

Ki uta ki tai
Manaia River Restoration Plan



Ko au ko te awa
I am the river
ko te awa ko ahau
and the river is me
mai rāno!
forever (from the beginning of time)

August 2020

Table of Contents

1	Project background	4
2	Harbour and catchment planning and Manaia River	4
3	Communication and engagement.....	5
3.1	Community engagement	6
3.1.1	Who did we involve?.....	6
3.1.2	What we heard.....	8
3.1.3	Our commitment to the community.....	9
4	Scope and expectations	10
5	Previous works	11
6	Manaia River action tables and map reference	12
7	The Manaia River catchment	18
7.1	Introduction	18
8	He tangata – the people	21
9	Physical attributes.....	22
9.1	Geology	22
9.2	Soils	25
9.3	Present land cover for Manaia catchment	27
9.4	Erosion potential of Manaia catchment	29
9.5	Land use capability.....	31
10	Water quality	33
11	Ecological and biodiversity information	37
11.1	Significant natural area (SNA)	38
11.1.1	Background information	38
11.1.2	SNAs in the Manaia catchment.....	39
11.2	Restoring native habitat biodiversity.....	41
11.3	Native vegetation and soil erosion	42
11.4	Pest animals	42
11.5	Pest plants.....	43
11.6	Kauri protection – kauri dieback.....	44
12	Coastal habitat	45
12.1	Mangrove communities	47
12.2	Immediate threats for the coastal marine area (CMA) – at Manaia	47
12.2.1	Grazing	48
13	Stream erosion.....	48

14	Climate change effects.....	51
14.1	NIWA study – Climate change resilience of a Māori community	51
14.2	Waikato Regional Council flood modelling 2009	52
15	How regional council will support this work.....	54
15.1	Fencing and planting.....	54
15.2	River management.....	54
15.2.1	Flood mitigation	56
16	Funding	56
16.1	Funding options	57
17	References/Bibliography.....	59
18	Appendices.....	60
18.1	Appendix 1 – Manaia Draft Actions	61

Acknowledgements

The impetus for this plan arose from ongoing conversations with tangata whenua about the preservation and enhancement of Manaia River and surrounding land. The Manaia community have willingly given up their time, knowledge, and experience to engage with Waikato Regional Council in the development of this plan. We have endeavoured to capture the aspirations of the community to set the foundation for the Manaia River Restoration Plan.

We wish to acknowledge the support and contributions that have been made by Ngāti Pukenga, Ngaati Whanaunga, Department of Conservation staff and the people of the Manaia.

The community within this catchment have helped us to prepare this document and their patience and support is appreciated. It is their vision, aspirations and support which makes this work possible.

It is now our collective responsibility as community, tangata whenua and agencies to bring this document to life and to seek to make a difference to the future of Manaia River and the catchment.

1 Project background

Ki uta ki tai – Coromandel/Manaia is split into two components: the full harbour and catchment management plan and a restoration plan that focuses on Manaia River.

This document focuses on the latter, and the plan is a partnership between landowners and Waikato Regional Council. The plan will enable Waikato Regional Council (the council) to expand on river management works that have been carried out on Manaia River since the 2002 and 2008 weather events. It also builds on the kōrero between the council and the community as to restoration opportunities and how the community would like to see their awa in the future. This plan supports the desire by the Manaia River community and individual landowners for a more comprehensive restoration programme. It will become a deliverable of Ki Uta Ki Tai – Coromandel/Manaia Harbour and Catchment Management Plan (HCMP), due to be completed this year.

Central to this work is the relationship with the Manaia community, the wider whanau of Ngāti Pukenga ki Manaia, Ngaati Whanaunga, Ngāti Maru, individual landowners along the Manaia River and Te Wharekura o Manaia. We engaged with landowners (approximately 20 properties in close proximity to the river) to help us understand the current issues and concerns held by the Manaia River community regarding river and catchment matters such as water quality, erosion, restoration, habitat and flow during floods. Council field staff also walked along the Manaia River to collate ideas and options for river and catchment works.

This plan seeks to address the community's concerns, building on historical works and ensuring a well-planned, coordinated approach. It also identifies funding sources to support prioritised works. All projects will be a collaboration between the Manaia River Community, respective landowners, the marae and/or kura and the council.

2 Harbour and catchment planning and Manaia River

The Manaia River Restoration Plan sits as a deliverable of the Coromandel/Manaia HCMP. This is a key tool in the delivery of work programmes for the Coromandel Zone.

Harbour and catchment management plans are a way for people to share what they would like their natural environment to be like in the next 10 to 50 years. Environmental changes are raising people's awareness of the need for careful management of our natural resources into the future, along with the need to meet economic, cultural, and social outcomes.

The Manaia River Restoration plan will build on the fantastic work already being carried out by tangata whenua in the Manaia catchment. The plan is non-statutory, operational, and focuses on delivering results. The plan will help determine where the Manaia community should focus their efforts in river restoration, and where the council and other partners can give support.

“Be around for future generations” – an aspirational quote from a Manaia River hui attendee.

It is important to note this is a non-statutory exercise and will not pre-empt the co-governance plan to be produced as a result of the Pare Hauraki Collective Treaty settlement, nor change any existing consents that people hold.

3 Communication and engagement

A key factor in the success of this project will be the continuing engagement with the Manaia community, landowners, and partners, building on the kōrero from the Manaia River restoration hui held in August 2019.

The people of Manaia have a willingness to openly share, dream and discuss the current issues and potential for a thriving, vibrant, abundant Manaia river – both in terms of the native flora and fauna and the revitalisation of the community for its people.

It was recognised, during plan development, that engaging early with mana whenua on matters is critical as that provides extremely valuable and worthwhile insights with benefits for both parties.

We went back and checked in with the community with what we had heard and as the plan evolved. Checking in will continue as the plan is progressed, through community korero, hui, newsletters, and media articles.



Picture 1 Manaia River restoration hui, August 2019

3.1 Community engagement

A community hui was held at Manaia Marae in August 2019 so the council and agencies could draft the river restoration plan based on the community's challenges with, and aspirations for, the Manaia River and associated lands. The information gathered from the 30+ attendees at the Manaia Marae formed the basis of the draft restoration plan. There were similarities to what the community voiced 14 years ago in their Manaia Community Plan prepared for Thames-Coromandel District Council. The Manaia Community Plan, prepared in 2005/06, included the aspiration:

- *Protecting and strengthening Te Taiao*
 - *By the year 2020 Manaia will be a thriving community of culturally enriched, environmentally active, educated and politically astute people.*
 - *The Manaia catchment will be the focus of nationally and international envy because it will have a vibrant harbour and native forests, clean air, rivers and stream, fertile and stable soil.*

Many steps have already been taken towards this aspiration, and the delivery of this restoration plan will go a long way to fully support the desired outcomes.

A second wananga at the marae was held in March 2020. Twenty people attended, and they represented a cross section of the community. This group helped prioritise works, identify missing issues and actions, and discuss the next steps of the draft restoration plan put before them. The kōrero, was robust, positive, encouraging and focused on delivery. This wananga helped refine and further develop the work programme, including actions and possible funding avenues. There was a strong desire for works to start soon to leverage on the renewed enthusiasm and for works to be bigger than *business as usual* with the ability to 'layer' up projects for multiple benefits.



Picture 2 Workshopping concepts and refining works programme, March 2020

3.1.1 Who did we involve?

The Manaia River community is arguably the largest Māori community residing collectively on the Coromandel Peninsula. Those that whakapapa to the whenua include Ngāti Pukenga Ki Manaia, Ngaati Whanaunga, Ngāti Maru and Ngāti Tamatera.

To realise a restoration plan for the Manaia River, it is important that the council supports the Manaia River community to take leadership in the restoration of their river catchment, and understand that

while properties are owned individually or collectively along the Manaia River, iwi Māori still live largely by the philosophy that 'we' belong to the land.

The council worked with the Ngāti Pukenga chairperson and invited ratepayers and community members residing along the Manaia River to attend the marae workshop to engage, collaborate and provide an opportunity to share their knowledge, aspirations and concerns for the Manaia River and adjacent lands.

We heard throughout the process that communities know their awa (river) best. To help achieve the best outcome for the river, we wanted to hear what changes they have observed and experienced over the years and to understand the connection between the people and the natural environment.

People said they had been connected to the river since the first waka arrived. Ko au ko te awa. Ko te awa ko ahu (I am the river and the river is me).



Picture 3 The now familiar maps on the discussion tables during the Manaia River hui, March 2020

3.1.2 What we heard

From our community engagement and feedback, we heard that there are a wide variety of issues and they largely connect. We collated the information and the following five themes emerged:

Theme	Description
Improve water quality	<i>To restore the Manaia River to how it was 50+ years ago.</i>
Flood mitigation	<i>To undertake work to help mitigate flooding along the river and adjacent properties.</i>
Monitoring	<i>Establish monitoring to determine a baseline and measure water quality improvements/changes.</i>
Restoring biodiversity	<i>Identify the unique flora and fauna of Manaia; develop a restoration plan to ensure diversity and abundance of species for future generations.</i>
Community participation	<i>Explore opportunities (including in business) by establishing and growing community-led initiatives that embrace the local environment.</i>

*Ko au ko te awa
Ko te awa ko ahu
I am the river
And the river is me*

It should be noted that one person, at the hui, asked for the removal of mangroves and one person mentioned they did not want 1080 in the waterways. Kōrero with the community mirrored, to some extent, the values we heard during engagement for other harbour and catchment plans for the Coromandel Peninsula. It also highlighted the great work that is already being done and the strengths of the community through collaboration and willingness to make a change for the environment. The blend of two cultures and importance of mātauranga Māori and whānau connection to environment can be seen in the following diagram.

What would you like to see?
'Like the 1950's – what we did with our Nanny's – kai back in our awa'

4 Scope and expectations

The Manaia River Restoration Plan is not about comprehensive flood control but about integrated river management that may better protect property, reduce sediment in the river and harbour and improve water quality. The plan includes pest reduction, improving plant and animal diversity and sustaining the mauri of the river and surrounds, from the mountain ranges to the sea. It will promote environmental best practice and help ensure economic, social, cultural, and environmental sustainability. The plan will encourage partnerships between iwi, community and key agencies and work towards a proactive community with a greater sense of environmental ownership. The aspirations are the return of river species, being able to swim in the river, and ensuring an improved environment for future generations.

Hui aspiration: the river will *'be around for future generations.'*



Picture 4 Intergeneration knowledge: Manaia River restoration hui, March 2020

5 Previous works

Table below shows the river management and river improvement works carried out by Waikato Regional Council from 2009 to 2019. On average, \$20,000 per annum is spent on Manaia River (this does not include staff time for communication, engagement, catchment works or management staff).

	2009-10		2010-11		2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		2017-18		2018-19		2019-20		
Activity of works	Spend	Lbr Hrs	Spend	Lbr Hrs	Spend	Lbr Hrs	Spend	Lbr Hrs	Spend	Lbr Hrs	Spend	Lbr Hrs	Spend	Lbr Hrs	Spend	Lbr Hrs	Spend	Lbr Hrs	Spend	Lbr Hrs	Spend	Lbr Hrs	
River Mngt	\$3,716.99	33.5	\$13,388.50	69	\$5,120.05	30.5	\$9,825.60	22.75	\$3,150.39	6	\$11,956.66	38.5	\$19,240.32	13.5	\$18,863.65	56	\$4,152.90	14	\$22,124.31	80	\$20,732.23	41	
River Improv			\$22,407.74	15	\$18,550.25	10	\$17,824.09	39	\$15,548.34	6	\$10,227.86	13.5	\$2,533.06	5	\$3,285.49	25.5			\$481.50	3			
Total costs	\$3,716.99		\$35,796.24		\$23,670.30		\$27,649.69		\$18,698.73		\$22,184.52		\$21,773.38		\$22,149.14		\$4,152.90		\$22,605.81		\$20,732.23		\$223,129.93
Total labour hours		33.5		84		40.5		61.75		12		52		18.5		81.5		14		83		41	521.75

We recognise that many of the issues identified have a long historical link; therefore, we are focusing this restoration plan on actions we can do now which will make a difference to the environment in the next 10-50 years.

6 Manaia River action tables and map reference

The following table sets out key pieces of work to be considered and prioritised as shown in Map 1 (except for action 6/7) below. The information in the table has been refined from Appendix 1, the aspirations of the community as heard at the hui. Not all the actions identified by the community in Appendix 1 fits the scope of this restoration plan, e.g. work that is outside the scope of the regional council.

