KO TĀNGONGE TE WAI: CHALLENGES OF RESTORATION AND MANAGEMENT OF A FLOOD PLAIN LAKE

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ABSTRACT

Historically, Lake Tāngonge was one of the most important mahinga kai of the Te Hiku o Te Ika iwi providing abundant aquatic and dry crop food resources. Tāngonge is now a wetland system in a peat basin overlying sand substrate, fed by artesian sources, local catchments and the Awanui River, near Kaitaia, Northland, New Zealand.

In the 1930s the Lake was drained in a major government scheme to make way for Pakeha settlement, aid farming development and mitigate flood inundations of the Kaitaia Township. The experience of land alienation and environmental degradation created barriers to its use, food production, kaitiakitanga knowledge and practices and prevented local Māori interaction with the environment. This impacted on the cultural and ecological integrity of the catchment.

As a result of Treaty settlement processes, significant areas of Tāngonge will be returned as cultural redress in 2014. The collective vision of the iwi is to restore the taonga as a wetland that will rekindle engagement with and usage of Tāngonge by manawhenua and local communities. This paper tells the story of Tāngonge and presents challenges of restoration from a manawhenua perspective.

KEYWORDS

Catchment, iwi Māori, wetland restoration, collaboration, indigenous, stormwater, flooding, sewerage.

PRESENTER PROFILE

Troy Brockbank is a qualified civil engineer with Stormwater360 New Zealand. He has nine years professional experience in the stormwater industry and has developed specialist skills in designing and constructing stormwater management devices.
Ko Te Rarawa te Iwi, Ko Ngāti-te-Ao te hapū, Ko Tāngonge te wai.

Wendy Henwood is a social science researcher and evaluator. She has been involved with community environmental restoration projects for many years and is part of the Tāngonge restoration working group.
Ko Te Rarawa te iwi, Ko Ngāi Tupoto, Ngāti Here ōku hapū.

Waikarere Gregory grew up alongside what remained of Tāngonge in the 1970s, hering stories of its grandeur and delighting in trips to go eeling, or catch kewai. Now, a mother, she hopes her tamariki will too partake of its' fruits.
Ko Te Rarawa te iwi, Ko Ngāti-te-Ao te hapū, Ko Tāngonge te wai.

1 INTRODUCTION

Tāngonge near Kaitaia, New Zealand was once a significant lake and wetland area. It held perenial surface water that grew large plantations of taro. It was the rippling and swaying effect of the tall taro in the wind that led to the name Tāngonge:

> "Ano te mara taro a Taiawarua, me nga koroi o Hotu, ka puhia te hau ka tāngonge noa." (Hongi 1930, Graham 1991)

Historically, Tāngonge is regarded as one of the most important mahinga kai (food production area) of Te Hiku o Te Ika iwi. A number of hapū used and managed the fresh water fishery, bird life, gardens and other natural resources contributing enormously to the local economies, health and wellbeing of local hapū for countless generations.

This remarkable ecosystem was severely modified over time; the people were removed, large irrigation channels were dug and the land drained in a major government scheme in the 1930's to make way for Pakeha settlement. The land has slowly changed from wetland forest and vegetation to agricultural pasture.

Today the Tāngonge wetland system lies in a complex catchment that includes a major river, many stream tributaries, significiant groundwater incursion, urban and agricultural runoff. In one sense Tāngonge owes its existence to 'stormwater'; seasonal inundations, particularly via the flood events of the Awanui river, which have over geological time established the lakebed. A tension between historical and current usage underlines a cultural divergence as to what constitutes 'stormwater' and is implicated in differing aspirations for resource management by manawhenua and settler populations.

Tāngonge and the surrounding area have been the subject of iwi claims since the 1890s and the subject of inquiry by the Crown with no outcome for the claimants. As a result of recent Treaty settlement processes, significant areas surrounding Tāngonge will be returned to the iwi of Te Rarawa and Ngai Takoto as cultural redress in 2014.

