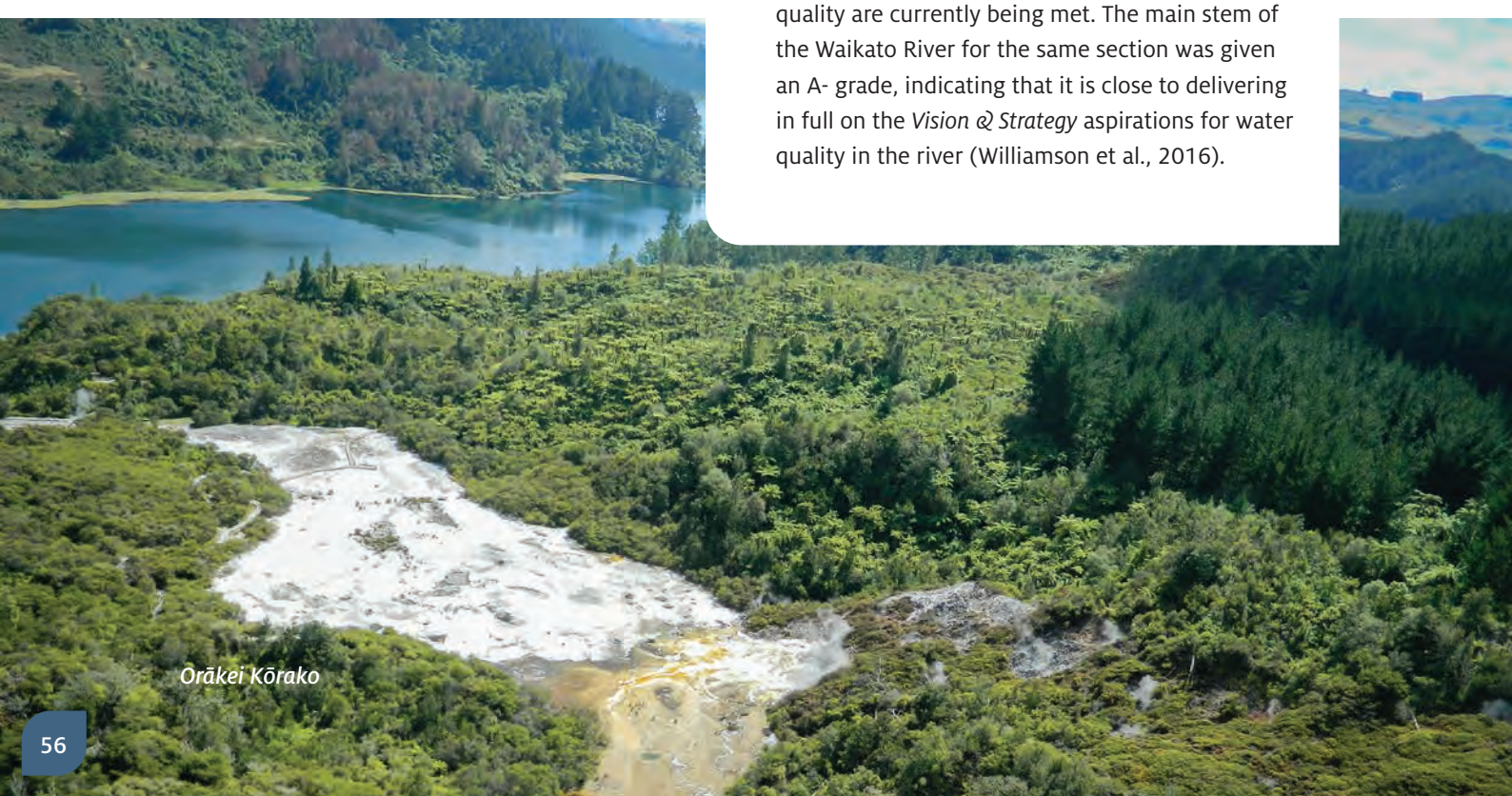
To iwi, the biggest impacts include that of the hydro dams, which have altered the relationship of iwi with the Waikato River. The direct impact of the hydro dams in the Upper Waikato was immediate and created cultural impacts by severing the 'veins' of the river, altering the natural flow of its waters and impacting migration of tuna where natural barriers had not previously existed. Other catchment development issues, including clearance of native vegetation and other land use changes, have affected access of iwi to the river, degraded water quality, desecrated sites of significance and greatly impacted taonga fisheries (Collier et al., 2010; Ngati Tahu-Ngati Whaoa Runanga Trust, 2013; Raukawa Charitable Trust, 2015).

WATER QUALITY

Water quality monitoring of the tributaries to the upper Waikato River show considerable spatial and temporal variability across the catchment. Although having elevated nitrogen and phosphorus levels some or all of the time, upper catchment streams such as the Pueto, Torepatutahi and Wai-O-Tapu are all considered safe for swimming. In contrast, further down the catchment, streams such as the Mangaharakeke and Tahunātara are not currently safe for swimming due to high levels of *E. coli* (Waikato Regional Council, 2017b).

Relative to the lower reaches of the Waikato River, water quality in the main stem of the upper Waikato catchment is still generally of high quality. Using data from 2007, the Ministry for the Environment ranked 77 sites in NIWA's National River Water Quality Network to assess water quality state. When nutrients nitrate, total nitrogen, dissolved reactive phosphorus and total phosphorus were combined, the Waikato River near Taupō ranked sixth highest nationally compared to other large New Zealand rivers. In contrast, monitoring locations further downstream at Hamilton city ranked 60th out of 77 sites nationally (NIWA, 2010).

Water quality in the assessed tributaries of the Waikato River between Huka Falls and Ohakuri were recently given an overall C grade by the Waikato River Authority Report Card, indicating that only some of the *Vision & Strategy* aspirations for water quality are currently being met. The main stem of the Waikato River for the same section was given an A- grade, indicating that it is close to delivering in full on the *Vision & Strategy* aspirations for water quality in the river (Williamson et al., 2016).



Orākei Kōrako

Further downstream, tributaries entering the river between Ohakuri and Karāpiro were given an overall report card grade of C- for water quality. The main stem of the Waikato River in this section was given a B grade, reflecting moderate water quality conditions and a decline relative to upstream (Williamson et al., 2016).

Visual water clarity also declines as water travels down river. Between 2012 and 2016, clarity in the river was excellent when it left Lake Taupō, decreased significantly between Lake Taupō and Ohāki, then declined gradually in the lower part of the river (Waikato Regional Council, 2017a: Figure 5).

Prior to the development of the hydro dams, water flowed from Lake Taupō to the sea within approximately six days. Now it takes several weeks. The increased retention time of water within hydro lakes contributes to the growth of algal cells (called phytoplankton), especially during the summer. Phytoplankton makes the water appear greener and reduces its visual clarity (Waikato Regional Council, 2017a).

The majority of nutrient and sediment inputs into the upper Waikato River come from diffuse sources (e.g. land run off). Changes in land use in the Upper Waikato, particularly the change from forestry to pastoral farming, have contributed to the downward trend in water quality indicators for this area (Waikato Regional Council, 2014b). The geothermal nature of this catchment (for example, Wai-O-Tapu Stream) is also a natural contributor to the reduction in quality as the river travels from its relatively pristine upper reaches to the lower receiving waters, contributing to heavy metal loading as well as elevated water temperatures in small tributaries (Waikato Regional Council, 2014b).

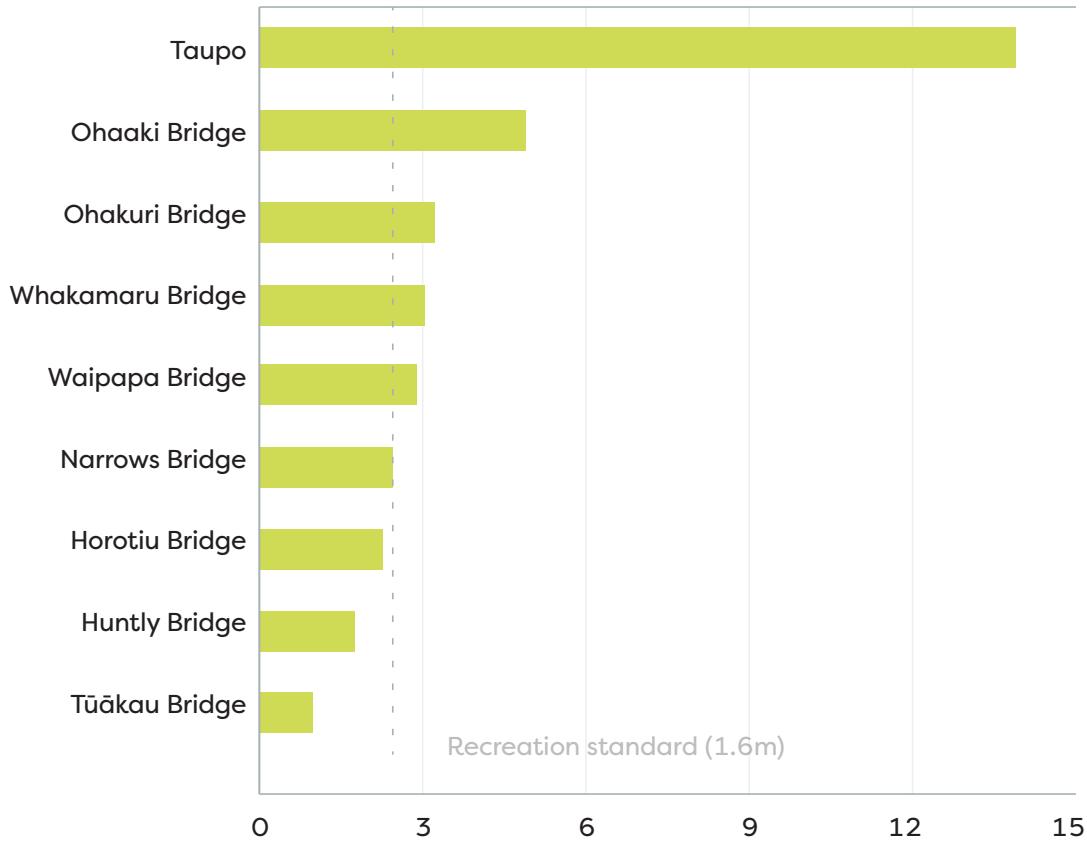


Figure 5. Median visual water clarity in the Waikato River (2012-16)
Note that the section from Taupō to Waipapa Falls within the Upper Waikato section of the Restoration Strategy*, whereas the Narrows to Tūākau sections fall within the Central/Lower Waikato sections. The dotted line represents the minimum regional council standard for contact recreation. Source: Waikato Regional Council, 2017a.*

FISH

Prior to the damming of the upper Waikato River for hydropower generation, the river was rough and turbulent. There were numerous rapids between Huka Falls and Karāpiro which prevented many fish species from accessing the upper parts of the river. Only species with a strong swimming ability could navigate the rapids and occupy the upper reaches. Other species found upstream of the rapids were those that do not have a marine phase (and have no need to navigate past the dams) and those that were transferred by Māori and Pākehā (Te Arawa River Iwi Trust, 2015).

Native fish species presently recorded in the upper Waikato River and tributaries include kōaro, kōkopu, piharau, pōrohe (smelt), common bully, Cran's bully and tuna (eel), although tuna are dependent on catch and transfer past the Karāpiro Dam. Introduced species recorded include brown and rainbow trout, brook char, brown bullhead catfish, rudd, gambusia and guppy (Te Arawa River Iwi Trust, 2015). Rainbow and brown trout were introduced into New Zealand between the mid to late 1800s. Following their introduction to the Waikato River catchment, many native taonga fish in the upper river became scarce. This has been attributed to the predatory nature of the trout (Te Arawa River Iwi Trust, 2015).

Kōura are also found within the Upper Waikato catchment and were once common in tributary streams as well as the main stem of the Waikato River and hydro lakes. Like many of the fish species, they are important traditional kai species for local iwi. The species has experienced a major decline in abundance (Clearwater et al, 2014; Hawes et al., 1999) and although little is known about the reasons for this decline (NIWA, 2010), eel predation as the result of the trap and transfer programme may be an important contributor among other factors (Clearwater et al. 2014; Hawes et al., 1999). This programme involves the transfer of elvers into parts of the river where they may not have been present in such numbers historically (Ngati Tahu-Ngati Whaoa Runanga Trust pers. comm., 2017).

Loss of habitat is a significant threat to native fish populations and can be caused by a range of factors both within waterways and on adjacent land. Such factors include drainage of wetlands, clearance of riparian vegetation, physical modification of waterways, pest plant invasion and land use that impacts water quality (Raukawa Charitable Trust, 2012). The Te Arawa River Iwi Trust Fisheries Plan (2015) also mentions heavy metals, pest fish and fluctuations in river levels as potential contributors to declining numbers of native fish.

Kākahi (fresh water mussel)

BIODIVERSITY

Many of New Zealand's geothermal systems are located within the Upper Waikato (and Taupō) areas and have unique ecosystems and ecological features associated with them (Ngati Tahu-Ngati Whaoa, 2013). Examples include Te Kopia reserve, which comprises 10 per cent of the remaining geothermal vegetation present in the Waikato region, and Lake Rotokawa, which is a site of national significance due to its nationally uncommon habitat types including fumaroles, geothermally heated dry ground, geothermal stream margins and a wetland on the lake shore (Ngati Tahu-Ngati Whaoa Runanga Trust, 2013).

Many geothermal ecosystems and associated surface features have been lost or damaged as a result of track building, stock damage, draining of geothermal springs, wetlands and seeps, plantation forestry operations and extraction of geothermal fluids. A number of the remaining geothermal features are still under threat (Waikato Regional Council, 2014b).

Conversions from forestry to pasture have placed pressure on indigenous fauna and many tributary streams have been converted from shaded channels to open channels and exposed to higher light levels, resulting in warmer water and increased aquatic plant growth (Waikato Regional Council, 2014b). Within the Upper Waikato catchment, large remnants of native vegetation now only exist within the Pureora Forest Park and Maungatautari Ecological Island (Waikato Regional Council, 2014b).

Ngati Tahu-Ngati Whaoa (2013) iwi recall that in the past there was an abundance of native flora and fauna within their rohe, with tī kōuka, mānuka, flax and raupō being very common plants and podocarp forest being widespread. Along the river, wetland plants and animals were common and there were many geothermally active areas where geothermal vegetation could be found.

The Waikato Regional Council's *Upper Waikato Zone Plan* (2014b) identifies several key issues associated with biodiversity loss in the catchment, including:

- reduction, fragmentation and isolation of indigenous ecosystems and habitats
- loss of corridors or connections linking indigenous ecosystems and habitats
- loss or disruption to migratory pathways in water, land or air
- effects of changes to water flows, levels and quality on ecosystems
- an increased threat from animal and plant pests.

The report card for the Waikato River gave the section of river between Huka Falls and Karāpiro an overall grade of C+ for ecological integrity, indicating that with regards to ecological health it delivers on only some of the *Vision & Strategy* aspirations for a healthy river (Williamson et al., 2016). In particular this part of the river scored lower on aspects relating to fish passage, invasive aquatic plants and wetland buffers.

EROSION AND SEDIMENTATION

Much of the Upper Waikato catchment is characterised by young, soft and loose soils made up of Taupō pumice and other volcanic materials that are prone to erosion. The catchment contains many short steep catchments that are prone to heavy rainfall events which exacerbate erosion and soil loss and this has led to widespread sedimentation in upper catchment (Waikato Regional Council, 2014b).

Gully erosion has historically been the biggest erosion issue in the Upper Waikato catchment, with land conversion from native forestry to pasture causing significant increases in sediment loads (Hicks and Hill, 2010). Large soil conservation schemes established in the 1970s and 1980s addressed much of the issue at that time. However, new conversion from exotic forestry to pasture in the last decade, and the associated recontouring of this land, has increased the risk of new gullies developing following high rainfall events (Palmer et al., 2015). In areas of extensive conversion, significant erosion processes such as rilling are being observed. Steep slopes within these areas are especially vulnerable to further erosion under pasture cover (Palmer et al., 2015) and major soil erosion issues are now emerging.

The Waikato Regional Council's *Upper Waikato Zone Plan* (2014b) identifies the following as key erosion and sedimentation issues for the catchment:

- stock access to waterways
- management of steep land
- conversion of pine to pasture, particularly on LUC class 6-8 soils
- loss of small seeps and wet areas adjacent to streams
- declining effectiveness of historic soil conservation works on private land.

RECREATION

Access to the Waikato River within the section between Huka Falls and Ohakuri is difficult due to the incised and fast flowing nature of the river. However, between Ohakuri and Karāpiro there are extensive bike trails, reserves, beaches and boat ramps. The hydro lakes are popular for fishing, boating and other watersports and Lake Karāpiro is a world-renowned rowing venue (Williamson et al., 2016), although aquatic weeds such as hornwort require ongoing management (Hofstra and de Winton, 2016).

Overuse at some of these spots is becoming an issue, especially during the warmer months, and there is potential to provide further recreational opportunities and facilities to meet the growing demand (Williamson et al., 2016).

Within the tributaries of the upper catchment there are some areas that are popular for fishing and picnicking. However, access to these areas is thought to be declining due to access restrictions associated with land use change, presence of vegetation growth in riparian areas and health and safety issues (Williamson et al., 2016).

GOALS

The following goals were developed by iwi, stakeholders and community representatives for the Upper Waikato catchment:

	1	2	3	4
WATER QUALITY	Water quality across the Upper Waikato has improved, and areas where fresh water allows the taking of food, swimming and recreation are more widespread.	Significant 'hotspots' (e.g. subcatchments or tributaries) have been identified, and targeted clean-up activity progressed.	Fresh water quality enables habitats for indigenous plants and animals to thrive.	Constructed wetlands are created to reduce subcatchment sediment and nitrogen discharges.
FISH	The fisheries of the Upper Waikato and their habitats are valued, enhanced and protected to enable long term sustainable use.	Collaborative education and research opportunities increase knowledge and understanding of fisheries in the Upper Waikato.		
EROSION AND SEDIMENTATION	Erosion from land and sedimentation to water is reduced, with an emphasis on full retirement and revegetation of steep (LUC class 7, 8) land and gully heads.	Education, farm planning and capacity building programmes assist communities in reducing erosion in the Upper Waikato.		
SUSTAINABLE LAND MANAGEMENT	Land and water management is integrated and undertaken at a subcatchment level.	Education and innovation underpins best practice riparian and wetland management.		
BIODIVERSITY	Ecological networks include the full range of freshwater and terrestrial ecosystem types found throughout the Upper Waikato catchment, are in a healthy functioning state and support representative native flora and fauna.	An active and engaged community is involved in biodiversity protection, enhancement and restoration work, including the incorporation of mātauranga Māori practices.	Existing wetlands are protected and enhanced and new wetland habitat is created in appropriate locations.	
SOCIAL AND RECREATIONAL	Rivers and waterways are widely used by the community and are a place to relax, play, exercise, recreate and gather kai.	Aquatic and riparian pest species are controlled/ eradicated.	River restoration activities enhance the economic wellbeing of the Upper Waikato.	

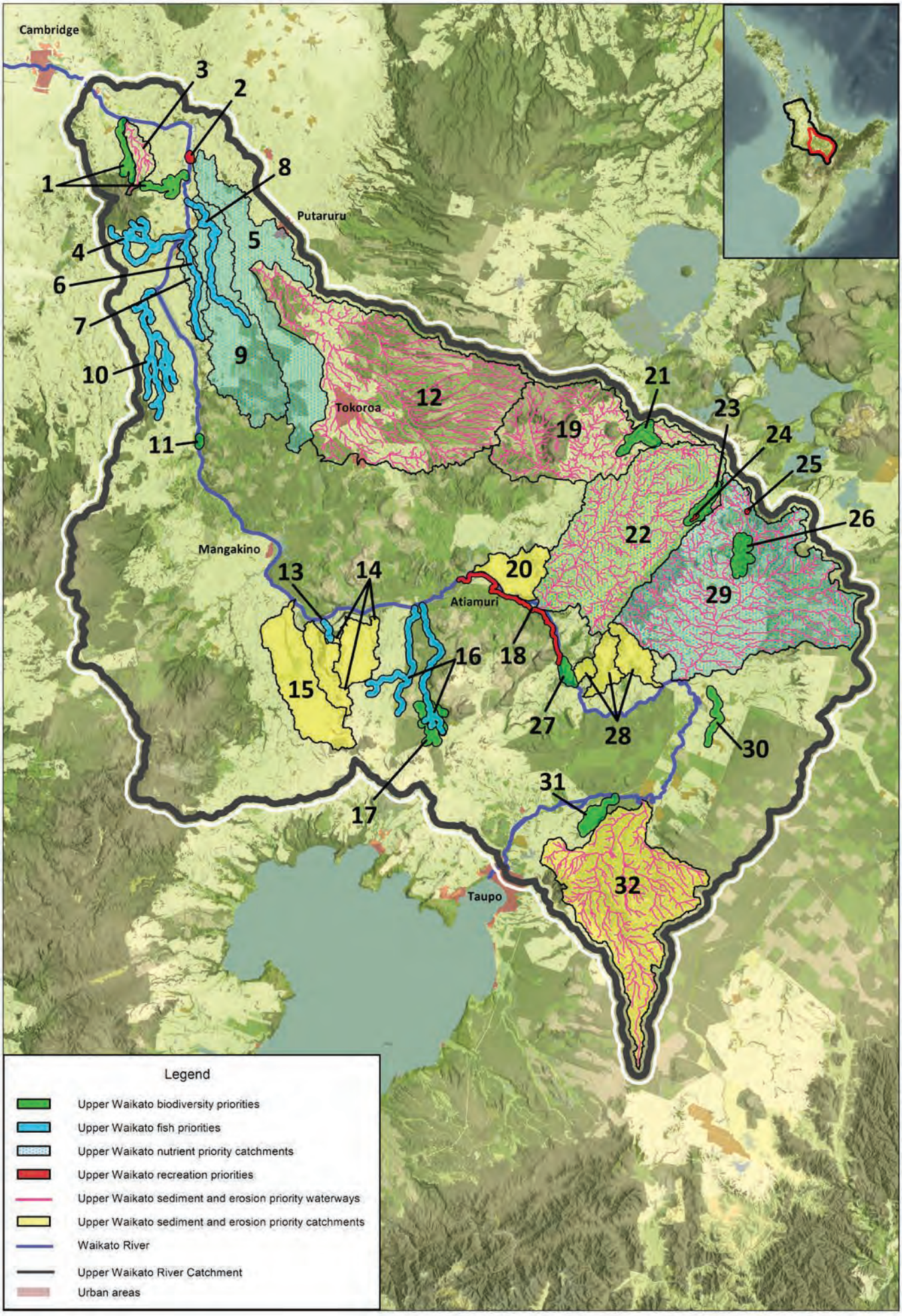


Figure 6. Location of priority projects in the Upper Waikato catchment

PRIORITY PROJECTS

Thirty-two projects in the Upper Waikato catchment scored a favourable cost-benefit score and have been included in the *Restoration Strategy*. These are illustrated in Figure 6. Projects are listed in order from lower to upper catchment and their priority ranking is provided in the summary tables that follow. Appendix 6 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018) contains more detailed information on each project, including recommended management actions and estimated costs.

Total project value is estimated at almost $53.5 million. Funding priorities include 990km of riparian/wetland fencing, 270ha of riparian revegetation, stabilising and fencing (where required) up to 1950ha of LUC class 6e land and 2100ha of LUC class 7 land, four new walkways/public access areas and a tuna transfer programme.

SUMMARY TABLES OF PRIORITY PROJECTS

MEDIUM PRIORITY

RIPARIAN MANAGEMENT ALONG SELECTED TRIBUTARIES FLOWING FROM MAUNGATAUTARI INTO LAKE KARĀPIRO — UW 1

Location: Two stream networks (totalling 23km) including Wairakau Stream and an unnamed tributary to Lake Karāpiro directly upstream of Finlay Park camp.

Summary of priority works

- Riparian fencing (37km)
- Possum control
- Revegetation (18.5ha)
- Project managvement/staffing/incidentals (25%)

Total estimated cost: $1,252,265

HIGH PRIORITY

DEVELOPMENT OF ANIWANIWA RESERVE (LAKE KARĀPIRO) — UW 2

Location: Waikato River at Lake Karāpiro.

Summary of priority works

- Cultural history assessment
- Install vault toilet
- Install park furniture
- Construct car park and road access
- Earthworks and development of camping area
- Boat ramp development
- Native planting and landscaping
- Creation and installation of interpretation panels/plaza area
- Project management/staffing/incidentals (20%)

Total estimated cost: $481,200

HIGH PRIORITY

WAIONE STREAM EROSION PROTECTION AND RIPARIAN ENHANCEMENT — UW 3

Location: Waione Stream – this stream rises on the northern flank of Maungatautari and flows north-northeast to Lake Karāpiro.

Summary of priority works

- Riparian fencing (10km)
- Native riparian planting (3ha)
- Riparian willow/poplar pole planting (260 poles)
- Project management/staffing/incidentals (25%)

Total estimated cost: $235,933

HIGH PRIORITY

FISH HABITAT REHABILITATION WITHIN WAITETI STREAM CATCHMENT, ARAPUNI — UW 4

Location: Waiteti Stream catchment – a 27km long network consisting of streams flowing from headwaters on Maungatautari mountain to the Waikato River immediately downstream of Arapuni Dam. The network of streams include Te Umutawa Stream and Otautora Stream, which enter Waiteti Stream and flow into the Waikato River.

Summary of priority works

- Fencing (26km)
- Planting (13ha)
- Project management/staffing/incidentals (25%)

Total estimated cost: $902,720

A stream flowing from Maungatautari that would benefit from fencing and planting.

HIGH PRIORITY

WATER QUALITY IMPROVEMENT IN THE LOWER POKAIWHENUA CATCHMENT — UW 5

Location: Lower Pokaiwhenua catchment (from Arapuni Road downstream) – a 13,558ha area of moderately steep land draining westward from the upper catchment and Mamaku Plateau to enter the Waikato River at Lake Arapuni.

Summary of priority works

- Fencing wetlands and ephemeral streams (58km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $580,000

An example of a wetland that would benefit from fencing to exclude cattle.

MEDIUM PRIORITY

FISH HABITAT REHABILITATION ON HUIHUITAHA STREAM — UW 6

Location: Huihuitaha Stream – a 15km stream flowing from headwaters near Waotu to enter the Waikato River immediately downstream of Arapuni Dam.

Summary of priority works

- Fencing (24km)
- Native planting (12ha)
- Project management/staffing/incidentals (25%)

Total estimated cost: $833,280

MEDIUM PRIORITY

WATER QUALITY IMPROVEMENT IN THE HUIHUITAHA CATCHMENT — UW 7

Location: Huihuitaha subcatchment – a 2007ha catchment located near Arapuni, consisting of a 31km stream network. The main Huihuitaha Stream enters the Waikato River below Lake Arapuni.

Summary of priority works

- Fencing wetlands and ephemeral streams (5km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $50,000

MEDIUM PRIORITY

FISH HABITAT REHABILITATION ON LITTLE WAIPĀ STREAM — UW 8

Location: Little Waipā Stream – a 23km stream flowing from headwaters near Waotu to enter the Waikato River at Lake Arapuni, approximately 5km downstream of Arapuni Dam on the east side of the river.

Summary of priority works

- Fencing (11.5km)
- Planting (5.75ha)
- Project management/staffing/incidentals (20%)

Total estimated cost: $383,309

HIGH PRIORITY

WATER QUALITY IMPROVEMENT IN THE LITTLE WAIPĀ CATCHMENT — UW 9

Location: Little Waipā catchment – a 12,152ha catchment that lies adjacent and to the west of the Huihuitaha. The main stream enters the Waikato River at Lake Karāpiro.

Summary of priority works

- Fencing wetlands and ephemeral streams (88km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $880,000

MEDIUM PRIORITY

LONGFIN EEL HABITAT REHABILITATION IN MANGARE STREAM CATCHMENT — UW 10

Location: Mangare Stream catchment – located on the western side of the Waikato River near Lake Arapuni. The Mangare Stream is 18km long, flowing from its headwaters near Arohena north to the downstream end of Lake Arapuni.

Summary of priority works

- Riparian fencing (30km)
- Native planting (20ha)
- Eel trap and transfer programme
- Project management/staffing/incidentals (30%)

Total estimated cost: $2,046,902

Longfin eel

VERY HIGH PRIORITY

BIODIVERSITY ENHANCEMENT OF JACK HENRY WETLAND — UW 11

Location: Jack Henry Wetland, located next to the Waikato River at the upper end of Lake Arapuni.

Summary of priority works

- Management plan development
- Weed control
- Project management/staffing/incidentals (15%)

Total estimated cost: $63,020

Streambank erosion along the Pokaiwhenua Stream.

VERY HIGH PRIORITY

UPPER POKAIWHENUA STREAMBANK EROSION PROTECTION AND RIPARIAN ENHANCEMENT — UW 12

Location: The main channel and tributaries of the upper Pokaiwhenua Stream (generally between Tokoroa and Putaruru).

Summary of priority works

- Riparian fencing (127km)
- Riparian willow/poplar pole planting (3187 poles)
- Native riparian planting (32ha)
- Project management/staffing/incidentals (25%)

Total estimated cost: $2,827,852

HIGH PRIORITY

KŌURA HABITAT REHABILITATION ON UANUI STREAM — UW 13

Location: Uanui Stream – a 2.6km long stream flowing into the western side of Lake Whakamaru.

Summary of priority works

- Site evaluation and planning
- Riparian management (520m fencing and 0.3ha native planting)
- In-stream works (including obtaining resource consent)
- Liaison with landowners and community
- Project management/staffing/incidentals (20%)

Total estimated cost: $43,818

Koura

VERY HIGH PRIORITY

HILL COUNTRY EROSION PROTECTION AND REMEDIATION IN THE MARAEMĀNUKA, OKAMA AND UANUI CATCHMENTS

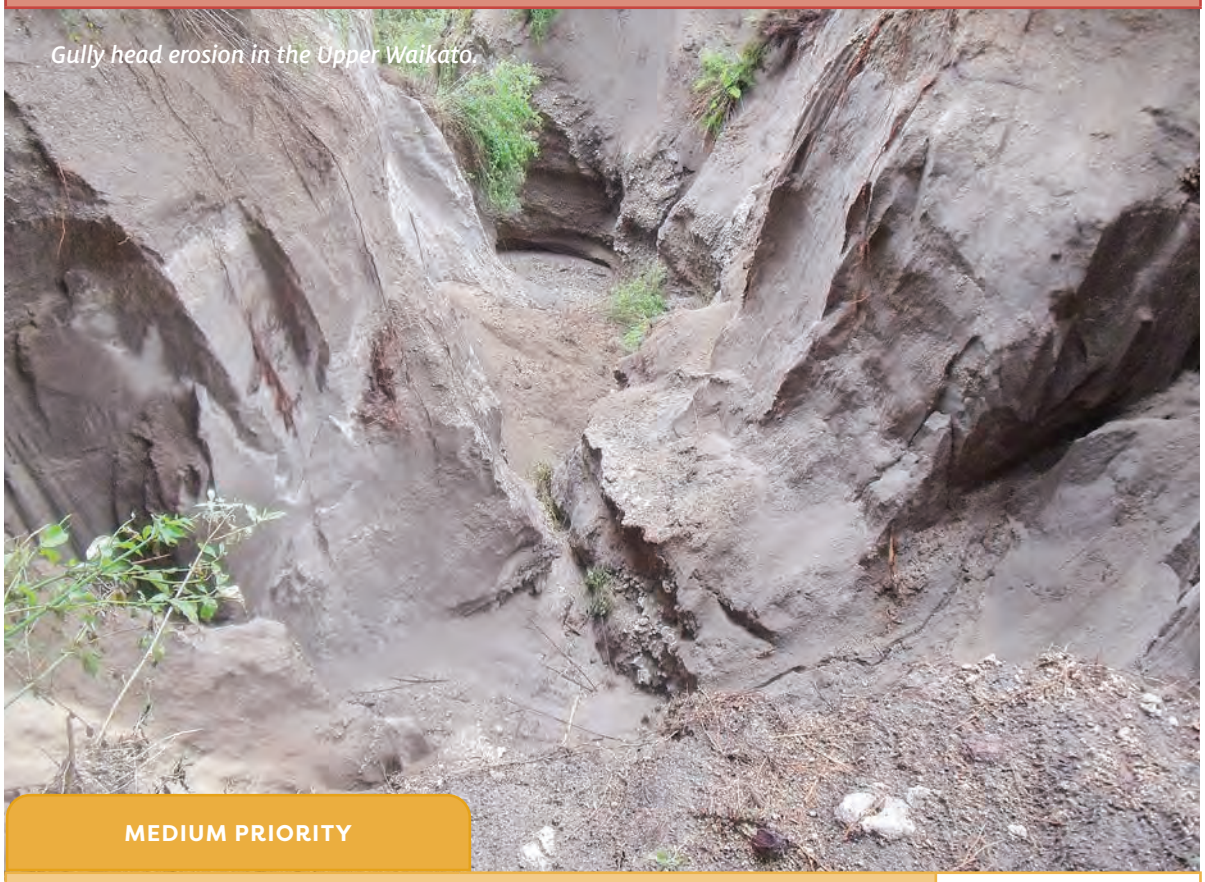
UW 14

Location: Maraemānuka, Okama and Uanui catchments – on the western side of the Waikato River near Lake Whakamaru.