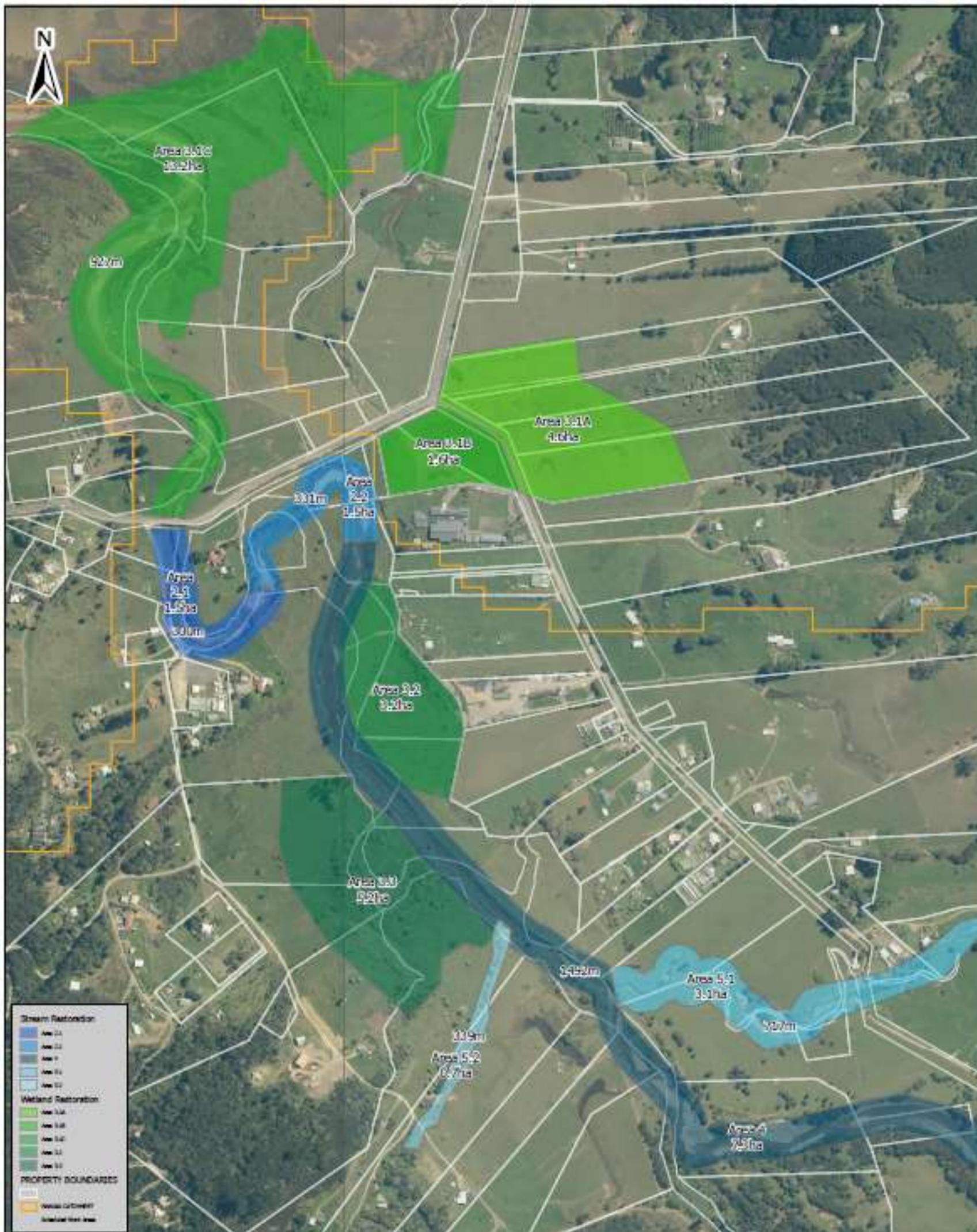
Draft Manaia Action Table - post wananga

Action	Map ref	Focus	Goal	Works area	Actions	Led by	Length (m)	ha	units	Estimates	Total			
1		To provide economic opportunities through catchment restoration activities	Iwi want to make living in Manaia more viable and sustainable, to provide jobs while improving the environment and stimulating the local economy both socially and economically	Training and development	On farm field day with experts to look at land use options, capabilities, and alternatives i.e. continuous cover forestry						\$10,000.00			
					Source a training provider to train community in pole planting, chainsaw use, spraying/weed control, native planting and propagation, predator control. Training will ensure ongoing work on projects is sustainable									
					Investigate subject matter experts on cottage industries, i.e. native nursery, bees, gardens, kai, weaving									
					Education and awareness raising around managing waterway, alternative land uses, soil management									
2	2.1, 2.2	Erosion protection and restoration of Manaia River from NZTA corner to bridge	To mitigate flooding through river maintenance and management, vegetation control and erosion protection	2.1 Remediation: Bend above Manaia SH bridge; work with landowners on a plan for pest plant eradication and erosion protection	Plant, prep, maintain		600	1.5	2000	\$4,000.00	\$42,600.00			
					Gravel extraction/management					\$6,600.00				
					Erosion control, rock/vegetation armouring					\$25,000.00				
					Infill with native planting					\$7,000.00				
				2.2 Corner bordering NZTA main road is remediated; protect corner from further erosion through channel realignment, vegetation management, erosion control and infill native planting	Stream edge is already fenced							2200		\$12,100.00
					Establish erosion protection/bank batter on eroded areas									
					Bench 1 metre high, covered in geotextile cloth									
					Rock riprap									

					Vegetation and erosion control							
					Stream channel realignment							
					Plant, prep, maintain						\$4,400.00	
					Plant coastal natives to protect banks, includes maintenance for 3 years						\$7,700.00	
3	3.1, 3.2, 3.3	Wetland recreation for environmental/social/ economic development	Work with interested landowners to develop marginal land left fallow or presently grazed to create cottage industry and/or a wetland area for harakeke, tuna habitat, native garden; restore and enhance native flora and fauna, though the delivery of constructed wetlands	Grow community education/ involvement in environmental work that stimulates the economy, grows jobs, and has the potential to grow local contract businesses and cottage industry	Identify and talk to community/ landowners		440	3.2	12000	HCMP and catchment new works labour hours		\$85,280.00
					Design plan and project to micro level							
					Identify and secure external funding sources							
				3.2 Oxbow area fenced and developed	Talk with community/kura to gauge appetite and identify champions to drive project, with outcome of forming working group							
					Scope plan with resource requirements outlined and identified funding sources							
					Resource consenting costs – expertise/resource consent for design of constructed wetlands					\$12,000.00		
					Wetland construction; materials and machinery					\$2,000.00		
					Fencing					\$5,280.00		
					Planting					\$42,000.00		
					Plant, prep, maintain					\$24,000.00		
					3.1 Identify landowners (3.1A and 3.1.B) from Goldfield Rd/SH junction as well as downstream to coastal environ (3.1C); if agreeable, develop a restoration plan focus around constructed wetlands, including expertise, administration resource costs and operational work programme	Resource consenting costs – expertise/resource consent for design of constructed wetlands		3586	19.4	1600	\$12,000.00	
				Wetland construction; materials and machinery						\$10,000.00		
				Boardwalk and interpretative signage						\$150,000.00		
				Plant, prep, maintain						\$32,000.00		
				Site/weed maintenance programme						\$114,800.00		
				Fence river edge below bridge						\$11,232.00		
				Establish erosion protection/ bank batter on eroded areas								
Plant coastal natives to protect banks; includes maintenance for 3 years						\$56,000.00						
	Check out if fenced		680	5.2	20000	HCMP	\$135,160.00					

				3.3. Potential wetland area that connects to Manaia River main channel; on true left of river, mid-section	Identify landowner and see if they would like to develop wetland							
					Plan with landowner work programme							
					Resource consenting costs – expertise/resource consent for design of constructed wetlands					\$12,000.00		
					Wetland construction; materials and machinery					\$5,000.00		
					Fencing					\$8,160.00		
					Planting					\$70,000.00		
					Plant, prep, maintain					\$40,000.00		
4	4	Channel maintenance and enhancement	Manaia main channel needs clearing and planting to avoid erosion	Clear channel as required and fence to minimum 10m of riverbank, plant willows, infill native and plants	Weed control						\$5,000.00	\$109,000.00
					Blockage removal					\$5,000.00		
					Gravel management					\$11,000.00		
					Riparian fencing along areas not fenced					\$22,000.00		
					Step back existing fencing that is too close to river					\$12,000.00		
					Erosion control – channel training, vege groyne, willow planting					\$54,000.00		
			Upper river channel is maintained and erosion protection in place	To have riverbanks to bush line planted in native plants and channel managed to prevent erosion during high rainfall to support a reduction in sedimentation and improvement in water quality	Blockage removal					\$4,950.00	\$23,900.00	
					Gravel management					\$4,950.00		
					Weed control along main channel and tributaries – kikuyu, woolly nightshade, black berry, moth plant					TBC		
					Willow pole planting					\$3,000.00		
					Possible native tree planting					TBC		
					Erosion control					\$11,000 (\$2750.00 per day)		
5	5.1, 5.2	Tributaries fenced and planted	Tupa steam fenced in its entirety (approx. 1000 metres)	5.1 Fence Tupa Stream to give a corridor of native habitat and keep stock out to assist in improving water quality	Stream fenced, taking high ground variance from 5-15m minimum planted margin		1432		19600	\$11,456.00	\$57,856.00	
					Erosion control, possible channel training, vege groyne					\$9,000.00		
					Plant, prep, maintain					\$11,200.00		
					Willow pole planting					\$6,600.00		
					Possible native tree planting					\$19,600.00		
		Ensure all tributaries to Manaia River are fenced and planted	Fence, plant with natives and plan 3-year maintenance programme for all tributaries that supports a reduction in	Fence all unfenced stream edges		n/a	n/a	n/a	\$9,000.00	\$51,500.00		
				Native planting					\$35,000.00			

				sedimentation and an improvement in water quality	Maintenance					\$7,500.00	
			Waharaparapa Stream fenced and planted, and stream mouth restored	5.2 Have stock excluded and remedial work completed to manage erosion, and permanent water reticulation to remove the need for cattle access to stream	Fencing		678	36553	2680	\$5,424.00	\$43,164.00
		Planting					\$9,380.00				
		Plant, prep, maintain					\$5,360.00				
		Culvert across stream for stock and transport					\$15,000.00				
		Water reticulation					\$8,000.00				
6		Improved biodiversity through biosecurity measures	A coordinated approach to plant and pest control along the awa and up into ngahere (forest)	Potential for extensive predator control for the purpose of biodiversity enhancement; deliver whanau desire to protect/enhance ngahere and manu	Predator control – mixed methods, picking up existing trap network. Discussion figure					\$200,000 (Discussion figure)	\$180,000.00
				Kauri protection measures taken; education/awareness raised and available across community	Given the significance of the Manaia Kauri Sanctuary, ideally kauri protection would be at the upper end/gold standard				\$50,000 (arbitrary)	\$50,000.00	
7		Water quality monitoring	Potential to establish guidelines/measuring of water quality/biodiversity of catchment	Build on stream mouth monitoring programme and faecal contaminant/source tracking work from 2015 as baseline	Establish programme to work with community to monitor water quality					WRC labour	\$130,000.00
					Work with community/school to establish a fish survey programme; monitor river species numbers in awa						
					Processing samples					Lab fees	
					10-year programme to monitor change						
										Total (Est)	\$1,316,592.00



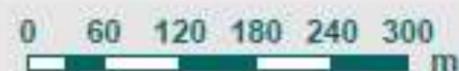
Acknowledgements and Disclaimers
 Cadastral information derived from Land Information New Zealand's Landonline Cadastral Database. CROWN COPYRIGHT RESERVED. Valuation Data Sourced from Territorial Authority District Valuation Roll

© Waikato Regional Council 2004. WRC REC Catchment/ Watercourse/ Watershed. Data derived from NIWA, MIE, LINZ – Copyright Reserved. Licensed under CC BY 4.0.

© Waikato Regional Aerial Photography Service (WRAPS) 2017. Imagery sourced from Waikato Regional Council. Licensed under CC BY 4.0.

DISCLAIMER: While Waikato Regional Council has exercised all reasonable skill and care in controlling the contents of this information, Waikato Regional Council accepts no liability in contract, tort or otherwise howsoever, for any loss, damage, injury expense (whether direct, indirect or consequential) arising out of the provision of this information or its use by you.