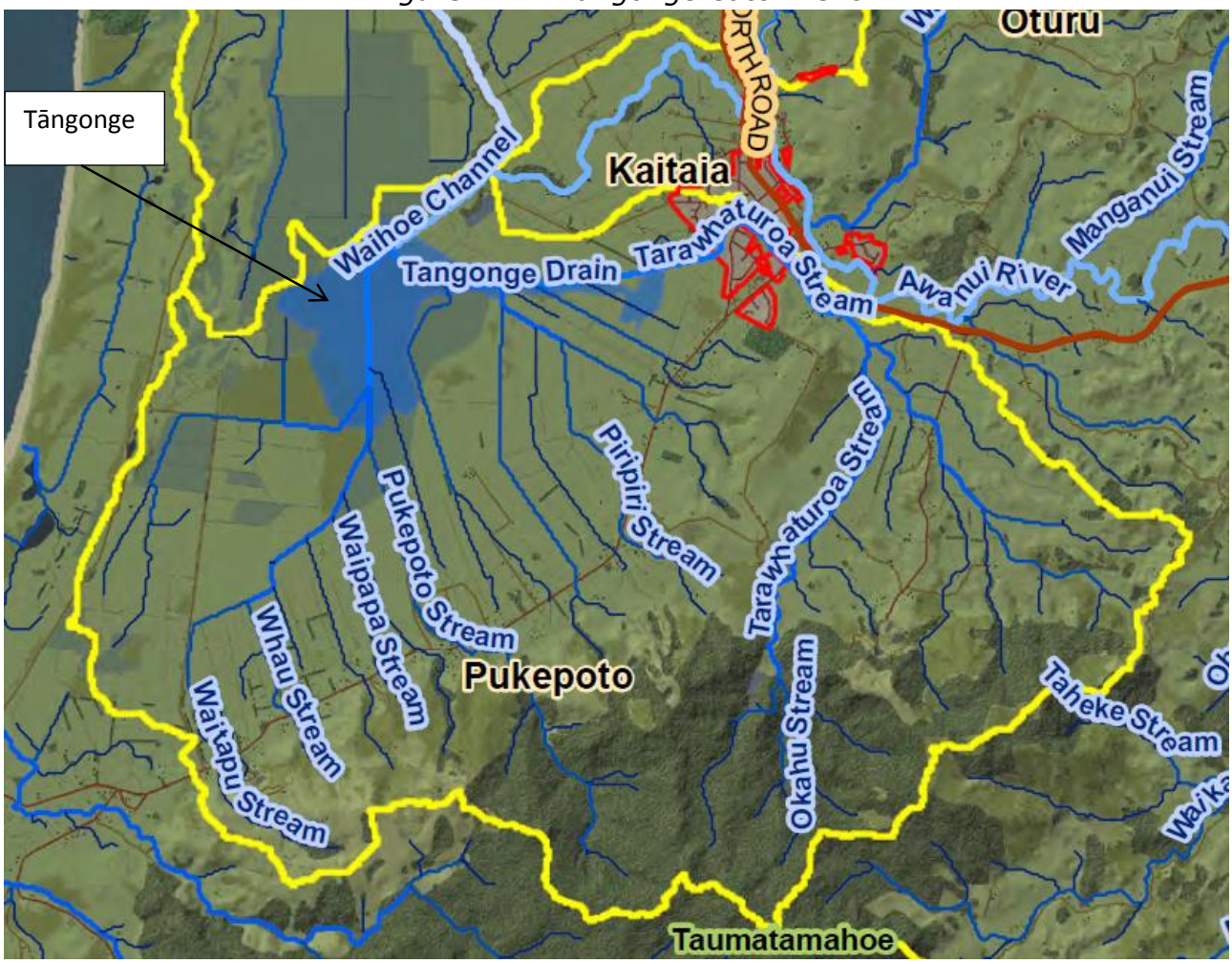
The collective vision of the iwi is to restore this taonga as a wetland facilitating renewal through education, and research education that will rekindle the engagement with and usage of Tāngonge by manawhenua and the local community. A Tāngonge Restoration group has been formed to facilitate restoration action.

In this paper we aim to tell the story of Tāngonge from a manawhenua perspective, discussing tensions, considerations and possibilities for restoration and development now that Treaty settlement has confirmed iwi ownership of this taonga.