Summary of priority works

- 11 erosion control structures on LUC 6e land
- 268ha LUC 6e land managed with plantation species
- 184ha LUC 7 land managed with plantation species
- Fencing retired LUC 8 land (22km)
- Erosion control outside LUC 6e, 7 and 8 land
- Fencing existing indigenous forest remnants (5.6km)
- Project management/staffing/incidentals (30%)

Total estimated cost: $2,691,000



Gully head erosion in the Upper Waikato.

MEDIUM PRIORITY

MANGAKOWHIRIWHIRI CATCHMENT HILL COUNTRY EROSION PROTECTION AND REMEDIATION

UW 15

Location: Mangakowhiriwhiri catchment – a 6934ha catchment draining into the Waikato River near the small town of Whakamaru.

Summary of priority works

- 16 erosion control structures on LUC 6e land
- 412ha LUC 6e land managed with plantation species
- 96ha LUC 7 land managed with plantation species
- Fencing retired LUC 8 land (24km)
- Erosion control outside LUC 6e, 7 and 8 land (32ha)
- Fencing existing indigenous vegetation (4km)
- Project management/staffing/incidentals (30%)

Total estimated cost: $3,081,000

VERY HIGH PRIORITY

KŌURA HABITAT REHABILITATION IN WAIPAPA, MOKAUTEURE AND ONGARAHU STREAMS

UW 16

Location: 45km of waterways consisting of Waipapa Stream below Tirohanga Road, and Mokauteure and Ongarahu streams below Forest Road. Mokauteure Stream is a tributary to Waipapa Stream which has headwaters east of Mokai and flows into the Waikato River immediately downstream of Tram Road Bridge (downstream of Ātiamuri Dam). Ongarahu Stream is in a neighbouring catchment to the east and flows into the Waikato River upstream of Waipapa Stream.

Summary of priority works

- Site evaluation and planning
- Fencing (4.5km)
- Planting and weed control (2.25ha)
- Liaison with forest managers
- In-stream works (including resource consent)
- Project management/staffing/incidentals (20%)

Total estimated cost: $196,670

HIGH PRIORITY

BIODIVERSITY ENHANCEMENT AT FOREST ROAD WETLAND

UW 17

Location: Forest Road Wetland is a 196ha wetland complex located approximately 6.5km east of Mokai.

Summary of priority works

- Management plan development
- Fencing upgrade and new fencing (53km)
- Planting (8ha)
- Ground-based weed control
- Possum control
- Aerial willow control
- Project management/staffing/incidentals (20%)

Total estimated cost: $1,522,099

Indigenous vegetation at Forest Road Wetland.

HIGH PRIORITY

CYCLEWAY/WALKWAY ALONG THE WAIKATO RIVER BETWEEN ĀTIAMURI AND ORĀKEI KŌRAKO

UW 18

Location: A 20km length of the Waikato River between Ātiamuri and Orākei Kōrako.

Summary of priority works

- Project planning including scoping the trail route, obtaining agreement from landowners, undertaking cultural impact assessment and securing project funding
- Legal requirements and procurement
- Walkway construction including signage and riparian planting
- Project management/staffing/incidentals (30%)
- Formalising land access agreements, preparing and lodging resource consent applications, tender processes.

Total estimated cost: $2,591,550

HIGH PRIORITY

UPPER TAHUNĀTARA STREAM EROSION PROTECTION AND RIPARIAN ENHANCEMENT

UW 19

Location: The upper Tahunātara and Pokaitu Stream catchment located northeast of Ātiamuri and containing a 569km stream network.

Summary of priority works

- Fencing (57km)
- Native planting (14.25ha)
- Pole planting (1425 poles)
- Project management/staffing/incidentals (25%)

Total estimated cost: $1,263,832

MEDIUM PRIORITY

ĀTIAMURI CATCHMENT EROSION PROTECTION AND REMEDIATION

UW 20

Location: Ātiamuri catchment – a 1709ha catchment located on the northeastern side of the Waikato River upstream of Ātiamuri township.

Summary of priority works

- 4 erosion control structures on LUC 6e land
- 99ha LUC 6e managed with plantation species
- 122ha LUC 7 land managed with plantation species
- Erosion control outside LUC 6e, 7 and 8 land (7ha)
- Fencing existing indigenous forest remnants (1km)
- Project management/staffing/incidentals (25%)

Total estimated cost: $840,625

Kapenga Wetland.

HIGH PRIORITY

BIODIVERSITY ENHANCEMENT OF KAPENGA WETLAND AND NEARBY HAMILLS WETLAND

UW 21

Location: Kapenga and Hamills wetlands are located approximately 9km south of Rotorua near Kapenga.

Summary of priority works

- Fencing (1.4km)
- Willow control
- Native riparian planting (22ha)
- Infill planting (4.1ha)
- Weed control
- Project management/staffing/incidentals (15%)

Total estimated cost: $1,493,053

HIGH PRIORITY

WHIRINAKI INTEGRATED CATCHMENT PROGRAMME

UW 22

Location: The Whirinaki catchment – a 23,403ha catchment flowing into the Whirinaki Arm and then into Lake Ohakuri.

Summary of priority works

- 33 erosion control structures on LUC 6e land
- 834ha LUC 6e land managed with plantation species
- 797ha LUC 7 land managed with plantation species
- Fencing retired LUC 8 land (76km)
- Erosion control outside LUC 6e, 7 and 8 land (107ha)
- Fencing existing indigenous vegetation (75km)
- 25 sediment traps
- Fencing wetlands and ephemeral streams (97km)
- Riparian fencing (124km)
- Riparian willow/poplar pole planting (3093 poles)
- Native riparian planting (31ha)
- Project management/staffing/incidentals (30%)

Total estimated cost: $14,050,288

A wetland suitable for fencing in the Whirinaki catchment.

MEDIUM PRIORITY

BIODIVERSITY ENHANCEMENT IN THE UPPER OTAMAKOKORE STREAM CATCHMENT (ABOVE CORBETT ROAD IN THE WAIKITE VALLEY)

UW 23

Location: The project site is located in the Otamakokore Stream catchment upstream of Waikite Valley Thermal Pools.

Summary of priority works

- Fencing (5km)
- Revegetation (45ha)
- Wilding conifer control
- General weed control
- Project management/staffing/incidentals (20%)

Total estimated cost: $2,371,837

MEDIUM PRIORITY

WALKWAY AROUND WAIKITE GEOTHERMAL WETLAND

UW 24

Location: The project site is a 13ha wetland near Waikite Valley Thermal Pools (south of Rotorua in the upper reaches of the Otamakokore catchment).

Summary of priority works

- Walkway design and resource consenting
- Construction of walkway, boardwalk and wooden bridges
- Development and installation of interpretation signage
- Development of picnic areas
- Re-fencing (20m)
- Project management/staffing/incidentals (20%)

Total estimated cost: $335,520

MEDIUM PRIORITY

LAKE NGĀHEWA WALKWAY

UW 25

Location: Lake Ngāhewa is a volcanic lake located to the north of the Wai-O-Tapu thermal area.

Summary of priority works

- Walkway design and resource consenting
- Construction of walkway and boardwalk
- Development and installation of interpretation signage
- Development of seating areas
- Project management/staffing/incidentals (20%)

Total estimated cost: $531,600

VERY HIGH PRIORITY

RESTORATION OF WAI-O-TAPU SOUTH GEOTHERMAL AREA — UW 26

Location: The Wai-O-Tapu South geothermal area is located along SH5 between Rotorua and Taupo.

Summary of priority works

- Hand pulling of wilding pine seedlings
- Wilding pine control – maintenance
- Felling wilding pine
- General plant pest control
- Project management/staffing/incidentals (15%)

Total estimated cost: $198,375

VERY HIGH PRIORITY

BIODIVERSITY ENHANCEMENT AT ORĀKEI KŌRAKO AND RED HILLS — UW 27

Location: Orākei Kōrako and Red Hills is a 162ha area consisting of geothermal ecosystems and native vegetation alongside the bank of the Waikato River.

Summary of priority works

- Wilding conifer control
- General weed control
- Fencing (1.8km)
- Surveillance
- Project management/staffing/incidentals (15%)

Total estimated cost: $117,990

HIGH PRIORITY

HILL COUNTRY EROSION PROTECTION AND REMEDIATION IN THE WHAKAPANAKE, WAITAKAHI AND WHAREKAKA CATCHMENTS — UW 28

Location: The Whakapanake, Waitakahi and Wharekaka catchments have a combined area of 4014ha and are located at the southern end of the Paeroa Range.

Summary of priority works

- 5 erosion control structures on LUC 6e land
- 134ha LUC 6e land managed with plantation species
- 336ha LUC 7 land managed with plantation species
- Fencing retired LUC 8 land (10km)
- Management outside LUC 6e, 7 and 8 land (5ha)
- Fencing existing indigenous vegetation (3km)
- Project management/staffing/incidentals (30%)

Total estimated cost: $2,080,000

VERY HIGH PRIORITY

WATER QUALITY IMPROVEMENT AND RIPARIAN PROTECTION AND ENHANCEMENT IN THE WAI-O-TAPU CATCHMENT

UW 29

Location: The Wai-O-Tapu catchment is 33,145ha and has a 537km stream network. It is located in the vicinity of Reporoa.

Summary of priority works

- Riparian fencing (120km)
- Riparian willow/poplar pole planting (3010 poles)
- Native riparian planting (30ha)
- Wetland fencing (135km)
- Project management/staffing/incidentals (30%)

Total estimated cost: $4,171,310

VERY HIGH PRIORITY

BIODIVERSITY ENHANCEMENT ON THE LOWER REACH OF RUATAWHIRI STREAM AND PART OF TOREPATUTAHI STREAM

UW 30

Location: A 8.5km length of waterway encompassing the lower end of Ruatawhiri Stream (2km upstream of Allen Road) downstream to the confluence with Torepatutahi Stream and part of Torepatutahi Stream (a 1.3km length downstream of the Ruatawhiri tributary).

Summary of priority works

- Management plan development
- Riparian fencing (5.1km)
- Riparian planting (4.2ha)
- Willow control (18.6ha)
- Weed control
- Project management/staffing/incidentals (25%)

Total estimated cost: $395,373

Native sedges along Toretaputahi Stream with willow trees in behind.

VERY HIGH PRIORITY

BIODIVERSITY ENHANCEMENT AT LAKE ROTOKAWA AND LAKE ROTOKAWA NORTH

UW 31

Location: A geothermal area located approximately 7km east of Wairakei.

Summary of priority works

- Fencing (4km)
- Wilding pine control
- Weed control
- Project management/staffing/incidentals (15%)

Total estimated cost: $357,420

VERY HIGH PRIORITY

PUETO CATCHMENT HILL COUNTRY AND STREAMBANK EROSION PROTECTION AND REMEDIATION

UW 32

Location: Pueto catchment – a 19,900ha catchment lying east of Lake Taupō with an estimated 128km of streams flowing through pasture.

Sumary of priority works

- 7 erosion control structures on LUC 6e land
- 181ha LUC 6e land managed with plantation species
- 596ha LUC 7 land managed with plantation species
- Erosion control outside LUC 6e, 7 and 8 land (55ha)
- Fencing existing indigenous vegetation (2km)
- Riparian fencing (64km)
- Riparian willow pole planting (1603 poles)
- Native riparian planting (16ha)
- Project management/staffing/incidentals (30%)

Total estimated cost: $4,560,106

Pueto catchment run off.

WAIPĀ

CURRENT STATE AND PRESSURES

INTRODUCTION

The Waipā catchment covers 306,569ha and is dominated by the Waipā River channel and associated tributaries. The Waipā River is the single largest tributary of the Waikato River. It begins at Pekepeke Spring in Maraeroa at the ancient home of Taporapora at the foot of Rangitoto mountain. It flows past many significant areas, whare and pā of chiefs, below the mountain of Pirongia o Kahu towards Ngaati Mahanga near Whatawhata, and finally converging with the Waikato at Ngāruawāhia, the footstool of the Kīngitanga, 115km from its headwaters in Pekepeke (Collier et al., 2010).

The Waipā catchment contains 4825km of mapped stream and river channels. Almost three-quarters of this stream length consists of small first and second order channels, draining primarily pastoral land dominated by dairy, beef and sheep farming (Waikato Regional Council, 2014a).

Since the arrival of Europeans, the catchment has been transformed from a landscape dominated by native forest, scrub and tussock with significant areas of wetland in the north to a landscape where low-lying valleys are now dominated by pasture for agricultural use (McGlone, 1989, as cited in NIWA, 2014). Approximately 78 per cent of the catchment area is in pasture, 21 per cent in native vegetation, scrub and other land uses, and 1 per cent is in production forestry. Almost all of the significant wetland areas have been drained for agricultural purposes, with only pockets of wetlands and shallow peat lakes remaining (Waikato Regional Council, 2014a).

The lower reaches of the main tributaries to the Waipā River are characterised by relatively low gradient, sinuous and sluggish channels that have been significantly modified in some locations through historic works. Those works typically included clearing, enlarging and straightening to improve channel efficiency and reduce flooding and damage to the pastoral land (Waikato Regional Council, 2014a).

Upper Waipā River

CULTURAL IMPORTANCE

Iwi with affiliations to the Waipā River are Waikato-Tainui, Maniapoto and Raukawa. Iwi have overlapping interests along the Waipā River; however, it is generally accepted that Waikato-Tainui interests extend from Ngāruawāhia to the Pūniu River and Maniapoto's to the upper (southern) reaches of the catchment. Raukawa interests include the catchment area to the eastern side of Te Awamutu to Waipapa and down to Maraeroa.

Waipā River iwi have a strong relationship with their river and regard the river as their awa tūpuna (ancestral river). It is seen as an indivisible entity and any harm to the mauri (life force) of the river is harm to the mauri of the iwi. Anything which damages the river also affects the spiritual wellbeing of the people.

Mana whenua have identified a number of concerns around declining water quality in the Waipā, including effects on populations of taonga species in the catchment, reduced opportunities to use land and water, impact on marae drinking water supplies and the use of water resources that are highly valued because of particular properties such as healing or rongoā. The decline of native flora and fauna is also a concern for iwi (NIWA, 2014).

Many significant and historic sites have been damaged, destroyed or are no longer accessible, including wāhi tapu, urupā, historic access points and river crossings and kāinga (home or dwelling, gardens, pā and named river features).

Tū kaha, tū māia, tū manawanui te maunga Kakepuku-te-aroaro-o-Kahu.Te awa o Pūniu e māpuna nei.

Ko te mauri o oku whare Te Aroha o Ihoa me Te Maru o Ihoa, wairua tapū, wairua noa.

Ko Mangatoatoa tuarua te marae.

Ko Paretekawa nō Ngāti Maniapoto.

Ko Tainui te waka e hoea rā, Ko Hoturoa te tangata

Ko Sam Ingley ahau.

Tihei mauri awa!

WATER QUALITY

Water quality in the tributaries of the Waipā River was recently given an overall C- grade in the Waikato River Authority Report Card, indicating that only some of the *Vision & Strategy* aspirations for water quality are being met. The main stem of the Waipā River was given a D grade, indicating that it does not deliver on the *Vision & Strategy* aspirations for water quality in the river. The report card scores reflect that water quality and clarity are unsafe for swimming in the main stem and many tributaries (Williamson et al., 2016).

In general, water quality in the Waipā River declines from the upper reaches to the lower reaches. In particular, the Waipā River has high sediment inputs from streambank and hill country erosion (Waikato Regional Council, 2014a), which significantly impacts water clarity. The Ministry for the Environment, using data from 2007, ranked water quality state across 77 sites in NIWA's National River Water Quality Network. When nutrients nitrate, total nitrogen, dissolved reactive phosphorus and total phosphorus were combined, the Waipā River ranked 56 at Otewa, and 74 at Whatawhata (NIWA, 2010).

Long term monitoring by Waikato Regional Council shows rising trends in total nitrogen in the Waipā River and tributaries at 10 of the 16 monitoring stations over the period from 1993 to 2012. The river also has moderate but reasonably stable levels of phosphorus at some sites, although P is increasing at the most downstream monitoring sites (Vant, 2013).

Changing land use and intensification from hill country farming to dairy farming is increasing nutrient loads from the catchment, particularly nitrogen (Waikato Regional Council, 2014a). Between 2003 and 2012, run off and leaching from pastoral land in the catchment accounted for about 75 per cent of the mass flows of nitrogen and 59 per cent of the mass loads of phosphorus to the river. There are three discharges of treated sewage wastewater and one of industrial wastewater in the catchment and together these contribute about 2 per cent of the total nitrogen and 7 per cent of the phosphorus load to the river (Vant, 2014). The remaining loads derive mostly from natural sources (Vant, 2014).

Faecal contamination (measured by *E. coli*) is high but stable in the catchment. The predominant source of this is from diffuse losses from agricultural land (Waikato Regional Council, 2014a).

Aquatic macroinvertebrate monitoring indicates that the habitat quality of streams in the Waipā catchment is below average when compared to other streams in the Waikato region. It ranges from poor to excellent across the catchment, depending in part upon the upstream and adjacent land use (Waikato Regional Council, 2014a).

FISH

The Waipā River and tributaries are home to many different species of fish, including at least 19 native species and at least 10 species of introduced fish. Many of these species, along with other aquatic species such as kōura and kāeo, are important as a traditional source of kai for river iwi. Tuna was particularly significant for iwi and once plentiful along the rivers and streams of Maniapoto (e.g. Pūniu and Waipā river catchments). The Maniapoto Fisheries Plan (2014) recounts tuna being so highly regarded that intertribal wars were fought over access to fishing grounds.

Many of the larger native fish species found in the Waipā catchment, including shortjaw, banded and giant kōkopu, are found in medium to small-sized tributary streams flowing from Mount Pirongia. These streams provide cool, clear water and a complex natural in-stream habitat, which these species prefer (David and Speirs, 2010).

Many native fish species (and other aquatic species) have been declining in abundance over the last few decades. This includes the Waikato and Waipā River tuna fishery, which is thought to have declined by about 75 per cent in this time. The causes of decline include forest clearance, sedimentation, predation by pest fish, loss of wetland and lowland habitat and poor fishery management. However, the most significant reason for decline in abundance is thought to be the degradation of habitat (NIWA, 2010).

Many of New Zealand's native freshwater species are diadromous and must spend part of their life cycle in the sea. Either they go to sea to spawn (e.g. tuna) or larvae go there to grow and develop (e.g. whitebait, smelt, bullies). Therefore, barriers such as culverts and dams also have an impact on native fish abundance and diversity. The two known barriers to fish passage on the Waipā River main stem are the water supply weir at Ōtorohanga and Owen Falls, a further 36km upstream (West et al., 1993, cited in Collier et al., 2010).

EROSION

Historical accounts of the Waipā River describe the water as dark brown in colour and peat-stained (Hochstetter, 1867). However, large reaches of the main stem of the mid-lower river were still regularly used for swimming until 20-30 years ago. Even today, some of the Waipā River discolouration is natural. However, it is also exacerbated by human activity such as vegetation clearance in erosion-prone areas, increasing flood flow and streambank and riverbank erosion (NIWA, 2010). From 2002 to 2008, an estimated 1000ha of the catchment land was converted from plantation to pasture, almost 60 per cent on erosion-prone LUC class 6e and 7 land. From 2001 to 2008, intensification occurred on 31 per cent of pastoral land in the catchment, 32 per cent of which was on LUC 6e and 7 land (Waikato Regional Council, 2014a).

Sixty-seven per cent of the sediment load in the lower Waikato River comes from the Waipā River catchment and studies show that the majority of this comes from the upper Waipā (Hicks and Hill, 2010).

The soft mudstone geology of the catchment makes it more erosion prone, with landslides and streambank erosion the biggest issues in generating sediment, especially in pastoral landscapes (Waikato Regional Council, 2014a). Investigations undertaken by Palmer et al. (2015) suggested that bank erosion was likely to be the dominant source of sediment in the most heavily sediment-laden streams.

A major contributor of sediment in the upper Waipā catchment is the Tunawaea landslide. In 1991 this caused an estimated 500,000 cubic metres of material to dam the Tunawaea Stream for about a year. It eventually overtopped in a flood event and failed, and the material washed downstream, raising the riverbed. This material has continued to move down the Waipā River since this time. This has caused ongoing sediment issues, including adding at least 200,000 cubic metres to the river system. Waikato Regional Council has implemented a specific project to stabilise the material from the landslide in the upper Waipā Gorge and to provide a regular, stable channel along the valley floor. The aim is to prevent erosion of the terraces and help the river move its bedload through the system effectively and with a minimum of damage to the channel (Waikato Regional Council, 2014a).

The Waipā Catchment Plan (Waikato Regional Council, 2014a) lists the following implications of erosion and sedimentation in the Waipā catchment:

- loss of natural soil resource that takes hundreds of years to create, and associated loss of productivity and land use options
- impacts on water quality
- impacts on the habitats of taonga species in the catchment
- potential negative effects on indigenous biodiversity, river recreation and flood risks, as well as future pastoral productivity and community prosperity
- deposition of sediment (aggradation) in the main channel, leading to increased erosion and flood hazards.

Example of mass earth movement in the upper Waipā catchment.

BIODIVERSITY

The Waipā River once flowed through a catchment containing a diverse range of indigenous ecosystems, including streams, rivers, lakes, wetlands, karst, forest and shrublands. These ecosystems provided critical habitats for indigenous fauna and flora. They also provided a range of fundamental ecological services including reducing erosion and downstream sedimentation, and nutrient storage and recycling (Waikato Regional Council, 2014a).

Within the Waipā catchment, clearance of indigenous forest and draining of peat bogs, wetlands and lakes has been very extensive and the condition of rivers, streams and lakes is declining (Waikato Regional Council, 2014a). *The Waipā Catchment Plan* identifies a range of threats to the remaining indigenous ecosystems, including:

- grazing by livestock
- ongoing vegetation removal
- habitat fragmentation
- increased edge effect
- altered hydrology
- nutrient enrichment of low nutrient ecosystems
- plant pests
- predation and browsing by pest animals (Waikato Regional Council, 2014a).

Despite this, the headwaters of many tributaries of the Waipā contain high quality water and, correspondingly, in-stream biodiversity values are highest in these areas. In the western ranges (e.g. Pirongia) and the Rangitoto Range in the southeast, high water quality and stream health conditions are associated strongly with locations of intact indigenous forests (Waikato Regional Council, 2014a).

On the west of the Waipā catchment is one of New Zealand's major karst areas, containing caves, blind valleys, disappearing streams and sculptured rock outcrops. This area has unique geomorphological and ecological features and processes (Department of Conservation, 2014). The type of vegetation and flora present is influenced by the lime-rich, alkaline soils formed from the weathering of limestone. This, combined with the diverse range of parent materials, has led to a wide diversity of plant species, possibly unmatched anywhere else in the Waikato region (Clarkson, 2002). Many plant species that grow in this area, such as the fern *Asplenium cimmeriorum* and Awaroa hebe (*Hebe scopulorum*) are only found in karst environments (Department of Conservation, 2014). Threats to karst areas include damage to caves, changes to surface vegetation, farming and forestry, sedimentation, flooding, mining, and recreation and tourism activities that are not well managed to protect the environment (Department of Conservation, 2014).

The largest remnants of indigenous forest and shrubland are found on the predominantly steeper areas of the upper catchment, e.g. Pirongia and the Rangitoto Range. Lowland remnants are very small and fragmented within a predominantly pastoral landscape. The small size of many of these remnant habitats is an issue that will be difficult to address in the long term as many have a pronounced 'edge effect', which can lead to an increase in pest plant numbers, light availability, wind and extremes of temperature and humidity (Waikato Regional Council, 2014a).

The Waikato River Authority Report Card for the river gives the Waipā main stem a C+ and the tributaries a B- for ecological integrity. This indicates a low to moderate rating and suggests that only some of the *Vision & Strategy* aspirations for a healthy river are being met (Williamson et al., 2016).

RECREATION

When compared with the Waikato River main stem and tributaries, recreation undertaken on the Waipā River and tributaries is limited. The upstream reach above Ōtorohanga is popular for trout fishing and used for picnicking and swimming during summer. Below Ōtorohanga, there is a small amount of boating activity but this is limited by river morphology and lack of boat ramps – only one well maintained public boat ramp is currently in place, located at Ngāruawāhia. The ability for people to utilise the Waipā River for recreational activities is also limited by poor water quality in the river (Williamson et al., 2016).

GOALS

The following goals were developed by iwi, stakeholders and community representatives for the Waipā catchment:

	1	2	3
WATER QUALITY	The quality and flow of water is maintained and enhanced.	Water quality is such that waters within the catchment are swimmable and safe to take food from in all places.	
FISH	Indigenous fish have access throughout the river catchments (except where natural barriers exist) and the catchment has an abundance of taonga species such as kōkopu, piharau, tuna, kōura and kāeo.	There is a programme of restoration, enhancement and protection of fish habitat, pā tuna and other significant fishing sites.	
EROSION AND SEDIMENTATION	The appropriate management of steep and erosion-prone land is promoted and incentivised.	River margins prone to significant erosion are managed to minimise erosion risk, whilst enhancing aquatic habitat and retaining the natural character of river systems.	Riparian planting of preferably indigenous species is undertaken to stabilise riverbanks, reduce erosion and enhance terrestrial and aquatic biodiversity.
SUSTAINABLE LAND MANAGEMENT	Wetlands are created or protected and actively managed to enhance multiple functions.	Land uses are being adapted to match the capability of the land.	
BIODIVERSITY	The catchment has an interconnected network of healthy, indigenous ecosystem types (forest, shrubland, wetlands, lakes, river and stream habitats and margins) supporting native flora and fauna.	Where possible, the natural functioning of floodplains and other ephemeral wetland sites is restored and maintained.	
EDUCATION AND CAPACITY BUILDING	Restoration initiatives maximise opportunities for education and capacity building within the catchment.		

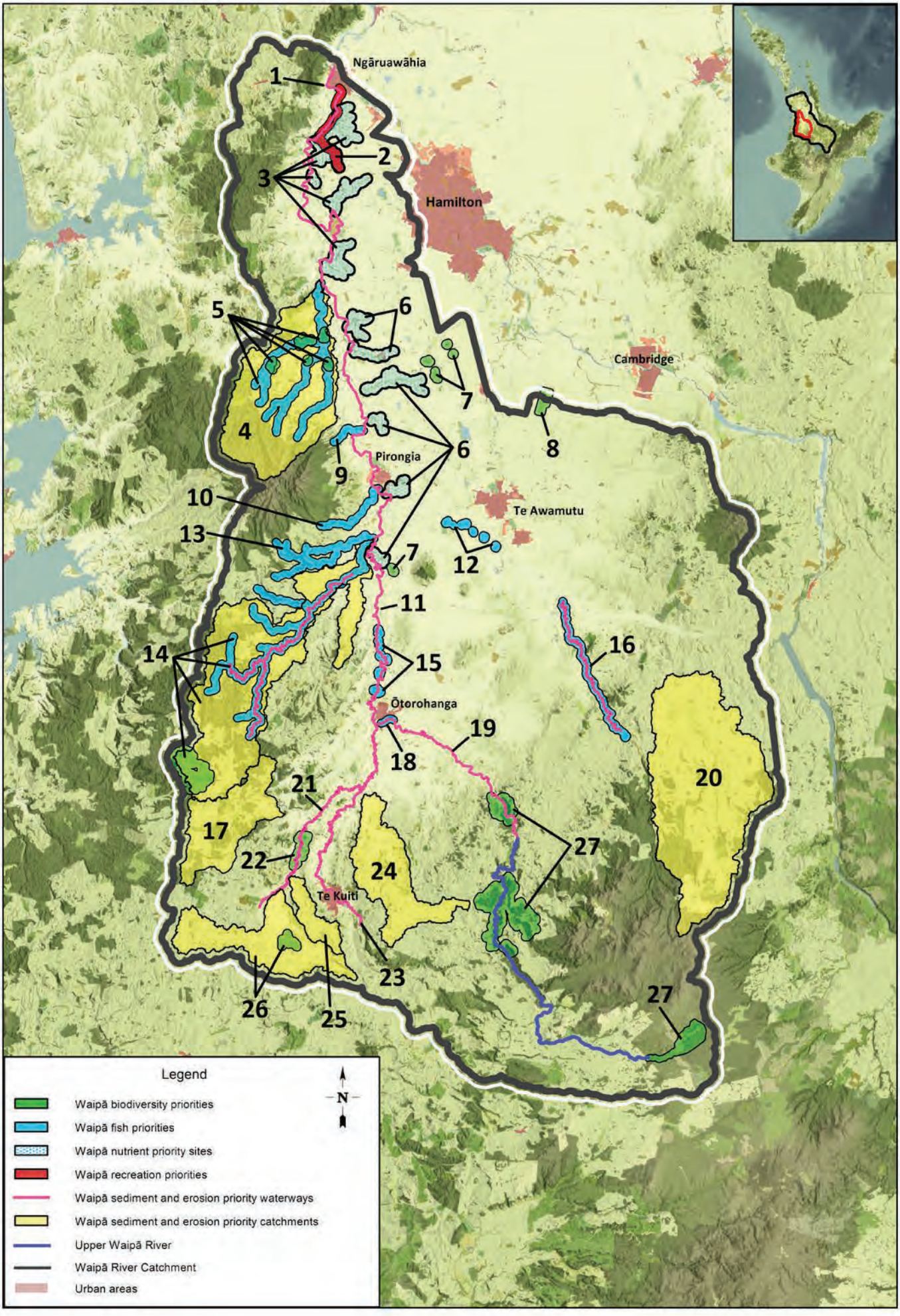


Figure 7. Location of priority projects in the Waipā catchment

PRIORITY PROJECTS

Twenty-seven projects in the Waipā catchment scored favourable cost-benefit scores and have been included in the *Restoration Strategy*. These are illustrated in Figure 7. Projects are listed in order from lower catchment to upper catchment and their priority rankings are provided in the summary tables that follow. Appendix 7 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018) contains more detailed information on each project, including recommended management actions and estimated costs.

Total project value is estimated at just over $90 million. Funding priorities include a new river walkway from Ngāruawāhia to Te Kōwhai, 450km of riparian/wetland fencing, 410ha of riparian revegetation, stabilising of up to 4800ha of erosion-prone LUC class 6e land and 3050ha of LUC class 7 land, more than 750km of fencing of plantings, sidelings, seeps and existing indigenous vegetation in hill country, enhancement of 17 river oxbows, remediation of up to 20 barriers to native fish passage, and putting vegetation or rock structures along 100km of eroded riverbank, which will also provide fish habitat.