Lower Manaia River Properties & work schedule areas WRAPS 2017



Scale at A3
 = 1:5,000

Created by: Andrew Hoffmann
 Date: 15/04/2020
 Version: 2
 Job No: REQ160521



Map 1. Works locations Manaia River

Site	Length (m)	ha	Works overview
2.1	600	1.5	River management – erosion protection
2.2			River channel planning, erosion protection, native planting
3.1a	936	4.6	Constructed wetland
3.1b	550	1.6	Constructed wetland
3.1c	2100	13.2	Riparian planting and wetland recreation, including board walk
3.2	440	3.2	Wetland/oxbow
3.3	680	5.2	Wetland retirement
4	2984		Fence and plant to give corridor of native habitat
5.1	1432		Stream fenced: taking high ground variance from 5-15m minimum planted margin
5.2	678		Stream fenced and planted



**Picture 5 Where would you begin the mahi?
Manaia River restoration hui, March 2020**

7 The Manaia River catchment

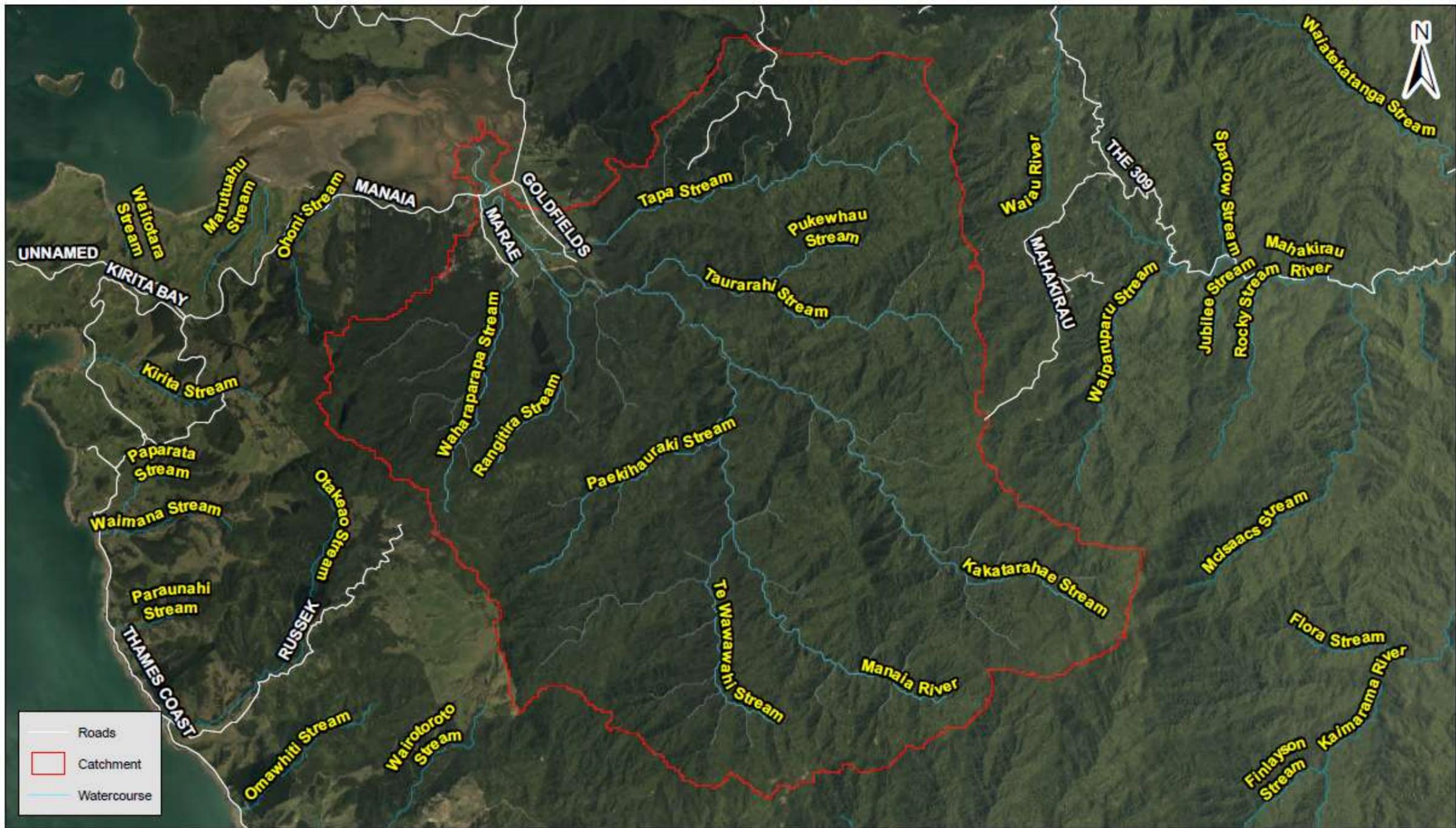
7.1 Introduction

On the Coromandel Peninsula's west coast, just south of Coromandel town, there is a settlement which is known to some as *the centre of the universe, Manaia*. Chances are you will have driven through Manaia as you head north. This mahi is all about Manaia (and particularly the river, wetlands and flood plain), appropriately named as the mythical creature Manaia is usually depicted as having the head of a bird and the tail of fish, and this restoration plan includes from the mountain to the sea.

This plan for mahi focuses on the Manaia River channel, two main tributaries (the Tupa and Waharaparapa streams) and the properties adjacent to them and other waterways below the bush line. Plans for the wider Manaia catchment will be included in the Ki Uta ki Tai – Coromandel/Manaia HCMP.

The Manaia River flows north from its sources in the Coromandel Range to reach Tīkapa Moana (the Hauraki Gulf) at Manaia Harbour, 10 kilometres southwest of Coromandel township. There are large areas of indigenous vegetation in the middle and upper Manaia catchment, which is nationally and internationally significant for biodiversity. However, the catchment has about 3 kilometres of river channel in pasture. The total river length is 12km and it weaves through approximately 20 properties.

There is a marae and school in the catchment and the community is actively working with the council on river management.



Acknowledgements and Disclaimers
 © Waikato Regional Aerial Photography Service (WRAPS) 2017. Imagery sourced from Waikato Regional Council. Licensed under CC BY 4.0
 © Waikato Regional Council 2004. WRC REC Catchment/ Watercourse/ Watershed. Data derived from NIWA, MfE, LINZ – Copyright Reserved. Licensed under CC BY 4.0.
 Roads data sourced from Terralink International Limited.

Manaia River Catchment: AERIAL [2017 WRAPS]

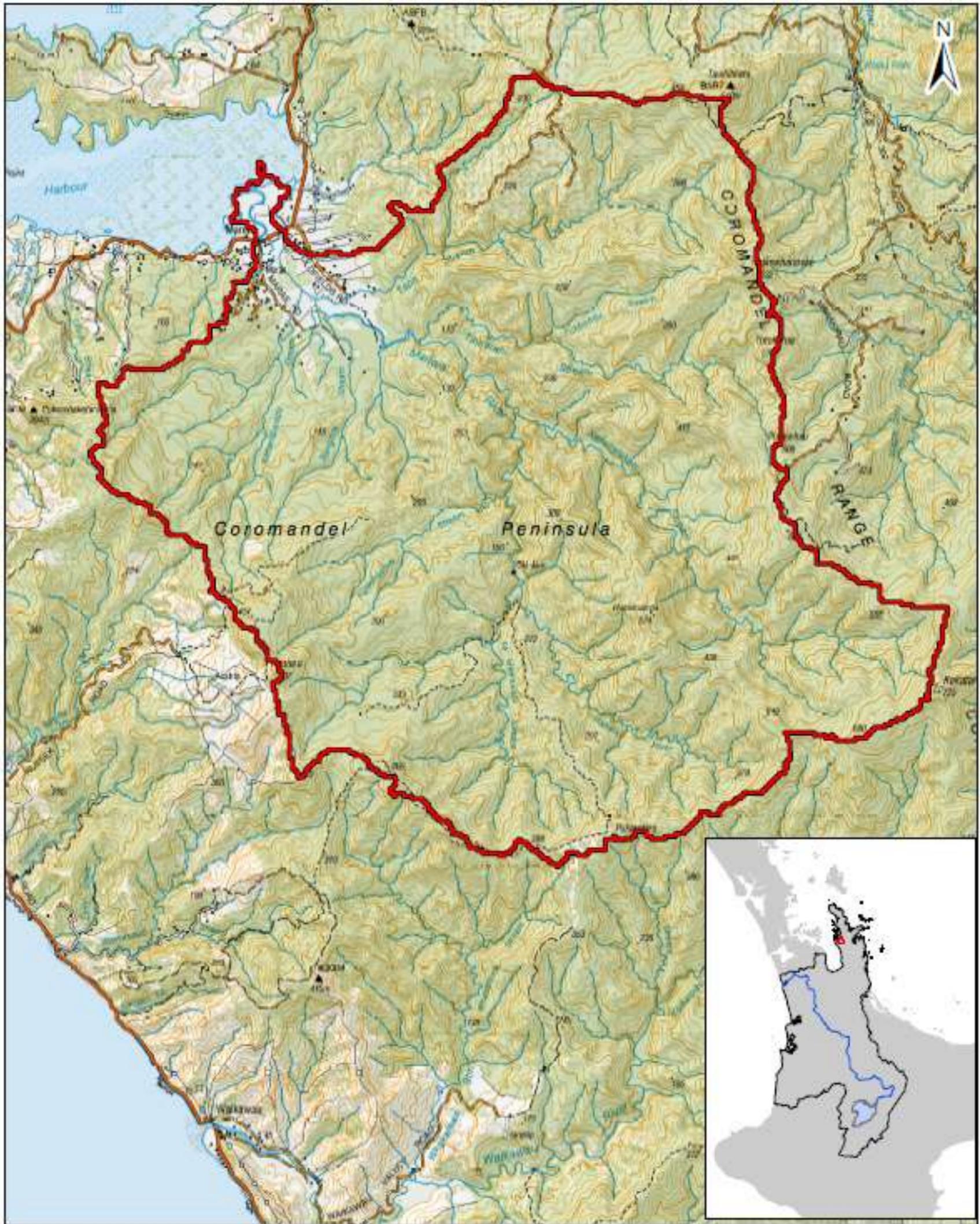


Created by: Andrew Hoffmann
 Date: 3/02/2020
 Version: 2
 Job No.: REQ145879
 File: REQ145879_ManaiaCatchment_AERIAL_A3.mxd



DISCLAIMER: While Waikato Regional Council has exercised all reasonable skill and care in controlling the contents of this information, Waikato Regional Council accepts no liability in contract, tort or otherwise howsoever, for any loss, damage, injury expense (whether direct, indirect or consequential) arising out of the provision of this information or its use by you.

Map 2. Manaia River catchment



Acknowledgements and Disclaimers
 Topographic Maps sourced from LINZ. Sourced from the LINZ Data Service and licensed for reuse under CC BY 4.0.

Legend

 Catchment boundary

**Location of
 Manaia Catchment**

For Waikato Regional Council staff only

0 0.5 1 1.5 2 2.5 km

Scale at A3
 = 1:40,000

Created by: HCE
 Date: 3/02/2020
 Version: 1
 Job No.: REQ153135
 File: REQ153135_A3
 Location: NZTopo Special



DISCLAIMER: While Waikato Regional Council has exercised all reasonable skill and care in controlling the contents of this information, Waikato Regional Council accepts no liability in contract, tort or otherwise however, for any loss, damage, injury expense (whether direct, indirect or consequential) arising out of the provision of this information or its use by you.

Map 3. Topographic map Manaia River

8 He tangata – the people

Manaia is arguably the largest Māori community on the peninsula north of Thames. The people are predominantly of Ngāti Pūkenga ki Manaia, Ngaati Whanaunga and Ngāti Maru. The ancestral meeting house at Manaia is named after Ngāti Pūkenga paramount chief Te Kouorehua and the whare manaaki is Ngairihanga.

Manaia, 10km south of Coromandel town, was gifted by Ngāti Maru to Ngāti Pūkenga in recognition of Te Kouorehua's assistance during the musket wars. Ngāti Maru iwi also reside at Manaia, and together with Ngāti Pūkenga and Ngaati Whanaunga, have tribal authority at Manaia. This is one of the few large Māori-owned areas in Hauraki.

The Manaia River (Te Awa o Manaia) is the ancestral river of the Manaia people. This means the relationship between the people and the awa is inseparable; without one, the other is lost.



Picture 6 Manaia River and towards the kura; looking down stream

Ko Manaia, he pataka kai' (Manaia the food store)

Manaia was well known for its rich abundance of food within the catchment: in the river, estuary, and sea. Fishing and mussel farming employ locals, however, as they are for most other estuarine harbours on the peninsula siltation, nutrient inputs and mangrove expansion are a concern for the harbour.

9 Physical attributes



Picture 7 Manaia River upstream, as it leaves the ngahere (bush) and enters the pasture

9.1 Geology

Like much of the main Coromandel Range, the Manaia catchment is underlain with a base rock of greywacke formed some 150 million years ago during the Cretaceous period (see Chart 1 below). Greywacke is a common New Zealand sandstone that makes up the basement rock of the main ranges of the North Island, and it is found from Manaia to the top of the Coromandel Peninsula. This base has more recently been covered with volcanic rock (Malengreau et al. 2000).