2 CATCHMENT DESCRIPTION

Tāngonge is a wetland ecosystem located within a low lying peat basin on the alluvial plains of the Awanui River near Kaitāia, Northland, New Zealand. The Tāngonge catchment (Figure 1) is approximately 7000 Ha (Cathcart 2005) of mainly agricultural pasture with forested upper slopes. The catchment is bordered by the Orowhana range (Herekino Forest) along the southern boundary, the extensive dune ridge of Te Oneroa- a-Tōhē (90 mile Beach) along the north-western boundary and the Awanui River along the eastern boundary. The Waitapu, Whau, Waipapa, Pukepoto, Piripiri, Okahu and Tarawhataroa (also refered as Tarawhaturoa) streams discharge into Tāngonge via numerous irrigation drains. The outflow is discharged into the Awanui River via the artificial Waihou (also refered as Waihoe) Channel.

Figure 1: Tāngonge Catchment



2.1 KEY CATCHMENT FEATURES

2.1.1 AGRICULTURAL PASTURE

A significant portion of the Tāngonge catchment consists of agricultural pasture and associated farming activities. The majority of connected waterways, natural streams and artificial drains are currently unfenced with no riparian margins. Hence, untreated agricultural runoff is currently discharged directly into the waterways and stock are often free to wander.

The water quality of waterbodies within agricultural catchments has been unequivocally demonstrated to be significantly affected by farming practices (Wilcock et al. 2007, Larned et al. 2004, Wilcock et al. 1999). Potential adverse effects from surface water with high contaminant loadings can include: increased nutrient loadings promoting nuisance biological growth, high ammonia levels that are toxic to fish, microbial contamination of waterways rendering them unsuitable for drinking and contact recreation use, suspended solids resulting in the reduction of water clarity and smothering of aquatic life. Literature examined by Wilcock (2006) reported an estimated E.coli loading of $3.6x10^9$ E. coli/Ha/day from a cattle grazed pastures. Colins et. al (2004) reported overland flow transported to a head water stream flow during heavy rainfall events can containing between $2x10^5 - 6x10^8$ E. coli/m^2 from a hillside catchment. Total nitrogen loads entering streams associated with farming practices is typically >20kg/Ha/yr, whereas total phosphorus is typically >5kg/Ha/yr (Wilcock et al. 2007, Elliott et al. 2006). Farm dairy shed effluent treatment systems can also contribute to the increase in contaminant loading. It was estimated that 51% of systems discharged to land in 2002 and are by far the most numerous point source discharges to surface waters and land in Northland (Northland Regional Council 2002). Direct deposition of containments can also occur from stock wandering into un-fenced waterways.