SUMMARY TABLES OF PRIORITY PROJECTS

HIGH PRIORITY

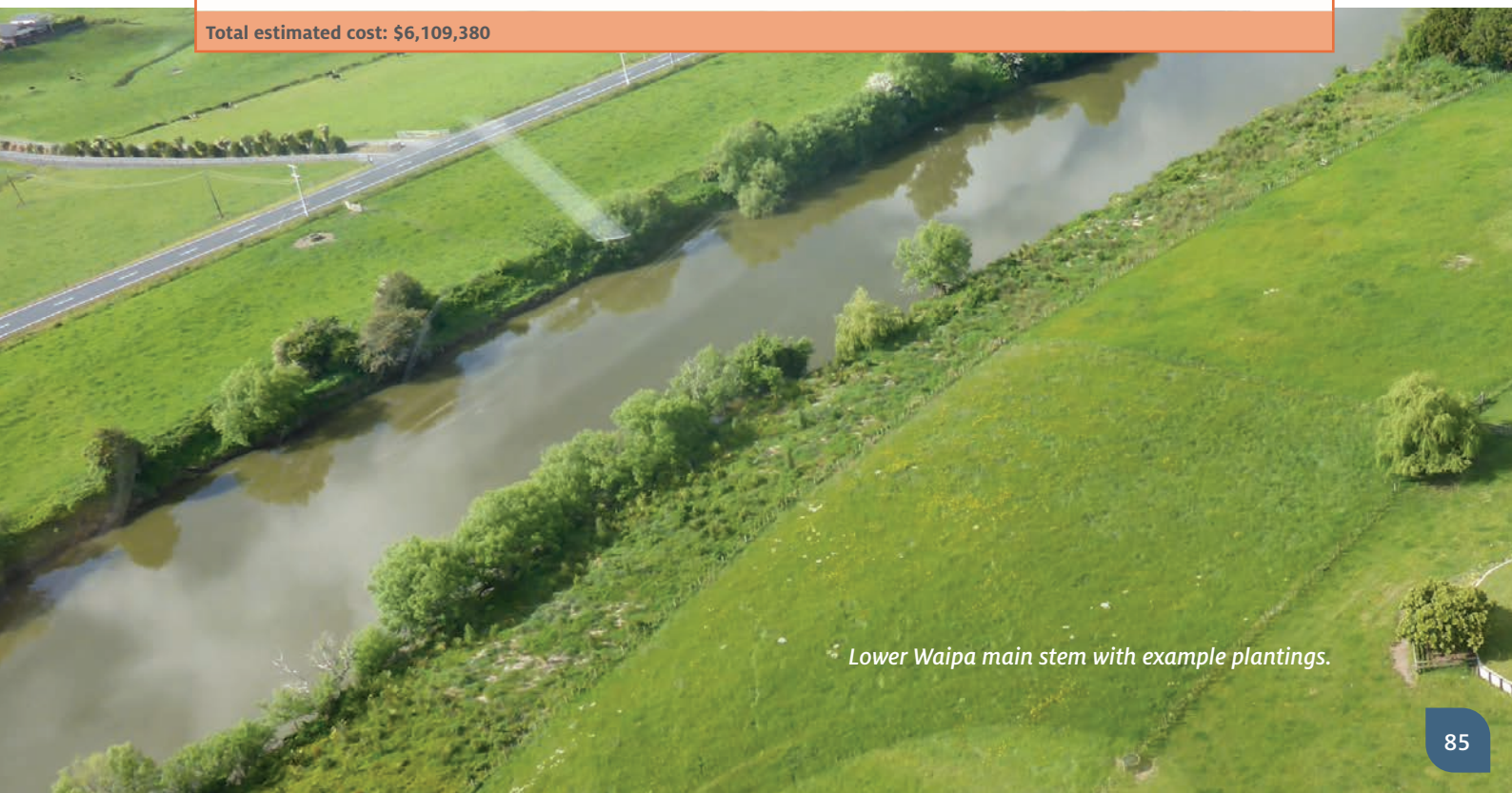
WAIPĀ RIVER EROSION PROTECTION AND REMEDIATION – PIRONGIA TO NGĀRUAWĀHIA	WP 1

Location: A 30km reach of the Waipā River from Pirongia to Whatawhata bridge and a 28km reach from Whatawhata bridge to the confluence with the Waikato River at Ngāruawāhia.

Summary of priority works

- Fencing (53km)
- Poplar/willow pole planting (2,200 poles)
- Native planting (112ha)
- Project management/staffing/incidentals (25%)

Total estimated cost: $6,109,380



Lower Waipa main stem with example plantings.

HIGH PRIORITY

WALKWAY FROM TE KŌWHAI TO NGĀRUAWĀHIA TOWNSHIP VIA TE OTAMANUI GULLY AND ALONG THE WAIPĀ RIVER

WP 2

Location: Te Kōwhai to Waipā River through Te Otamanui gully and then along the Waipā River to Ngāruawāhia township.

Summary of priority works

- Walkway construction (8.9km)
- Fencing (8.9km)
- Signage
- Native planting (5,250 plants)
- Surveying
- Project management/staffing/incidentals (25%)

Total estimated cost: $2,051,250

MEDIUM PRIORITY

ENHANCEMENT OF WAIPĀ WETLANDS IN PRIORITY NUTRIENT CATCHMENTS (WAIKATO DISTRICT)

WP 3

Location: Selected Waikato District gully wetlands greater than 10ha and located within high nutrient yielding subcatchments in the Waipā catchment (11 wetlands in total).

Summary of priority works

- Management plan development
- Fencing
- Willow control
- Weed control
- Native planting
- Possum control
- Project management/staffing/incidentals (30%)

Total estimated cost: $4,987,225

A Waipā district gully wetland showing native plants being invaded by climbing weeds.

HIGH PRIORITY

KANIWHANIWHA CATCHMENT EROSION PROTECTION AND REMEDIATION — WP 4

Location: Kaniwhaniwha catchment – an 11,434ha catchment extending from the bush clad slopes of Mt Pirongia to the Waipā River.

Summary of priority works

- Pole planting erosion prone LUC 6e land (325ha)
- Plantation species on erosion prone LUC 6e land (325ha)
- Plantation species on LUC 7 land (63ha)
- Fencing existing indigenous vegetation (28km)
- Fencing managed LUC 6e land (65.5km)
- Fencing managed LUC 7 land (8km)
- Treating erosion outside LUC 6e, 7 and 8 land (85.5ha).
- Project management/staffing/incidentals (25%)

Total estimated cost: $5,920,625

VERY HIGH PRIORITY

KANIWHANIWHA CATCHMENT STREAMS FISH HABITAT REHABILITATION AND RESTORATION OF FOREST REMNANTS — WP 5

Location: A 50km long stream network within the Kaniwhaniwha catchment and selected forest remnants ranging from 0.7ha to 32ha in size.

Summary of priority works

- Waterway fencing (50.8km)
- Riparian planting (25.4ha)
- Installing in-stream woody debris
- Possum control
- Fencing forest remnants (10.2km)
- Remediation of fish barriers (3 barriers)
- Weed control
- Project management/staffing/incidentals (30%)

Total estimated cost: $2,705,588

MEDIUM PRIORITY

ENHANCEMENT OF WAIPĀ WETLANDS IN PRIORITY NUTRIENT CATCHMENTS (WAIPĀ DISTRICT) — WP 6

Location: Selected Waipā District gully wetlands greater than 10ha and located within high nutrient yielding subcatchments within the Waipā catchment (8 gully wetlands in total).

Summary of priority works

- Management plan development
- Fencing
- Native planting
- Willow control
- Weed control
- Possum control
- Project management/staffing/incidentals (30%)

Total estimated cost: $3,498,025

MEDIUM PRIORITY

RESTORATION OF PRIORITY LOWLAND KAHIKATEA REMNANTS (AND ASSOCIATED WETLANDS) BETWEEN TE KŪITI AND TEMPLEVIEW

WP 7

Location: Selected Waipā River catchment kahikatea remnants and associated wetlands.

Summary of priority works

- Fencing (9.9km)
- Possum control (2.2ha)
- Weed control for 3 years
- Native planting (1.5ha)
- Project management/staffing/incidentals (20%)

Total estimated cost: $214,114

A kahikatea remant and associated wetland that would be a candidate for retirement and protection.

HIGH PRIORITY

ENHANCEMENT OF WATER LEVELS IN THE MOANATUATUA WETLAND

WP 8

Location: Moanatuatua Wetland – a 140ha peat bog wetland located east of Ōhaupō.

Summary of priority works

- Site surveys to determine height and design for a weir
- Weir design plans
- Resource consent
- Weir construction x 2
- Project management/staffing/incidentals (30%)

Total estimated cost: $78,000

HIGH PRIORITY

MANGAKARA STREAM FISH HABITAT REHABILITATION — WP 9

Location: A 3.7km reach of Mangakara Stream, flowing from the bush line on Mt Pirongia (near Grey Road, Te Pahu) to the Waipā River.

Summary of priority works

- Riparian fencing (6km)
- Native planting (2.4ha)
- Remediation of fish barriers
- Project management/staffing/incidentals (20%)

Total estimated cost: $177,748

Mangakara Stream where stock exclusion and riparian planting is recommended.

MEDIUM PRIORITY

MANGAUIKA STREAM FISH HABITAT REHABILITATION — WP 10

Location: A 9km reach of Mangauika Stream flowing from Mt Pirongia in the vicinity of Te Tahi Road to join the Waipā River at Pirongia village.

Summary of priority works

- Riparian fencing (13.5km)
- Native planting (6.75ha)
- Remediation of fish barriers
- Project management/staffing/incidentals (25%)

Total estimated cost: $464,345

HIGH PRIORITY

WAIPĀ RIVER BANK EROSION PROTECTION AND REMEDIATION – ŌTOROHANGA TO PIRONGIA

WP 11

Location: A 37km reach of the Waipā River from Ōtorohanga to Pirongia.

Summary of priority works

- Riparian fencing (24km)
- Native planting (24ha)
- Design and install fish habitat structures (30)
- Plant poplar/willow poles (2400)
- Design and install erosion protection structures (10)
- Vegetation management and disposal (12km)
- Project management/staffing/incidentals (30%)

Total estimated cost: $2,590,702

A section of Waipā River showing bank erosion and high sediment load.

HIGH PRIORITY

TUNA HABITAT REHABILITATION WITHIN 7 PŪNIU RIVER OXBOWS

WP 12

Location: A collection of historic oxbows along the Pūniu River southwest of Te Awamutu.

Summary of priority works

- Development of project plans
- Excavation
- Fencing
- Native planting
- Weed control
- Culvert installation
- Resource consent
- Project management/staffing/incidentals (30%)

Total estimated cost: $296,151

MEDIUM PRIORITY

NGAKOAOHIA STREAM (AND SELECTED TRIBUTARIES) FISH HABITAT REHABILITATION

WP 13

Location: Ngakoaohia Stream and selected tributaries (flowing from Pirongia mountain near Ngutunui).

Summary of priority works

- Fencing (26km)
- Native planting (13ha)
- Remediation of fish barriers
- Project management/staffing/incidentals (30%)

Total estimated cost: $1,015,528

VERY HIGH PRIORITY

MOAKURARUA INTEGRATED CATCHMENT PROGRAMME

WP 14

Location: Moakurarua catchment – a 14,974ha catchment in the upper Waipā River catchment with a stream network of 277km.

Summary of priority works

- River erosion control (26km)
- Pole planting erosion prone LUC 6e land (665ha)
- Plantation species on erosion prone LUC 6e land (665ha)
- Fencing managed LUC 6e land (131km)
- Plantation species on LUC 7 land (647ha)
- Fencing managed LUC 7 land (91km)
- Treating erosion outside LUC 6e, 7 and 8 land (22ha)
- Streambank fencing (72km)
- Riparian planting river/streams (36ha)
- Fencing existing indigenous vegetation (38km)
- Goat control on LUC 6e and 7 land
- Project management/staffing/incidentals (30%)

Total estimated cost: $18,162,054

A mixture of high erosion land and remnant vegetation in the Moakurarua catchment.

A Waipā River oxbow.

HIGH PRIORITY

TUNA HABITAT REHABILITATION WITHIN 10 WAIPĀ RIVER OXBOWS	WP 15

Location: A collection of historic oxbows along the Waipā River between Pirongia and Ōtorohanga.

Summary of priority works

- Development of project plans
- Excavation
- Fencing
- Native planting
- Weed control
- Culvert installation
- Resource consent
- Project management/staffing/incidentals (30%)

Total estimated cost: $372,184

VERY HIGH PRIORITY

MANGATUTU RIVER EROSION PROTECTION, REMEDIATION AND MANAGEMENT, AND REHABILITATION OF FISH HABITAT

WP 16

Location: A 20km reach of the Mangatutu River from Pūniu to Wharepuhanga Road.

Summary of priority works

- River erosion protection/remediation (16km)
- Willow management (7km)
- Streambank fencing (14.7km)
- Willow/poplar pole planting (1,422 poles)
- Native planting (16ha)
- Project management/staffing/incidentals (30%)

Total estimated cost: $1,558,050

Rock groynes provide erosion protection and habitat for fish species.

VERY HIGH PRIORITY

WAITOMO RIVER – HEADWATERS TO CAVES EROSION PROTECTION AND REMEDIATION

WP 17

Location: Waitomo catchment and caves – a 4434ha catchment situated southwest of Ōtorohanga, upstream of Waitomo village, and containing the Waitomo glowworm caves.

Summary of priority works

- Pole planting erosion prone LUC 6e land (60ha)
- Plantation species on erosion prone LUC 6e land (60ha)
- Fencing managed LUC 6e land (10km)
- Plantation species on LUC 7 land (92ha)
- Fencing managed LUC 7 land (19km)
- Treating erosion outside LUC 6e, 7 and 8 land (3.6ha)
- Project management/staffing/incidentals (25%)

Total estimated cost: $1,542,500

HIGH PRIORITY

REHABILITATION OF FISH HABITAT AT ŌTOROHANGA (WAIPĀ RIVER) — WP 18

Location: The 1.3km section of Waipā River between Ōtorohanga rail bridge and the weir.

Summary of priority works

- Installation of structures for fish habitat (13 structures)
- Resource consent
- Project management/staffing/incidentals (20%)

Total estimated cost: $66,120

HIGH PRIORITY

WAIPĀ RIVER BANK EROSION PROTECTION AND REMEDIATION – TOA BRIDGE TO ŌTOROHANGA — WP 19

Location: A 21km reach of the Waipā River from Toa bridge to Ōtorohanga.

Summary of priority works

- Erosion protection structures (21km)
- Native planting behind structures (4ha)
- Willow management (8km)
- Poplar/willow pole planting (1600 poles)
- Fencing (13.3km)
- Native planting behind new fences (13ha)
- Project management/staffing/incidentals (30%)

Total estimated cost: $1,956,843

MEDIUM PRIORITY

UPPER PŪNIU CATCHMENT EROSION PROTECTION AND REMEDIATION — WP 20

Location: The upper Pūniu catchment – a 16,857ha catchment situated southeast of Te Awamutu and bordering the eastern boundary of the Waipā catchment.

Summary of priority works

- Pole planting erosion prone LUC 6e land (688ha)
- Plantation species on erosion prone LUC 6e land (688ha)
- Fencing managed LUC 6e land (116km)
- Plantation species on erosion prone LUC 7 land (1857ha)
- Fencing managed LUC 7 land (172km)
- Treating erosion outside LUC 6e, 7 and 8 (52ha) land
- Fencing indigenous forest remnants (34km)
- Goat control on treated LUC 6e and 7 land
- Project management/staffing/incidentals (30%)

Total estimated cost: $21,657,448

Waipā River bank erosion before remedial works.

HIGH PRIORITY

MANGAPU RIVER EROSION PROTECTION AND RIPARIAN ENHANCEMENT — WP 21

Location: A 35km reach of the Mangapu River broken up into two reaches. The top reach is 21km and extends from Waitomo Valley Road to Trooper Road. The lower reach is 14km long and is downstream of Waitomo Valley Road.

Summary of priority works

- River erosion management and protection (27km)
- Willow management (5.25km)
- Fencing (25km)
- Willow/poplar pole planting (1799 poles)
- Native planting (25ha)
- Project management/staffing/incidentals (25%)

Total estimated cost: $1,714,357

VERY HIGH PRIORITY

BIODIVERSITY RESTORATION WITHIN LOWLAND KAHIKATEA FRAGMENTS IN MANGAPU CATCHMENT — WP 22

Location: Selected lowland kahikatea remnants in Mangapu catchment and their associated wetlands.

Summary of priority works

- Management plan development
- Fencing (15.6km)
- Native planting (4ha)
- Weed control
- Possum control
- Project management/staffing/incidentals (20%)

Total estimated cost: $410,890

HIGH PRIORITY

MANGAOKEWA STREAM EROSION PROTECTION AND REMEDIATION — WP 23

Location: Mangaokewa Stream – a 23km reach of stream which flows from the Viaduct Reserve through the Te Kūiti township to the confluence with the Mangapu River at Hangatiki.

Summary of priority works

- River erosion management and protection
- Willow/poplar management (3.5km)
- Willow/poplar disposal
- Fencing (21.2km)
- Willow/poplar pole planting (1533 poles)
- Native planting (10.6ha)
- Project management/staffing/incidentals (25%)

Total estimated cost: $984,391

MEDIUM PRIORITY

MANGARAPA CATCHMENT EROSION PROTECTION AND REMEDIATION

WP 24

Location: Mangarapa catchment – a 5306ha catchment situated south of Ōtorohanga and east of Te Kūiti.

Summary of priority works

- Pole planting erosion prone LUC 6e land (325ha)
- Plantation species on erosion prone LUC 6e land (325ha)
- Fencing managed LUC 6e land (54km)
- Plantation species on erosion prone LUC 7 land (78ha)
- Fencing managed LUC 7 land (14km)
- Treating erosion outside LUC 6e, 7 and 8 land (18.5ha)
- Fencing indigenous vegetation bordering LUC 6e land (14.5km)
- Goat control on treated LUC 6e and 7 land
- Project management/staffing/incidentals (25%)

Total estimated cost: $4,991,435

Pole planting on erosion prone land in the upper Waipā.

MEDIUM PRIORITY

MANGATEA CATCHMENT EROSION PROTECTION AND REMEDIATION

WP 25

Location: Mangatea catchment – a 1326ha catchment situated southwest of Te Kūiti.

Summary of priority works

- Pole planting erosion prone LUC 6e land (76ha)
- Plantation species on erosion prone LUC 6e land (76ha)
- Fencing managed LUC 6e land (14km)
- Plantation species on erosion prone LUC 7 land (5ha)
- Fencing managed LUC 7 land (2km)
- Treating erosion outside LUC 6e, 7 and 8 land (12.4ha)
- Fencing indigenous forest remnants (3.4km)
- Goat control on treated LUC 6e and 7 land
- Project management/staffing/incidentals (25%)

Total estimated cost: $1,181,680

MEDIUM PRIORITY

MANGARAMA CATCHMENT EROSION PROTECTION AND REMEDIATION

WP 26

Location: Mangarama catchment – a 5439ha catchment southwest of Te Kūiti.

Summary of priority works

- Pole planting erosion prone LUC 6e land (264ha)
- Plantation species on erosion prone LUC 6e land (264ha)
- Fencing managed LUC 6e land (42km)
- Plantation species on erosion prone LUC 7 land (315ha)
- Fencing managed LUC 7 land (31km)
- Treating erosion outside LUC 6e, 7 and 8 land (3.1ha)
- Fencing indigenous forest remnants (6.2km)
- Goat control on treated LUC 6e and 7 land
- Project management/staffing/incidentals (25%)

Total estimated cost: $5,237,625

HIGH PRIORITY

BIODIVERSITY RESTORATION OF PRIORITY SITES IN THE UPPER WAIPĀ CATCHMENT

WP 27

Location: Selected upper Waipā River forest remnants, wetlands and associated tributary streams.

Summary of priority works

- Fencing (21.2km)
- Native planting (0.75ha)
- Ground based willow control
- Project management/staffing/incidentals (20%)

Total estimated cost: $539,717

A forest remnant in the upper Waipā catchment.

SHALLOW LAKES
ROTO KORAHA

CURRENT STATE AND PRESSURES

INTRODUCTION

The Waikato and Waipā river catchments contain 52 shallow lakes greater than 1ha in size. The majority of these lakes have been formed in association with the Waikato River system and its floodplain and the formerly extensive peat bogs of the region (Figure 8). The catchment's shallow peat and riverine lakes are the largest remaining collection of their type in New Zealand. The physical characteristics of 36 lakes for which data exists is shown in Table 1.

Shallow lakes provide for a range of values – as habitat for native flora and fauna including taonga and game species, recreation, and also for water supply, commercial and traditional fisheries, and flood control. Shallow lakes also perform nutrient cycling and other ecosystem processes that contribute to the life supporting capacity of the wider environment.

The shallow lakes within the Waikato catchment make up approximately 30 per cent of New Zealand lakes that have been categorised as having poor to extremely poor water quality and having undergone substantial declines in ecological condition. Many of these lakes have shifted from a clear-water macrophyte-dominated state to a turbid, phytoplankton-dominated state as land use intensification has increased (Dean-Speirs et al., 2014a).

The freshwater wetlands associated with our shallow lakes are a stronghold for threatened, at risk and rare plant communities. These include plants that are specifically adapted to peat wetlands, such as "threatened" swamp helmet orchid and "at risk" giant cane rush (Department of Conservation, 2014). Highly valued native bird populations such as "threatened" wuxia/New Zealand dabchick, matuku/Australasian bittern, "at risk" mohopereru/banded rail, pūweto/spotless crake and mātātā/North Island fernbird are also present along with extensive game bird populations. These freshwater wetlands also provide important habitat for a range of fish species, including black mudfish and migratory species such as longfin eel, shortfin eel and galaxiids (Department of Conservation, 2014).

Shallow lakes function differently to deep lakes in that their depth provides for them to be:

- capable of supporting submerged aquatic plants over most of the lake bed as their shallow depths allow sufficient light penetration for plant growth, assuming all other habitat and ecological requirements are favourable (i.e. substrate, disturbance, water levels)
- regularly stirred up by wind and wave action which prevents prolonged periods of thermal stratification and serves to recycle nutrients from the bottom sediments to the overlying water column. The large interface between the lake bed and water column acts to amplify the influence of bed sediments on lake water quality
- very susceptible to changes in hydrology due to catchment land use and climatic conditions
- more heavily impacted by invasive species such as pest fish and plants.

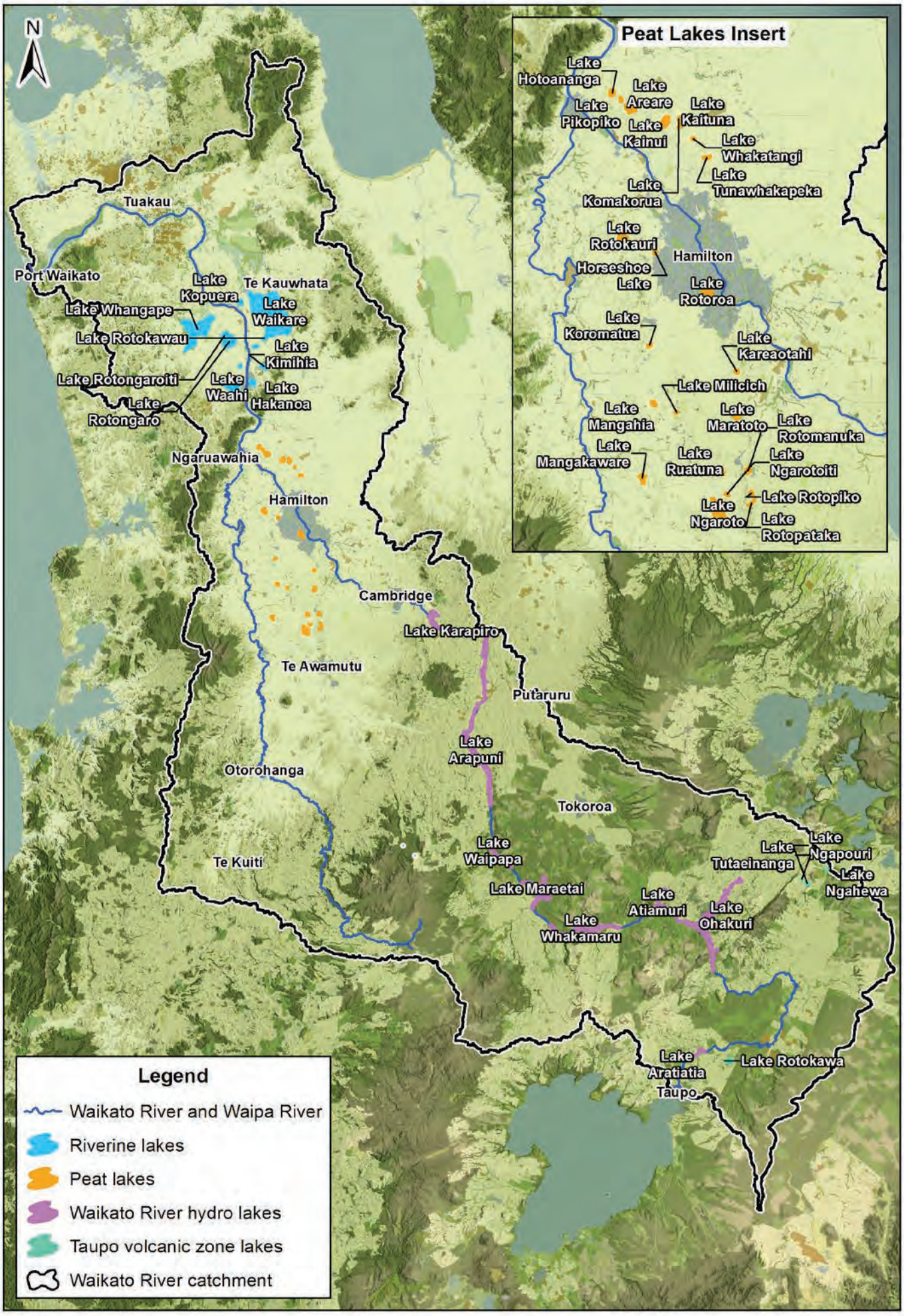


Figure 8. Location of lake groups within the Waikato catchment

As a result, shallow lakes are particularly vulnerable to deterioration and require a specific management approach (Dean-Speirs et al., 2014a).

A range of factors have been identified as contributing to the ongoing decline of the health and wellbeing of many shallow lakes in the Waikato catchment, including:

- high loads of diffuse contaminant inputs of nutrients, sediment and bacteria from catchment run off and livestock access to the lakes
- internal regeneration of nutrients from sediment resuspension (by wind action or pest fish) and/or release of nutrients as a result of low oxygen events at the lakebed
- high abundance of pest fish (e.g., koi carp and catfish), and/or aquatic weeds (alligator weed, oxygen weed, hornwort)
- reduced water depth due to drainage and/or reduced flushing due to water control structures and artificial regimes such as the Lower Waikato Flood Control Scheme
- past development of large exotic weed beds that create deoxygenation events and often precede a switch to turbid, nutrient enriched conditions
- removal of vegetation filtering potential in the catchment through drainage of marginal wetland vegetation, agricultural development and grazing access (NIWA, 2010).

Lake Waikare shows the impacts of multiple stressors, including catchment land use, pest fish and a modified hydrological regime.

LAKE	LAKE TYPE	LAKE AREA (HA)	LAKE DEPTH (M)	CATCHMENT AREA (HA)	CURRENT VEGETATION STATUS
Areare	Peat	33	5.1	262	Non-vegetated
Hakanoa	Riverine	52	2.5	613	Non-vegetated
Kainui	Peat	25	6.7	132	Non-vegetated
Kaituna	Peat	12	1.3	580	Non-vegetated
Kimihia	Riverine	58	1	1485	Non-vegetated
Koromatua	Peat	10	0.8	200	Non-vegetated
Mangahia	Peat	8.4	1.8	354	Non-vegetated
Mangakaware	Peat	13	4.8	238	Poor
Maratoto	Peat	18	7.1	88	Non-vegetated
Milicich	Peat	2.2	2.3	54	Non-vegetated
Ngāhewa	Volcanic	8.4	5.5	746	Moderate
Ngāroto	Peat	108	4	1846	Non-vegetated
Ohinewai	Riverine	16	4.5	347	Non-vegetated
Okowhao	Riverine	21	2.2	Unknown	Non-vegetated
Penewaka	Riverine	4	1	Unknown	
Puketirini	Artificial	54	80	95	Poor
Rotokauri	Peat	42	4	933	Non-vegetated
Rotokawau	Peat	22	1.2	1804	Non-vegetated
Rotokotuku	Peat	11	8	18.5	
Rotomānuka North	Peat	12.3	8.7	479	Non-vegetated
Rotomānuka South	Peat			479	
Rotoroa	Peat	55	6	258	Moderate
Ruatuna	Peat	13	3.2	190	Non-vegetated
Rotopiko East	Peat	1.6	4.4	163	High
Rotopiko North	Peat	5	5	163	Excellent
Rotopiko South	Peat	8.3	3.3	163	High
Te Kapa	Riverine	1	1.5	Unknown	Non-vegetated
Te Koutu	Riverine	6	1.5	416	
Tunawhakaheke (Lake E)	Peat	7	1	100	Non-vegetated
Tutaeinanga	Volcanic	3.1	11	501	Non-vegetated
Waahi	Riverine	522	5	9221	Non-vegetated
Waikare	Riverine	3442	1.8	21055	Non-vegetated
Waiwhakareke (Horseshoe)	Peat	3	3	66	Non-vegetated
Waiwhata	Riverine	9	0.8	Unknown	Non-vegetated
Whakatangi	Peat	2.7	3.4	170	
Whangape	Riverine	1450	2.7	31767	Non-vegetated

Table 1. Characteristics of 36 Waikato/Waipā catchment shallow lakes. Current vegetation state is based on recent results of the standardised Lake SPI macrophyte survey programme as of 2015 (source Waikato Regional Council).

CULTURAL IMPORTANCE

Lakes are an integral component within the whakapapa of rivers and wetlands. Due to the concealing nature of wetlands and lakes, iwi would store and preserve taonga within them, thus ensuring their safety. (Waikato-Tainui, 2013). Historically there have been many battles around the lake areas, including Hingakaka (Battle of Hingakaka), Waikare and Kōpuera (Battle of Rangiriri), in which the bones of tribal ancestors currently lie preserved in state.

A number of lakes have pā sites associated with them. These pā are usually found around the lake margin, either on a natural or a 'built' mound (Environment Waikato, 2007). The lakes are commonly identified as food baskets for marae and communities. They are recreational playgrounds and contribute to the health and wellbeing of marae. Unfortunately, due to the degradation of lake waters, the ability of lakes to provide healthy food (tuna, kōura and kāeo) has diminished.

WATER QUALITY

Lake water quality state is generally determined by the degree of water column nitrogen (N) and phosphorus (P) enrichment. The enrichment process, known as eutrophication, occurs naturally over long time scales but is greatly accelerated by increases in nutrient loading from anthropogenic activities in the catchment. Elevated water column nutrient concentrations stimulate excessive plant growth leading to poor water clarity, reduced dissolved oxygen concentrations in the bottom waters during summer months, and an increase in nuisance algal blooms and scums (e.g. Cooke et al., 2005).

Water quality for most of the Waikato lakes for which monitoring data is available is generally poor, as indicated by high water column N and P concentrations, and consequently high chlorophyll a (Chl a) biomass and poor water column transparency.

Values of the trophic level index (TLI) (Burns et al., 2000), a New Zealand-specific measure of lake trophic state based on mean annual TP, TN, Chl a and Secchi depth, indicate 21 of the 22 monitored Waikato catchment lakes, including all peat and riverine lakes, are eutrophic or supertrophic (TLI score >4.0, Table 2). Only one lake is mesotrophic (moderate trophic level, TLI 3-4; artificial Lake Puketirini) and no lakes are oligotrophic (TLI <3, low trophic status). Water column transparency, as measured by Secchi disk depth, is poor (less than 1m) across almost 70 per cent of monitored lakes (data from Waikato Regional Council, 2017).

Lake Rotokauri in the Waipā catchment.

Most Waikato monitored lakes are not compliant with the national bottom line for lake ecosystem health under the National Policy Statement for Freshwater Management (2011) – National Objectives Framework (NOF; New Zealand Government, 2014). Sixteen of the 22 lakes (73 per cent) fail the national bottomline (D Band) for all three ecosystem health attribute states (annual median TN, TP and Chl a).

Trends in lake TN, TP, Chl a and Secchi disk for 11 Waikato lakes with sufficient monitoring data available over the last 10 years (2008-2017) have been relatively stable for most systems despite high trophic levels. There was no significant (less than 1 per cent change per annum) deteriorating trend for TN, TP or Chl a in 10 of the 11 lakes analysed. A significant increase in TN is observed in Lake Hakanoa. Significant trends were also detected for water column transparency across five unvegetated lakes but these did not correspond to increasing TN, TP or Chl a in the same lakes. The results also indicated a large degree of inter-annual variability over time, especially in the larger riverine lakes (Whangape and Waikare).

Blue-green algae

Blue-green algae (cyanobacteria) often dominate the phytoplankton community in eutrophic lake systems. Several species are known to produce a range of toxins such as dermatoxins, hepatoxins and neurotoxins, as well as undesirable tastes, odours and surface scums. Potential risks to human health may occur following exposure through primary or secondary contact recreation, including respiratory, irritation and allergy symptoms (Huisman et al., 2005).

An assessment of human health risk for secondary contact recreation is carried out on five Waikato-Waipā lakes by Waikato Regional Council on a regular basis (lakes Hakanoa, Ngāroto, Waahi, Waikare and Whangape). Monitoring results show that high cell counts (blooms) of potentially toxic cyanobacteria species occur frequently in all five lakes during summer months. As such, health warnings are issued for these lakes regularly. Health warnings are not always constrained to summer and may also be issued during other seasons as well. Noteworthy is Lake Waikare, for which a health warning is in place all year round (Waikato Regional Council pers. comm.).

BIODIVERSITY

Volcanic lakes

Both of the shallow volcanic lakes of the catchment are located in the volcanic/geothermal area around Maungakakaramea (Rainbow Mountain) and Wai-O-Tapu, in the upper Waikato River catchment. Native vegetation in these catchments is very low (less than 5.2 per cent). However, Lake Ngāhewa is *c.* 100m from the forested Maungakakaramea and there are five lakes within a 5km radius, including Lake Tutaeinanga (Dean-Speirs et al., 2014b).