The basement rock, collectively known as the Manaia Hill Group, can be seen in a road cutting on State Highway 25: vertical bands of greywacke and argillite formed in the late Jurassic to early Cretaceous period (160-110 million years ago).



Picture 8 The SH25 road cutting showing banded greywacke and argillite known as the Manaia Hill group. The formation has been tilted over time to a vertical position

The Miocene epoch was when widespread andesite volcanoes were present around the Colville-Manaia area, and the volcanic rocks are known as the Coromandel Group. Mount Ruapehu is a present-day example of an andesite volcano with typical andesitic ash and lava deposits.

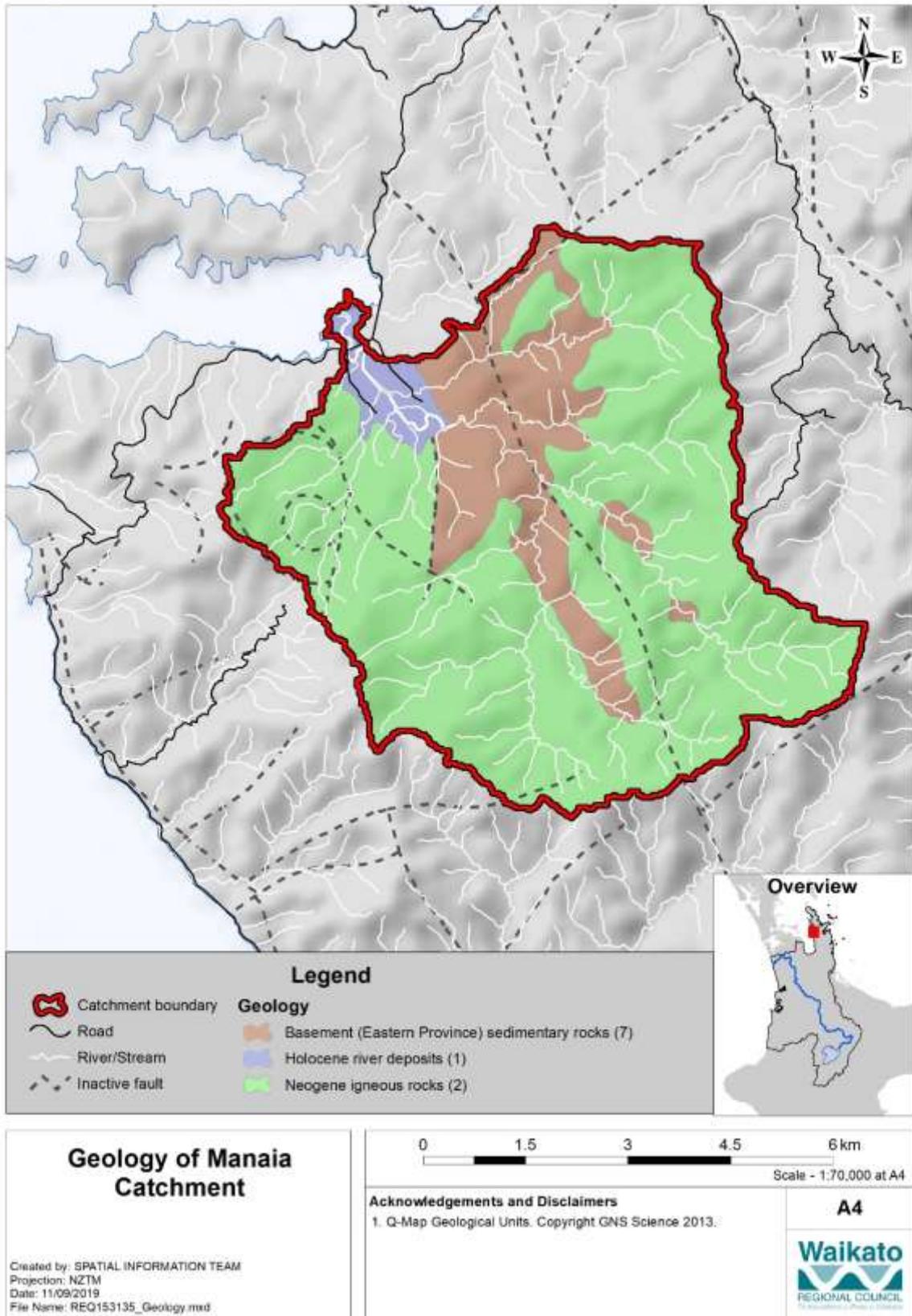
These ancient volcanic landforms have been deeply eroded over millions of years, creating the steep and heavily incised landscape we see today. Volcanic tephra (airborne material ejected, such as ash) has become weathered over geological time, contributing to the formation of the area's volcanic brown soils.

When the last ice age ended about 10,000 years ago, the warmer climate of the Holocene epoch produced the most recent geology. Manaia and Coromandel harbours formed when sea levels rose over 100 metres, drowning river valleys.

Recent geology consists of unconsolidated deposits that dominate the valley floors, stream mouths and foreshores. These are the sands, silts and gravels that are typical of an active cycle of erosion, deposition, and reworking of materials from the older landforms.

Chart 1. Geological timescales

Geological Period	Million years ago (mya)	Geological epoch	Manaia
Quaternary	Recent to 2.58 mya	Holocene epoch	Recent – 10 000 ya
Neogene	2.58 to 23 mya	Miocene epoch	5.33mya – 23 mya
Paleogene	23 to 66 mya		
Cretaceous	66 -145 mya		
Jurassic	145-200 mya		



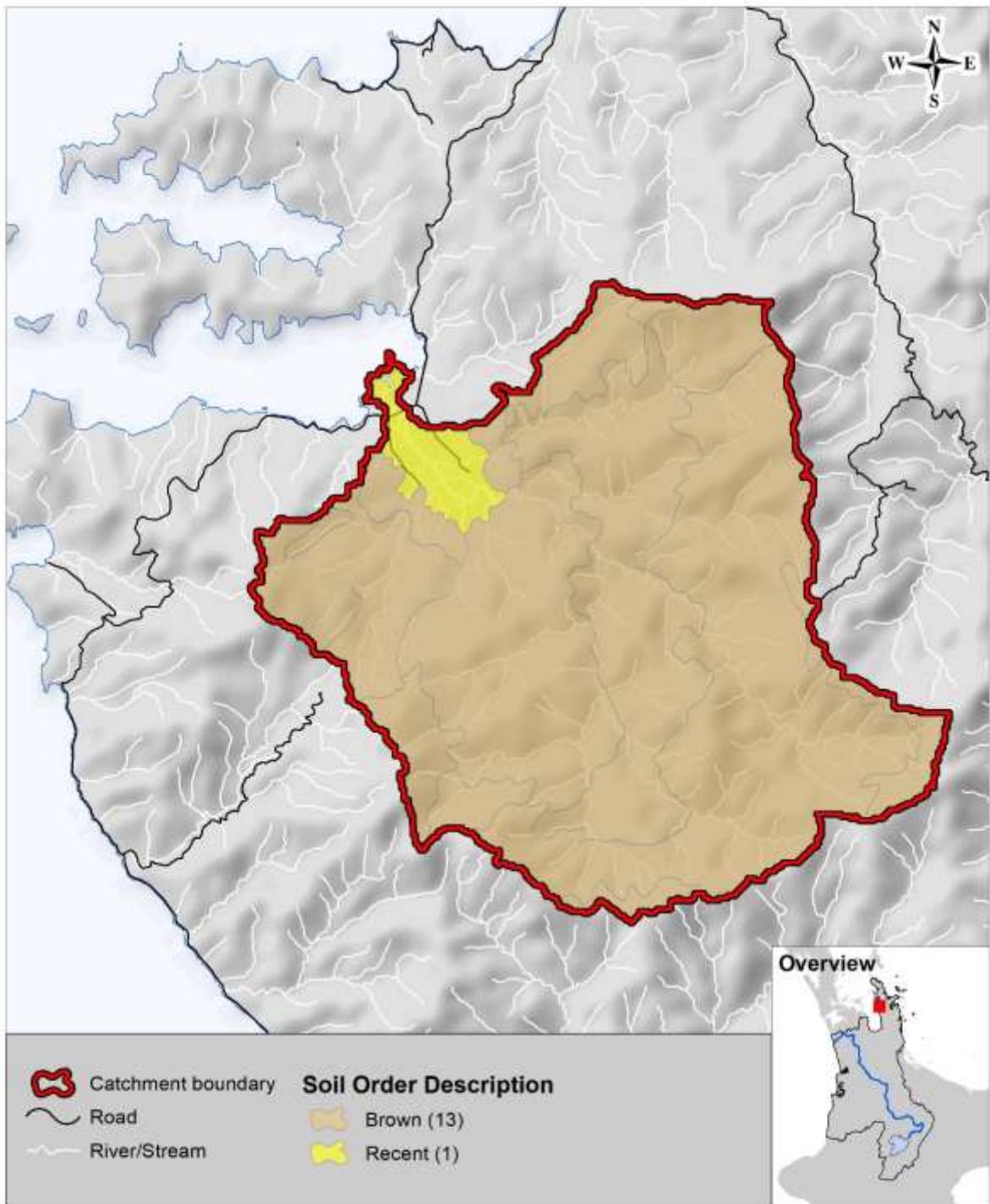
Map 4. Geology of Manaia catchment
(The geology map shows the broad geological types with reference to their geological age.)

9.2 Soils

Soil type	Sub area (ha)	Catchment %
Brown	4613	96.2
Recent	180.6	3.8
Total	4793.6	100

The Manaia catchment is dominated by brown soils (96.2 per cent) which are volcanic in origin (mostly andesite in this catchment) and have weathered from parent volcanic material or greywacke. The brown colouring is from iron oxides. These soils are typical in areas where total summer dryness is uncommon (rainfall exceeds 1000mm per year). They do not become waterlogged in winter as they are generally well-drained and have moderate amounts of organic matter. The brown soils in this catchment are found on the Manaia slopes.

Recent soils (3.8 per cent) are the soils formed on recent land surfaces such as the silts and gravel of alluvial flood plains or the sandy soil typical of coastal environments. These soils are relatively young, formed usually within the last 2000 years, and are generally free draining.



<h3>SMAP Soil Order for Manaia Catchment</h3> <p>Created by: SPATIAL INFORMATION TEAM Projection: NZTM Date: 11/09/2019 File Name: REQ153135_SMAP_Soil_Order.mxd</p> <p><small>DISCLAIMER: While Waikato Regional Council has exercised all reasonable skill and care in controlling the contents of this information, Waikato Regional Council accepts no liability in contract, tort or otherwise (howsoever, for any loss, damage, injury expense (whether direct, indirect or consequential) arising out of the provision of this information or its use by you.</small></p>	<p>0 1.5 3 4.5 6 km</p> <p>Scale - 1:70,000 at A4</p>
	<p>Acknowledgements and Disclaimers SMAP Data reproduced with the permission of Landcare Research New Zealand Limited</p>