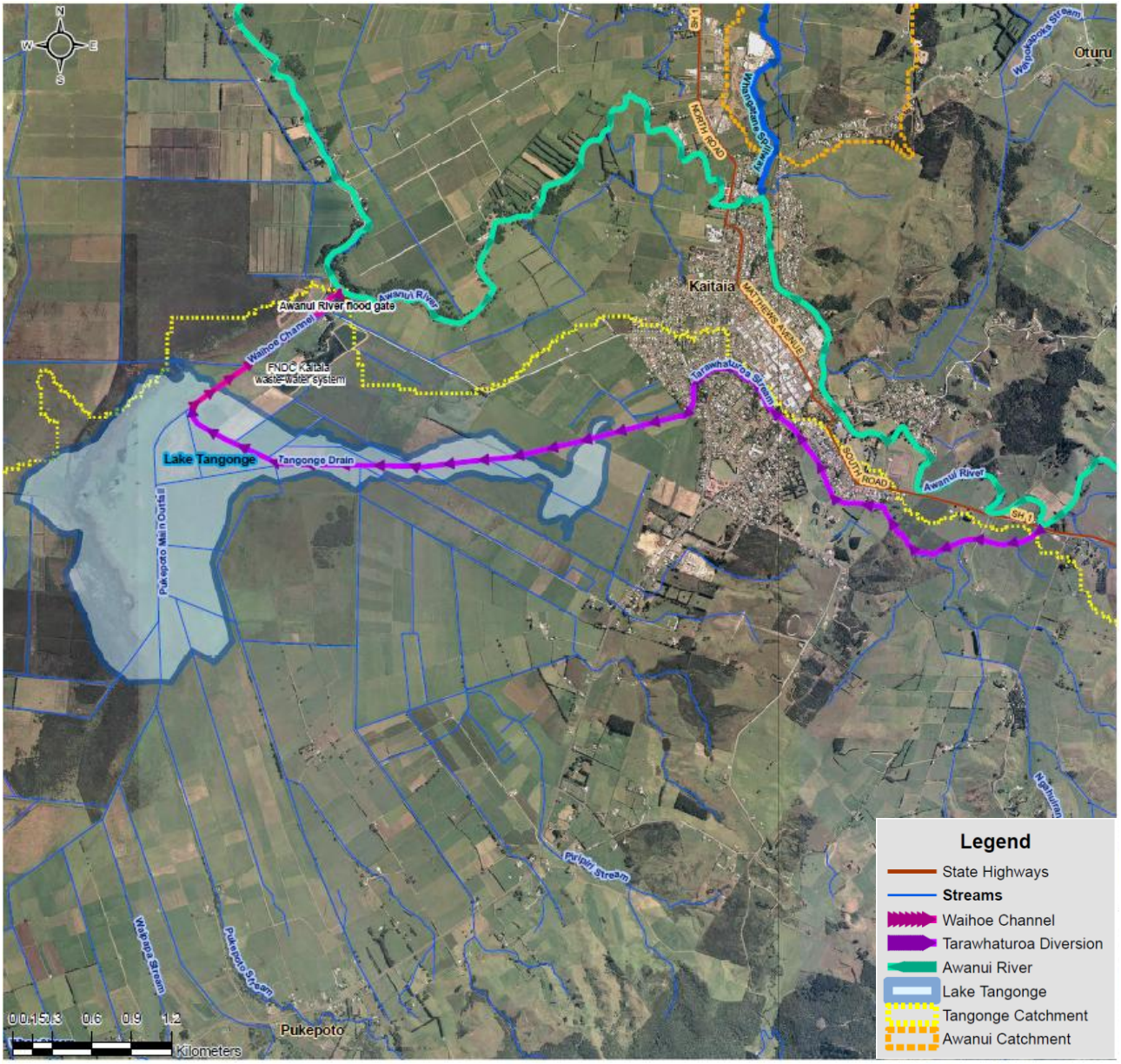
It is anticipated that fencing and planting riparian margins along the waterways will provide a first line of treatment via filtration and plant uptake to diffuse contaminants from runoff whilst also preventing access to stock. Additional benefits include increased stream bank stability to protect stream and valuable productive soil, reduced water temperatures, reduced stock losses and therefore saving money on replacements and/or veterinary costs, and improved habitats for aquatic life. Potential challenges may arise from the monetary cost to undertake such work, and obtaining upstream land-owner agreement and buy-in to implement new land practices. While some land owners can see the benefits of improving environmental outcomes and are keen to be involved with research and plans for Tāngonge, others show disinterest and deny their role in contributing to environmental outcomes.

2.1.2 FLOOD CONTROL

The Kaitāia township is situated on a floodplain between the Awanui River and Tarawhataroa stream. It is estimated that over 3000 people are living in a flood-susceptible area of Kaitāia (Cathcart 2005). Urban land development and de-forestation to pasture has increased the volume of runoff. This is due to a reduction in the abilty to infiltrate into soils and be soaked up by vegetaton through evapo-transpiration. The Awanui River Flood Scheme (figure 2) is designed to ease the volume of floodwater within the Awanui River and prevent inundation of the township. Tāngonge is an important component of the scheme; providing significant temporary off-line detention aiding in the reduction of the river water levels (Cathcart 2005).