Lake Ngāhewa has a low-moderate diversity of vegetation types adjoining the lake, including a flax-cabbage tree wetland and raupō reedland along the lake's margin. Tutaeinanga has only a narrow band of riparian vegetation, which is currently being managed to remove weeds and replant with native plants (Newland, 2016). Both lakes have a low abundance and diversity of submerged plants. Ngāhewa contains only a few shoots of a native pondweed while Tutaeinanga has beds of the weed egeria occurring in the shallow margins (Burton et al., 2015). Both lakes also occur upstream of multiple hydro dams and the Wai-O-Tapu geothermal field, resulting in a depauperate fishery. In the past kōura, kākahi, common smelt and rainbow trout have been recorded at the lakes. Recent surveys have only found kākahi remaining at Lake Tutaeinanga, and kākahi and rainbow trout at Lake Ngāhewa, the latter stocked by the Eastern Bay of Plenty Fish and Game Council (Newland, 2016).

Ngāhewa has a high diversity of zooplankton (22 species), unlike Tutaeinanga with only 13 species (Duggan, 2008).

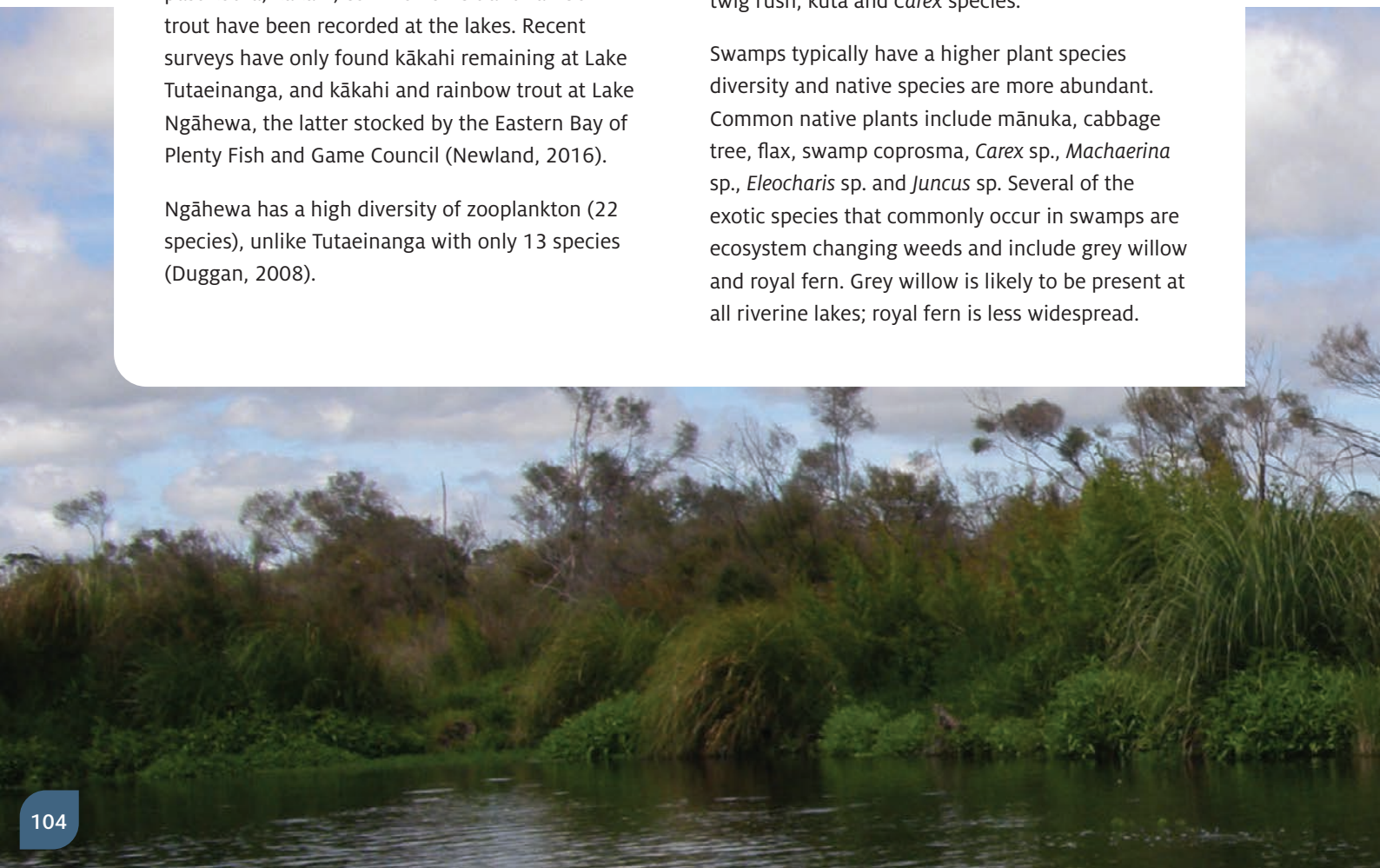
The lakes and surrounding reserves provide habitat for a range of other fauna, including long-tailed bat and bird species of conservation significance, New Zealand dabchick, black shag, little black shag, North Island fernbird, spotless crake and Australian coot. Native and introduced waterfowl are common at both lakes (Newland, 2016).

Riverine lakes

There are 13 shallow riverine lakes in the Waikato River catchment, mostly located in the lower Waikato River catchment north of Te Kōwhai. The riverine lakes are part of an extensive nationally significant, interconnected system of open water, wetlands and waterways that provide important habitats for native plants and animals.

The most common wetland types that occur at the riverine lakes are floodplain marshes and swamps. At a few lakes, such as Whangape and Rotongaro, some of the swamps transition into fens. Plant species diversity is typically lower in the marshes, which are often dominated by a suite of exotic plants, including crack willow, willow weeds, gypsywort, water purslane, water primrose and *Juncus* species. Native species tend to be localised and include emergent rushes and reeds such as raupō, jointed twig rush, kuta and *Carex* species.

Swamps typically have a higher plant species diversity and native species are more abundant. Common native plants include mānuka, cabbage tree, flax, swamp coprosma, *Carex* sp., *Machaerina* sp., *Eleocharis* sp. and *Juncus* sp. Several of the exotic species that commonly occur in swamps are ecosystem changing weeds and include grey willow and royal fern. Grey willow is likely to be present at all riverine lakes; royal fern is less widespread.



Several nationally rare plant communities occur at the riverine lakes. These include floodplain kahikatea forest at Lake Whangape and amphibious turfs that occur on seasonally exposed shorelines of some of the larger lakes, such as Whangape, Rotongaro, Rotongaroiti and Waahi. It is within the amphibious turfs that most riverine lake plant species of conservation significance occur (e.g. *Fimbristylis velata*, *Ranunculus limosella*). Most threatened plant species that have been recorded in the past at riverine lakes, e.g. *Myriophyllum robustum* and *Gratiola concinna*, are now only found in the Lower Waikato in large remaining wetlands, such as Whangamarino.

Almost all riverine lakes have poor water clarity and as a result none, except Te Otamanui Lagoon, are known to still contain submerged plants. It is possible that Lake Opuatia may still have submerged plants but this lake has not been surveyed since 1991 when it was found to have a low diversity (four species) of native and exotic plants (Champion et al., 1993).

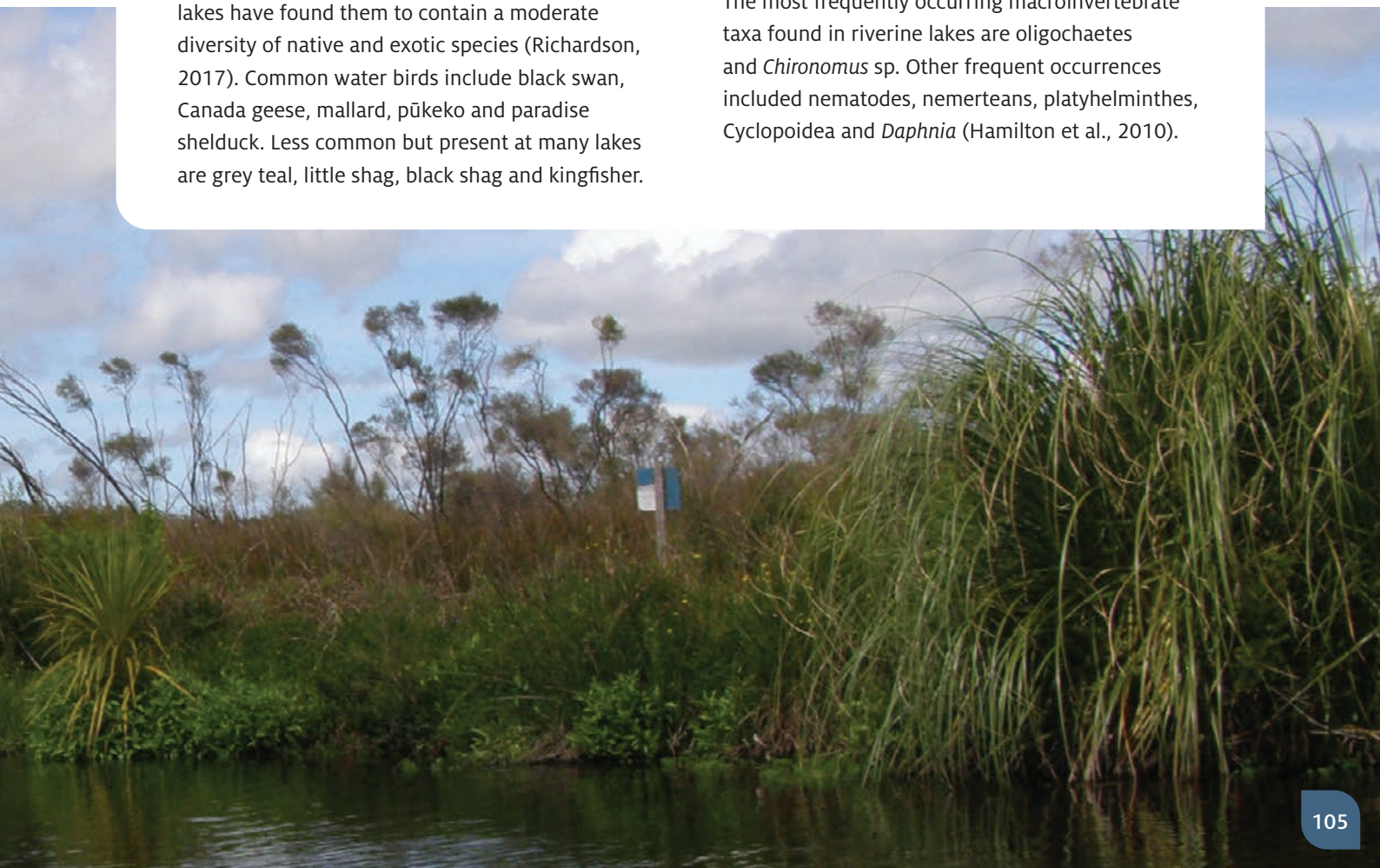
Wetlands associated with riverine lakes are vastly reduced from their former extent. However, along with open water, they still provide habitat for many bird species. Recent bird surveys at a few riverine lakes have found them to contain a moderate diversity of native and exotic species (Richardson, 2017). Common water birds include black swan, Canada geese, mallard, pūkeko and paradise shelduck. Less common but present at many lakes are grey teal, little shag, black shag and kingfisher.

There are recent records of the presence of birds of conservation significance (e.g. New Zealand dabchick, Australasian bittern, marsh crake, spotless crake, North Island fernbird, little black shag, black shag) at some lakes, but they are unlikely to be as widespread as recorded in surveys by the Wildlife Service and others in the 1980s and 1990s, given the collapse of submerged plants and reduction of wetland habitat at most riverine lakes.

The riverine lakes are located within the New Zealand 'hotspot' for pest fish. Most lakes contain an abundance of the pest fish species koi carp, brown bullhead catfish, mosquito fish and goldfish. Rudd are also common, and a notable population of European perch occur at Lake Waahi. Native fish species also occur at riverine lakes – the most common include shortfin eel and common bully. Other native fish species common in riverine lakes include common smelt and longfin eel. Less common are īnanga, grey mullet, black mudfish and lamprey (Waikato Regional Council, 2014b).

Kāeo (freshwater mussels) would have been widespread in riverine lakes in the past. They are now known only from Lake Waikare (Waikato Regional Council, 2014b).

The most frequently occurring macroinvertebrate taxa found in riverine lakes are oligochaetes and *Chironomus* sp. Other frequent occurrences included nematodes, nemerteans, platyhelminthes, Cyclopoidea and *Daphnia* (Hamilton et al., 2010).



Peat lakes

There are 37 peat lakes in the Waikato River catchment. Most occur in the Waipā and Waikato districts and were originally associated with the extensive Komakorau, Rukuhia and Moanatuatua bogs. In their natural state they have naturally acidic water that is low in nutrients and dissolved oxygen and stained by tannins. A number of highly specialised plant and animal species are associated with peat lakes in their natural state due to their ability to live in these conditions.

Today, most of the peat lakes have high fertility and pH measurements more typical of riverine lakes. As a result, they contain similar plant and animal species. There are, however, some notable differences discussed below.

Seven of the peat lakes retain submerged plants. Rotopiko East and Rotopiko North both have diverse and abundant native submerged floras, although the invasive weed *Utricularia gibba* has established in these lakes within the last 10 years (Burton et al., 2015). Lakes Pataka and Hotoananga both contained sparse covers of native charophytes and pondweeds when they were last surveyed (2007 and 2010). Rotopiko South, Mangakaware and Rotoroa all contain a mix of native and introduced plants with the invasive aquatic weed egeria occurring in Mangakaware and Rotoroa (Burton et al., 2015).

A legacy of stock grazing to the water edge at most peat lakes up until the last 10-20 years has resulted in a significant loss of wetlands associated with these lakes. It has also resulted in a loss of diversity in plant species and plant community types. Many of the plant species associated with low fertility wetlands are now absent or very uncommon. Some remain at Rotopiko East, Lake Milicich, Ngāroto and Maratoto, which still contain one or more of the following: sphagnum, sundews, wirerush and *Machaerina teretifolia* (Paula Reeves pers.comm.).

The peat lakes are less well connected for fish passage than the riverine lakes. As a result, many of the Waipā peat lakes do not contain koi carp and Lake Koromatua does not contain any introduced fish (Waikato Regional Council, 2014b).

Lake Mangakaware is one of the few peat lakes that retains submerged vegetation.

GOALS

The following goals were developed by iwi, stakeholders and community representatives for the shallow lakes:

1	Nutrient and sediment inputs to lakes are reduced by a proportion that leads to noticeable improvements in lake water quality so that lakes are safe for swimming and gathering of taonga species.
Natural hydrology at key lakes is restored, including through enhancing the size and extent of wetlands and margins and increasing water levels.	2
3	Koi carp biomass is reduced by 80 per cent in key lakes and maintained at this level. The impacts of other pest fish on lake water quality are managed.
Innovative interventions are developed, tested and implemented to improve lake values, including options such as flocculants, dredging and enhancing lake embayments.	4
5	Important lake species such as kāeo and native aquatic plants are re-established.
Integrated catchment management programmes protect and enhance priority shallow lakes and their catchments.	6
7	Flagship lake catchments are established and used for educational and promotion purposes.
A full range of ecosystem types associated with lakes in the catchment are protected and maintained with a focus on high value natural environments.	8
9	Communities have access to lakes for a range of recreational purposes, including swimming and gathering of food.

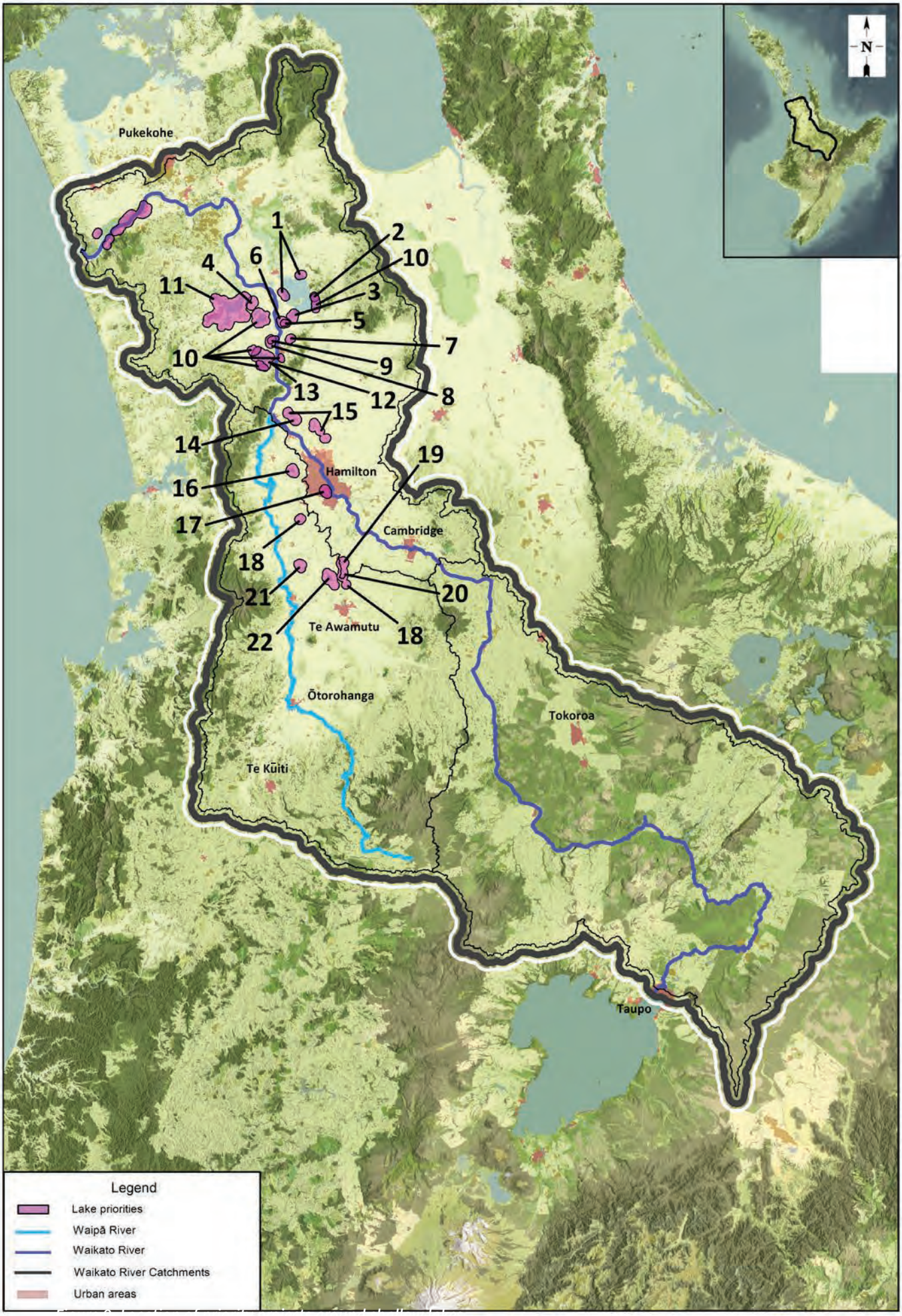


Figure 9. Location of priority projects around shallow lakes

PRIORITY PROJECTS

Twenty-two projects relating to shallow lakes in the Waikato catchment scored a favourable cost-benefit score and have been included in the *Restoration Strategy*. These are illustrated in Figure 9. Projects are listed in order from lower to upper catchment and their priority rankings are provided in the summary tables that follow. Appendix 8 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018) contains more detailed information on each project, including recommended management actions and estimated costs.

Total project value is estimated at just over $31 million. Funding priorities include improved or new recreation facilities at three lakes, 87km of lake margin fencing, 230ha of revegetation, 330ha of plant pest control, pest fish removal programmes at three lakes, large constructed wetland treatment systems on the inflows of four key lakes, internal sediment load reduction at two lakes, re-establishment of native aquatic plants at four lakes and increasing tuna habitat at two lakes.

SUMMARY TABLES OF PRIORITY PROJECTS

MEDIUM PRIORITY

INCREASE EEL HABITAT IN LAKE WAIKARE	L 1

Location: Lake Waikare – a 3442ha lake located to the southeast of Te Kauwhata township (and connected to the Whangamarino wetland by the Pungarehu canal).

Summary of priority works

- Fell alder trees into the lake and anchor in place to form eel habitat
- Native planting
- Resource consent
- Project management/staffing/incidentals (25%)

Total estimated cost: $103,200

HIGH PRIORITY

DEVELOPMENT OF LAKE WAIKARE SOUTH RESERVE FOR RECREATION	L 2

Location: A Waikato District Council reserve located on the eastern side of Lake Waikare between the lake and Waikare Road.

Summary of priority works

- Boardwalk construction (85m)
- Gravel walkway construction (415m)
- Fencing (450m)
- Native planting (20,600 trees)
- Picnic area development
- Resource consent
- Project management/staffing/incidentals (15%)

Total estimated cost: $423,031

HIGH PRIORITY

BIODIVERSITY ENHANCEMENT OF LAKE ROTOKAWAU — L 3

Location: Lake Rotokawau and surrounding wetland – a 22ha peat lake and 145ha wetland situated southwest of Lake Waikare and connected to Lake Waikare by a 500m channel.

Summary of priority works

- Investigate isolating the lake from surface flows
- Implementation of isolation measures
- Fencing (3.5km)
- Native planting (2ha)
- Weed control
- Project management/staffing/incidentals (20%)

Total estimated cost: $367,597

MEDIUM PRIORITY

ENHANCEMENT OF WETLAND HABITAT AT LAKE TE KAPA AND LAKE WAIWHATA — L 4

Location: Lake Te Kapa (0.7ha) and Lake Waiwhata (2.2ha) – two peat lakes located between Lake Whangape and Lake Rotongaroiti, about 10 minutes north of Huntly.

Summary of priority works

- Fencing (1.15km)
- Willow control
- Weed control
- Native planting (6.45ha)
- Project management/staffing/incidentals (25%)

Total estimated cost: $325,877

In the centre of the foreground, surrounded by a large wetland, is Lake Te Kapa. To the left is Lake Waiwhata, also surrounded by wetland. Lake Whangape is in the background.

HIGH PRIORITY

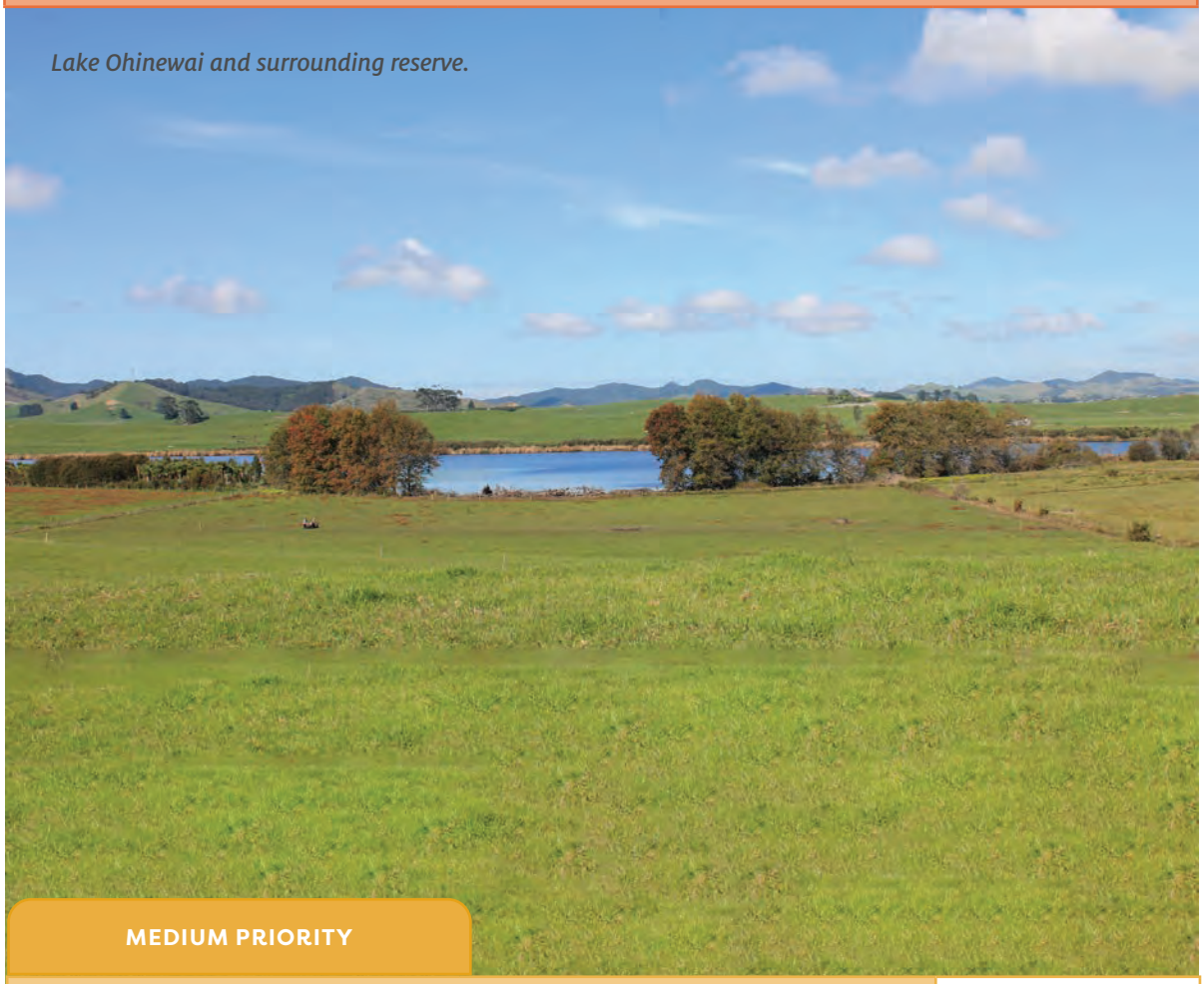
INCREASE EEL HABITAT IN LAKE OHINEWAI — L 5

Location: Lake Ohinewai – a shallow (4.5m deep) 16ha peat lake located within a pastoral catchment (347ha in size) near the township of Ohinewai.

Summary of priority works

- Investigate and design appropriate woody debris structures that can be installed for eel habitat.
- Resource consent
- Install structures
- Project management/staffing/incidentals (25%)

Total estimated cost: $55,000



Lake Ohinewai and surrounding reserve.

MEDIUM PRIORITY

DEVELOPMENT OF LAKE OHINEWAI RESERVE FOR RECREATION — L 6

Location: Waikato District Council and Department of Conservation reserve located next to and around Lake Ohinewai

Summary of priority works

- Development of reserve concept plan
- Access road construction
- Re-vegetation (25ha)
- Installation of walkways, picnic and viewing areas
- Additional planting and installation of amenity structures
- Project management/staffing/incidentals (20%)

Total estimated cost: $2,094,960

HIGH PRIORITY

RESTORING MINIMUM WATER LEVEL AT LAKE KIMIHIA

L 7

Location: Lake Kimihia – a 44ha riverine lake on the northeastern outskirts of Huntly.

Summary of priority works

- Site investigation and ground level surveys for weir design
- Design weir and bund
- Resource consents
- Bund construction
- Weir construction
- Maintenance
- Project management/staffing/incidentals (20%)

Total estimated cost: $150,000

HIGH PRIORITY

WATER QUALITY AND HABITAT ENHANCEMENT AT LAKE OKOWHAO

L 8

Location: Lake Okowhao – an 8ha riverine lake located north of Huntly.

Summary of priority works

- Design and construct treatment wetland
- Resource consent
- Weed control
- Willow control
- Native planting (5ha), fencing (1.5km)
- Project management/staffing/incidentals (20%)

Total estimated cost: $1,285,302

HIGH PRIORITY

PROVIDE FISH PASSAGE PAST LAKE OKOWHAO OUTLET STREAM PUMP STATION AND FLOODGATE

L 9

Location: Lake Okowhao outlet stream pump and floodgate near Te Ohaaki Road, north of Huntly.

Summary of priority works

- Installation of fish friendly floodgate
- Installation of fish friendly flood pump
- Project management/staffing/incidentals (15%)

Total estimated cost: $280,600

VERY HIGH PRIORITY

BIODIVERSITY ENHANCEMENT OF SELECTED WETLANDS AROUND SHALLOW LAKES

L 10

Location: Selected wetlands around Lakes Hakanoa, Rotongaro and Rotongaroiti, Waahi and Waikare (see Appendix 8 of the *Waikato and Waipā River Restoration Strategy* Technical Report for detail on which wetlands are a priority).

Summary of priority works

- Fencing (16.6km)
- Native planting (76.55ha)
- Willow control
- Weed control
- Hydrological re-instatement
- Project management/staffing/incidentals (30%)

Total estimated cost: $4,193,523

Drone innovation is enabling more cost-effective and targeted willow control around our lakes.

VERY HIGH PRIORITY

WATER QUALITY AND HABITAT ENHANCEMENT AT LAKE WHANGAPE

L 11

Location: Lake Whangape – the second largest lake (1450ha) in the lower Waikato River catchment, located 5km west of Rangiriri township.

Summary of priority works

- Fencing (26.1km)
- Alligator weed control
- Weed and willow control
- Native planting (12.02ha)
- Project management/staffing/incidentals (20%)

Total estimated cost: $1,826,471

VERY HIGH PRIORITY

WATER QUALITY AND HABITAT ENHANCEMENT AT LAKE WAAHI

L 12

Location: Lake Waahi – the third largest lake (522ha) in the Lower Waikato catchment, located west of Huntly township.

Summary of priority works

- Reduce external sediment loads by undertaking hill country soil conservation work and riparian fencing and planting
- Add flocculent to lake inflow
- Project management/staffing/incidentals (15%)

Total estimated cost: $5,364,566

VERY HIGH PRIORITY

INTENSIVE REMOVAL OF PEST FISH AT LAKE WAAHI

L 13

Location: Lake Waahi – the third largest lake (522ha) in the Lower Waikato catchment, located west of Huntly township.

Summary of priority works

- Develop a detailed project plan
- Engineering assessments and design of pest fish barrier
- Consultation and cultural assessment
- Resource consents/permits
- Intensive removal of pest fish
- Monitoring for koi carp population changes and overall ecosystem effects of the work
- Landowner reparation
- Project management/staffing/incidentals (30% in Year 1 and 20% in Years 2-10)

Total estimated cost: $2,642,732

HIGH PRIORITY

WATER QUALITY AND HABITAT ENHANCEMENT AT LAKE AREARE

L 14

Location: Lake Areare – a 33ha peat lake in the Horsham Downs area.

Summary of priority works

- Design and construct a treatment wetland
- Resource consents
- Native planting (1.7ha)
- Project management/staffing/incidentals (20%)

Total estimated cost: $277,220

HIGH PRIORITY

WETLAND ENHANCEMENT AT HORSHAM DOWNS LAKES — L 15

Location: Lakes Pikopiko, Hotoananga, Kaituna, Tunawhakaheke, Whakatangi, Komakorau. These small peat lakes are located in the Horsham Downs area and collectively cover 71.7ha. All of the lakes discharge to the Waikato River near Taupiri.

Summary of priority works

- Fencing (1.25km)
- Native planting (6.7ha)
- Weed control
- Possum control
- Project management/staffing/incidentals (20%)

Total estimated cost: $492,458

A floating wetland within one of the constructed treatment systems at Lake Kaituna.

HIGH PRIORITY

DEVELOPMENT OF LAKE ROTOKAURI RESERVE FOR RECREATION — L 16

Location: Lake Rotokauri – a 41.7ha lake located on the northern boundary of Hamilton city and the southern boundary of Waikato district.

Summary of priority works

- Walkway construction (2km)
- Native planting (6ha)
- Installation of picnic and viewing areas
- Possum control
- Additional planting and installation of amenity structures
- Project management/staffing/incidentals (20%)

Total estimated cost: $1,319,185

VERY HIGH PRIORITY

WATER QUALITY AND HABITAT ENHANCEMENT AT LAKE ROTOROA — L 17

Location: Lake Rotoroa (Hamilton Lake) – a 55ha lake situated in central Hamilton

Summary of priority works

- Public information campaign to increase awareness of the impact of water fowl on lake water quality
- Management of pest fish
- Eradication of Egeria and native plant re-establishment
- Project management/staffing/incidentals (20%)

Total estimated cost: $1,075,200

MEDIUM PRIORITY

WETLAND ENHANCEMENT AT LAKES ROTOPATAKA, PATAKA AND POSA — L 18

Location: Lake Pataka (4.6ha) and Lake Posa (2ha) are located south of Templeview. Lake Pataka flows into Lake Posa and discharges to the Waipā River. Lake Rotopataka (2.8ha) is located north of Te Awamutu and discharges to the Waikato River.