Map 5. Soil orders for Manaia catchment

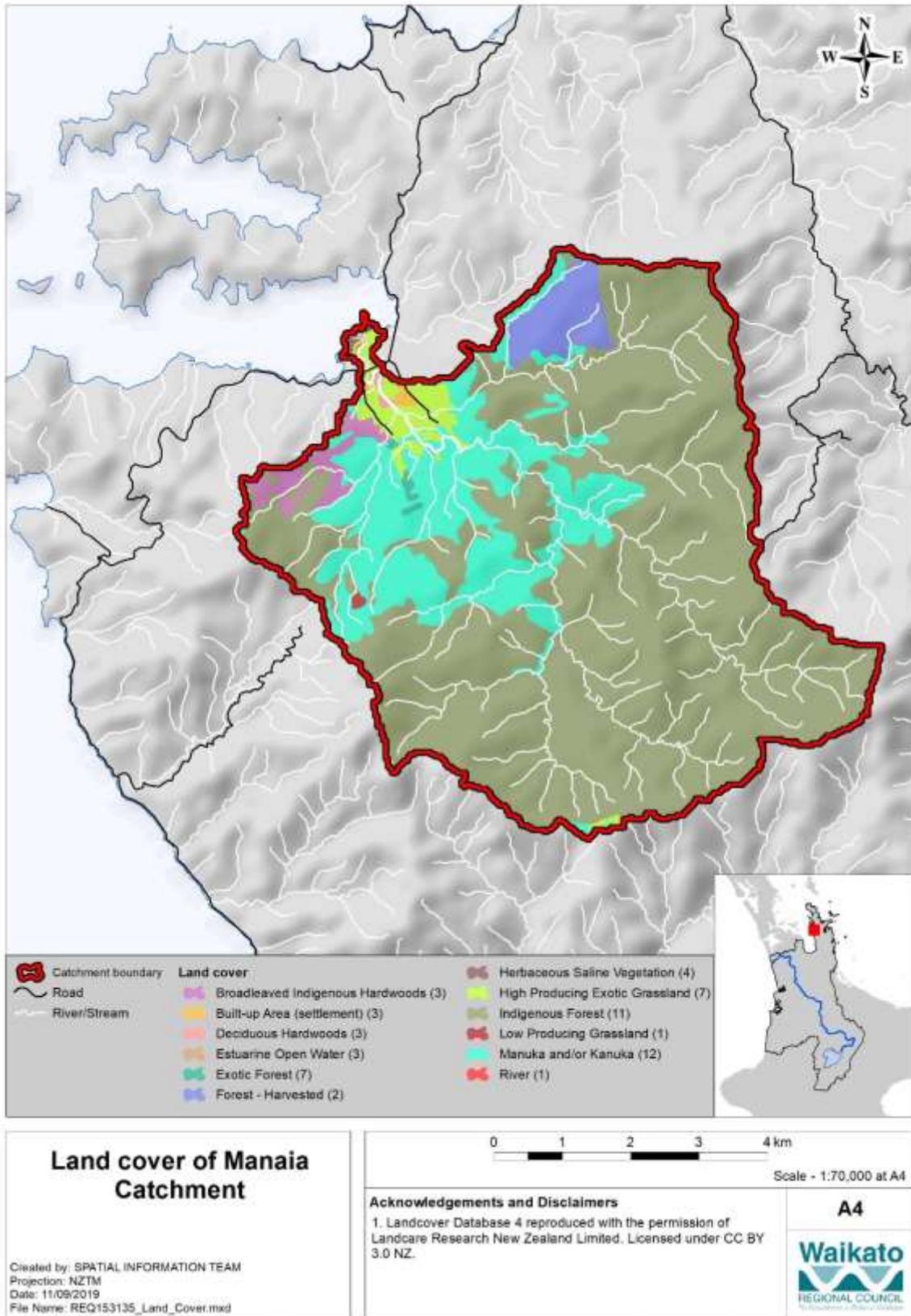
9.3 Present land cover for Manaia catchment

Name of cover (as of 2012)	Sub area (ha)	Catchment %
Broadleaved indigenous hardwoods	83.4	1.7
Built-up area (settlement)	10.6	0.2
Deciduous hardwoods	8.3	0.2
Estuarine open water	0.3	0
Exotic forest	14.2	0.3
Forest - harvested	140	2.9
Herbaceous saline vegetation	8.7	0.2
High producing exotic grassland	130.7	2.7
Indigenous forest	3479.9	72.6
Low producing grassland	3.8	0.1
Mānuka and/or kānuka	912.6	19
River	2.8	0.1
Total	4795.3	100

The main catchment cover is indigenous forest at 72.6 per cent with mānuka/kānuka scrub being the second most common cover. Grasslands only cover at 2.8 per cent. Forestry in the upper catchment is 3.2 per cent overall.

Land cover can influence the intensity of erosion, flooding, and sedimentation. In general, an intact vegetation cover, particularly in the steeper areas of a catchment, will reduce the intensity of these naturally occurring processes.

As recorded in historic accounts of the catchment, the rapid removal of the original forest during activities such as kauri logging or clearing land by fire for farming has produced an intense period of erosion and sedimentation due to the loss of protective vegetation. Today, regenerating scrub, appropriate land management of pastoral or forestry activities and formal protection of indigenous forests have helped mitigate the historic sudden changes in land cover and the subsequent downstream effects such as sedimentation.



Map 6. Manaia catchment land cover

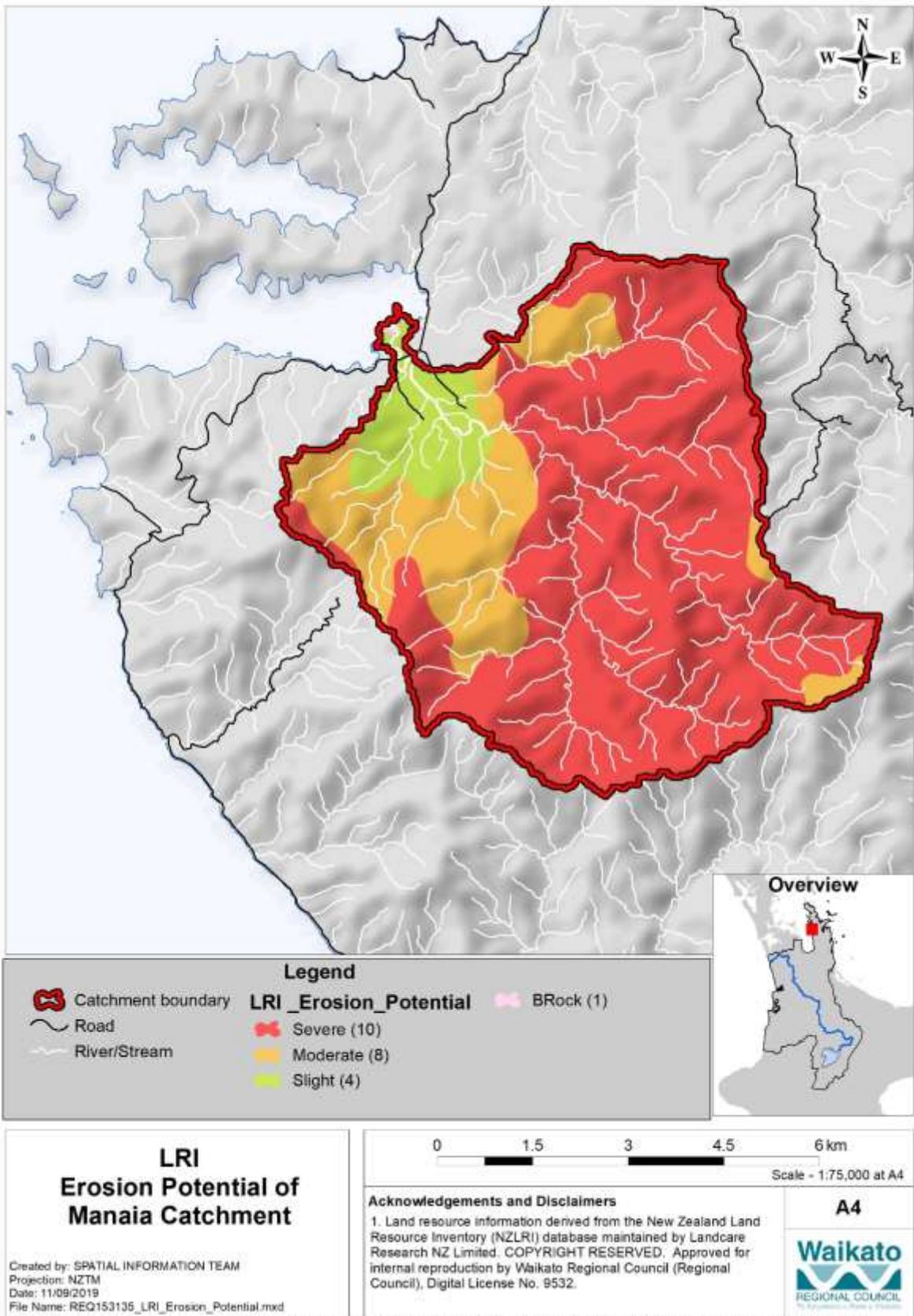
9.4 Erosion potential of Manaia catchment

Erosion potential description	Sub area (ha)	Catchment %
BRock (base rock)	9.6	0.2
Moderate	1014.2	21.1
Severe	3400.4	70.9
Slight	371.1	7.7
Total	4795.3	99.9

Erosion is an important natural and continuous process. Even under forest cover, erosion such as soil slips still occur. Slope and erosion rates are important limiting factors for land use and, through mapping erosion potential, a catchment's advantages and limitations can be assessed.

The issue of managing land to lessen the impact of erosion, or to avoid exacerbating it through activities such as farming or clear-felling steep slopes, has led to the land use capability (LUC) classification system.

Seventy per cent of the Manaia catchment has severe erosion potential. When overlaying this with the land cover map (**Map 6**), the areas of severe erosion potential are also areas with indigenous forest and mānuka/kānuka cover. This is the ideal cover for a short, steep catchment such as Manaia. The most vulnerable land is protected by well-established mature ngahere (bush) or regenerating scrub.



Map 7. Erosion potential of Manaia catchment

9.5 Land use capability

By considering erosion type, vegetation cover, soil type and terrain (slope and topography), etc., we can determine the land use capability. LUC determines how versatile land can be for cultivation and productive activities such as agriculture or horticulture.

LUC class	Sub area (ha)	Catchment %	
2s	161.8	3.4	Class 2 indicates high performance sheep and beef production on alluvial flats is possible. In the Manaia catchment, this is limited by soil type (2s). The soils are partially limited by their relative youth and therefore a lack of a mature, deep soil profile.
6e	1182.4	24.7	The 24.7% that is Class 6 land is a mixture of pastoral farming, exotic forest (pines) or scrub.
7e	3441.5	71.8	Land that is Class 7e or 7w is unsuitable for production purposes and should be retired from such activities.
7w	9.6	0.2	
Total	4795.3	100.1	

In the above table, **e** is for erosion, **s** is for soil and **w** is for wetness.

There are 8 LUC classes which signify land versatility and arability, with Class 1 being the most versatile and 8 having severe limitations.

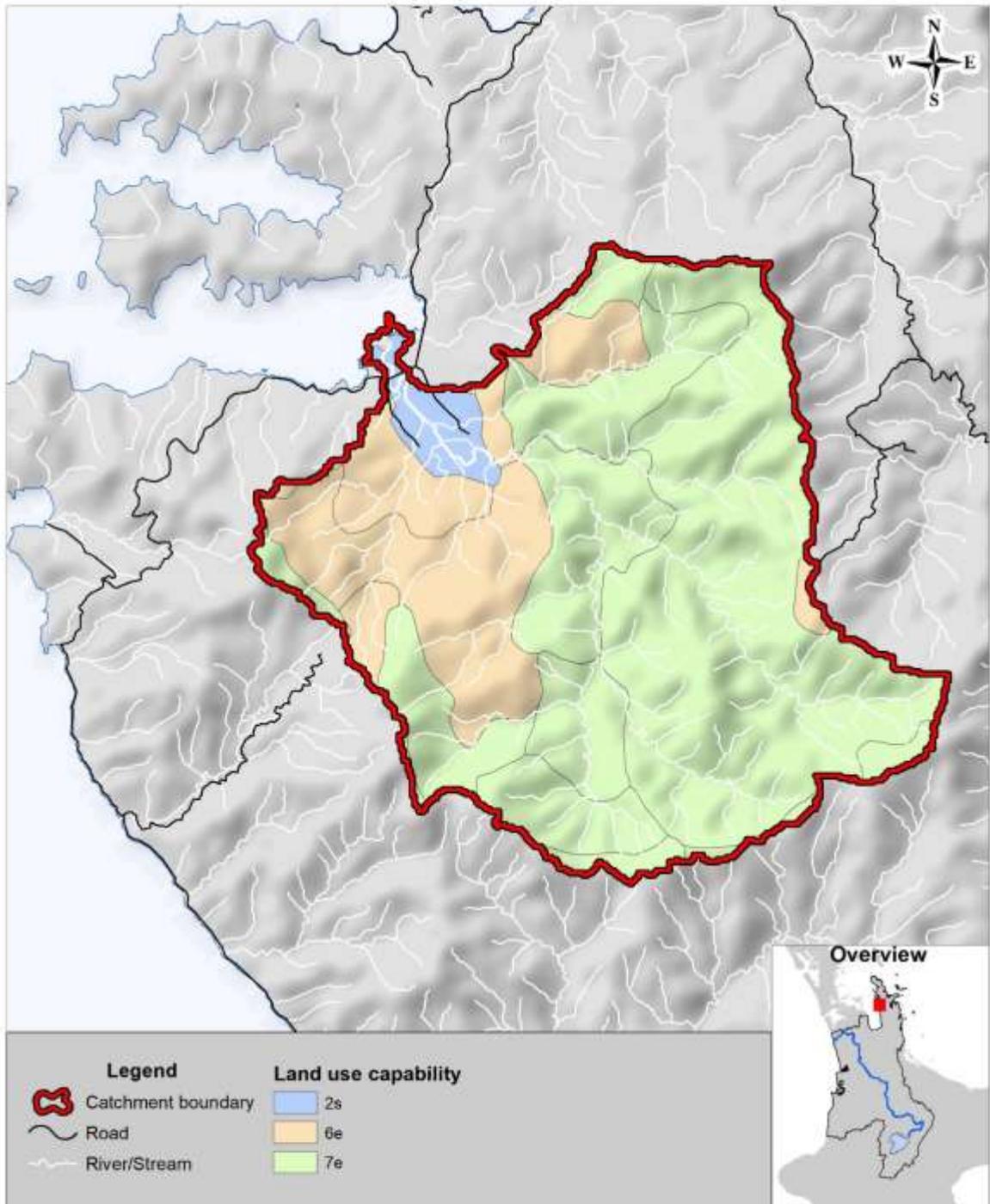
e	Signifies the main limitation to diversity of land use and cultivation is soil erosion risk. Both steep land and flat land can be limited by a high erosion risk. For example, 8e is assigned to both extremely steep hill country and land such as sand spits or back dunes. Even though sand spits may be flat land, wind erosion of the sandy soils may severely impact on that land's uses.
s	Signifies the main limitation to diversity of land use and cultivation is soil type.
w	Signifies the main limitation to diversity of land use and cultivation is wetness of the soils.