The scheme diverts part of the peak floodwater flow, 31% of a 1:30 year flood event (Cathcart 2005), from the Awanui across State Highway 1, south of Kaitāia, into the Tarawhataroa and out into the artificial Tāngonge Drain to Tāngonge . Floodwaters are temporarily detained within the available storage of Tāngonge by the Waihou Floodgate located at the outfall of the artificial Waihou Channel. Once the river levels have significantly subsided floodwaters are discharged back into the Awanui River, north of Kaitāia, upstream of the Rangaunu Harbour. The Waihou Stopbank extends westwards from the Awanui river to prevent floodwaters stored in Tāngonge spreading north across the developed peatland and along the Waipapakauri Outfall.

Figure 2: Awanui River Flood Scheme: Tāngonge Sub-catchment



Extended detention of flood waters within Tāngonge can lead to anoxic conditions due to decaying plant life. When this 'poison' is released into the Awanui, aquatic life can be significantly harmed or killed.

Wetland restoration of Tāngonge will require perennially raising of the water level. Consequently, this could lead to a reduction in the temporary storage volume during a flood event, which may impact the effectiveness of the Awanui River Flood Management Scheme.

2.1.3 KAITĀIA WASTE WATER TREATMENT PLANT

The Kaitaia wastewater treatment plant (WWTP) is located on the south-east corner of Tāngonge adjacent to Bonnets Rd. It receives waste water via pressure mains from the townships of Kaitāia, and more recently, Awanui due to decommission of its

ageing effluent disposal system in 2013. The WWTP consists of three existing oxidation ponds in series with a total surface area of 109,000m^2 (Far North District Council 2013). The final effluent from the ponds is discharged directly into the Waihou channel (Northland Regional Council 2002). The Far North District Council is currently undertaking detailed design work of additional sludge dewatering facilities and storage areas to the immediate west of the Kaitāia WWTP.

The existing ponds are located on top of natural ground. Hand augers completed in 2011 to the west of the ponds indicate a very stiff to stiff, plastic and moderately sensitive clay layer, typically 0.5-1.5m beneath ground level. Free water was approximately 0.9-1.2m beneath ground level. The clay layer extended approximately 1m and was determined to have a vertical permanent permeability of 1x10E-9 m/s (Opus International Consultants Ltd 2011). Despite this there is some risk of leachate infiltrating through the pond base and into the groundwater.

Floodwater can enter the wastewater sewerage system when either the Kaitāia or Awanui townships are flooded, either from overflowing river water or stormwater trapped behind flood-gated outfalls (Cathcart 2005). This can lead to overflowing within the townships and overloading the WWTP, resulting in contaminated discharges to the Waihou Channel, Tāngonge and the Awanui river.

Manawhenua do not accept human effluent released into Tāngonge as an appropriate outcome as it conflicts with Māori values of tapu (sacred) and noa (common). It is also seen as culturally offensive and degrading.

3 MĀORI ENVIRONMENTAL PERSPECTIVES

3.1 INTERCONNECTEDNESS

Maori philosophy emphasises the kinship of all aspects of the experiential world so that they themselves are integrated into the cycles and changes occuring within the broad environment. Historically there are holistic conceptions of the environment as well as the inter-relationship of elements. An example is the earth and the sky, personified in Māori mythology as Papatuanuku (Earth Mother) and Ranginui (Sky Father) as locked in eternal embrace. Another example is the thought of watercourses at a catchment level, "mai uta ki tai" (on its journey from the land to the sea). Other features such as the ocean, the forest, and the weather were also the province and actions of deities. Rivers, lakes and other local features were the realm of supernatural beings such as taniwha (at Tāngonge Paraweta). These supernatural beings were deemed to be the kaitiaki (guardian) of their respective realms who needed to be acknowledged and respected to ensure safe and sustainable use of resources.

Resource rights were allocated according to ancestral connection, historical occupation and use. In this instance Hapū that lived adjacent to Tāngonge made use of its prolific food resources and ready water supplies to support extensive cultivatons. Others travelled considerable distances to Tāngonge and made temporary camps in order to harvest and store seasonal bounty such as the catch from the inanga (whitebait) runs of spring and the tuna heke (migrating freshwater eel) that attend the early floods of autumn.