Summary of priority works

- Fencing (795m)
- Native planting (5.5ha)
- Willow control
- Project management/staffing/incidentals (20%)

Total estimated cost: $330,901

Extensive raupo beds (pale brown) encircle Lake Posa.

VERY HIGH PRIORITY

PROTECTING AND ENHANCING WATER QUALITY AT LAKE ROTOMĀNUKA

L 19

Location: Lake Rotomānuka – located near Ōhaupō, this is a complex of two separate lake basins (Lake Rotomānuka North and Lake Rotomānuka South [Lake Gin]) that are hydrologically connected through a 10ha shallow seasonally flooded wetland.

Summary of priority works

- Purchase of land (6ha)
- Fencing (1.5km)
- Native planting (8ha)
- Construction of treatment systems on drains
- Resource consents and consultation for constructed treatment systems
- Baseline survey of Lake Rotomānuka North to establish fish densities
- Annual fishing of Rotomānuka North
- Submerged plant translocation
- Project management/staffing/incidentals (20%)

Total estimated cost: $1,323,967

Constructed treatment system on the main inflow into Rotomānuka South 2016.
Photo: Department of Conservation

MEDIUM PRIORITY

LAKE ROTOPIKO PEST FISH ERADICATION

L 20

Location: Lake Rotopiko peat lake complex – situated south of Ōhaupō. The complex consists of three permanent lakes named North (5.3ha, 4m deep), East (1.6ha, 4.4m deep) and South (8.3ha, 3.6m deep). There is an ephemeral wetland area between North and South lakes that connects the two during wet seasons (referred to as Winter Lake).

Summary of priority works

- Consultation and cultural assessment
- Resource consents/permits
- Pest fish eradication
- Monitoring success of pest fish eradication
- Return indigenous fish species
- Landowner reparation
- Project management/staffing/incidentals (20%)

Total estimated cost: $496,328

VERY HIGH PRIORITY

RESTORATION OF WETLAND AND AQUATIC PLANT ECOSYSTEMS AT LAKE MANGAKAWARE

L 21

Location: Lake Mangakaware – a 12.9ha peat lake located west of Te Awamutu.

Summary of priority works

- Fencing (2.05km)
- Native revegetation of lake margin/reserve (27.3ha)
- Construction of treatment systems on drains
- Resource consents and consultation for constructed treatment systems
- Annual maintenance of sediment basins/silt traps for 10 years
- Eradication of egeria (including resource consent, scoping survey, hand weeding, barrier control and monitoring)
- Project management/staffing/incidentals (20%)

Total estimated cost: $1,488,402

MEDIUM PRIORITY

WATER QUALITY AND HABITAT ENHANCEMENT AT LAKE NGĀROTO

L 22

Location: Lake Ngāroto – the largest of the peat lakes in the Waikato region with an area of 108ha, located approximately 5km north of Te Awamutu.

Summary of priority works

- Land purchase (19ha)
- Fencing
- Construction of treatment systems on drains
- Resource consents and consultation for constructed treatment systems
- Annual maintenance of sediment basins/silt traps for 10 years
- Alum dosing
- Project management/staffing/incidentals (20%)

Total estimated cost: $5,639,540

It is proposed to buy the low-lying land at the southern end of Lake Ngāroto to construct a large wetland.

IWI PRIORITIES
NGĀ WHAKAAROTAU Ā IWI

- Waikato-Tainui priorities
- Raukawa priorities
- Te Arawa River Iwi Trust priorities
- Ngāti Tūwharetoa priorities
- Maniapoto priorities
- Iwi priorities for shallow lakes

WAIKATO-TAINUI PRIORITIES
NGĀ WHAKAAROTAU O WAIKATO-TAINUI

GOALS

The following goals were developed for Waikato-Tainui priorities:

1	The life creating and life supporting capabilities of mauri is protected and restored.
Taonga species are enhanced, accessible and sustained to ensure intergenerational preservation and future use.	2
3	Cultural and environmental values are given priority in decision making for natural resource management and use.
Traditional water sources for cultural purposes are protected in all projects.	4
5	Maatauranga Maaori and tikanga are incorporated in natural resource use and restoration projects. This includes traditional methods for site preparation, restoration techniques, health and safety.

PRIORITY PROJECTS

Waikato-Tainui has identified 36 projects totalling $29,542,168. These are summarised in the tables that follow. A more comprehensive plan for each project can be found in Appendix 9 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018).

The Waikato-Tainui rohe was divided into four areas covering Karāpiro to Ngaaruawaahia, Ngaaruawaahia to Mercer, Mercer to Te Puuaha o Waikato and Puuniu River junction to the confluence with the Waikato River in Ngaaruawaahia. In each of these areas, projects generally focus on large scale planting (160ha total), fencing (189km total), protection and acknowledgement of sites of significance (120 pou) and capacity training of iwi to fulfil responsibilities as kaitiaki. There are also tribally wide projects which focus on education of rangatahi (youth) and supporting particular areas and activities associated with the Kiingitanga.

SUMMARY TABLES OF PRIORITY PROJECTS

Waikato-Tainui – overall rohe

VERY HIGH PRIORITY

ENABLING MANAWHENUA TO ENGAGE IN RIVER RESTORATION – WAIKATO-TAINUI	WT 1

Central and Lower Waikato, Waipaa: Area A and Area C
Location: Waikato-Tainui area of the Waikato River from Karapiro to Te Puuaha and the Waipaa River from the Puuniu Junction down to Ngaaruawaahia.

Summary of priority works

- Creation of education package
- Waananga to determine education areas
- Purchasing resources to support training
- Delivery of education programme
- Project management/staffing/incidentals (30%)

Total estimated cost: $4,725,000

Tangirau whanau

VERY HIGH PRIORITY

WAIKATO-TAINUI RIVER EDUCATION PROGRAMME	WT 2

Central and Lower Waikato, Waipaa: Area A and Area C

Location: Waikato-Tainui area of the Waikato River from Karapiro to Te Puuaha and the Waipaa River from the Puuniu Junction down to Ngaaruawaahia.

Summary of priority works

- Develop education curriculum
- Delivery of education programme
- Create education package
- Resources required to support programme
- Project management/staffing/incidentals (25%)

Total estimated cost: $5,800,000

VERY HIGH PRIORITY

WAIKATO-TAINUI RIVER CHAMPIONS — WT 3

Central and Lower Waikato, Waipaa: Area A and Area C
Location: Waikato-Tainui area of the Waikato River from Karapiro to Te Puuaha and the Waipaa River from the Puuniu Junction down to Ngaaruawaahia.

Summary of priority works

- Organise celebratory dinner
- Carve tohu for champions
- Create champion celebration format
- Project management/staffing/incidentals (20%)

Total estimated cost: $160,000

Rangiriri — he waahi pakanga.

HIGH PRIORITY

MANA O TE AWA – WATER QUALITY MONITORING – WAIKATO-TAINUI — WT 4

Central and Lower Waikato, Waipaa: Area A and Area C
Location: Waikato-Tainui area of the Waikato River from Karapiro to Te Puuaha and the Waipaa River from the Puuniu Junction down to Ngaaruawaahia.

Summary of priority works

- Waananga to establish kaitiaki
- Water quality field testing kits
- Acquire Stream Health Monitoring and Assessment Kits
- Capacity building
- Project management/staffing/incidentals (20%)

Total estimated cost: $723,456

Waikato-Tainui – Te Puuaha Marae (Mercer ki Te Puuaha o Waikato)

VERY HIGH PRIORITY

TUATAHI – TUNA HABITAT PONDS – TE PUUAHA MARAE — WT-TP1

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Mercer and Port Waikato.

Summary of priority works

- Pond construction (15)
- Planting (4.5ha)
- Fencing (6km)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $842,108

Tuna in the lower Waikato River.

VERY HIGH PRIORITY

TUARUA – 10HA WETLAND CREATION, RESTORATION AND PROTECTION – TE PUUAHA MARAE — WT-TP2

Central and Lower Waikato: Area A

Location: Waikato River and all tributaries between Mercer and Port Waikato.

Summary of priority works

- Fencing (4km)
- Cultural training and safety
- Wetland planting (10ha)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $768,976

VERY HIGH PRIORITY

TUARUA – IDENTIFICATION, RESTORATION AND PROTECTION OF WAAHI TAPU AND SITES OF SIGNIFICANCE – STAGE 1 – TE PUUAHA MARAE — WT-TP3

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Mercer and Port Waikato.

Summary of priority works

- Waananga to identify sites (10)
- Photographing and mapping of sites
- Interview knowledge holders
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $252,980

VERY HIGH PRIORITY

TUARUA – RESTORING AND PROTECTING WAAHI TAPU AND SITES OF SIGNIFICANCE – STAGE 2 – TE PUUAHA MARAE

WT-TP4

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Mercer and Port Waikato.

Summary of priority works

- Fencing of 20 sites (20km per site)
- Riparian planting around 20 sites (20ha)
- iPou or carved pou
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $676,423

Tewhatewha commemorating the trenches at Rangiriri.

HIGH PRIORITY

TUARUA – 30 PUNA RESTORATION – TE PUUAHA MARAE

WT-TP5

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Mercer and Port Waikato.

Summary of priority works

- Fencing of puna (6km)
- Waananga to identify puna
- Riparian planting around puna
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $662,090

HIGH PRIORITY

TUATORU – 10KM RIPARIAN AND TAONGA SPECIES HABITAT RESTORATION – TE PUUAHA MARAE

WT-TP6

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Mercer and Port Waikato.

Summary of priority works

- Installation of fish habitat structures
- Planting (5ha)
- Fencing (10km)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $704,457

HIGH PRIORITY

TUATORU – 20 WATERCRESS RESTORATION PROJECTS – TE PUUAHA MARAE

WT-TP7

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Mercer and Port Waikato.

Summary of priority works

- Waananga to identify sites
- Grow watercress seedlings
- Watercress restoration
- Capacity building
- Project management/staffing/incidentals (25%)

Total estimated cost: $100,000

Watercress is desired in streams and rivers.

Waikato-Tainui – Ngaaruawaahia ki Mercer

VERY HIGH PRIORITY

TUATAHI – 10HA WETLAND CREATION, RESTORATION AND PROTECTION – NGAARUAWAAHIA KI MERCER

WT-M1

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Ngaaruawaahia and Mercer.

Summary of priority works

- Fencing (4km)
- Cultural training and safety
- Wetland planting (10ha)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $768,976

VERY HIGH PRIORITY

TUATAHI – RESTORING ACCESS TO THE WAIKATO RIVER THROUGH WAKA TAUA – TURANGAWAEWAE

WT-M2

Central and Lower Waikato: Area A
Location: Turangawaewae Marae.

Summary of priority works

- Construction of waka taua shed facilities
- Waananga with whaanau
- Paaharakeke planting (1ha)
- Capacity and capability building
- Project management/staffing/incidentals (15%)

Total estimated cost: $722,400

VERY HIGH PRIORITY

TUATAHI – RESTORING ACCESS TO WAIKATO RIVER AND WAKA TAUA – WAAHI PAA

WT-M3

Central and Lower Waikato: Area A
Location: Waahi Paa.

Summary of priority works

- Engineering and landscape design
- Gather information for pou
- iPou and carved pou
- Building boat ramp and waka landing
- Project management/staffing/incidentals (30%)

Total estimated cost: $531,974

VERY HIGH PRIORITY

TUATAHI – IDENTIFICATION, RESTORATION AND PROTECTION OF WAAHI TAPU AND SITES OF SIGNIFICANCE – STAGE 1 – NGAARUAWAAHIA KI MERCER

WT-M4

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Ngaaruawaahia and Mercer.

Summary of priority works

- Waananga to identify sites (10)
- Mapping and photography of sites
- Interview knowledge holders
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $252,980

VERY HIGH PRIORITY

TUARUA – RESTORING AND PROTECTING WAAHI PAA'S WAAHI TAPU – STAGE 2 – NGAARUAWAAHIA KI MERCER

WT-M5

Central and Lower Waikato: Area A
Location: Waahi Paa.

Summary of priority works

- Site fencing (0.6km)
- Installation of cultural symbolism
- Site preparation and planting of urupa
- Waananga with whānau
- Project management/staffing/incidentals (30%)

Total estimated cost: $49,576

VERY HIGH PRIORITY

TUARUA – RESTORING AND PROTECTING WAAHI TAPU AND SITES OF SIGNIFICANCE – STAGE 2 – NGAARUAWAAHIA KI MERCER

WT-M6

Central and Lower Waikato: Area A

Location: Waikato River and all tributaries between Ngaaruawaahia and Mercer.

Summary of priority works

- Fencing of 20 sites (20km per site)
- Riparian planting around 20 sites (20ha)
- iPou or carved pou
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $676,423

HIGH PRIORITY

TUARUA – 30 PUNA RESTORATION – NGAARUAWAAHIA KI MERCER

WT-M7

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Ngaaruawaahia and Mercer.

Summary of priority works

- Waananga to identify puna
- Fencing of puna (6km)
- Riparian planting around puna
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $662,090

HIGH PRIORITY

TUATORU – TUNA HABITAT PONDS – NGAARUAWAAHIA KI MERCER

WT-M8

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Ngaaruawaahia and Mercer.

Summary of priority works

- Pond construction (15)
- Planting (4.5ha)
- Fencing (6km)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $842,108

VERY HIGH PRIORITY

TUATORU – 10KM RIPARIAN AND TAONGA SPECIES HABITAT RESTORATION PROJECT – NGAARUAWAAHIA KI MERCER

WT-M9

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Ngaaruawaahia and Mercer.

Summary of priority works

- Installation of fish habitat structures
- Planting (5ha)
- Fencing (10km)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $725,257

HIGH PRIORITY

TUATORU – 20 WATERCRESS RESTORATION PROJECTS – NGAARUAWAAHIA KI MERCER

WT-M10

Central and Lower Waikato: Area A

Location: Waikato River and all tributaries between Ngaaruawaahia and Mercer.

Summary of priority works

- Waananga to identify sites
- Grow watercress seedlings
- Watercress restoration
- Capacity building
- Project management/staffing/incidentals (25%)

Total estimated cost: $100,000

Waikato-Tainui – Karapiro ki Ngaaruawaahia

VERY HIGH PRIORITY

TUATAHI – 10KM RIPARIAN AND TAONGA SPECIES HABITAT RESTORATION PROJECT – KARAPIRO KI NGAARUAWAAHIA

WT-K1

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Lake Karapiro and Ngaaruawaahia.

Summary of priority works

- Installation of fish habitat structures
- Planting (5ha)
- Fencing (10km)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $725,257

VERY HIGH PRIORITY

TUATAHI – IDENTIFICATION, RESTORATION AND PROTECTION OF WAAHI TAPU AND SITES OF SIGNIFICANCE – STAGE 1 – KARAPIRO KI NGAARUAWAAHIA

WT-K2

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Lake Karapiro and Ngaaruawaahia

Summary of priority works

- Waananga to identify sites (10)
- Mapping and photographing sites
- Interview knowledge holders
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $252,980

VERY HIGH PRIORITY

TUARUA – RESTORING AND PROTECTING WAAHI TAPU AND SITES OF SIGNIFICANCE – STAGE 2 – KARAPIRO KI NGAARUAWAAHIA

WT-K3

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Lake Karapiro and Ngaaruawaahia.

Summary of priority works

- Fencing of 20 sites (20km per site)
- Riparian planting around 20 sites (20ha)
- iPou or carved pou
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $676,423

VERY HIGH PRIORITY

TUARUA – 10HA WETLAND CREATION, RESTORATION AND PROTECTION – KARAPIRO KI NGAARUAWAAHIA

WT-K4

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Lake Karapiro and Ngaaruawaahia

Summary of priority works

- Fencing (4km)
- Cultural training and safety
- Wetland planting (10ha)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $768,976

VERY HIGH PRIORITY

TUARUA – TUNA HABITAT PONDS – KARAPIRO KI NGAARUAWAAHIA

WT-K5

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Lake Karapiro and Ngaaruawaahia.

Summary of priority works

- Pond construction (15)
- Planting (4.5ha)
- Fencing (6km)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $842,108

HIGH PRIORITY

TUATORU – 20 WATERCRESS RESTORATION PROJECTS – KARAPIRO KI NGAARUAWAAHIA

WT-K6

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Lake Karapiro and Ngaaruawaahia.

Summary of priority works

- Waananga to identify sites
- Grow watercress seedlings
- Watercress restoration
- Capacity building
- Project management/staffing/incidentals (25%)

Total estimated cost: $100,000

HIGH PRIORITY

TUATORU – 30 PUNA RESTORATION – KARAPIRO KI NGAARUAWAAHIA

WT-K7

Central and Lower Waikato: Area A
Location: Waikato River and all tributaries between Lake Karapiro and Ngaaruawaahia.

Summary of priority works

- Waananga to identify puna
- Fencing of puna (6km)
- Riparian planting around puna
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $662,090

Te puna o Taawhiao at Turangawaewae.

Waikato-Tainui – Puuniu ki Ngaaruawaahia

HIGH PRIORITY

TUATAHI – TUNA HABITAT PONDS – PUUNIU KI NGAARUAWAAHIA — WT-P1

Waipaa: Area C
Location: Waikato River and all tributaries between Puuniu junction on Waipaa River and Ngaaruawaahia.

Summary of priority works

- Pond construction (15)
- Planting (4.5ha)
- Fencing (6km)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $842,108

Construction of tuna ponds near Te Awamutu. Photo: Pūniu River Care

HIGH PRIORITY

TUATAHI – 30 PUNA RESTORATION – PUUNIU KI NGAARUAWAAHIA — WT-P2

Waipaa: Area C
Location: Waikato River and all tributaries between Puuniu junction on Waipaa River and Ngaaruawaahia.

Summary of priority works

- Waananga to identify puna
- Fencing of puna (6km)
- Riparian planting around puna
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $662,090

VERY HIGH PRIORITY

TUATAHI – TUNA EDUCATIONAL PONDS – WHATAWHATA

WT-P3

Waipaa: Area C
Location: Whatawhata.

Summary of priority works

- Earthworks to create ponds
- Planting (1ha)
- Fencing of ponds (8km)
- Capacity and capability building
- Project management/staffing/incidentals (25%)

Total estimated cost: $112,379

VERY HIGH PRIORITY

TUATAHI – IDENTIFICATION, RESTORATION AND PROTECTION OF WAAHI TAPU AND SITES OF SIGNIFICANCE – STAGE 1 PUUNIU KI NGAARUAWAAHIA

WT-P4

Waipaa: Area C
Location: Waikato River and all tributaries between Puuniu River junction on the Waipaa River and Ngaaruawaahia.

Summary of priority works

- Waananga to identify sites (10)
- Interview knowledge holders
- Photographing and mapping of sites
- Capacity and capability building
- Project management/staffing/incidentals (25%)

Total estimated cost: $252,980

VERY HIGH PRIORITY

TUARUA – RESTORING AND PROTECTING WAAHI TAPU AND SITES OF SIGNIFICANCE – STAGE 2 – PUUNIU KI NGAARUAWAAHIA

WT-P5

Waipaa: Area C
Location: Waikato River and all tributaries between Puuniu River junction on the Waipaa River and Ngaaruawaahia.

Summary of priority works

- Fencing of 20 sites (20km per site)
- Riparian planting around 20 sites (20ha)
- iPou or carved pou
- Capacity and capability building
- Project management/staffing/incidentals (30%)

Total estimated cost: $676,423

VERY HIGH PRIORITY

TUARUA – 10HA WETLAND CREATION, RESTORATION AND PROTECTION – PUUNIU KI NGAARUAWAAHIA

WT-P6

Waipaa: Area C
Location: Waikato River and all tributaries between Puuniu River junction on the Waipaa River and Ngaaruawaahia.

Summary of priority works

- Fencing (4km)
- Wetland planting (10ha)
- Cultural training and safety
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $768,976

HIGH PRIORITY

TUARUA – 10KM RIPARIAN AND TAONGA SPECIES HABITAT RESTORATION – PUUNIU KI NGAARUAWAAHIA

WT-P7

Waipaa: Area C
Location: Waikato River and all tributaries between Puuniu River junction on the Waipaa River and Ngaaruawaahia.

Summary of priority works

- Installation of fish habitat structures
- Planting (5ha)
- Fencing (10km)
- Capacity building
- Project management/staffing/incidentals (30%)

Total estimated cost: $725,257

HIGH PRIORITY

TUATORU– 20 WATERCRESS RESTORATION PROJECTS – PUUNIU KI TURANGAWAEWAE

WT-P8

Waipaa: Area C
Location: Waikato River and all tributaries between Puuniu River junction on the Waipaa River and Ngaaruawaahia.

Summary of priority works

- Waananga to identify sites
- Grow watercress seedlings
- Watercress restoration
- Capacity building
- Project management/staffing/incidentals (20%)

Total estimated cost: $100,000

Photo: Pūniu River Care.

RAUKAWA PRIORITIES
NGĀ WHAKAAROTAU O RAUKAWA

PRIORITY PROJECTS

Raukawa have identified 13 priority areas to support the key themes of restoring the relationship with the Waikato awa and capturing and sharing knowledge. These priority areas include empowering the iwi through kaitiakitanga wānanga, capturing and sharing mātauranga-a-Raukawa, restoring mahinga kai, identifying significant sites, planting and fencing, and reconnecting with the entire river and its waters.

Raukawa have developed two sets of potential project areas within the Raukawa rohe (area). To Raukawa, the relationship with the awa was of paramount importance, and this is reflected in their priority areas.

Iwi, hapū, whānau and uri of Raukawa are encouraged to develop projects as guided by these project areas. Further information on these priorities is provided in Appendix 10 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018).

Funding priority one: Relationship

The objective for funding priority one is the enhancement and restoration of the relationship between Raukawa uri, whānau, marae, hapū, iwi and the Waikato and Waipā river catchments.

Potential project areas

In the following table, there is a selection of projects that are considered to contribute to achieving the objective. This is not a definitive list of potential projects, but is intended to act as guidance to people or organisations seeking funding or making funding decisions in the above priority area.

Tuna is a significant mahinga kai species for ngā uri o Raukawa.

POTENTIAL PROJECT AREAS	SUMMARY OF POTENTIAL PROJECTS
MAHINGA KAI RESTORATION	**Tuna restoration:** The restoration of tuna stocks within the catchment. The objective could include increasing tuna habitats within the Raukawa takiwā and would need to include wānanga on traditional methods of gathering and preparing tuna. **Watercress restoration:** Raukawa uri are able to harvest watercress from their traditional and/or hydroponic sites. **Kōura restoration:** Investigate why kōura populations have decreased in areas. Establishing fenced riparian margins in areas which support healthy kōura populations and monitor kōura.
RECONNECTION TO NGĀ AWA O RAUKAWA	Restoring the relationship between Raukawa marae/hapū with the various awa that surround marae. This could include disability accessways from marae to awa, enhancing and restoring the mauri by riparian planting and fencing, and the restoration of traditional swimming holes.
RAUKAWA WAKA HAUORA	The creation of a Raukawa waka hauora programme. It could include a wānanga programme that utilises the healing qualities of the Waikato River to aid the health and wellbeing of the Raukawa uri, utilising Raukawa tikanga and kawa.
RAUKAWA MARAE WAKA AMA	Raukawa to assert their mana whakahaere along the awa through waka ama. Raukawa iwi/marae/hapū to regularly use the awa for recreational purposes and allowing uri to gain an understanding of the importance of the awa to the iwi.
RAUKAWA KAITIAKI ENHANCEMENT	Raukawa marae/hapū become more effective kaitiaki as guardians, educators and nurturers of life. This could include the creation of nurseries to enable marae to undertake riparian planting while creating a whakapapa for plants to whakahono marae to the awa, along with ensuring that Raukawa kaitiaki are trained to carry out these activities which would include putting kaitiaki through the New Zealand Certificate in Conservation.
RAUKAWA HISTORICAL SITE VISUALISATION	Raukawa Historical Site Visualisation will provide cultural assets that may be displayed and kept in a Raukawa taonga room and/or for inclusion on a future website. The project will help facilitate a connection to the history and land for the people. It will provide visual narratives of sites along the Waikato River as they would have appeared historically. This will be achieved through the use of latest computer technologies available, including 3D modelling.
RAUKAWA RECONNECTION WITH NGĀ WĀHI TŪTURU	Restoring the relationship between Raukawa marae/hapū with the various historical sites of significance within the catchment. This project would see improved access to sites throughout the takiwā and ensure the cultural integrity of the sites are restored and protected (where appropriate). This may be achieved through legacy planting, site identification or whare kōrero.

Funding priority two: Mātauranga Raukawa and knowledge

The objective of funding priority two is the enhancement and restoration of mātauranga Raukawa and knowledge and its application. For this purpose of this priority, mātauranga Raukawa is defined in *Te Rautaki Taiao* and is set out below. Knowledge is defined as all other sources of information.

Mātauranga Raukawa

Mātauranga is ancestral and traditional information and knowledge that has been developed through the centuries and generations. Mātauranga Māori is a term that describes the body of knowledge originating from ancestors, including the Māori worldview and perspectives, Māori creativity and cultural practices. Mātauranga Māori embraces individual, local, and collective knowledge, Māori values, cultural expressions, perspectives, observations, being traditional, historical and contemporary.

For Raukawa mātauranga, Raukawa would include:

- practical common sense, based on teachings and experience passed on from generation to generation
- knowledge of the whenua, covering knowledge of the environment and the relationship between things
- a holistic perspective. It cannot be compartmentalised and cannot be separated from the people who hold it. It is rooted in the spiritual health, culture and language of the people. It is a way of life
- an authority system. It sets out the rules governing the use of resources, respect, an obligation to share. It is dynamic, cumulative and stable
- a way of life. Wisdom is using knowledge in good ways. It is using the heart and the head together. It comes from the spirit in order to survive; and gives credibility to people.

Potential project areas

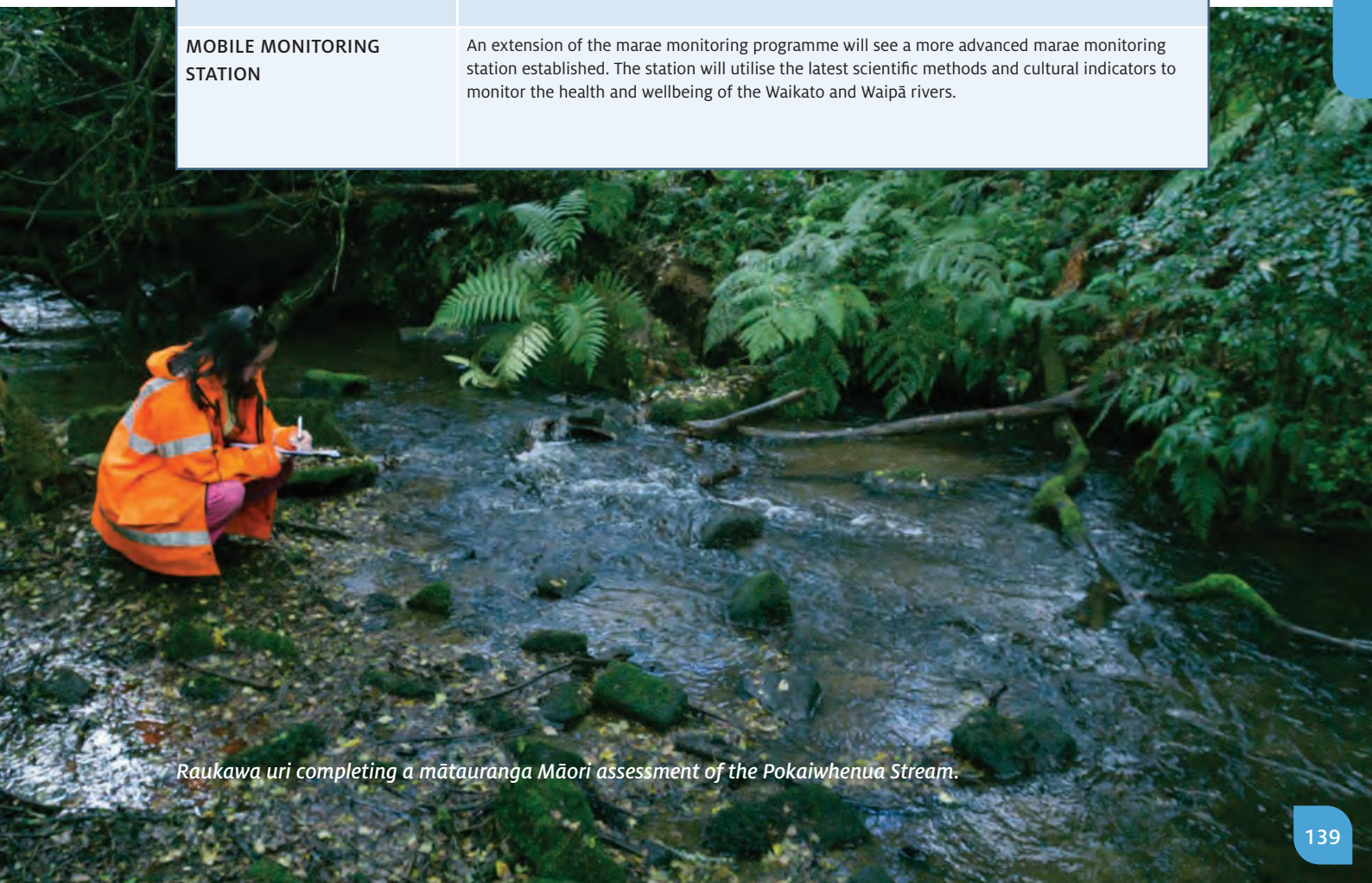
Following is a selection of potential project areas that are considered to achieve or contribute to the achievement of the objectives. It is not a definitive list of potential projects but is meant to act as a guide to potential people or organisations seeking funding or making funding decisions in the above areas.

Decision making

A number of considerations need to be taken into account when assessing which projects should take priority. The overarching consideration is whether a project contributes to the restoration and protection of the health and wellbeing of the Waikato and Waipā rivers as required under *Te Ture Whaimana*.

For Raukawa, the essence of the Ngā Mana o Ngā Atua model as well as the Raukawa values and principles must be given effect and any funding decisions within the Raukawa takiwā must be consistent with these if they are to deliver on the Raukawa priorities. Both of these elements are outlined as follows.

POTENTIAL PROJECT AREAS	SUMMARY OF POTENTIAL PROJECTS
MĀTAURANGA RAUKAWA RESTORATION	A series of wānanga held annually throughout the year. Each wānanga will focus on certain aspects of mātauranga Māori.
MĀTAURANGA RAUKAWA; MATEA AKO O RAUKAWA KAITIAKI RAUKAWA EDUCATION: THE LEARNING NEEDS OF RAUKAWA KAITIAKI	Developing a new approach to education that both embodies the unique place of the awa in Raukawa cultural identity. This approach would also need to recognise the opportunities for new knowledge to be created through collaboration for our awa, our iwi, our people. This multi-year project will establish an education programme delivered using mātauranga Raukawa and the latest scientific technology.
HE TIRA HOE O NGA IWI O TE AWA O WAIKATO	Iwi waka on a tira hoe along the awa, beginning at the source and travelling along its length to Te Pūaha. The tira hoe will provide the opportunity for iwi to exercise and share their mana whakahaere, mātauranga, kōrero. This could be a biannual event.
MĀTAURANGA RAUKAWA PUKAPUKA	Investigates the creation of a mātauranga Raukawa pukapuka. The pukapuka could share and record mātauranga Raukawa to ensure this knowledge is retained for future generations.
MARAE MONITORING STATION	Marae monitoring stations to assist marae/hapū to become more effective kaitiaki by giving marae the tools and knowledge to monitor the condition of their awa. This will include the development and testing of cultural health indicators for the Raukawa areas of interest in the Waikato River catchment.
MOBILE MONITORING STATION	An extension of the marae monitoring programme will see a more advanced marae monitoring station established. The station will utilise the latest scientific methods and cultural indicators to monitor the health and wellbeing of the Waikato and Waipā rivers.



Raukawa uri completing a mātauranga Māori assessment of the Pokaiwhenua Stream.

Ngā Mana o Ngā Atua

Ngā Mana o Ngā Atua model is the framework which guides contemporary Raukawa environmental and resource management. Mana (prestige, integrity) is attributed in the Raukawa view within three spheres: Ngā Mana o Ngā Atua, Ngā Mana o Te Whenua and Ngā Mana o Ngā Tangata.