Manaia is a catchment dominated by steep hills and stream gullies which limits the versatility of the land for production purposes in the upper catchments.

At present, what was considered marginal productive pastoral land on the Coromandel is now being considered productive for new commercial ventures based around the mānuka honey industry. This is an ideal land use as establishing vegetation is an appropriate land cover for such erosion prone terrain.

To learn more about the LUC of land refer:

http://www.landcareresearch.co.nz/_data/assets/pdf_file/0017/50048/luc_handbook.pdf



<p>LRI - Land Use Capability classes of Manaia Catchment</p> <p>Created by: SPATIAL INFORMATION TEAM Projection: NZTM Date: 11/09/2019 File Name: REQ153135_Land_Use_Capability_2.mxd</p>	<p>0 1 2 3 4 km</p> <p>Scale - 1:70,000 at A4</p>
	<p>Acknowledgements and Disclaimers</p> <p>1. Land resource information derived from the New Zealand Land Resource Inventory (NZLRI) database maintained by Landcare Research NZ Limited. COPYRIGHT RESERVED. Approved for internal reproduction by Waikato Regional Council (Regional Council), Digital License No. 9532.</p>
<p>A4</p>	

DISCLAIMER: While Waikato Regional Council has exercised all reasonable skill and care in controlling the contents of this information, Waikato Regional Council accepts no liability in contract, tort or otherwise howsoever, for any loss, damage, injury expense (whether direct, indirect or consequential) arising out of the provision of this information or its use by you.

Map 8. Land use capability of Manaia catchment

10 Water quality

Many small stream mouths in the Coromandel flow to beaches. These stream mouths support a wide range of aquatic life and are often popular swimming locations. The water at these locations can be susceptible to contaminants washed from the catchment because the mixing of fresh water with seawater is often limited. Furthermore, some of the stream mouths become blocked regularly because of natural coastal processes.

During January and February 2015, Waikato Regional Council sampled the water quality of 18 of these stream mouths in the Coromandel area, including two in the Coromandel/Manaia catchment (**Figure 1**): of the Whangarahi Stream and Manaia River.

The purpose of this investigation was to provide a one-off snapshot of coastal stream mouth water quality in the Coromandel area and to trial a new approach to investigate potential sources of faecal bacteria such as humans, possums, dogs, pigs, gulls and ruminant animals, more specifically cows (Wilson, 2016).

This work could be used as a benchmark for future monitoring programmes.

The sampling programme was designed to investigate two aspects regarding water quality:

1. the ecological health of the system, and
2. the concentration and potential sources of faecal bacteria that, at high levels, can indicate a human health risk.

It is important to note, however, that the report on the results of the survey does not make specific comments on public health, such as whether a location is deemed safe to swim or not, as this is out of scope and outside of council's jurisdiction.

Results of the investigation of ecological health are shown in **Figure 2**. To assess results for ecological health, water quality parameters were compared to Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000), commonly referred to as the ANZECC guidelines.¹ The ANZECC guidelines provide very conservative guideline values, and exceeding one of these values does not imply that there are any adverse ecological effects. Instead, this indicates that further investigation should occur to determine the cause of the exceedance and to determine whether there are any adverse ecological effects.

Results of the investigation looking at the suitability of the coastal stream mouth sites for contact recreation are shown in **Figure 3**. To assess water quality for contact recreation, results were compared to guideline values for parameters relating to contact recreation (MfE & MoH, 2003), commonly referred to as the recreational water quality guidelines.

The key findings for all sites were (Wilson, 2016)²:

- These water types are particularly susceptible to contaminants (excess nutrients and faecal contaminants) that are washed from the surrounding land, particularly 24-48 hours after heavy rainfall.

¹ There were no New Zealand specific guidelines for estuarine water quality at the time of writing this report. The ANZECC guidelines recommend that values for south-east Australia be used in the absence of more appropriate regional or national guideline values in New Zealand.

² Also described in a summary of the technical report available at www.waikatoregion.govt.nz/services/publications/technical-reports/2016/tr201607/

- The water clarity was good (low turbidity) and dissolved oxygen concentration was typically high at most sites.
- Median nutrient concentrations were within the guideline values at most sites. This means that at most sites, nutrient concentrations were within the guideline values at least half the time. The reason for these exceedances is more complex than just heavy rainfall.
- Most sites were within the recreational water quality guideline value most of the time. However, most sites exceeded the guideline value following heavy rainfall in the area. Some sites also exceeded guideline values during spring tides.
- Faecal source tracking was useful to identify possible sources of faecal bacteria in the water; however, it could not determine exactly how much each source contributed overall.
- Ruminant animals were one of the most common sources of faecal contamination. Possum and gull sources were also seen at most locations.
- Human sources were only detected at a few sites and only on few occasions following heavy rainfall or high spring tides.

The above findings apply to the Manaia site. In addition, a particularly noteworthy conclusions drawn in Wilson (2016) was:

- During the two sampling months, the ecological health of the Manaia River was very high. Faecal bacteria exceeded guideline values on only two occasions. On one of these occasions, exceedance followed heavy rainfall. This is typical in these water types and why Thames-Coromandel District Council, Waikato District Health Board and the council advise people not to swim after heavy rainfall.

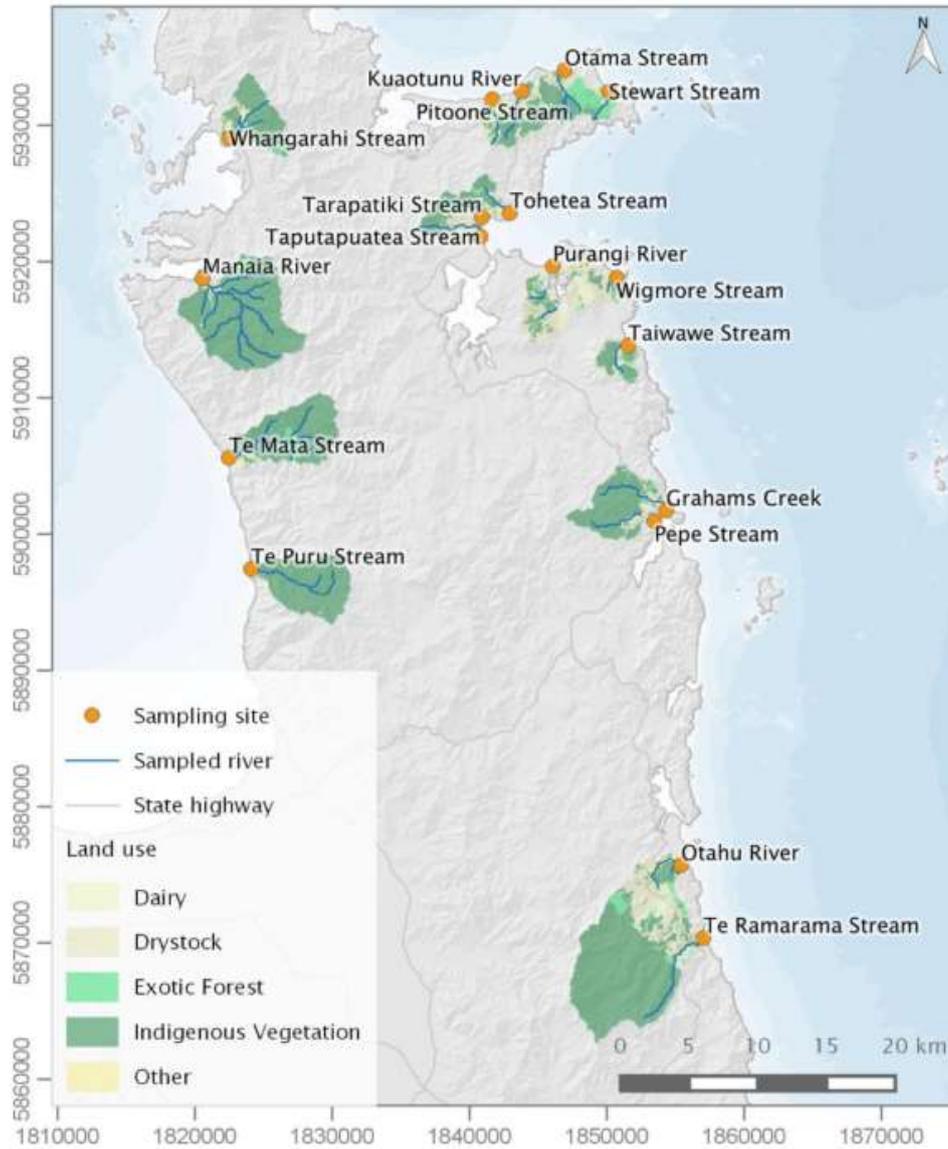


Figure 1. Locations of water quality sampling sites surveyed in 2015. Located in the Coromandel/Manaia catchment are Whangarahi Stream and Manaia River. The size and land use of each stream's catchment is indicated by the coloured shading. NZTM coordinates are indicated on the surrounding frame. Source: Wilson (2016).

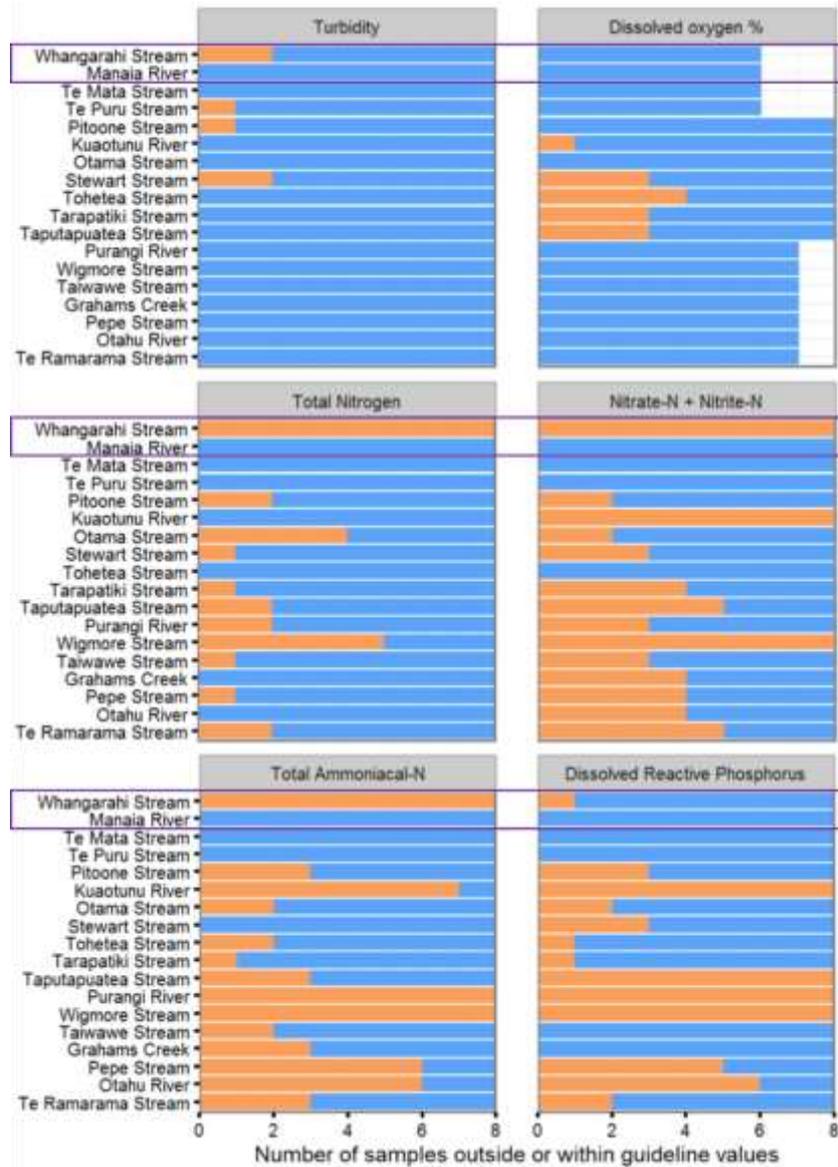


Figure 2. Summary of results used to assess the ecological health of the coastal stream mouth sites. Sites in the Coromandel/Manaia catchment are those in the purple box. Results shown in blue are within the ANZECC water quality guidelines. Results shown in orange exceed the guidelines. Source: Wilson (2016).