For manawhenua of Tāngonge, kaitiakitanga practices based on deep local knowledge and sensitivity to the long-established patterns of water movement, were eroded, mahinga kai were damaged and gardening systems harmed. This undermined

economic, cultural and spiritual self-sufficiency of whanau, hapū and iwi. Kaitiakitanga, understood as involving both function and practice, is a familiar term nowadays that is generally and variously applied to the natural and physical environment. Selby (2010) defines kaitiakitanga as:

> " … relationships between humans and the environment, humans and their gods and between each other" (Selby et al. 2010).

Te Rarawa kaumatua often use the term 'mana tiaki' as opposed to kaitiakitanga and descriptions go beyond caring for the physical dimensions of the environment to encompass philosophical, spiritual and leadership domains - the overarching purpose was to ensure the sustainability of whanau, hapū and iwi, and their resources for generations to come.

3.2 UNDERPINNING VALUES

Maori notions of water involve strong values which are inclusive of all elements of being, both tangible and intangible; there is a 'mauri' to be respected and protected. The mauri of all aspects of Tāngonge, and the seasonal events affecting the land and waterways are commonly recalled in oral histories. The mauri of the Ngapuhi lake, Omapere, near Kaikohe, Northland is described as being:

> " … something that stirred hidden forces in [Maori] … It was something much more grand and noble than a meer sheet of water covering a muddy bed. … it was a striking landscape feature possessed of a 'mauri' or 'indwelling life principle' which bound it closely to the fortunes and destiny of his tribe." (McDowall 2011)

Historically Maori values associated with water have not been recognised, and there have been conflicting interests. Pakeha settlers regarded wetlands as swamps, useless until drained and converted to pasture. Maori concerns at the loss of mahinga kai were not a consideration as demonstrated in late 1800s writings relating to lakes and wetlands:

> "Around about this outlet [of the lake Omapere] the natives have a small fishing reserve, from which they possibly take ten shillings worth of eels a year and on account of this we are suffering an annual loss of many hundreds of pounds … it simply is a scandal that the full development of such a fine piece of land should be held back because of a paltry native fishing right … " (McDowall 2011)

Tensions over the different understandings arose in many locations as evident in claims to the Waitangi Tribunal (2010) and ongoing kaitiaki restoration efforts (Henwood, Henwood 2011, Panelli, Tipa 2007, Harmsworth et al. 2003). Summarising the outcomes of such conflicts McDowall (2011) writes:

> "The draining of swamps and mitigation of flooding (operations that often involved interference with rivers and lakes) to bring more land into agricultural production, was equated with the 'national interest'. The country's future lay in sheep and cattle, not eel and koura. … invariably the 'national interest' was identical to that of the Pakeha farming sector, and in conflict with the traditional Maori economic and land use practices".

For iwi an holistic understanding supports a catchment wide approach (Tipa, Nelson 2008) to addressing waterway issues and emphasises the interdependence and interconnectedness of the environment (Selby et al. 2010). Environmental enhancement and restoration have become a platform for Maori engagement and cultural development in some areas; efforts by local hapū at Lake Whakaki for example are regarded as not only about environmental rejuvenation but are also a strategy of "indigenous politics of resistance and cultural recovery" (Selby et al. 2010).

3.3 ENVIRONMENTAL MODIFICATION

In Māori mythology, Maui's brothers' greed was said to have caused the once smooth 'skin of the fish' to wrinkle in pain to form mountains and valleys. Maori thinking in no way precluded modification of natural environments. Earthworks and the construction of food harvesting structures are widely in evidence in local landscapes. Defensive structures, such as Pa sites, were dug and built on strategic sites. At lake Omapere multiple exits to the waterway were constructed to equitably share the tuna harvest. At Tāngonge itself there are accounts of Maori drainage works that produced the Waihou Channel, adding land to the Pukepoto Block and preceding but eventually incorporated into the government scheme. In 1934 Herepete Rapihana, giving evidence at a Maori Land Court hearing, explained the work which had been carried out in 1902, as helping to stablise the margins of Tāngonge that were undermined by the floodwaters from Kaitaia but was clear of the limits of the action stating:

> "We did not want to drain the Tāngonge Lake fully, as it was our food supply." (Maori Land Court 1934)

Nevertheless such environmental modifications were fundamentally at human scale and fitted into the basic ecological economic models that allowed hapū and iwi to live sustainably for centuries in the environments that they encountered in Aotearoa.