Ngā Mana o Ngā Atua is bestowed from the gods or spiritual realm with Ngā Mana o te Whenua coming from the earth or Papa-tū-ā-nuku, the earthly realm. Ngā Mana o Ngā Tāngata comes from belonging to an extended family. In this way, the people of Raukawa understand that all realms of the spiritual, the land and the people are inherently interconnected. For example, the whenua (or afterbirth of a baby) is buried in ancestral land and thus brings full circle, closing the connection between the giving or birth of life and the connection between the land and the spiritual domains of life.

As individuals, we as Raukawa identify through the realms of the mana bestowed by the atua, or spiritual realm, the land of our tūpuna/ancestors, its life giving mana; and through our extended whānau/hapū/iwi, or tangata. Raukawa do not identify ourselves as isolated individuals. We identify with our communities that encompass both living members and ancestors who have passed away.

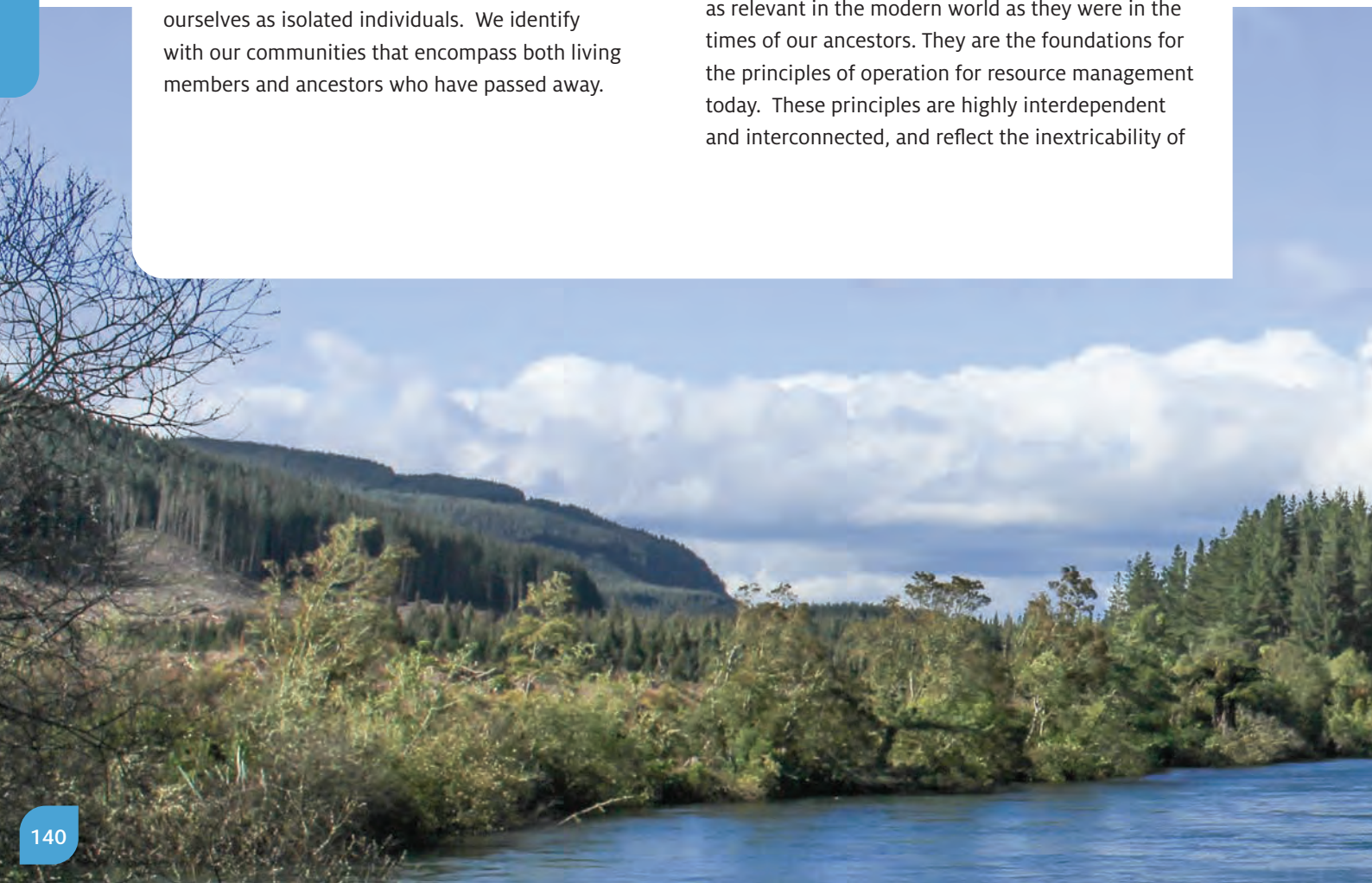
Raukawa values and principles

Te Rautaki Taiao discusses in detail the values and principles of Raukawa and where these originated. For Raukawa, the land and landforms remind us of our histories, genealogies and ultimately of Papa-tū-ā-nuku. How we should operate with and use our environment remains firmly within our histories, geographies and cosmologies.

The values and tikanga that govern our relationship with the natural world are applicable in today's context and can provide a road map for the iwi moving into the future. These values and tikanga assist us in defining and/or regulating acceptable or unacceptable behaviour in relation to the use and management of the environment. These values and tikanga can also provide opportunities and potential for the growth and prosperity of the iwi and the community moving forward.

These tikanga and oral forms of communication will continue to be significant and will influence how Raukawa moves forward in the environment through restoration and incorporating the values and tikanga into the decision-making of whānau, hapū, and iwi.

The values and tikanga remain unchanged. They are as relevant in the modern world as they were in the times of our ancestors. They are the foundations for the principles of operation for resource management today. These principles are highly interdependent and interconnected, and reflect the inextricability of



people from the environment and from the spiritual realm.

These values and principles, as guided and informed by our worldview, influence and impact on all decisions pertaining to environmental and resource management issues. They guide us in how we conduct ourselves and our long term aspirations. They remind us to consider the environment and our footprint on it at all times.

These key values and principles are:

- mātauranga Raukawa
- whenua, mana whenua and tangata whenua
- tikanga
- whakapapa
- whānaungatanga
- rangatiratanga
- kaitiakitanga
- manaakitanga
- ūkaipō
- pūkenga
- kotahitanga.

This background illustrates how Raukawa make decisions in respect of its guardianship role over the environment. These values and principles provide guidance and essential considerations that are taken into account when considering the use and management of the many ecosystems which make up the environment.

It is expected that projects will recognise and give effect to Raukawa values and principles. It is also expected that projects will address the following:

1. How will the proposed activity/project contribute to the vision and objectives of *Te Ture Whaimana*. That is, how will the activity/project contribute to the restoration and protection of the health and wellbeing of the Waikato and Waipā rivers.
2. How the proposed activity/project contributes to the integrated restoration and management of the Waikato and Waipā river catchments. This reflects the interconnected and integrated approach required under Ngā Mana o Ngā Atua.
3. Is the proposed activity consistent with the values and principles of Raukawa? Discussion with Pūtake Taiao at Raukawa Charitable Trust is strongly encouraged.

Pohaturoa is a pou whenua and wāhi tapu for Raukawa.

FUNDING CONSIDERATIONS

The funding considerations below are intended to assist funding and project providers with the information that should be addressed if they are looking to assist in delivery of Raukawa priorities. The considerations should be applied to both funding priority one 'relationships' and funding priority two 'mātauranga Raukawa and knowledge'.

Objective

To ensure that all applications and funding decisions recognise and provide for the Raukawa values and principles.

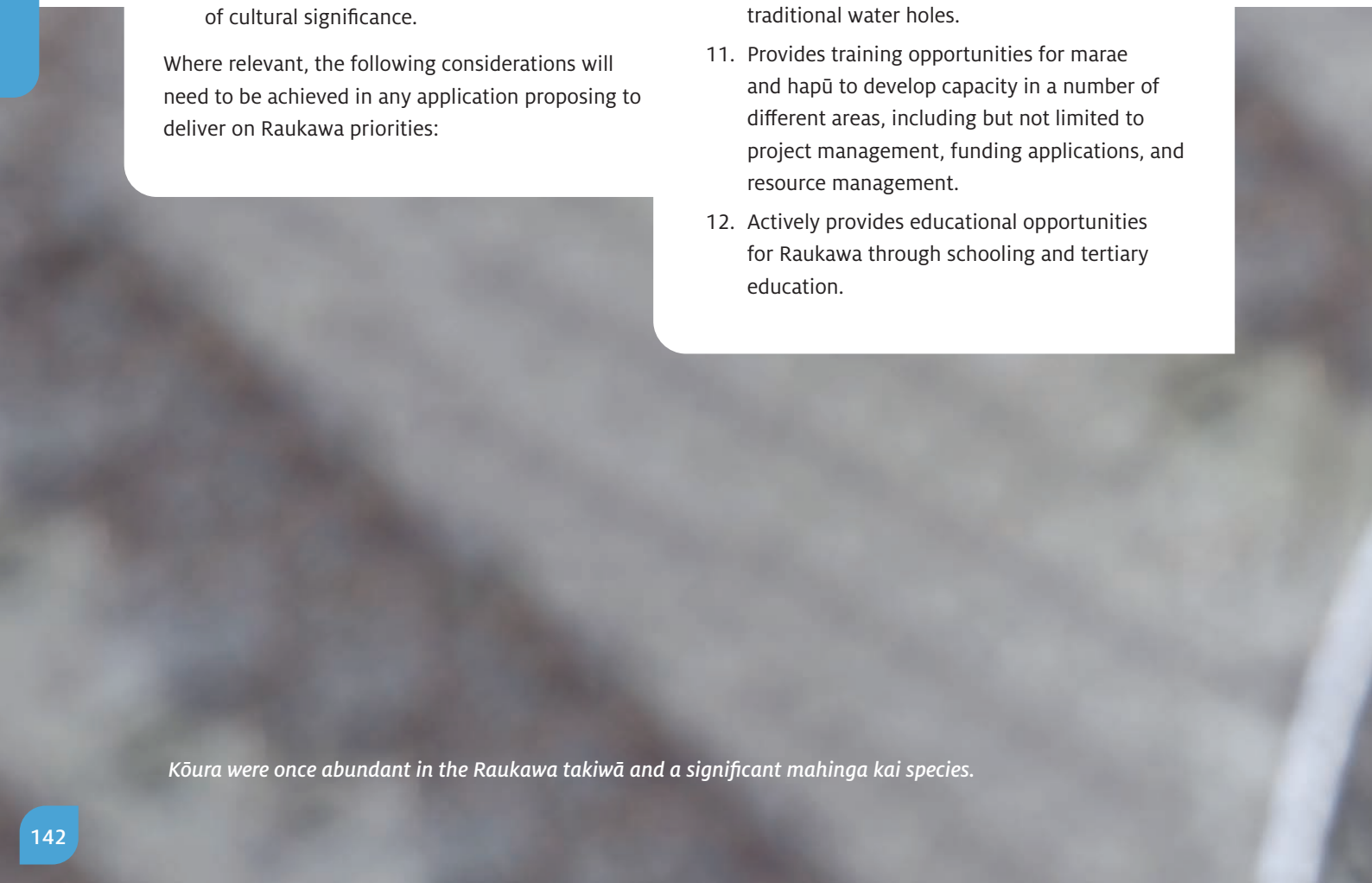
Criteria

There are three criteria that are seen as essential by Raukawa to be met through applications for proposed funding. These are:

1. discussions by the applicant with Raukawa Charitable Trust over the proposed activity/ project
2. recognition of and provision for mātauranga Māori
3. that the effects from the proposed activity/ project do not adversely affect or destroy a site of cultural significance.

Where relevant, the following considerations will need to be achieved in any application proposing to deliver on Raukawa priorities:

1. To ensure water quality is maintained and enhanced as a result of the proposed activity.
2. Seek to enhance existing access to cultural sites of significance and kai gathering places.
3. Provide access to sites where there is currently no access; where appropriate, an activity should provide access.
4. Provide the ability for Raukawa to carry out its cultural practices as appropriate.
5. Recognises and provides for Raukawa ability to exercise its mana whakahaere.
6. Provide, where possible, the opportunity for Raukawa to have ongoing involvement with the proposed activity. For example, Raukawa marae could assist in the monitoring of water quality.
7. The restoration and enhancement of existing ecosystems occurs.
8. Where the activity is adjacent to a waterbody, riparian planting is undertaken where required.
9. Where possible, provide educational opportunities on mātauranga Māori and Raukawa tikanga and kawa.
10. Assist with the restoration of sites used traditionally for certain purposes, where appropriate. For example, the restoration of traditional water holes.
11. Provides training opportunities for marae and hapū to develop capacity in a number of different areas, including but not limited to project management, funding applications, and resource management.
12. Actively provides educational opportunities for Raukawa through schooling and tertiary education.



Kōura were once abundant in the Raukawa takiwā and a significant mahinga kai species.

Outcomes

Raukawa seeks the following outcomes.

- That all parties have an inherent understanding of the mauri of the Waikato River.
- Raukawa uri are regularly accessing and using the awa and its resources for recreational and cultural purposes.
- All Raukawa uri are knowledgeable of the traditional practices of tūpuna and are able to apply these practices in a contemporary setting.
- Raukawa uri are able to enjoy the awa in a manner that fits their cultural memory.
- Raukawa values and principals are known, upheld and expressed.
- Raukawa uri are able to practise their tikanga and kawa and maintain their mana whakahaere.
- Raukawa uri are knowledgeable on western science and are able to apply it to the restoration of the awa in conjunction with mātauranga Raukawa.
- Raukawa is involved in the decision making in their areas of interest and association.

TE ARAWA RIVER IWI TRUST PRIORITIES

NGĀ WHAKAAROTAU O TE TARAHITI AWA Ā IWI O TE ARAWA

PRIORITY PROJECTS

Te Arawa River Iwi Trust (TARIT) has identified eight projects to support Tuhourangi-Ngāti Wahiao and Ngāti Kearoa-Ngāti Tuarā, totalling $1,302,868. These are summarised in the tables that follow.

TARIT has a strong interest in restoring natural resource sites (including those important for mahinga kai), capturing knowledge from their people and recognising their sites of significance through installation of iPou.

Ngati Tahu-Ngati Whaoa are an affiliate to TARIT and have identified 10 priority projects totalling $2,782,425. These are also summarised in the following tables.

The projects focus on restoring the relationship with the Waikato River through capturing kōrero and holding waka ama events, the restoration of mahinga kai (tuna and kōura), cultural activities including use of rongoā (natural medicines) and weaving, and physical restoration of key sites of significance.

A more comprehensive plan for each project can be found in Appendix 11 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018)

Ohaki Wetland

SUMMARY TABLES OF PRIORITY PROJECTS

HIGH PRIORITY

NGĀTI KEAROA-NGĀTI TUARĀ KŌURA AND TUNA RESTORATION	NKNT & TNW 1

Upper Waikato: Area B
Location: Māori owned farm site known to Ngāti Kearoa-Ngāti Tuarā Trust.

Summary of priority works

- Tuna and kōura pond project plan
- Transfer tuna and kōura
- Construct tuna and kōura pond
- Capacity building
- Project management/staffing/incidentals (25%)

Total estimated cost: $187,696

HIGH PRIORITY

NGĀTI KEAROA-NGĀTI TUARĀ WATERCRESS RESTORATION	NKNT & TNW 2

Upper Waikato: Area B
Location: Upper Waikato River catchment within the area of Ngāti Kearoa-Ngāti Tuarā.

Summary of priority works

- Identification of watercress sites (20 sites)
- Acquisition of seed stock
- Marae and landowner engagement
- Construction of watercress sites
- Project management/staffing/incidentals (25%)

Total estimated cost: $100,000

HIGH PRIORITY

SHARING OUR STORY – THE NGĀTI KEAROA-NGĀTI TUARĀ/TARIT RIVER IPOU

NKNT & TNW 3

Upper Waikato: Area B
Location: Upper Waikato River and its tributaries within the area of Ngāti Kearoa and Ngāti Tuarā.

Summary of priority works

- Wānanga to collate information
- Information technology integration
- Fabricate iPou (20)
- Capacity building
- Project management/staffing/incidentals (25%)

Total estimated cost: $360,100

VERY HIGH PRIORITY

IDENTIFICATION AND PROTECTION OF NGĀTI KEAROA-NGĀTI TUARĀ SITES OF SIGNIFICANCE

NKNT & TNW 4

Upper Waikato: Area B
Location: Upper Waikato River and its tributaries within the area of Ngāti Kearoa and Ngāti Tuarā.

Summary of priority works

- Wānanga to collate information
- Interviews and literature review
- Mapping and capturing wāhi tapu sites
- Capacity building
- Project management/staffing/incidentals (20%)

Total estimated cost: $135,750

VERY HIGH PRIORITY

TE ARAWA RIVER IWI CHAMPIONS

NKNT & TNW 5

Upper Waikato: Area B
Location: Upper Waikato River and its tributaries within the area of Te Arawa River iwi affiliates.

Summary of priority works

- Project plan for recognition ceremony
- Tohu for champions
- Champions awards dinner
- Project management/staffing/incidentals (25%)

Total estimated cost: $140,000

Rangatahi at Orākei Kōrako.

VERY HIGH PRIORITY

ENABLING TUHOURANGI-NGĀTI WAHIAO TO RECONNECT WITH THE WAIKATO RIVER

NKNT & TNW 6

Upper Waikato: Area B
Location: Upper Waikato River and its tributaries within the area of Tuhourangi-Ngāti Wahiao.

Summary of priority works

- Acquisition of waka ama (4 x 6 person)
- Establish training and wānanga
- Acquisition of associated safety equipment

Total estimated cost: $121,786

VERY HIGH PRIORITY

ENABLING NGĀTI KEAROA-NGĀTI TUARĀ TO RECONNECT WITH THE WAIKATO RIVER

NKNT & TNW 7

Upper Waikato: Area B
Location: Upper Waikato River and its tributaries within the area of Ngāti Kearoa-Ngāti Tuarā.

Summary of priority works

- Acquisition of waka ama (4 x 6 person)
- Establish training and wānanga
- Acquisition of associated safety equipment

Total estimated cost: $121,786

VERY HIGH PRIORITY

KŌRERO TAONGA TUKU IHO

NKNT & TNW 8

Upper Waikato: Area B
Location: Upper Waikato River and its tributaries within the Tuhourangi-Ngāti Wahiao rohe.

Summary of priority works

- Wānanga to collate information
- Interviews and literature review
- Mapping and capturing wāhi tapu sites
- Capacity building
- Project management/staffing/incidentals (25%)

Total estimated cost: $135,750

VERY HIGH PRIORITY

INVESTIGATION AND CONSTRUCTION OF TUNA/KOURA PONDS (KAI BOWL) FOR CULTURAL HARVEST

NTNW 1

Upper Waikato: Area B
Location: Waikato River catchment within Ngati Tahu-Ngati Whaoa area.

Summary of priority works

- Investigation of mahinga kai farming
- Identification of sites
- Construction of ponds (6)
- Project management/staffing/incidentals (20%)

Total estimated cost: $277,572

Mahinga kai wananga.
Photo:Ngati Tahu-Ngati Whaoa Runanga Trust

VERY HIGH PRIORITY

REHABILITATION/RESTORATION OF KEY MAHINGA KAI SITES

NTNW 2

Upper Waikato: Area B
Location: Mangahoanga, Mangakara, Kawaunui, Orakonui, Mangatoetoe, Pueto, Torepatutahi, Mangamingi and the mouths of all inflowing streams into Te Awa o Waikato.

Summary of priority works

- Collate information on historic mahinga kai sites
- Assess state of identified sites
- Distribute information and wananga
- Implementation of enhancement measures
- Project management/staffing/incidentals (30%)

Total estimated cost: $66,560

VERY HIGH PRIORITY

GEOTHERMAL MATAURANGA

NTNW 3

Upper Waikato: Area B
Location: Orakei Korako, Waihunuhunu, Red Hills, Wai-o-Tapu, Maunga Kakaramea, Waikite, Mangaongaonga, Rotokawa, Ohaki, Whangairorohea, Ngatamariki, Golden Springs, Waimahana, Te Kopia, Atiamuri.

Summary of priority works

- Wananga and capture matauranga
- Implementation of enhancement measures
- Comparison with western science knowledge
- Distribute information and wananga
- Project management/staffing/incidentals (30%)

Total estimated cost: $80,600

Maunga Kakaramea and Lake Rotowhero.
Photo: Department of Conservation

VERY HIGH PRIORITY

WETLANDS – NGATI TAHU-NGATI WHAOA MATAURANGA – RONGOA AND WEAVING

NTNW 4

Upper Waikato: Area B
Location: Red Hills Conservation Covenant, Deep Creek/Torepatutahi, Waikite, Ngahewa, Ohaki, Tutukau Z East, Takapou/Te Toke, Wai-O-Tapu, Ruatawiri.

Summary of priority works

- Wananga and capture wetland matauranga
- Assessment of identified wetland sites
- Implementation of enhancement areas
- Distribute information and wananga
- Project management/staffing/incidentals (30%)

Total estimated cost: $80,600

VERY HIGH PRIORITY

CULTURAL HISTORY RESEARCH AND DOCUMENTATION — NTNW 5

Upper Waikato: Area B
Location: Waikato River catchment within Ngati Tahu-Ngati Whaoa area.

Summary of priority works

- Collation of historic marae and pa sites
- Work with landowners to acknowledge sites
- Establish kohatu or pou
- Share information with marae and public
- Project management/staffing/incidentals (30%)

Total estimated cost: $119,600

VERY HIGH PRIORITY

WAKA PADDLE, KORERO SHARING AND BUILDING CONNECTION WITH TE AWA O WAIKATO — NTNW 6

Upper Waikato: Area B
Location: Waikato River catchment within Ngati Tahu-Ngati Whaoa area: Nga awa Purua to Atiamuri.

Summary of priority works

- Cultural and water safety training
- Catering for attendees
- Provision of waka and safety equipment
- Project management/staffing/incidentals (25%)

Total estimated cost: $143,500

VERY HIGH PRIORITY

NGATAMARIKI SCENIC RESERVE/ORAKONUI CATCHMENT REHABILITATION/ ENHANCEMENT — NTNW 7

Upper Waikato: Area B
Location: Lower Orakonui Stream Catchment/Ngatamariki Scenic Reserve.

Summary of priority works

- Control of weeds (6 years)
- Establish appropriate signage
- Planting and maintenance
- Develop walkway to geothermal area
- Project management/staffing/incidentals (30%)

Total estimated cost: $645,417

VERY HIGH PRIORITY

SUPPORT OF NGATI TAHU-NGATI WHAOA LAND BLOCKS/TRUSTS TO ACHIEVE SUSTAINABILITY OUTCOMES

NTNW 8

Upper Waikato: Area B
Location: Tutukau Z East, Takapou, Ohaki Tribal Trust, Tauhara No 2 Trust, Paeroa South, Tahorakuri 2, whanau trusts, Tauhara Moana and some smaller blocks.

Summary of priority works

- Develop restoration strategies
- Implement restoration activities
- Project management/staffing/incidentals (20%)

Total estimated cost: $509,208

VERY HIGH PRIORITY

ESTABLISH PLANTED CORRIDORS FOR ALL STREAMS FROM THE PAEROA RANGE WITHIN THE ROHE AND TE AWA O WAIKATO CATCHMENTS

NTNW 9

Upper Waikato: Area B
Location: Paeroa Range and associated tributaries flowing from the range within the NTNW rohe.

Summary of priority works

- Fencing of streams
- Work with agencies to achieve vision
- Planting of native plants and creating corridors
- Project management/staffing/incidentals (20%)

Total estimated cost: $149,760

VERY HIGH PRIORITY

OHAKI WETLAND ENHANCEMENT AND RESTORATION

NTNW 10

Upper Waikato: Area B
Location: Ohaki Wetland, Broadlands Road, Broadlands.

Summary of priority works

- Planting and maintenance of wetland (15ha)
- Control of willow within wetland
- Project management/staffing/incidentals (20%)

Total estimated cost: $709,536

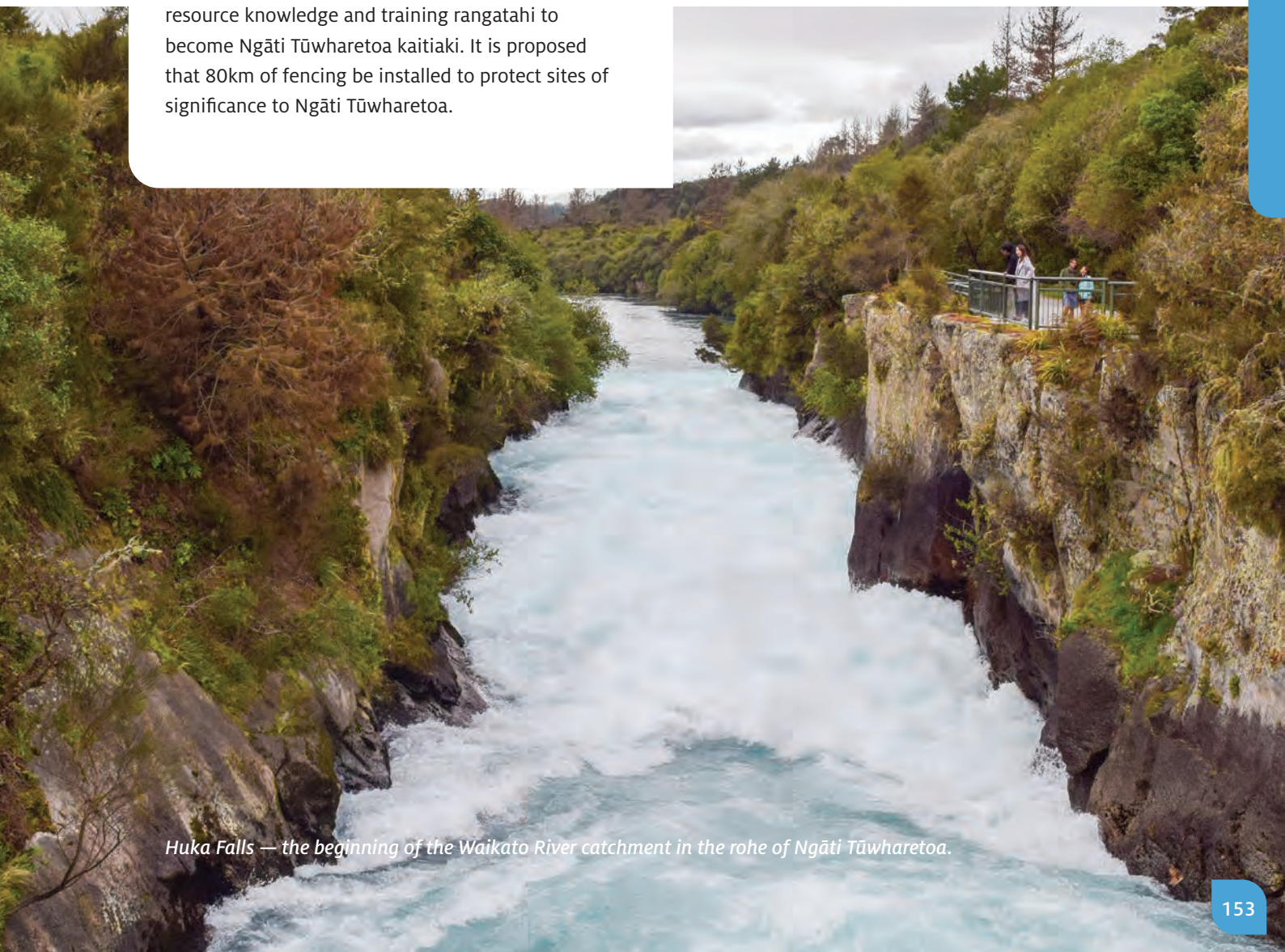
NGĀTI TŪWHARETOA PRIORITIES

NGĀ WHAKAAROTAU O NGĀTI TŪWHARETOA

PRIORITY PROJECTS

Ngāti Tūwharetoa have identified five projects totalling $1,921,864. These are summarised in the tables that follow. A more comprehensive plan for each project can be found in Appendix 12 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018).

Projects include capturing mātauranga a Ngāti Tūwharetoa by holding multiple wānanga and acquiring knowledge held by external entities. There is also a strong focus on consolidating natural resource knowledge and training rangatahi to become Ngāti Tūwharetoa kaitiaki. It is proposed that 80km of fencing be installed to protect sites of significance to Ngāti Tūwharetoa.



Huka Falls — the beginning of the Waikato River catchment in the rohe of Ngāti Tūwharetoa.

SUMMARY TABLES OF PRIORITY PROJECTS

HIGH PRIORITY

ENABLING DESCENDANTS OF NGĀTI TŪWHARETOA TO ENHANCE THE MAURI O NGĀ WHENUA ME TE TAIAO	TŪWHARETOA 1

Upper Waikato: Area B
Location: Waikato River within Ngāti Tūwharetoa area.

Summary of priority works

- Conservation training
- Kaitiaki training
- Project management/staffing/incidentals (20%)

Total estimated cost: $384,444

VERY HIGH PRIORITY

WĀNANGA FOR ALL 8 NGĀTI TŪWHARETOA AREA B MARAE	TŪWHARETOA 2

Upper Waikato: Area B
Location: Waikato River within Ngāti Tūwharetoa area.

Summary of priority works

- Wānanga (8 marae)
- GIS spatial mapping
- Project management/staffing/incidentals (15%)

Total estimated cost: $46,460

VERY HIGH PRIORITY

MULTI PHASED NGĀTI TŪWHARETOA ARCHIVES PROJECT	TŪWHARETOA 3

Upper Waikato: Area B
Location: Waikato River within Ngāti Tūwharetoa area.

Summary of priority works

- Interview tribal kaumātua
- Preserve captured information
- Collate external Ngāti Tūwharetoa related information
- Project management/staffing/incidentals (25%)

Total estimated cost: $506,597

HIGH PRIORITY

FENCING OF NGĀTI TŪWHARETOA'S SITES OF SIGNIFICANCE

TŪWHARETOA 4

Upper Waikato: Area B
Location: Waikato River within Ngāti Tūwharetoa area.

Summary of priority works

- Fencing of sites of significance (80km)
- GIS mapping of sites
- Project management/staffing/incidentals (15%)

Total estimated cost: $764,750

Hatupatu rock — a site of significance that has been protected and enhanced.

HIGH PRIORITY

NGĀTI TŪWHARETOA MĀTAURANGA AND SCIENCE EDUCATIONAL WĀNANGA

TŪWHARETOA 5

Upper Waikato: Area B
Location: Pueto Stream.

Summary of priority works

- Design curriculum with two colleges
- Hold wānanga
- Gather field data
- Undertake field sampling
- Project management/staffing/incidentals (30%)

Total estimated cost: $219,613

MANIAPOTO PRIORITIES
NGĀ WHAKAAROTAU O MANIAPOTO

GOALS

The following goals were developed for Maniapoto priorities:

1	The ability of mana whenua to undertake customary activities and have kaitiaki over resources, which are protected and enhanced; particularly on, in, under and around waterways, including wetlands.
Culturally and historically significant sites are identified, protected and restored.	2
3	The river provides for recreational use and social needs, is widely used by the community, and is a place to gather kai, relax, play and exercise.
The mauri of the river and its landscape is protected and enhanced.	4

PRIORITY PROJECTS

Maniapoto Māori Trust Board has identified eight priority projects totalling $3,854,559. These are summarised in the tables that follow. A more comprehensive plan for each project can be found in Appendix 13 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018).

Priorities include supporting improved access of marae to safe water supplies, implementing erosion remediation programmes including planting (32ha), fencing (57km) and engineering solutions, and working with their Māori land trusts to improve sustainability practices. Kaitiaki training and protecting sites of significance are also important aspirations for the iwi.

SUMMARY TABLES OF PRIORITY PROJECTS

VERY HIGH PRIORITY

MARAE AND COMMUNITY WATER SUPPLY: PROTECTION, ENHANCEMENT AND EDUCATION PROGRAMME – MANGAPŪ RIVER CATCHMENT

MANIAPOTO 1

Waipā: Area C
Location: Puna and swimming areas in Waitomo and Oparure in the Mangapū River catchment.

Summary of priority works

- Wānanga to confirm puna (3) and swimming (4) sites
- Planting (5000 plants)
- Fencing
- Information panels
- Project management/staffing/incidentals (25%)

Total estimated cost: $85,613

VERY HIGH PRIORITY

MARAE AND COMMUNITY WATER SUPPLY: PROTECTION, ENHANCEMENT AND EDUCATION PROGRAMME – WAIPĀ RIVER CATCHMENT

MANIAPOTO 2

Waipā: Area C
Location: Puna and swimming areas in the Waipā River catchment.

Summary of priority works

- Wānanga to confirm puna (2) and swimming (7) sites
- Planting (5000 plants)
- Fencing
- Create and install information panels
- Project management/staffing/incidentals (25%)

Total estimated cost: $99,612

VERY HIGH PRIORITY

WAITOMO STREAM – EROSION PROTECTION AND REMEDIATION WITH RIPARIAN PLANTING

MANIAPOTO 3

Waipā: Area C
Location: Waitomo Stream in the Waipā River catchment.