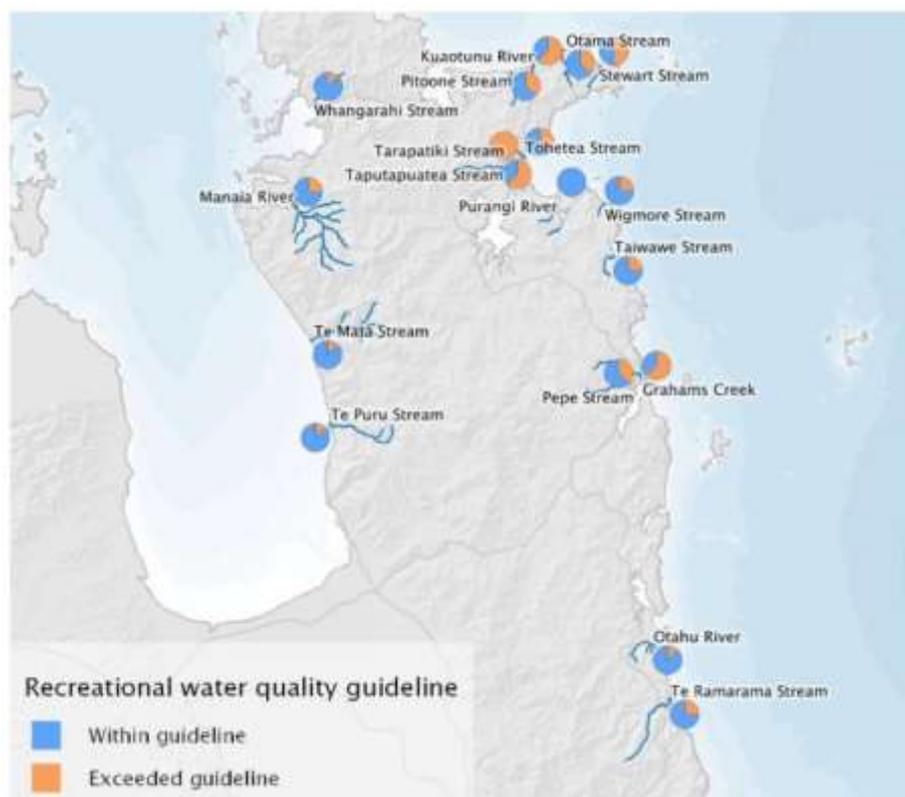


Figure 3. Summary of the faecal bacteria results used to assess the suitability of the water for contact recreation. The circles show the per cent of samples that were within the guidelines (blue proportion) and those that exceeded the recreational water quality guidelines (orange). Source: Wilson (2016).

11 Ecological and biodiversity information

The Coromandel Ecological Region has nine ecological districts and stretches from Aotea/Great Barrier Island to Te Hunga Ridge in the Kaimai Range.

The Colville Ecological District (ED) is the second most northern district. It encompasses the Moehau Range and Cuvier Island. Its southern boundaries are north of Whitianga on the eastern side and Te Mata on the western side.

The maunga Kakatarahae (725m above sea level) is within the Thames Ecological District though the Kakatarahae Stream flows westward in the Manaia catchment and therefore sits in the Colville ED.

Two distinctive features of the Colville ED are the exposure of relatively large blocks of greywacke and common occurrence of taraire (*Beilschmiedia tarairi*) trees.

The Colville ED has not suffered the same amount of clearance as other ecological districts in the Waikato region. With a relatively large amount of scrub, regenerating forest and (albeit heavily logged) forest remnants, the ED is remarkable for its diversity of high quality wildlife habitat and is in a zone characterised by high levels of regional endemism for woody plant species.

Ecological habitats found within the Colville Ecological District are montane forest, coastal forest, lowland forest, and wetlands, including saltwater marshlands. Threatened or naturally uncommon plant species such as *Pittosporum virgatum* are also present.

Species of fauna, that either no longer exist, are rare/threatened, or have fragmented populations in other parts of New Zealand, can be found in the Colville ED. North Island brown kiwi, pāteke (brown teal), kākā, mohopererū (banded rail), matuku-hūrepo (Australasian bittern) and mātātā (fernbird) populations are present within the Colville ED. Extremely rare reptiles such as striped gecko (toropuku Coromandel) and pepeketua (Archey's and Hochstetter's frogs) are also present in fragmented populations.

Significant Natural Areas of the Thames-Coromandel District: Terrestrial and Wetland Ecosystems Environment Waikato Technical Report 2010/36

<https://www.waikatoregion.govt.nz/assets/PageFiles/20481/TR%202010-36.pdf>



9 Pāteke swimming in Colville Ecological District (ED)

Pāteke are now a regular sight across the Colville ED. They were introduced back onto the northern tip of the peninsula in 2002. They have since spread around the Coromandel Peninsula from this original release site thanks to continuing predator control.

11.1 Significant natural area (SNA)

11.1.1 Background information

The council identifies significant natural areas (SNA) as areas that meet one or more criteria for significance in the Waikato Regional Policy Statement.

Identification of SNA is an important step in managing the region's natural heritage, protecting threatened species from the risk of extinction, reconnecting fragmented ecosystems, and meeting

the requirements of the Resource Management Act 1991. Significant natural areas provide us with a wide range of ecosystem services, including habitat for native plant and animal species, flood, or erosion control, providing oxygen and helping to regulate climate and scenic appeal.

SNA mapping helps to identify significant habitat or populations of indigenous fauna and flora which allow us to consider what management tools are needed to maintain or improve these populations.

11.1.2 SNAs in the Manaia catchment

SNA Name	Type	Significance
TC272b - Coromandel Forest Park Outlier 1	Lowland broadleaf/podocarp forest	Regional
TC420 - Coromandel Forest Park	Lowland to montane forest and scrubland	International
TC272 - Tawhitirahi Area	Semi-coastal, lowland secondary broadleaf forest and scrubland	National
TC312 - Pukewhakatara Forest	Lowland broadleaf/podocarp forest and coastal broad/small leaved scrubland	National
TC312b - Manaia Block Stewartship Land	Lowland kauri conifer-broadleaf forest	Local
TC273 - Mahakirau (borders Manaia catchment)	Rata/podocarp/tawa forest	International

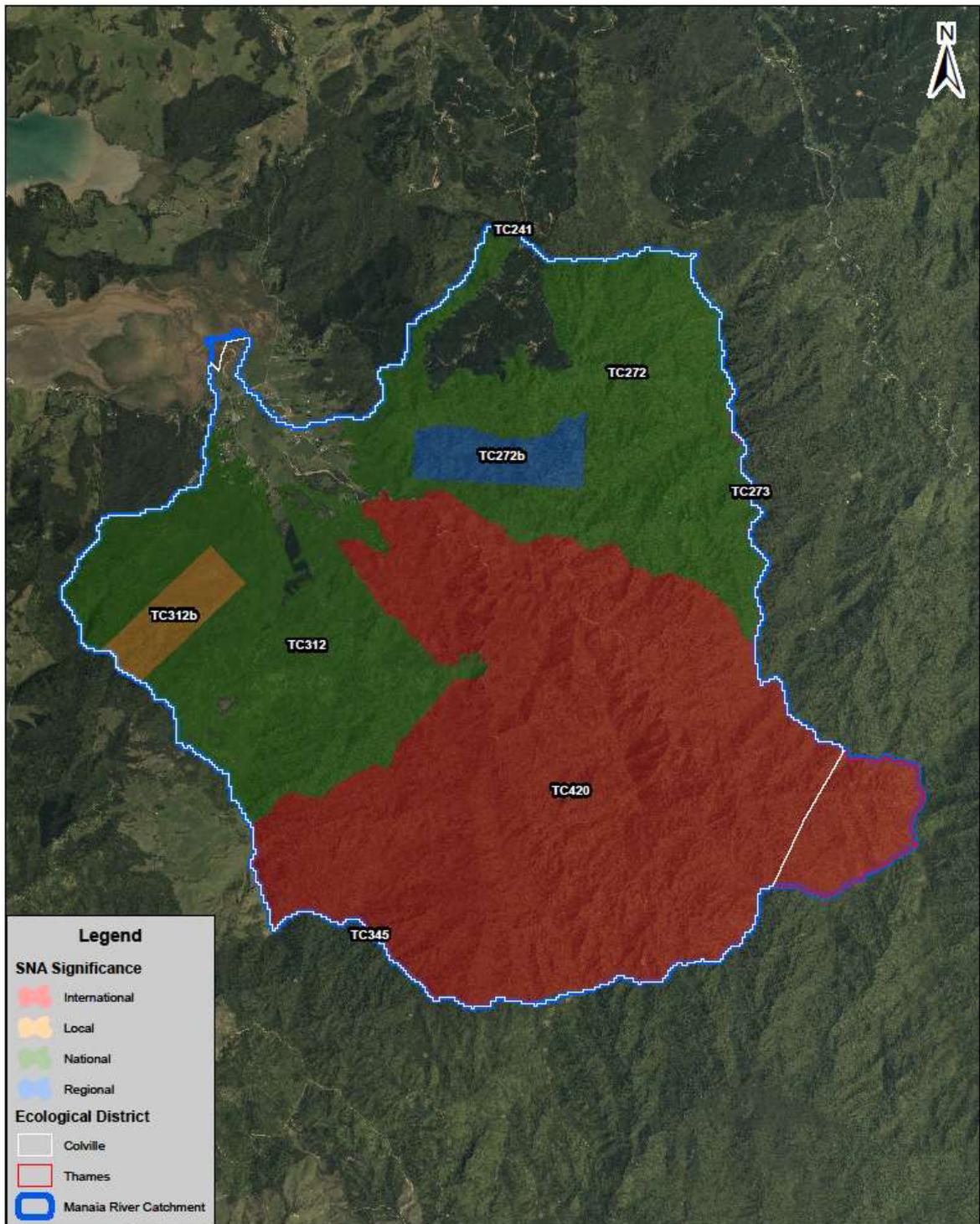
Council and other organisations encourage landowners to retire and restore significant areas of biodiversity, and have various funding grants available that landowners can apply for.

The *Significant Natural Areas of the Thames-Coromandel District: Terrestrial and Wetland Ecosystems Environment Waikato Technical Report 2010/36*, which includes Colville ecological district, can be found here:

<https://www.waikatoregion.govt.nz/assets/PageFiles/20481/TR%202010-36.pdf>.

The Manaia River catchments were identified as being in the highest scoring 20 per cent of river catchments in a SNA identification type exercise, with some being identified as a top priority for protection.

The data in the technical report is derived from analysis and interpretation of aerial photography along with information from ecological reports and data (where available), local ecological knowledge and limited field surveys.



Legend

SNA Significance

- International
- Local
- National
- Regional

Ecological District

- Colville
- Thames
- Manaia River Catchment

Acknowledgements and Disclaimers
 © Waikato Regional Aerial Photography Service (WRAPS) 2017. Imagery sourced from Waikato Regional Council. Licensed under CC BY 4.0.

Ecological information derived from the Department of Conservation's Ecological Regions and Districts of New Zealand (3rd edition). COPYRIGHT RESERVED.

Provisional Significant Natural Area data are derived from interpretation of aerial photography along with information from ecological reports and data (where available), local ecological knowledge and/or limited field surveys. The data are provisional and should be used for indicative purposes only. The data have been captured at scales of 1:10,000 or smaller and it is recommended it not be used at greater scales (e.g. 1:5,000) without detailed field survey.

**Manaia River Catchment
 Significant Natural Areas
 (SNA)**

For Waikato Regional Council staff only



Created by: HCE
 Date: 30/07/2019
 Version: 1
 Job No.: REQ152197
 File: REQ152197_A3 Manala River SNA Mapping.mxd



DISCLAIMER: While Waikato Regional Council has exercised all reasonable skill and care in controlling the contents of this information, Waikato Regional Council accepts no liability in contract, tort or otherwise, however, for any loss, damage, injury expense (whether direct, indirect or consequential) arising out of the provision of this information or its use by you.

Map 9. Manaia River catchment significant natural areas

11.2 Restoring native habitat biodiversity

To improve habitat biodiversity in catchments, the council and other organisations help landowners and communities invest in the planting of native species that are suitable for the ecological area.