Environmental modification and exploitation inherent to the colonial process, produced long-term damage to the rich, diverse ecosystem of Tāngonge, with major negative biophysical, cultural, economic and social consequences. The lakebed was radically changed, aquatic environments altered, species were depleted or lost and the natural integrity of the ecosystem seriously compromised. According to Geoff Park drainage schemes had altered the landscape of large tracts of land throughout the country by the 1960s:

> "Crown drainage operations had eliminated the indigenous flora and fauna of the great majority of New Zealand's lowland swamps" (McDowall 2011).

Patterns of biological adaptation to the water levels and flows, around ecological niche exploitation, food webs and reproduction, established at an evolutionary scale for multiple different but interdependant species, were swept aside in a matter of years.

4 THE TĀNGONGE RESTORATION PROJECT

The return of the Tāngonge lands is at once both exciting and challenging for iwi. Exciting to be involved in the future of this important resource returned as redress that has the potential to improve environmental, economic, social and cultural outcomes for mana whenua and the wider Te Hiku o Te Ika region. Challenging to

understand the catchment, issues of land use, hydrology, flooding and sewerage in order to make the best possible decsions about restoration.

As previously discussed Tāngonge is considered a taonga of great cultural significance; culture and the environment are intertwined. Cultural values and considerations are therefore at the forefront of restoration efforts; stories, whakapapa and whakatauki that have been handed down through the generations play a vital part in understanding the interconnections, the challenges and the remedies.

Restoration approaches are focused on facilitating environmental renewal and rejuvenation through ongoing activities such as fencing waterways to exclude livestock, reinstating native species in wetland areas, pest control, monitoring programmes, community lead research, and education. Two small initiatives are underway one detailing the hydrology and water flows of the location, and the other building an inventory of flora and fauna species that will be monitored over time to understand change and guide further work. The involvement of a number of local schools in the area (secondary, kura kaupapa and primary), is a specific strategy that signals Tāngonge as an educational resource and an important part of the curriculum.

Collaborations, and partnerships involving active participation and expert advice with schools, government agencies, research groups and mana whenua are at the core of the staged, community-led restoration.

This long term project has potential to achieve positive outcome at a variety of levels. It will bring the community together for a common cause, offer all age groups opportunities to participate in some part of the restoration, provide an educational resource for the community that has an environmental and educational focus (all levels of learning), raise awareness of environmental issues with a large number of people (those with local connections and the general public), maintain whanau, hapū, iwi interest in ongoing learning and research.

5 CONCLUSIONS

Treaty settlements will result in over 400Ha of land encompassing the Tāngonge wetland and several major adjoining farms being returned to the iwi in 2014 as redress. Much deliberation and ongoing strategising has already taken place about how to craft the resources released by the settlement into productive and transformational assets for manawhenua. Bringing Tāngonge whanau, hapū and iwi together has begun to raise awareness and understanding of the history and the issues at this time. The process has also created a collective vision to restore vibrant life to Tāngonge. Environmental restoration of the wetland and catchment will reconstitute ecosystems, regenerate species, rebuild the food and resource producing capacity of the area, and in the process contribute to economic, cultural, environmental and health gains and opportunities for the people of the entire region.

The restoration at Tāngonge is regarded as a long term project that will require intense participation, a broad range of skills, and ongoing action – all will rely on strong relationships, ongoing support and working together with a shared vision.

The challenges outlined in the technical materials presented in this paper are complicated and exacerbated by the divergence between iwi and settler views on the value, character and environmental dynamics of Tāngonge. Water-flows, including

those from flood and storm events, are among the most sensitive and challenging of these differences.

It is important that restoration at Tāngonge is driven from a cultural basis if it is to make a positive difference to whanau, hapū and iwi of the area. However, it is widely understood that an integrated holistic catchment wide approach is required. This will require consideration of a range of factors based on a mix of local and technical knowledge, thorough research, and action.