Summary of priority works

- Riverbank erosion remediation (18.6km)
- Planting (12.5ha)
- Fencing (25km)
- Wānanga
- Project management/staffing/incidentals (25%)

Total estimated cost: $1,185,500

VERY HIGH PRIORITY

MIDDLE PŪNIU RIVER – EROSION PROTECTION AND REMEDIATION WITH RIPARIAN PLANTING

MANIAPOTO 4

Waipā: Area C
Location: Middle Pūniu Stream in the Waipā River catchment.

Summary of priority works

- Riverbank erosion remediation (8km)
- Planting (16ha)
- Fencing (32km)
- Wānanga
- Project management/staffing/incidentals (25%)

Total estimated cost: $1,445,367

VERY HIGH PRIORITY

PIHARAU RESTORATION AND PROTECTION – UPPER WAIPĀ RIVER CATCHMENT

MANIAPOTO 5

Waipā: Area C
Location: Kahotea, Te Keeti, Purekireki, Hiona, Te Kauae Marae in Ōtorohanga, Pirongia, Puketotara, Waitomo.

Summary of priority works

- Wānanga to confirm piharau sites (8 sites)
- Planting (5000 plants)
- Capacity building including interviews
- Project management/staffing/incidentals (25%)

Total estimated cost: $84,688

Piharau (lamprey)

VERY HIGH PRIORITY

POU WHENUA – UPPER WAIPĀ RIVER CATCHMENT (IPOU PROJECT) — MANIAPOTO 6

Waipā: Area C
Location: Upper Waipā River catchment.

Summary of priority works

- Wānanga to confirm 20 sites
- Fabricate iPou
- Collate information with marae
- Unveiling of iPou
- Project management/staffing/incidentals (25%)

Total estimated cost: $721,250

VERY HIGH PRIORITY

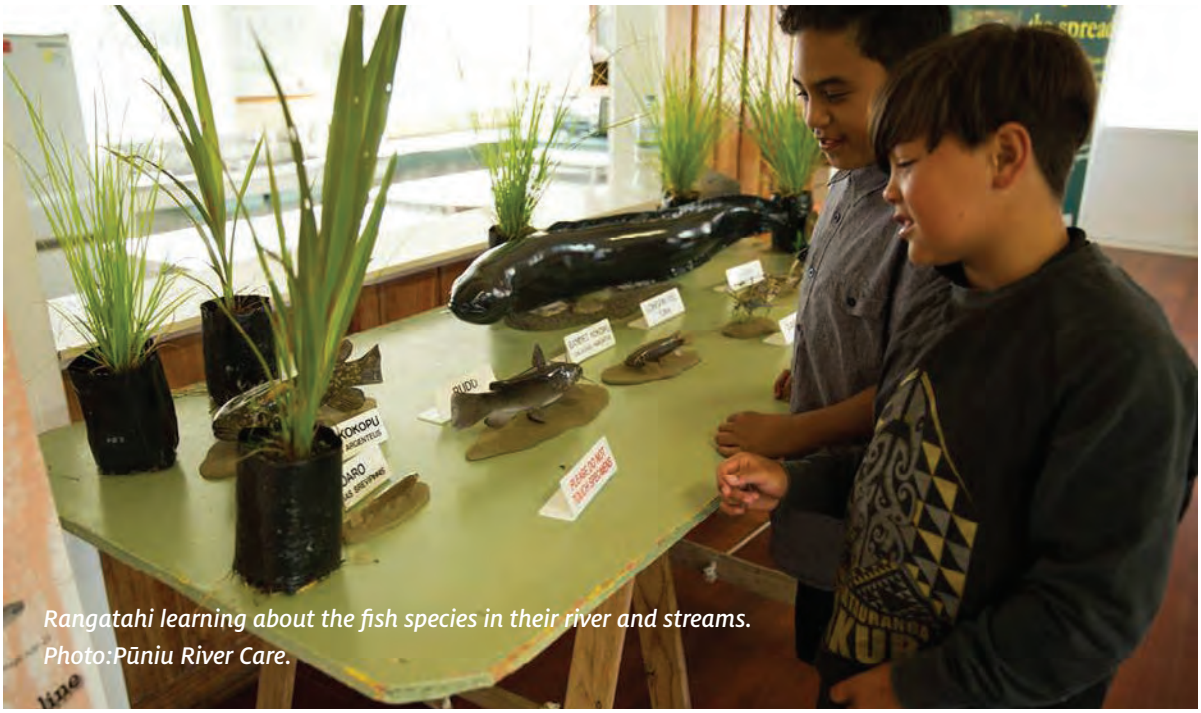
KAITIAKI TRAINING – IMPLEMENTATION OF THE MANIAPOTO CULTURAL HEALTH INDICATOR TOOL – MANGAŌKEWA RIVER — MANIAPOTO 7

Waipā: Area C
Location: Mangaōkewa River.

Summary of priority works

- Wānanga-a-marae
- Record, transcribe and share wānanga information
- Capacity and capability training
- Project management/staffing/incidentals (10%)

Total estimated cost: $186,450



Rangatahi learning about the fish species in their river and streams. Photo:Pūniu River Care.

VERY HIGH PRIORITY

BETTER FARMING PRACTICES PROGRAMME FOR GOVERNORS/MANAGERS OF MĀORI LAND BLOCKS – UPPER WAIPĀ RIVER CATCHMENT

MANIAPOTO 8

Waipā: Area C
Location: Māori land trusts in the upper Waipā River catchment.

Summary of priority works

- Wānanga with land trusts
- Identify future land use options
- Develop governance training programme
- Record, film, transcribe information gathered
- Project management/staffing/incidentals (20%)

Total estimated cost: $46,080

Photo:Pūniu River Care.

IWI PRIORITIES FOR SHALLOW LAKES

NGĀ WHAKAAROTAU O NGĀ IWI MŌ NGĀ ROTO KORAHA

PRIORITY PROJECTS

The shallow lake iwi work stream identified 16 priority projects with a value of $8,016,957. These are summarised in the tables that follow. A more comprehensive plan for each project can be found in Appendix 14 of the *Waikato and Waipā River Restoration Strategy Technical Report* (Waikato Regional Council, 2018).

The projects focus on the recognition of sites of significance to iwi, wetland restoration planting (27ha), fencing of wetland areas (33km), collating of knowledge, education and training. These projects apply to lakes in the Waipā and lower Waikato river catchments.

Lake Areare in the foreground. Lake Pikopiko and Hotoanaga can be seen in the top right corner (Horsham Downs).

SUMMARY TABLES OF PRIORITY PROJECTS

HIGH PRIORITY

WAIKATO-TAINUI SHALLOW LAKES PROJECT – COLLECTING, STORING AND SHARING OF TRADITIONAL KŌRERO REGARDING OUR LAKES

IWI LAKES 1

Shallow lakes: Area A
Location: Within the Waikato-Tainui rohe (area).

Summary of priority works

- Mātauranga interviews
- Publication of resources
- Photographing and mapping lakes
- Book and digital platform launch
- Project management/staffing/incidentals (25%)

Total estimated cost: $170,000

HIGH PRIORITY

KAINUI LAKES – PĀ HARAKEKE AND OTHER NATIVE PLANT RESTORATION AND ENHANCEMENT PROJECT

IWI LAKES 2

Shallow lakes: Area A
Location: Kainui (Horsham Downs) peat lakes (8 lakes) in Waikato-Tainui rohe (area).

Summary of priority works

- Site preparation (willow control)
- Re-seed sites with watercress seedlings
- Riparian planting (4ha)
- Restoration wānanga
- Project management/staffing/incidentals (20%)

Total estimated cost: $328,108

HIGH PRIORITY

KAINUI (HORSHAM DOWNS) LAKES PROJECT – COLLECTION, STORING AND SHARING OF TRADITIONAL KŌRERO REGARDING OUR LAKES

IWI LAKES 3

Shallow lakes: Area A
Location: Kainui (Horsham Downs) peat lakes (8 lakes) in Waikato-Tainui rohe (area).

Summary of priority works

- Mātauranga interviews
- Publication of resources
- Photographing and mapping lakes
- Book and digital platform launch
- Project management/staffing/incidentals (25%)

Total estimated cost: $162,500

HIGH PRIORITY

RECOGNISING AND HONOURING OUR SITES OF SIGNIFICANCE – KAINUI (HORSHAM DOWNS) LAKES IPOU PROJECT

IWI LAKES 4

Shallow lakes: Area A
Location: Kainui (Horsham Downs) peat lakes (8 lakes) in Waikato-Tainui rohe (area).

Summary of priority works

- Wānanga to collate information for up to 10 iPou
- Cultural training and safety
- Embed technology into iPou
- Fabricate and install iPou
- Project management/staffing/incidentals (30%)

Total estimated cost: $182,000

HIGH PRIORITY

LAKE KIMIHIA, LAKE WHANGAPE AND LAKE WAIKARE – TUNA PONDS

IWI LAKES 5

Shallow lakes: Area A
Location: Lake Kimihia (Huntly), Lake Waikare (Rangiriri/Te Kauwhata) and Lake Whangape (Huntly).

Summary of priority works

- Construction of ponds – earthworks (5000m^2)
- Planting around ponds (4.5ha)
- Fencing of ponds (6km)
- Capacity and capability development
- Project management/staffing/incidentals (30%)

Total estimated cost: $842,107

HIGH PRIORITY

LAKE NGĀROTO AND LAKE MANGAKAWARE PĀ HARAKEKE AND OTHER NATIVE PLANT RESTORATION AND ENHANCEMENT

IWI LAKES 6

Shallow lakes: Area C
Location: Lake Ngāroto (Te Awamutu), Lake Mangakaware (Paterangi) within the Waipā River catchment.

Summary of priority works

- Site preparation (willow clearance)
- Reseed sites with watercress seedlings (10 sites)
- Riparian plantings (4ha)
- Restoration wānanga
- Project management/staffing/incidentals (25%)

Total estimated cost: $320,592

VERY HIGH PRIORITY

RESTORATION OF PĀ HARAKEKE, WATERCRESS AND RAUPŌ AROUND LAKE WAAHI LAKE MARGINS

IWI LAKES 7

Shallow lakes: Area A
Location: Lake Waahi (Huntly).

Summary of priority works

- Site preparation
- Fencing (2km)
- Riparian planting (3ha) and raupō (1ha)
- Watercress seedlings (10 sites)
- Project management/staffing/incidentals (25%)

Total estimated cost: $385,592

VERY HIGH PRIORITY

LAKE WAIKARE PĀ HARAKEKE AND OTHER NATIVE PLANT RESTORATION AND ENHANCEMENT PROJECT

IWI LAKES 8

Shallow lakes: Area A
Location: Lake Waikare (Te Kauwhata).

Summary of priority works

- Site preparation
- Fencing (4km)
- Riparian planting (8ha)
- Re-seed sites with watercress seedlings (10 sites)
- Project management/staffing/incidentals (20%)

Total estimated cost: $730,557

VERY HIGH PRIORITY

KAITIAKITANGA IN ACTION THROUGH REDUCING KOI CARP (AND OTHER PEST FISH) IN THE LOWER WAIKATO LAKES

IWI LAKES 9

Shallow lakes: Area A
Location: Lake Waahi (Huntly), Lake Whangape (Huntly) and Lake Waikare (Te Kauwhata).

Summary of priority works

- Detailed project plan
- Equipment required for kaitiaki
- Koi gate design and installation
- Wānanga
- Project management/staffing/incidentals (25%)

Total estimated cost: $1,675,000

HIGH PRIORITY

RECOGNISING AND HONOURING OUR SITES OF SIGNIFICANCE – LOWER WAIKATO LAKES IPOU PROJECT

IWI LAKES 10

Shallow lakes: Area A
Location: Significant shallow lakes in the Waikato River catchment.

Summary of priority works

- Wānanga to collate information for up to 20 iPou
- Cultural training and safety
- Embed technology into iPou
- Fabricate, carve and install iPou
- Project management/staffing/incidentals (30%)

Total estimated cost: $962,000

HIGH PRIORITY

NGAA TAPU WAE O TE WHEROWHERO PROJECT

IWI LAKES 11

Shallow lakes: Area A
Location: Lake Waahi (Huntly).

Summary of priority works

- Project plan design
- Installation of iPou (4)
- Walkway (4.5km)
- Stream planting (1ha)
- Project management/staffing/incidentals (25%)

Total estimated cost: $954,539

VERY HIGH PRIORITY

NGAA RAUWIRI O TE RIU O WAIKATO-TAINUI

IWI LAKES 12

Shallow lakes: Area A
Location: Lake Waahi (Huntly), Lake Whangape (Huntly).

Summary of priority works

- Project plan design
- Cultural safety and training
- Establish pā tuna (one per site)
- Waananga
- Project management/staffing/incidentals (25%)

Total estimated cost: $208,750

HIGH PRIORITY

WAIKATO-TAINUI – TE WHAREKURA O RAKAUMANGAMANGA AND KURA – TUNA PONDS PROJECT

IWI LAKES 13

Shallow lakes: Area A
Location: Waahi Stream, Huntly. Te Wharekura o Rakaumangamanga.

Summary of priority works

- Earthworks to create 4 ponds
- Planting (1.2ha)
- Fencing (16km)
- Capacity and capability development
- Project management/staffing/incidentals (30%)

Total estimated cost: $227,762

HIGH PRIORITY

WAIPĀ PEAT LAKES PROJECT – COLLECTION, STORING AND SHARING OF TRADITIONAL KŌRERO REGARDING OUR LAKES

IWI LAKES 14

Shallow lakes: Area C

Location: Waipā peat lakes, in particular Lake Ngāroto and Lake Mangakaware.

Summary of priority works

- Mātauranga interview
- Print and publish resources
- Photograph and map lake sites
- Book and digital platform launch
- Project management/staffing/incidentals (25%)

Total estimated cost: $163,000

VERY HIGH PRIORITY

LAKE WHANGAPE WEIR PROJECT

IWI LAKES 15

Shallow lakes: Area A
Location: Lake Whangape (Huntly).

Summary of priority works

- Project plan and design for weir
- Cultural training and safety
- Site investigation and survey
- Installation of weir
- Project management/staffing/incidentals (25%)

Total estimated cost: $231,250

HIGH PRIORITY

RECOGNISING AND HONOURING OUR SITES OF SIGNIFICANCE – WAIPĀ PEAT LAKES IPOU PROJECT

IWI LAKES 16

Shallow lakes: Area C

Location: Significant Waipā peat lakes in the Waipā catchment.

Summary of priority works

- Wānanga to collate information for up to 10 iPou
- Cultural training and safety
- Embed technology into iPou
- Fabricate, carve and install iPou
- Project management/staffing/incidentals (30%)

Total estimated cost: $473,200

KNOWLEDGE GAPS AND MONITORING

NGĀ APUTA MĀTAURANGA

- **Knowledge gaps and research needs**
- **Monitoring the outcomes**

KNOWLEDGE GAPS AND RESEARCH NEEDS

NGĀ APUTA MĀTAURANGA ME NGĀ RANGAHAU ME WHĀIA TONUTIA

Throughout the course of the development of the *Restoration Strategy* a number of knowledge gaps and research needs were identified. These are detailed below and have been included as a way of highlighting research needs to researchers, research institutions and funders of research.

Central/Lower Waikato/Waipā

INFORMATION GAP 1	**SOLUTIONS FOR REDUCING THE NEED FOR MECHANICAL DESILTING OF LAND DRAINAGE AREAS SUCH AS THE KOMAKORAU STREAM/DRAINAGE NETWORK.**
	Information required: The Komakorau Stream network provides significant habitat for native fish species banded kōkopu and giant kōkopu. Mechanical desilting for land drainage purposes is a large threat to these fish populations. These fish species could be further protected if there were methods of reducing sediment from land drainage areas that involved less extensive mechanical cleaning. Fish experts have suggested potential solutions such as a targeted education programme as well as installation of 'V' shaped woody debris structures that provide habitat for fish and also perform a gradient control/sediment trapping function upstream of the structure, thus reducing drain cleaning to just these locations. Such solutions need further thought, socialisation and trialling.

INFORMATION GAP 2	**THE BENEFITS OF OFF-CHANNEL HABITATS SUCH AS PONDS AND OXBOWS FOR TUNA POPULATIONS. HOW CAN THESE AREAS BE DESIGNED AND MANAGED TO BENEFIT NATIVE FISH SPECIES WITHOUT EXACERBATING PEST FISH SPECIES?**
	Information required: Iwi and fish experts have recommended the creation and enhancement of off-channel habitats (e.g. ponds, cut-off oxbows) for providing habitat for tuna (eel) and cultural tuna harvesting opportunities. More information is required to quantify what impact these ecosystems have on eel populations (i.e. do eel populations increase or do eels simply move to these habitats from elsewhere?). More information and guidance is also required on the design and management of these habitats so that they benefit native fish species (e.g. eel) without exacerbating pest fish species (e.g. koi carp).

Upper Waikato

INFORMATION GAP 3	**THE EFFECT THAT WATER LEVEL VARIABILITY IN THE WAIKATO RIVER HYDRO LAKES HAS ON SMELT AND THEIR HABITAT**
	Information required: There is concern that water level fluctuations in the Waikato River may be negatively impacting on smelt habitats. Before any environmental enhancement work can be undertaken to improve smelt habitat a better understanding is required of how they are impacted by water level fluctuations caused by the day to day management of the Waikato River hydro dams.

Shallow lakes

INFORMATION GAP 4	**UNDERSTANDING THE CAUSES FOR THE DECLINE IN WATER QUALITY IN THE THREE TE ARAWA LAKES** **Information required:** The three Te Arawa lakes are in a degraded condition. However, the causes of their current water quality state are not entirely clear. It is difficult to propose remediation options in the absence of comprehensive information on cause of decline. Therefore, a project investigating catchment loads and sources and identifying remediation options for these lakes is recommended. This needs to be undertaken in consultation with the Te Arawa Lakes Trust.
INFORMATION GAP 5	**THE POTENTIAL OF AERATION TO IMPROVE WATER QUALITY IN LAKE NGĀHEWA** **Information required:** Aeration of bottom waters has been suggested as a possible restoration option for Lake Ngāhewa. However, this technology has not been tested in New Zealand and therefore the efficacy in our Waikato lakes is unknown. Investigation into the suitability of aeration in lakes that thermally stratify, with a view to potentially use at Lake Ngāhewa, is recommended.
INFORMATION GAP 6	**THE CONTRIBUTION THAT WATERFOWL MAKE TO E. COLI LEVELS IN LAKE ROTOROA (HAMILTON LAKE)** Information required: Unsatisfactory levels of *E. coli* in Lake Rotoroa are often an impediment to safe contact recreation and reducing these levels will be a critical component of bringing the lake to a swimmable standard. Expert consensus is that the most significant source of this *E. coli* will be from the large populations of waterfowl on the lake. Management of these birds would be a very sensitive issue for the Hamilton community, therefore, before robust recommendations can be made, the sources of *E. coli* should be confirmed and quantified. A project focused on faecal source tracking and contaminant load estimation has been recommended by the project Lake Working Group. Given public concerns about heavy metals in the lake sediments from historic exotic weed management it is also recommended that water column heavy metal concentrations be established.
INFORMATION GAP 7	**EFFECTIVE BARRIERS TO PEST FISH IN SHALLOW LAKES** **Information required:** Pest fish are a major impediment to restoration of Waikato shallow lakes. Attempts to eradicate or undertake sustained removal of these species are restricted by the lack of available options for preventing fish from accessing the lakes. This is complicated by the need to still provide access for native fish species. Investigations and trials on the design of an effective barrier for pest fish are recommended – with a focus on preventing transfer of koi, rudd and catfish.
INFORMATION GAP 8	**THE EFFICACY OF FLOCCULANTS AND SEDIMENT BINDING AGENTS IN WAIKATO SHALLOW LAKES** **Information required:** Sediment capping is a widely used method to reduce internal phosphorus loads and improve lake ecological state. It has been successfully used in some New Zealand lakes but was recently found to be ineffective in the highly organic environment of a Waikato peat lake. Given that the Waikato region has a gradient of lakes ranging from riverine to peat, and sediment capping agents are an important tool for aiding in the rehabilitation of degraded lakes, it is important to know in which lakes these products will and will not work. Two projects have been identified in the *Restoration Strategy* which involve the addition of alum to lake inflows to reduce in-lake internal P loads. However, this work cannot proceed without further investigation of the efficacy of such agents for Waikato lakes at laboratory and mesocosm scale.

INFORMATION GAP 9	**PUBLIC ACCESS TO SHALLOW LAKES**
	Information required: There are a number of shallow lakes with paper roads and public reserves but with no public access. Further work needs to be undertaken to investigate opportunities for realising access opportunities to these lakes.

All units

INFORMATION GAP 10	**LOCATION OF ALL BARRIERS FOR NATIVE MIGRATING FISH**
	Information required: WRC and NIWA have undertaken some work to identify barriers but this work has focused on particular geographic areas or particular types of barriers. There still remains large information gaps, particularly around barriers on private land and small barriers such as culverts. One option identified to fill this gap is to analyse the GIS dataset showing fish species predicted to be in a particular waterway and compare it to the actual fish catch data for the waterway. Where species that are predicted to be in a waterway appear absent this may indicate the presence of a migration barrier. Field surveys could then be undertaken to determine the presence and type of barriers.

INFORMATION GAP 11	**REASONS FOR DECLINE OF KŌURA POPULATIONS**
	Information required: Since the late 1990s there has been an observed decline in kōura from stream and lake ecosystems and the reasons for this are yet to be conclusively determined. NIWA recently undertook a research project investigating the extent of kōura populations within the Waikato River hydro lakes of Aratiatia, Ohakuri and Ātiamuri as well as repeating surveys at locations where kōura had been found in the 1990s and examining other potential kōura habitat. The research provides initial information about the status of kōura populations in relation to the commercial eel fishery and other fish predators in the hydro lakes, and provides some information about the reproductive and disease status of kōura remaining in the Waikato River main stem. Further work is required to build on the findings of this research and to action the recommendations made within the report by Clearwater et al. (2014).

INFORMATION GAP 12	**THE BENEFITS TO EEL AND KŌURA POPULATIONS OF ADDING WOODY DEBRIS TO THE BEDS OF LAKES AND LARGE RIVERS.**
	Information required: Anecdotal evidence from New Zealand shows that in lakes and rivers, eels are always found where there is cover. Trials of wood installation in streams have shown benefits for a range of species so scientists expect there to be habitat benefits for a range of biota in lakes, including hydro lakes, and large river systems. More information is required around appropriate design and techniques for adding woody debris (e.g. type of wood, anchoring systems) in New Zealand situations. Field based trials are recommended along with effectiveness monitoring.

INFORMATION GAP 13	**THE IMPACT OF SEEPAGE WETLANDS ON NUTRIENT ATTENUATION**
	Information required: Protection of small seepage wetlands is recommended as a tool for reducing nutrient run off from agricultural land. However, further work is required to quantify the nutrient attenuation benefits of different seepage wetlands in different farming situations.

MONITORING THE OUTCOMES
TE AROTURUKI I NGĀ HUA

Implementation of the *Restoration Strategy* will be an ongoing process over a 15-20 year time frame. It is important that we understand the effectiveness of the strategy in helping to guide future restoration initiatives and priorities across all organisations with an interest in seeing the *Vision & Strategy* outcomes achieved. We need to know that the *Restoration Strategy* projects are being implemented, by whom, and how effective restoration activities are in achieving their expected outcomes and in achieving the overall objectives of the *Vision & Strategy*.

The report card for the Waikato and Waipā rivers (Willimason et al., 2016) provides a baseline from which to measure future progress of river restoration initiatives. It is intended that this will be repeated on a five-yearly basis to determine changes in the overall health and wellbeing of the river, and in future will be aligned with the *Restoration Strategy*.

The developers of the existing report card acknowledge that there are components for which adequate data was not available at the time to assess state. This particularly applies to indicators for measuring the state of cultural health and wellbeing. In these instances, new methods and cultural monitoring programmes designed and implemented by Waikato River iwi will be required. The report card framework is flexible and can incorporate the addition of new information and indicators in future versions (Williamson et al., 2016).

A revised effectiveness monitoring framework that will underpin future report cards will be developed in the near future and will be closely aligned with the *Restoration Strategy*.

Maniapoto iwi members assess the cultural health indicators of a stream.

GLOSSARY

TECHNICAL TERMS

Barriers to fish passage – any structure which prevents the movement of freshwater fish, e.g. perched culvert, flood gate.

Biodiversity – biodiversity, or biological diversity, is the variety of life. It is the variability among living organisms from all sources, including inter alia, terrestrial and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems.

Ecological integrity – the abundance and diversity of organisms and the ability of the ecosystem to absorb and rebound from pressure and disturbances. Measures for ecological integrity referred to in the *Restoration Strategy* include water temperature, contaminant levels, dissolved oxygen, riparian condition, connectivity, aquatic plants, fish and water birds.

Farm plan – a plan that identifies on-farm environmental risks and sets out a programme to manage those risks.

Fishable – for a waterway to be fishable it must be safe to take and eat food from. Water quality must be of a standard to sustain populations of fish.

Fish habitat structures – structures placed within waterways for the purpose of providing habitat for fish. These can be made from a range of products, including wood, plastic and concrete.

Hard engineering structures – hard engineering structures used for erosion control purposes are generally made from non-living material such as rock, metal or milled timber. Examples included rock riprap, gabion baskets and retaining walls.

LUC – Land Use Capability – a tool used to assess the potential uses of a unit of land and to determine its capacity for long-term sustained production. LUC takes into account the physical limitations of the land and is measured using various indicators, including rock type, soil type, slope, erosion degree and type, and vegetation. For further information on the various land use capability classes visit www.landcareresearch.co.nz/publications/books/luc.

PAF – project assessment form.

Releasing – this is the action of weeding around native plants to reduce competition from weed species.

Riparian margin – this is the area of land next to a waterway.

Shallow lake – a natural lake less than 10m deep

Soft engineering structures – soft engineering structures installed for erosion control purposes are generally made from live plant material and over time blend into the environment, e.g. vegetation groynes.

Swimmable – for a waterway to be swimmable the water must be of a quality that it is safe to swim in during all seasons (with the exception of during flood conditions) without the risk of becoming sick. It must also have safe access for swimming.

Willow/poplar pole – a young poplar or willow pole is a young tree stem between 1m and 3.5m long, which roots and sprouts when planted in the ground. Erodible hillsides can be stabilised by poles and sustained as farmland because the extensive root systems of these trees bind and hold the soil in place.

Woody debris structure – a structure made from live or dead tree material that is placed and anchored in a waterway for the purpose of providing habitat for fish. Structures can vary in size depending on the size of the waterway.

Vegetation management for erosion control purposes – this generally refers to the removal of vegetation (e.g. willow trees) that is causing (or likely to cause) erosion and/or planting of new vegetation for erosion control purposes.

PAPAKUPU

The papakupu (glossary) contains Māori words that are used within the *Restoration Strategy* and also words commonly associated with the environment. It is intended to assist users to better understand Māori words associated with the Māori names of areas, mountains, streams, lakes, wetlands and places. This should better inform project leaders of the historic context or importance of natural features to iwi, hapū and marae.

AROHA	Show sincerity and mutual respect, love.
ATĀHUA	Beautiful, pleasant, lovely.
ATUA	Gods, deities with responsibilities for different physical and spiritual realms or elements.
AWA	River, stream, waterways, freshwater bodies.
HĀKARI	To have a feast, banquet, celebratory meal.
HAPORI	Community, society, section of a kinship group.
HAPŪ	Subtribe, usually containing a number of whānau (family unit) and marae with a common ancestor or ancestors.
HARAKEKE	Flax.
HAU KĀINGA	True home, local people of a marae, home people.
HAUANGA KAI	The customary and contemporary gathering and use of naturally occurring and cultivated foods.
HĪKOI	To step, walk, march.
HUI	Gather, assemble, meet.
IKA	Fish or fisheries.
IWI	A tribe. A large group of people descended from a common physical or spiritual ancestor.
KAI	Food, eat.
KAITIAKI	Caretaker, caregiver, the role of protecting and nurturing the mauri of all living things and surrounding environments or natural resources. A guardian.
KAITIAKITANGA	The exercise of kaitiaki roles and responsibilities. The exercise recognises the intricate balance and integral relationship between all natural resources.
KARAKIA	Recite ritual chants, say grace, pray.
KAUMĀTUA	Elders (male and female).
KAWA	Customs and protocols, in particular those related to formal activities.
KĪNGITANGA	King Movement, established in the 1850s with a focus to stop the loss of land, promote Māori authority, maintain law and order, and promote traditional values and culture.
KŌIWI	Human bones, corpse.
KŌRERO	To tell, say and speak.
KOROWAI	Cloak.
KŌURA	Freshwater crayfish
MAHINGA KAI	A place where food is gathered, a cultivation.
MANA	Authority, protective power and prestige.
MANA MOTUHAKE	Tribal region; generally in this plan the tribal region of Waikato-Tainui, including the rohe of constituent marae and hapū.
MANA WHAKAHAERE	The exercise of rights and responsibilities to ensure that the balance and mauri (life force) of the rohe (area) is maintained.

MANA WHENUA	The tangata whenua (indigenous people) group or groups with primary mana whakahaere (rights and responsibilities) over an area
MANĀKI	To support, take care of, look out for.
MANGA	A stream, or branch of a river, creek.
MANU	Bird or birds.
MANUWHIRI	Visitors.
MĀORI	Native, indigenous and belonging to New Zealand.
MARAE	Traditional and contemporary gathering places that may hold a wharenui (meeting house), wharekai (dining room), wharepaku (ablution block), whare (other houses or structures).
MĀREIKURA	An order of female supernatural beings.
MĀTAURANGA	Knowledge, understanding.
MĀTAURANGA MĀORI	Traditional and contemporary Māori knowledge, knowledge systems and knowledge bases. This includes the body of knowledge originating from Māori ancestors, including Māori worldview and perspectives, Māori creativity, and cultural and spiritual practices.
MAUNGA	Mountain.
MAURI	Life force of both animate and inanimate things or objects.
MOANA	Sea, ocean.
NGAHERE	Forest.
NOA	Unrestricted, to be free from the extensions of tapu.
PĀ	A fortified place or fortification. Also a large groupings of plants valued by Māori weavers e.g. pā harakeke, pā kuta, pā raupō.
PAPAKĀINGA	Original home, home base, village, communal Māori land
PĀPĀTUANUKU	Earth or earth mother and wife of Ranginui – all living things originate from them.
PATUPAIAREHE	Fairy folk, mythical people who move at night and generally live in forests and mountains.
POWHIRI	Welcoming ceremony of visitors on a marae.
PUNA	Spring, a well, pool of water.
PŪRĀKAU	Legend, myth, ancient legend, story.
RAHUI	Prohibition placed on access to an area or resource. Prohibition placed on activity within, in, or on an area or with a resource. An important method of managing behaviour and resources.
RAKAU	Tree.
RANGATAHI	Youth, younger generation.
RANGATIRA	Chief (male or female), chieftain (male or female). The qualities of a leader are of concern to the integrity and prosperity of the people, the land, the language, and other cultural treasures (e.g. oratory and song poetry).
RANGINUI	The sky father and husband of Pāpātuanuku.
RARANGA	To weave, plait.
RAUPATU	Confiscation, usually in relation to lands, and its subsequent effects.
REPO	Swamp, bog, marsh.
ROHE	Area, boundary, territory or border of land.
RONGOĀ	Traditional medicine, remedies.
RŌPŪ	Group, party of people, company, association, entourage, organisation.
ROTO	A lake.

RUA KAI	A food pit.
TAIAO	Environment, nature, natural world.
TAIOHI	Youthful in the adolescent sense.
TANGATA	Person.
TĀNGATA	People.
TANGATA WHENUA	Local people, hosts, indigenous people – Māori and their whānau (families), hapū (subtribe), iwi (tribe) that whakapapa, or have genealogical connections, back to the land by virtue of first or primary occupation of the land.
TANIWHA	A water spirit, powerful creature, sometimes used in reference to powerful leaders or chiefs.
TAONGA	Treasure – applied to anything considered to be of value including socially or culturally valuable objects, resources, phenomenon, ideas and techniques.
TAONGA TUKU IHO	Heirloom, gifts or something handed down, cultural property.
TIKANGA	The customary system of values and practices that have developed over time and are deeply embedded in the social context.
TĪ KŌUKA	Cabbage tree.
TINANA	The main part of something, the body.
TOHU	Sign, mark, symbol, indicators of an event.
TUNA	Eel.
TUPUNA	Ancestor/ancestors.
WAEREA	Protective incantation for specific activities.
WĀHI TAPU	Culturally important areas for cultural and spiritual purification, cleansing and/or ceremonial purposes, activities, natural places, fisheries and food gathering sites, burial sites.
WAHINE	Lady, women.
WAI	Water.
WAIATA	Song or songs.
WAIRUA	Spirit.
WĀNANGA	Seminar, conference, forum, educational seminar.
WHAKAPAPA	Lineage and geneology. An essential knowledge within any tribal or Māori society.
WHAKĀRO	Thought, opinion, plan, idea, intention.
WHĀNAU	Family unit, not always immediate family, and may include those that are family by marriage, adoption, fostering, or other close relationship.
WHĀNUI	Wide, extended.
WHATUKURA	An order of male supernatural beings.
WHENUA	The land, the ground.