Returning to where we began, is stormwater not a combination of the great tears of aroha, Ranginui sheds in grief and anguish at his being torn apart from his love, Papatuanuku? And the other elements of a storm, a reminder of the turmoil and continuing conflict between the couples' sons over this separation. The furious winds of Tawhirimatea, who fled to the skies with his father, inflict discomfort on his brothers. Tangaroa, atua of the waters demonstrates his own ire in a storm. Tane must brace the ngahere against this rage and mourn as trees fall. And we humans as the descendants of Tumatauenga are caught up in all of this which serves as a reminder to us, to those who listen, of the precarious balance that exists between all.

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REFERENCES

Cathcart, B. 2005, *Awanui River Flood Management Plan*, Northland Regional Council.

Elliott, A.H., Alexander, R.B., Schwarz, G.E., Ude Shankar, Sukias J. P. S. & McBride, G.B. 2006, "Estimation of nutrient sources and transport for New Zealand using the hybrid mechanistic-statistical model SPARROW", *Journal of Hydrology (NZ),* vol. 44, no. 1, pp. 1-27.

Far North District Council 2013, *Resource Consent Application and Assessment of Effects on the Environment: Change to resource consent CON201230620 – Kaitaia WWTP Sludge Dewatering Facility*, New Zealand.

Graham, M. 1991, *Whakapapa and historical notes and accounts (photocopy of MS-Papers-4450)*, Collection edn, Alexander Turnbull Library, Wellington, New Zealand.

Harmsworth, G., Warmenhoven, T., Pohatu, P. & Page, M. 2003, *Waiapu Catchment Technical Report: Maori community goals for enhancing ecosystem health*, Landcare Research.

Henwood, W. & Henwood, R. 2011, "Mana Whenua kaitiakitanga in action: restoring the mauri of Lake Ōmāpere", *AlterNative: An International Journal of Indigenous Peoples,* vol. 7, no. 3, pp. 220-232.

Hongi, H. 1930, *Ancient Maori history : recollections of a rambler,* Wairoa Star Print, Wairoa, New Zealand.

Larned, S.T., Scarsbrook, M.R., Snelder, T.R., Norton, N.J. & Biggs, B.J.F. 2004, "Water quality in low-elevation streams and rivers of New Zealand: recent state and trends in contrasting land-cover classes", *New Zealand Journal of Marine and Freshwater Research,* vol. 38, pp. 347-366.

Maori Land Court 1934, *Northern Minute Book No 65*, New Zealand.

McDowall, R.M. 2011, *Ikawai : freshwater fishes in Māori culture and economy,* University of Canterbury, Christchurch, N.Z.

Northland Regional Council 2002, *State of the Environment Report 2002*, New Zealand.

Opus International Consultants Ltd 2011, *Kaitaia WWTP Sludge Bed: Preliminary Geotechnical Report*, New Zealand.

Panelli, R. & Tipa, G. 2007, "Placing Well-Being: A Maori Case Study of Cultural and Environmental Specificity", *EcoHealth,* vol. 4, no. 4, pp. 445-460.

Selby, R., Moore, P.J.G., Mulholland, M., 1976- & Te Wānanga-o-Raukawa 2010, *Māori and the environment : kaitiaki,* Huia, Wellington, N.Z.

Tipa, G. & Nelson, K. 2008, "Introducing Cultural Opportunities: A Framework for Incorporating Cultural Perspectives in Contemporary Resource Management", *Journal of Environmental Policy & Planning,* vol. 10, no. 4, pp. 313-337.

Wilcock, R.J., Monaghan, R.M., Thorrold, B.S., Meredith, A.S., Betteridge, K. & Duncan, M.J. 2007, "Land-water interactions in five contrasting dairying catchments:issues and solutions", *Land Use and Water Resources Research,* vol. 7, no. 2, pp. 1-10.

Wilcock, R.J., Nagels, J.W., Rodda, H.J.E., O'Connor, M.B., Thorrold, B.S. & Barnett, J.W. 1999, "Water quality of a lowland stream in a New Zealand dairy farming catchment", *Journal of Marine and Freshwater Research,* vol. 33, no. 4, pp. 683-696.