REFERENCES

TOHUTORO

Beard, C.M. 2010. 'Chapter 14 Wetlands and lowland floodplains' in K.J. Collier, D.P. Hamilton, W.N. Vant (Bill), & C. Howard-Williams (eds.), The Waters of the Waikato: Ecology of New Zealand's Longest River, Environment Waikato and the Centre for Biodiversity and Ecology Research (The University of Waikato), Hamilton, NZ, pp. 265-280.

Burns, N., Bryers, G., & Bowman, E. 2000. Reservoirs. Report for Ministry for the Environment. 122 pp.

Burton, T., de Winton, M., & Clayton, J. 2015. Assessment of the Lakes in the Waikato Region Using Lake SPI – 2015. NIWA Client Report: HAM2015-063, prepared for Waikato Regional Council, Hamilton, NZ.

Champion, P.D., De Winton, M.D., & De Lange, P.J. 1993. The Vegetation of the Lower Waikato Lakes. Volume 2: Vegetation of Thirty-Eight Lakes in the Lower Waikato. NIWA Ecosystems Publication No.8 August 1993, NIWA, Hamilton, NZ.

Clarkson, B. 2002. 'Chapter 12 Karst landscapes' in B. Clarkson, M. Merrett & T. Downs (eds.), Botany of the Waikato, Waikato Botanical Society Inc., Hamilton, NZ, pp. 91-95.

Clayton, J. 2002. 'Chapter 6 Lakes and Rivers' in B. Clarkson, M. Merrett & T. Downs (eds.), Botany of the Waikato, Waikato Botanical Society Inc., Hamilton, NZ, pp. 39-48.

Clearwater, S.J., Kusabs, I.A., Budd, R., & Bowman, E. 2014. Strategic Evaluation of Kōura Populations in the Upper Waikato River. NIWA Client Report No. HAM2014-086, prepared for the Waikato River Authority, NIWA Project WRA14204: 77.

Collier, K.J. & Grainger, N. 2015. 'Chapter 1 Introduction to Invasive Fish' in K.J. Collier & N.P.J. Grainger (eds.), New Zealand Invasive Fish Management Handbook, Lake Ecosystem Restoration New Zealand (LERNZ; The University of Waikato) and Department of Conservation, Hamilton, NZ, pp 3-6.

Collier, K., McCraw, D., & Watene-Rawiri, E.M. 2010. 'Chapter 1 Geography and history' in K.J. Collier, D.P. Hamilton, W.N. Vant (Bill), & C. Howard-Williams (eds.), The Waters of the Waikato: Ecology of New Zealand's Longest River, Environment Waikato and the Centre for Biodiversity and Ecology Research (The University of Waikato), Hamilton, NZ, pp. 1-25.

Cooke, G.D., Welch, E.B., Peterson, S., & Nichols, S.A. 2005. Restoration and Management of Lakes and Reservoirs, Third Edition, CRC Press. 616 pp.

DairyNZ. 2013 (updated December 2015). Sustainable Dairying: Water Accord. DairyNZ, Hamilton, NZ.

David, B.O. & Speirs, D.A. 2010. 'Chapter 10 Native Fish' in K.J. Collier, D.P. Hamilton, W.N. Vant (Bill), & C. Howard-Williams (eds.), The Waters of the Waikato: Ecology of New Zealand's Longest River, Environment Waikato and the Centre for Biodiversity and Ecology Research (The University of Waikato), Hamilton, NZ, pp. 193-208.

Dean-Speirs, T., Neilson, K., Reeves, P., & Kelly, J. 2014a. Waikato Region Shallow Lakes Management Plan: Volume 1. Objectives and Strategies for Shallow Lake Management. Waikato Regional Council Technical Report 2014/58, Waikato Regional Council, Hamilton, NZ.

Dean-Speirs, T., Neilson, K., Reeves, P., & Kelly, J. 2014b. Waikato Region Shallow Lakes Management Plan: Volume 2. Shallow Lakes Resource Statement: Current Status and Future Management Recommendations. Waikato Regional Council Technical Report 2014/59, Waikato Regional Council, Hamilton, NZ.

Deed of Settlement in relation to the Waikato River, 17 December 2009. https://www.govt.nz/dmsdocument/5982.pdf

Department of Conservation. 2014. Conservation Management Strategy. Waikato 2014-2014, Volume 1, Department of Conservation, Hamilton, NZ.

Duggan, I. 2008. Zooplankton Composition and a Water Quality Assessment of Seventeen Waikato Lakes Using Rotifer Community Composition. Environment Waikato Technical Report 2008/26, Waikato Regional Council (Environment Waikato), Hamilton, NZ.

Environment Waikato. 2007. Waipa District Peat Lakes and Wetlands: Issues and Solutions in the Conservation and Management of the Peat Lakes and Wetlands of the Waipa District and the Role of the Waipa Peat Lake and Wetland Accord, Environment Waikato, Hamilton, NZ.

Gibbs, M., Saffi, K., Albert, A., Duggan, I., Bowman, E. and Burger, D. 2015. Factors influencing chlorophyll a concentrations in the Waikato River. NIWA Client Report No. HAM2014-059, prepared for DairyNZ. Hamilton, NZ.

Goodman, J.M., Dunn, N.R., Ravenscroft, P.J., Allibone, R.M., Boubee, J.A.T., David, B.O., Griffiths, M., Ling, N., Hitchmough, R.A. and Rolfe, J.R. 2014. Conservation status of New Zealand freshwater fish, 2013. New Zealand Threat Classification Series 7. Department of Conservation, Wellington, NZ.

Grainger, N., Collier, K., Hitchmough, R., Harding, J., Smith, B. and Sutherland, D. 2014. Conservation status of New Zealand freshwater invertebrates, 2013. New Zealand Threat Classification Series 8. Department of Conservation, Wellington, NZ.

Hamilton, D., Vant, B., & Neilson, K. 2010. 'Chapter 13 Lowland Lakes' in K.J. Collier, D.P. Hamilton, W.N. Vant (Bill) & C. Howard- Williams (eds.), The Waters of the Waikato: Ecology of New Zealand's Longest River, Waikato University, Hamilton, NZ, pp. 245-264.

Hawes, I., Boothroyd, I., Boubee, J., Chisnall, B., Williams, E., Smith, J. and Smith, R. 1999. Ecology of the Waikato River Volume two – Appendices. NIWA Client Report CHC99/45, prepared for Mighty River Power, Hamilton, NZ.

Hicks, D.M. & Hill, R.B. 2010. 'Chapter 5 Sediment Regime: Sources, Transport and Changes in the Riverbed' in K.J. Collier, D.P. Hamilton, W.N. Vant (Bill) & C. Howard- Williams (eds.), The Waters of the Waikato: Ecology of New Zealand's Longest River, Waikato University, Hamilton, NZ, pp. 71- 92.

Hicks B.J., Ling N., & Wilson B.J. 2010. 'Chapter 11 Introduced Fish' in K.J. Collier, D.P. Hamilton, W.N. Vant (Bill) & C. Howard-Williams (eds.), The Waters of the Waikato: Ecology of New Zealand's Longest River, Environment Waikato and the Centre for Biodiversity and Ecology Research (The University of Waikato), Hamilton, NZ, pp. 209-228.

Hochstetter, F. von. 1867. New Zealand: Its Physical Geography, Geology and Natural History with Special Reference to the Results of Government Expeditions in the Provinces of Auckland and Nelson. J.G. Cotta.

Hofstra, D. & de Winton, M. 2016. Weed Management Plan for Hornwort in Lake Karāpiro. NIWA Client Report HAM2016-071, Hamilton, NZ.

Huisman, J., Matthijs, H.C.P., & Visser, P.M. (eds.). 2005. Harmful Cyanobacteria. Springer, Netherlands. 243 pp.

Leathwick, J., Clarkson, B.D., & Whaley P. 1995. Vegetation of the Waikato Region: Current and Historical Perspectives. Landcare Research Contract Report LC9596/022 to Waikato Regional Council (formerly Environment Waikato), Hamilton, NZ.

Newland, R. 2016. 3 Lakes Action Plan: An Interagency Plan for the Protection, Enhancement, and Restoration of Lakes Ngāhewa, Tutaeinanga and Ngapouri, Department of Conservation, Rotorua, NZ.

Ngāti Tahu-Ngāti Whaoa Runanga Trust. 2013. Rising Above the Mist: Te Aranga Ake i te Tamimahatanga. Ngāti Tahu-Ngāti Whaoa Iwi Environmental Management Plan, Ngāti Tahu-Ngāti Whaoa Runanga, Rotorua, NZ.

NIWA. 2014. Maniapoto Priorities for the Restoration of the Waipā River Catchment, prepared for Maniapoto Māori Trust Board, NIWA, Hamilton, NZ.

NIWA. 2010. Waikato River Independent Scoping Study, NIWA Client Report: HAM2010-032, prepared for Ministry for the Environment and Guardians Establishment Committee (precursor to the Waikato River Authority), NIWA, Hamilton, NZ.

New Zealand Government. 2014. National Policy Statement for Freshwater Management 2014. 37 pp.

Palmer, D., Dymond, J., Herzig, A., Betts, H., Marden, M., & Basher, L. 2015. SedNetNZ Modelling of the Waikato Catchment, Landcare Research, Hamilton, NZ.

Pannell, D.J., Roberts, A.M., Park, G., Alexander, J., Curatolo, A., & Marsh, S. 2012. Integrated Assessment of Public Investment in Land-Use Change to Protect Environmental Assets in Australia. Land Use Policy 29, pp. 377-387.

Raukawa Charitable Trust. 2015. Te Rautaki Taiao a Raukawa – Raukawa Environmental Management Plan, Raukawa Charitable Trust, Tokoroa, NZ.

Raukawa Charitable Trust. 2012. Raukawa Fisheries Plan, Raukawa Charitable Trust, Tokoroa, NZ.

Richardson, K. 2017. Bird Surveys at Eight Shallow Lakes in the Central and Northern Waikato. Wildlands Contract Report No. 4373, prepared for Waikato Regional Council, Hamilton, NZ.

Te Arawa River Iwi Trust. 2015. Te Arawa River Iwi Trust Fisheries Plan, Te Arawa River Iwi Trust, Rotorua, NZ.

Tempero, G.W. & Hicks, B.J. 2017. Responses of the Fish Community and Biomass in Lake Ohinewai to Fish Removal and the Koi Carp Exclusion Barrier. Waikato Regional Council Technical Report 2017/10, Waikato Regional Council, Hamilton, NZ.

Vant, W.N. 2010. 'Chapter 6 Water Quality' in K.J. Collier & N.P.J. Grainger (eds.), New Zealand Invasive Fish Management Handbook, Lake Ecosystem Restoration New Zealand (LERNZ; The University of Waikato) and Department of Conservation, Hamilton, pp 93-114.

Vant, B. 2013. Trends in River Water Quality in the Waikato Region, 1993-2012. Waikato Regional Council Technical Report 2013/20, Waikato Regional Council, Hamilton, NZ.

Vant, B. 2014. Sources of Nitrogen and Phosphorus in the Waikato and Waipā River, 2003-12. Waikato Regional Council Technical Report 2014/56, Waikato Regional Council, Hamilton, NZ.

Waikato Regional Council. 2011. Lower Waikato Zone Management Plan. WRA Policy Series 2011/04, Waikato Regional Council, Hamilton, NZ.

Waikato Regional Council. 2012. Central Zone Management Plan. WRC Policy Series 2012/02, Hamilton, NZ.

Waikato Regional Council. 2014a. Waipā Catchment Plan. Waikato Regional Council Technical Report 2014/33, Waikato Regional Council, Hamilton, NZ.

Waikato Regional Council. 2014b. Upper Waikato Zone Plan. Waikato Regional Council Technical Report 2014/05, Waikato Regional Council, Hamilton, NZ.

Waikato Regional Council website. 2017a. How Clean is the Waikato River? https://www.waikatoregion.govt.nz/Environment/Natural-resources/Water/Rivers/Waikato-River/How-clean-is-the-Waikato-River/

Waikato Regional Council website. 2017b. Waikato River Water Quality Monitoring Sites. https://www.waikatoregion.govt.nz/environment/natural-resources/water/rivers/waikato-river/map/

Waikato Regional Council. 2018. *Waikato and Waipā River Restoration Strategy Technical Report*. Waikato Regional Council Techncial Report 2018/08, Waikato Regional Council, Hamilton, NZ.

Waikato RiverCare. 2014. *Riparian Restoration Best Practice*, Waikato RiverCare, Hamilton, NZ.

Waikato-Tainui. 2013. *Waikato-Tainui Environmental Plan. Tai Tumu Tai Pari Tao Ao,* Waikato-Tainui Te Kauhanganui Inc., Hamilton, NZ.

Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010. ***http://www.legislation.govt.nz/act/public/2010/0024/latest/DLM1630002.html***

Williamson, B., Quinn, J., Williams, E., & van Schravendijk-Goodman, C. 2016, *2016 Pilot Waikato River Report Card: Methods and Technical Summary*, prepared for Waikato River Authority, Client Report No. HAM2016-011, NIWA, Hamilton.

APPENDIX 1 – OBJECTIVES OF THE VISION & STRATEGY

TĀPIRITANGA 1 – NGĀ WHĀINGA O TE TURE WHAIMANA

In order to realise the vision, the following objectives will be pursued:

1. The restoration and protection of the health and wellbeing of the Waikato River.
2. The restoration and protection of the relationships of Waikato-Tainui with the Waikato River, including their economic, social, cultural and spiritual relationships.
3. The restoration and protection of the relationships of Waikato River iwi according to their tikanga and kawa with the Waikato River, including their economic, social, cultural and spiritual relationships.
4. The restoration and protection of the relationships of the Waikato region's communities with the Waikato River, including their economic, social, cultural and spiritual relationships.
5. The integrated, holistic and coordinated approach to management of the natural, physical, cultural and historic resources of the Waikato River.
6. The adoption of a precautionary approach towards decisions that may result in significant adverse effects on the Waikato River, and, in particular, those effects that threaten serious or irreversible damage to the Waikato River.
7. The recognition and avoidance of adverse cumulative effects, and potential cumulative effects, of activities undertaken both on the Waikato River and within the catchment on the health and wellbeing of the Waikato River.
8. The recognition that the Waikato River is degraded and should not be required to absorb further degradation as a result of human activities.
9. The protection and enhancement of significant sites, fisheries, flora and fauna.
10. The recognition that the strategic importance of the Waikato River to New Zealand's social, cultural, environmental and economic wellbeing requires the restoration and protection of the health and wellbeing of the Waikato River.
11. The restoration of water quality within the Waikato River so that it is safe for people to swim in and take food from over its entire length.
12. The promotion of improved access to the Waikato River to better enable sporting, recreational and cultural opportunities.
13. The application to the above of both maatauranga Maaori and the latest available scientific methods.

APPENDIX 2 – STANDARD COSTS AND ASSUMPTIONS

TĀPIRITANGA 2 - NGĀ UTU PAEREWA ME NGĀ WHAKAPAE

WORKS	COST ESTIMATE (EXCL. GST)	ADDITIONAL DETAILS/ASSUMPTIONS
FENCING		
5 wire (with 2 electric)	$8 per metre	
7 or 8 wire post and batten on LUC 8 land	$25 per metre	
7 or 8 wire post and batten on all other LUC land	$20 per metre everywhere except the Central/Lower Waikato catchment where it is up to $25 per metre	
PLANTING		
Native trees		Note: For most projects, infill planting has not been specifically provided for in the costings unless indicated in the PAF. However, estimates of planting areas are generous and it is expected that costings should allow for some infill planting.
Native planting – standard site (e.g. grassy riparian margin)	$37,552 per hectare	Assumes planting at 1.5m spacing (4444 stems per hectare) and includes $2000 per hectare for site preparation, $3.50 per plant purchase (including transport), $1.50 per plant for labour and $3 per plant for five releasing events.
Native planting – weedy site (e.g. gully wetland with a range of weeds present)	$39,552 per hectare	Assumes planting at 1.5m spacing (4444 stems per hectare) and includes $4000 per hectare for site preparation, $3.50 per plant purchase (including transport), $1.50 per plant for labour and $3 per plant for five releasing events.
Native planting – wetland site (e.g. for whitebait habitat) where native plantings are predominantly monocots and a broadleaf specific herbicide can be used for releasing without killing plantings.	$117,550 per hectare	Assumes planting at 0.75m spacing (17,777 stems per hectare) and includes $2000 per hectare for site preparation, $3.50 per plant purchase (including transport), $1.50 per plant for labour and $1.50 per plant for five releasing events predominantly using a broadleaf specific herbicide.
Willows and poplars		Those undertaking planting of willow and poplar poles should use varieties bred for erosion control purposes and note the restrictions on planting pest willow species (e.g. grey and crack).
Willow/poplar poles – 3m tall (including planting labour and transport to site).	$12 per pole	Assumes a low grade pole for planting in areas that are retired from stock and where possums aren't considered a threat to plantings.
Willow/poplar poles for river margin planting – 3m tall (including planting labour and transport to an easily accessible site).	$14 per pole	Assumes a high grade pole with a dynex sleeve.
Willow/poplar poles for hill country planting – 3m tall (including planting labour and transport to a remote site).	$16 per pole	Assumes a high grade pole with a dynex sleeve.

PLANTATION SPECIES		
Reforestation with *Pinus radiata* or *Leptospermum scoparium* (mānuka) in the Waipā and Central/Lower Waikato catchment.	$3000 per hectare	This is based on planting with 2.5m-3m spacing. It does not include pruning and maintenance costs but does include site preparation.
Reforestation with *Pinus radiata* or *Leptospermum scoparium* (mānuka) in the Upper Waikato catchment.	$2500 per hectare including fencing	
ANIMAL PEST CONTROL		
Possum control using bait stations and brodifacoum bait.	$200 per hectare per year (over 3 years). Note: this cost is generous and would accommodate purchasing additional bait stations if more were required e.g. for a narrow riparian area.	This cost allows for placing approximately one bait station per hectare at a cost of $16 for each bait station (if purchased at wholesale rates). Start-up requires three 500g bait station fills over several months (totalling 1.5kg bait per station). Night shooting may also be required during start-up. Maintenance requires four 500g fills per year for each bait station. Labour to service bait stations is approximately 0.5 hours per fill at $50 per hour. One 10kg bag of bait costs $50. This will be sufficient to cover start-up and maintenance for three years. Costs have been averaged over three years as possum control within the *Restoration Strategy* is primarily for native plant establishment over three years.
Possum control using A12 Goodnature traps. (This method of possum control has been recommended in urban areas instead of bait stations).	$175 per hectare in the first year and $90 per hectare thereafter	The estimated cost is based on installing one trap per hectare. It includes purchase of A12 Goodnature traps at $150 each and 0.5 hours to install each trap. Traps require checking four times per year. Costs allow an average of 0.5 hours to check each trap each time (at $50 per hour) and include purchase of a replenishment pack at $40 per year.
Goat control	$51 per hour per hunter $408 per 100ha per year	This cost assumes one hunter for eight hours per 100ha of control area. Estimates include expected ammunition costs.
EARTHWORKS		
12 tonne excavator	$140 per hour $270 for transport to site	A 12 tonne excavator will move approximately 150m^3-200m^3 of soil per hour (assuming it is semi dry), slower for wet soil.
Long reach excavator	$180 per hour $400 for transport to site	A long reach excavator would take approximately 4 days (9 hours per day) to dig a 2m x 50m x 50m pond and spread the soil out behind – approximately 150m^3 per hour.

PROJECT MANAGEMENT COSTS		
Project management of very large projects, e.g. more than three different types of work (such as riparian management, fish barrier remediation and erosion control) and 20+ landowners and stakeholders.	30% of overall works cost	This includes all aspects of project management and general staffing, including landowner/ iwi/stakeholder consultation, procurement and contract management, vehicle use, koha for hui, office overheads, health and safety planning and incidentals such as equipment for a community planting day, printing and stationery.
Project management of large projects, e.g. multiple works actions (such as riparian management, fish barrier remediation and erosion control) and more than 10 landowners and stakeholders but likely less than 20.	25% of overall works cost	
Project management of small and medium sized projects, e.g. one or two different types of work (such as fencing, fish passage remediation) and consultation with up to 10 landowners and stakeholders.	20% of overall works cost	
Project management of a small projects, e.g. one type of work (such as riparian management) and consultation with up to 10 landowners and stakeholders.	15% of overall works cost	
FISH PASSAGE REHABILITATION		
A range of options are available, including fish ramps, baffles and mussel rope.	$5000	Most options will be cheaper than the cost estimate provided but this cost covers all options.
CULVERTS		
Installation of 6m long 450mm culvert with 150mm of metal underneath (one truckload)	$900 per 6m length of culvert	Includes $550 for culvert purchase and $350 for installation.
TIMBER WEIR		
6m wide timber weir	$7000 installed	

IN-STREAM WOODY DEBRIS STRUCTURES		
Total estimate for installing woody debris or rock for fish habitat at a site (comprising of up to 3 structures over a 1km length).	$11,403	Includes site visit with experts, design and installation. Cost estimate excludes resource consent fees.
Total estimate for installing woody debris or rock for fish habitat at a site (comprising 4-6 structures over a 2km length).	$20,826	Includes site visit with experts, design and installation. Cost estimate excludes resource consent fees.
Total estimate for installing woody debris or rock for fish habitat at a site (comprising 7-9 structures over a 2km length).	$29,589	Includes site visit with experts, design and installation. Cost estimate excludes resource consent fees.
WEED AND WILLOW CONTROL		
1ha of weed spraying (where weeds cover 10%-20% of the site) using a ute or quad bike.	$1400 per hectare per year	Cost includes chemical (typically glyphosate, grazon or tordon, pulse penetrant and marker dye) and labour.
As above but using a knapsack.		
1ha of weed spraying (where weeds cover more than 20% of the site) using a ute or quad bike.	$2800 per hectare per year	
As above (weedy site) and using a knapsack.	$5000 per hectare per year	
Ground based willow control using x-tree basal.	$4000 per hectare per year	Cost includes chemical and labour.
Mechanical willow removal along a waterway where willow is up to 30cm in diameter and low to medium density.	$20 per metre (including both sides). Burning of debris piles is an additional 20% of cost of removal.	Cost includes chemical and labour.
Mechanical willow removal along a waterway where willow is larger than 30cm in diameter and/or areas where willow vegetation is high density	$40 per metre (including both sides). Burning of debris piles is an additional 20% of cost of removal.	Cost includes chemical and labour.

LABOUR COSTS		
Technical specialist	$100-$200 per hour	Examples of technical specialists include ecologists, scientists, cultural specialist, engineers and environmental planners.
Field labourer	$40-$80 per hour	Examples of field workers include those undertaking water sampling, fish monitoring, weed control, checking animal traps and overseeing a native planting team.
WALKWAY DEVELOPMENT		
A flat 1.5m wide gravel track with no boardwalk sections or bridges and easy access.	$100 per metre	
A 1.5m-2m wide gravel track with little or no sections of boardwalk and/or some access challenges.	$150 per metre	
A 1.5m-2m wide gravel track with several small sections of boardwalk, waterway crossings and/or some access challenges.	$200 per metre	
Where large sections of boardwalk or crossings are required this has been costed specific to the project.		

APPENDIX 3 – FUNDERS AND CONTRIBUTORS

TĀPIRITANGA 3 - NGĀ KAIUTU ME NGĀ KAIĀWHINA

Funding organisations that regularly fund the kinds of projects identified in the *Restoration Strategy* are detailed below, along with information about their funding criteria and/or the types of projects they fund.

Waikato River Clean-up Trust

The Waikato River Clean-up Trust (WRCuT) provides funding for projects that improve the health and wellbeing of the Waikato and Waipā rivers and those who work towards the restoration and protection of the health and wellbeing of the rivers for present and future generations. The funding available is up to $7 million per year.

Each year, the trust releases an annual funding strategy that outlines funding priorities for that year. Examples of projects that have been funded in the past include (but are not limited to) riparian fencing and planting, puna restoration, lake and wetland restoration, protection and restoration of forest remnants, retirement and planting of erosion prone areas, restoration of cultural sites of significance, iPOU, whitebait spawning restoration, enhancing river and lake access, and iwi capacity building.

Some of the key funding criteria are:

- WRCuT must not fund a project or part of a project that another agency would fund or be likely to fund if the trust did not exist.
- There will be contestability in the allocation of funding.
- There will be a preference for funding practical projects rather than research. In allocating funding, adequate regard must be given to the *Vision & Strategy*, the scoping study, other relevant research, and furthering iwi environmental plans.
- Projects that have matched or supplementary funding will be given a priority (50 per cent co-funding is desirable).

For further information and to view a copy of the funding strategy on the Waikato River Authority website, go to www.waikatoriver.org.nz.

Waikato Catchment Ecological Enhancement Trust (WCEET)

The Waikato Catchment Ecological Enhancement Trust was established to foster and enhance the sustainable management of ecological resources in the Lake Taupō and Waikato River catchments. Funding awarded varies each year but is generally around half a million dollars.

Examples of projects that have been funded in the past include weed removal, wetland and lake restoration, predator control, wetland creation, planting and restoration.

For more information about the key funding criteria visit the trust's website at www.wceet.org.nz.

Afforestation Grants Scheme (AGS)

This funding programme is run by the Ministry for the Environment and is designed to help establish 15,000ha of new forest in New Zealand between 2015 and 2020. Up to $19.5 million is available until 2020 and grants of $1300 per hectare are available for growers to plant new small to medium-sized forests (5ha-300ha).

Some of the funding criteria are:

- Eligible land must be new forest planting. It must not:
  - be classed as 'forest land' under the Climate Change Response Act 2002 when you apply
  - have been 'forest land' on 31 December 1989
  - have been 'forest land' at any time in the five years before you apply.
- Planting must be with a forest species as defined in the Climate Change Response Act 2002. That is a species that is:
  - capable of reaching at least 5m in height at maturity in the place where it is located
  - not grown or managed primarily for the production of fruit or nut crops.

A number of pine and mānuka plantings in the Waikato catchment have received funding through AGS. Download the document titled *A Guide to the Afforestation Grants Scheme* from the website for more information – *www.mpi.govt.nz/funding-and-programmes/forestry/afforestation-grant-scheme*.

Trust Waikato

Trust Waikato provides donations to not-for-profit community groups and projects that improve the wellbeing of Waikato communities. The types of groups and projects supported is broad, including social services, education, sport, recreation, youth, art, culture, history and the environment. Trust Waikato is particularly interested in projects that target communities with the highest need. The trust awards around $10 million per annum.

Examples of projects funded in the past include community facilities, walkways, Hamilton Gardens development and educational projects.

Visit the website for detailed information on funding criteria – *www.trustwaikato.co.nz*.

Ngā Whenua Rāhui

This national fund supports the protection of indigenous ecosystems on Māori-owned land while honouring the rights guaranteed to landowners under Te Tiriti o Waitangi. It provides protection for Māori landowners through the use of 25-year renewable kawenata (covenants). It also provides significant support for the landowners, including pest control programmes, monitoring and consequent operational support.

Māori land authorities such as trusts and incorporations, organisations representative of whānau, hapū or iwi, and Māori owners of general land can apply.

Full Ngā Whenua Rāhui Fund criteria is outlined in the application pack, which can be found on the website *www.doc.govt.nz/ngawhenuarahui*.

Ministry for the Environment – Freshwater Improvement Fund

This national fund is for projects which improve the management of New Zealand's lakes, rivers, streams, groundwater and wetlands. The aim is to fund projects that will make the biggest difference with the available funding. The fund is therefore focusing on waterbodies in vulnerable catchments that are showing signs of stress but have not yet reached a 'tipping point'. $100 million is available over 10 years through a contestable funding round. The frequency of funding rounds is yet to be determined. However, $44 million was allocated in year 1 (2017).

Some of the funding criteria:

- The project must contribute to improving the management of New Zealand's freshwater bodies.
- The project must meet one or more of the following:
- achieve demonstrable co-benefits such as:
    - improved fresh, estuarine or marine water quality or quantity
    - increased biodiversity
    - habitat protection
    - soil conservation
    - improved community outcomes such as to recreational opportunity or mahinga kai
    - reduction to current or future impacts of climate change
    - reduced pressure on urban or rural infrastructure
    - increase iwi/hapū, community, local government or industry capability and capacity in relation to freshwater management
    - establish or enhance collaborative management of fresh water
    - increase the application of mātauranga Māori in freshwater management
    - include an applied research component that contributes to improved understanding of the impacts of freshwater interventions and their outcomes.
- The minimum request for funding is $200,000 (excluding GST).
- The fund will cover a maximum of 50 per cent of the total project cost.
- The project will be funded for a maximum period of up to five years after which the project objectives will have been achieved or the project will be self-funding.
- The project must achieve benefits that would not otherwise be realised without the fund or are not more appropriately funded through other sources.
- The effectiveness of the project and its outcomes will be monitored, evaluated and reported.
- An appropriate governance structure in place (or one will be established as part of the project).
- The applicant must be a legal entity.

For further information visit the fund website,
www.mfe.govt.nz/more/funding/freshwater-improvement-fund.

Ministry for the Environment – Community Environment Fund

The Community Environment Fund (CEF) empowers New Zealanders to take environmental action by funding projects that:

- strengthen environmental partnerships
- raise environmental awareness
- encourage participation in environmental initiatives in the community.

Some of the projects funded to date have involved pest proof fence construction, protection of rare and endangered freshwater and coastal ecosystems, ecosystem monitoring, weed control, riparian planting and animal pest control.

Funding criteria include:

- The project will contribute to one or more of the following:
  - strengthening partnerships
  - raising environmental awareness
  - encouraging participation in environmental initiatives in the community.
- The project is for a discrete time frame of up to three years. After this time, the project objectives will have been achieved and, where appropriate, the initiative will have become self-funding.
- The applicant is a legal entity.
- The application is seeking between $10,000 and $300,000 (excluding GST) from the Community Environment Fund.

For further information visit the fund website, *www.mfe.govt.nz/more/funding/community-environment-fund*.

Waikato Regional Council – Integrated Catchment Management Directorate

The Integrated Catchment Management (ICM) directorate undertakes catchment management, which includes land management, biosecurity and biodiversity projects.

Funding is often available for various aspects associated with catchment management, including fencing, planting and pest control. They are able to fund up to 35 per cent of the project costs for work in priority catchments.

Contact a Waikato Regional Council catchment management officer for further information on 0800 800 401 or visit www.waikatoregion.govt.nz/services/regional-services/river-and-catchment-management.

Waikato Regional Council – Natural Heritage Fund

This regional fund contributes to ecosystem restoration projects that aim to achieve "landscape scale" outcomes. The fund aims to protect and manage, in perpetuity, special places of ecological significance. The amount of funding available annually is expected to be in the range of $40,000 to $300,000.

Key priorities include the preservation of access to waterways and the coast, as well as protection of biodiversity, heritage sites and landscapes of significance to the community. To date, the Natural Heritage Fund has been used for a wide range of projects, including Maungatautari Ecological Island Trust, Waipā peat lake reserves and the purchase of the Ed Hillary Hope Reserve.

More information can be found at *www.waikatoregion.govt.nz/community/whats-happening/funding-and-scholarships/natural-heritage-fund*.

Queen Elizabeth II National Trust

Queen Elizabeth II National Trust (QEII Trust) was set up in 1977 to "encourage and promote the provision, protection, preservation and enhancement of open space".

QEII Trust helps private landowners in New Zealand permanently protect special natural and cultural features on their land with open space covenants. The trust can contribute to fencing costs and covers the cost associated with covenanting a site (e.g. surveying and legal fees).

To obtain QEII support you must be wanting to secure long-term protection of natural and cultural features on private land with a covenant. For more information visit *www.openspace.org.nz*.

Iwi authorities – Te Arawa River Iwi Trust, Raukawa Charitable Trust, Maniapoto Māori Trust Board, Tūwharetoa Māori Trust Board and Waikato Raupatu River Trust.

Sometimes iwi authorities will have funding available to support environmental initiatives in their rohe. Iwi groups looking to undertake work should contact their iwi authority to see if funding and/or support is available.

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Te Kaunihera ā Rohe o Waikato