By restoring the native plant cover we:

- create corridors and linkages between SNAs and/or habitat types – this may be connectivity between large fragmented habitats such as coastal forest areas or small scale such as a stream with a wetland in proximity but no native vegetation linking the two
- restore species that may have been present in the past but are now absent for various reasons, e.g. northern rata, which is susceptible to possum browsing, may have died out from an area of bush
- create more diverse habitat by providing different available food sources year-round for insects, lizards, and birds
- create and/or preserve carbon sinks; intensive pest animal browsing diminishes the potential carbon sink of existing native vegetation.

The guide to what is appropriate in the Colville Ecological District is found in the 'What to Plant in Coromandel Ecological Region' publication available online.

<https://www.waikatoregion.govt.nz/Environment/Natural-resources/Biodiversity/Planting-guides/What-to-plant-in-the-Coromandel-ecological-region/>

Native plant nurseries established by local communities are becoming a key focus for implementation of the community's aspirations, such as a healthier awa and catchment. There are numerous funding agencies to help communities establish native plantings. Funding can be raised through grants or crowd funding schemes such as:

- Million Metres Streams Project
<https://millionmetres.org.nz/>
- Te Uru Rakau One Billion Trees Programme
<https://www.teururakau.govt.nz/funding-and-programmes/forestry/one-billion-trees-programme/>



Picture 10 Manaia wants planting days with tamariki, like this day with students from Te Rerenga School

11.3 Native vegetation and soil erosion

By protecting and/or restoring native vegetation, like in SNAs or native scrub blocks, landowners help to address soil erosion and sedimentation issues within a catchment. Erosion and sediment deposition are natural cycles as landscapes change over time.

The issue for Aotearoa/New Zealand is that the significant and widespread removal of vegetation cover in a short period of time has seen an acceleration in the rate of erosion. This in turn has seen many harbours and estuaries infill with sediment and left hill country scarred with soil slips, etc. These areas can become vulnerable to further large-scale erosion, particularly during intense storm events.

Even where vegetation cover and bush canopy are present, the lack of understorey in many bush blocks, due to browsing of foliage and seeds by introduced mammals such as possum, goats, pigs and rats, leads to an increase in surface water runoff and soil erosion. A healthy understorey beneath the bush canopy allows for better water uptake, better filtration of sediment and increases resilience in extreme weather events.

Pest control, therefore, is a crucial part to maintaining a healthy bush block as it allows the understorey to persist. Recruitment of species (e.g. seedlings) is also enhanced when plants can establish without browsing pressure. Fencing off existing vegetation from browsing stock also addresses the above issues.



Picture 11 A lack of understorey (left) decreases the land's ability to absorb and filtrate both water and soil runoff whereas an intact understorey (right) aids filtration

11.4 Pest animals

Introduced animals that have readily naturalised in New Zealand (often in the absence of their natural predators from their land of origin) have had a significant impact on indigenous fauna and flora.

The introduction of mustelids (e.g. stoats) brush tail possums, rats, cats, hedgehogs, feral pigs, and goats have all impacted on Coromandel's native biodiversity. Uncontrolled dogs are a threat to adult Coromandel brown kiwi.

Mammalian predators reduce the likelihood of successful breeding seasons for our native birds by preying on eggs and chicks. If adult birds are sitting on nests, they are vulnerable to attacks as well which leads to a decline in adult female birds within a population.

There are many community groups and individuals within the Colville ED addressing this issue by servicing a wide network of trap lines for pest animal species. Communities are also doing restoration works such as planting native trees and carrying out citizen science, e.g. monitoring, to help protect and increase our indigenous species populations.

11.5 Pest plants



Picture 12 Woolly nightshade in the Pine Plantation behind Manaia

Invasive pest plants are a significant threat to the decreasing and fragmented native ecosystems/habitats within the Manaia catchment. Many of these habitats are already under pressure from disturbances both historic and current. Pest plants can colonise vulnerable areas, further reducing native vegetation, and may become ecosystem transformers. For example, large wild ginger infestations make it impossible for kiwi to probe the soil for food due to the large, impenetrable root systems of this plant.

The importance of controlling pest plants as bird numbers increase due to successful predator control is crucial. Birds can spread seeds of plant pests such as climbing asparagus and wild ginger, which are ecosystem transformers.

Key pest plants identified in the Manaia catchment

Moth plant	<i>Araujia hortorum</i> (formally <i>A. sericifera</i>)
Pampas grass	<i>Cortaderia selloana</i> and <i>Cortaderia jubata</i> (purple pampas) The web link below shows the difference between native toetoe and the two invasive pampas species. https://www.waikatoregion.govt.nz/services/regional-services/plant-and-animal-pests/plant-pests/pampas/
Saltwater paspalum	<i>Paspalum vaginatum</i>
Wild ginger	<i>Hedychium gardnerianum</i> and <i>H flavescens</i>
Woolly nightshade	<i>Solanum mauritianum</i>

For more detail about these pest plants see; <https://www.waikatoregion.govt.nz/services/regional-services/plant-and-animal-pests/plant-pests/>

Invasive willow species are also present in wetland areas. These are not the sterile hybrids used for soil conservation/streamside stabilisation.

11.6 Kauri protection – kauri dieback

Kauri are susceptible to a killer disease caused by the microscopic organism *Phytophthora agathidicida* (kauri dieback). Kauri dieback is found across parts of kauri lands including in the Waitakere Ranges, Waipoua, Great Barrier Island and on the Coromandel Peninsula at Whangapoua, Hukarahi (Whitianga) and Tairua. Scientists are working hard to find control tools for the disease, but there is currently no known treatment and once a tree is infected it will not survive.

The disease may be spread through as little as a pin prick of soil, therefore reducing soil movement in and near kauri on properties is the best defense. Soil movement can be reduced by:

- fencing out stock
- controlling pests such as pigs and goats
- ensuring anyone heading into native forest has cleaned all gear thoroughly as well as their dogs
- ensure machinery coming onto or leaving a property is dirt free.

For more information on kauri dieback visit www.waikatoregion.govt.nz/kauri



Picture 13 The upper catchment of Manaia has majestic stands of Kauri

12 Coastal habitat

The Manaia catchment has a diverse range of coastal habitats. The catchment has a mix of estuaries, sandy beaches, rocky headlands, shell banks and more open coastal areas. The sequence of coastal vegetation from tidal flats to estuarine areas and/or coastal forest is well represented in this catchment.

The tidal flats have populations of sea grass (*Zostera capricorni*) and mangroves (*Avicennia marina subsp. australasica*) changing into areas of saltmarsh (a mixture of rushes, sedges and shrub species) and sea meadow (ground cover species) such as remuremu (*Selliera radicans*). This coastal sequence occurs to the upper reaches of the saltwater/freshwater boundaries in the streams or water tables. Regenerating coastal forest occurs in some areas such as Hikurangi Point.

These sequences of coastal and estuarine vegetation are important habitat for fish species, shellfish, and coastal invertebrates such as crabs.

These areas are also important habitat for wading birds and shorebirds.

Although not restricted to just the coastal marshes, the destruction or degradation of freshwater wetlands by 90 per cent through human activities has meant many of our native wetland species have been “squeezed” into remaining areas, which include the coastal wetlands.

Fragmented populations of some of the rarer native bird species in the Colville Ecological District wetlands and seashore

Bird common name	Species name	Conservation status
Mohopereru/ banded rail	<i>Gallirallus philippensis</i>	Declining
Matuku hurepo/bittern	<i>Botaurus poiciloptilus</i>	Nationally critical
Pāteke / brown teal	<i>Anas chlorotis</i>	Recovering
Matata/New Zealand fernbird	<i>Bowdleria punctate</i>	Declining
Tuturiwhatu/New Zealand dotterel	<i>Charadrius obscurus</i>	Recovering



Picture 14 Downstream Manaia River - mangrove forest, saltmarsh, and intertidal habitat

Local authorities and coastal communities often collaborate to determine the impacts that have occurred with past practices, such as the large-scale deforestation of catchments, coastal development such as housing, drainage and roading as well as the impact of introduced pests.

Some key considerations for positive change in coastal areas that communities and local authorities may consider are as follows:

Aspirations

- People wish to protect the high recreation and natural values of the coast.
- The need to recognise the inter-linkages between land, water, biodiversity, and coastal issues, along with the high recreation and natural values held by people.
- The need to protect and restore coastal ecosystems, such as native saltmarsh areas, fish populations, shellfish beds and shorebird areas.
- The dynamics of mangrove populations and the ability of coastal vegetation to sequester and store carbon.

Concerns

- Coastal vegetation changes, including the spread of saltwater paspalum.
- The impact of elevated sediment inflows into the bays, while recognising that this is also a natural process in the overall life of a harbour.

- The decline in kai moana due to water quality issues.
- The dynamics of mangrove population expansion, e.g. around key navigation channels.

12.1 Mangrove communities

Mangroves in New Zealand comprise of a single native species *Avicennia marina subsp.australasica*, also known as manawa, that has been present in New Zealand for some 19 million years. Mangroves grow along sheltered coastlines in the northern part of the North Island. Their distribution is geographically limited by cold temperatures.

New Zealand mangroves:

- provide shelter and food for several species of fish (predominantly at high tide), shellfish, insects, and rare birds
- can protect and stabilise land
- form a buffer, in some areas, to absorb floodwaters, as well as protecting shore areas from wave action, erosion and flooding. (Waikato Regional Council website 2017)

For more information on mangroves see

<https://www.waikatoregion.govt.nz/googlesearch/?q=mangroves&ctl00>

The National Institute of Water and Atmospheric Research Ltd (NIWA) published a feature in 2017 on the potential of coastal mangrove and coastal vegetation to have an estimated rate of carbon sequestration that is 100 times faster than terrestrial forests. It is estimated that mangroves may store 120 tonnes of carbon per hectare. For further reading, the link to the article is as follows.

<https://www.niwa.co.nz/news/muddy-sinks>

NIWA also produced a publication outlining the guidance needed if communities are concerned about mangrove expansion and what best practices may be undertaken if such action is considered necessary. It also helps explain the role of mangroves in the coastal ecosystem and the importance of mangroves for fish and bird habitats, etc. The full publication can be found at <https://www.niwa.co.nz/freshwater-and-estuaries/management-tools/managing-mangrove-expansion>.

Management of mangroves can be appropriate in some areas for the purpose of maintaining stream flow or where they are encroaching on other significant habitat such as seagrass beds (*Zostera capricorni*) or saltmarsh.

12.2 Immediate threats for the coastal marine area (CMA) – at Manaia

The coastal marine area (CMA) is defined as the area below mean high water spring tides.

An **estuarine vegetation survey** was completed in 2013. The initial dataset included eight estuaries on the Coromandel Peninsula, including Manaia. The report detailed the results from a resurvey of estuarine vegetation in the Manaia Harbour. Comments are included on the threats to estuarine vegetation and other field notes of interest. A key threat to these habitats was stock intrusion and

grazing. The report is accompanied by digitised aerial maps of the survey site with vegetation community overlays and can be found at <http://www.waikatoregion.govt.nz/services/publications/tr200844/>.

12.2.1 Grazing

Stock intrusion and grazing was evident in places in the survey of the coastal vegetation. Stock grazing destroys fragile plant communities and opens the area for invasive weed species.

The exclusion of stock – with appropriate, well maintained fencing, stock floodgates across waterways and crossings where needed – is a significant step in helping to protect the coastal habitat. It also improves water quality by decreasing pugging and stock tread in these vulnerable areas, as well as decreasing direct faecal contamination.

Grazing in the coastal marine area or the CMA is a prohibited activity under Section 16.2.9 of the Waikato Regional Coastal Plan:

Livestock in Sensitive Areas (Prohibited Activity)

The presence of livestock in or on mangroves, saltmarsh, or eel grass, or on muddy substrata, in the CMA is a prohibited activity for which no resource consent shall be granted.

Principal Reasons for Adopting: *The presence of livestock in estuarine areas may damage or even destroy existing vegetation and stop regeneration, e.g. mangroves and saltmarsh. The destruction of fish spawning habitat can also be a result of livestock grazing and trampling. Archaeological sites and waahi tapu can also be damaged.*

<https://www.waikatoregion.govt.nz/Council/Policy-and-plans/Rules-and-regulation/Regional-Coastal-Plan/Regional-Coastal-Plan/APPENDIX-VI-Glossary/>

13 Stream erosion

Streambank erosion is a natural process as is channel movement/change across a floodplain over time. With the rapid deforestation of New Zealand catchments over the last 150 years, higher sediment yields, and accelerated bank erosion have occurred. Where stock have free access to the stream sides (known as the riparian strip), the continual pugging and stock tread damage along the banks increases the erosion rate of the banks and increases sediment yield into the water channels.



Picture 15 Riverbank erosion along Manaia River, prior to 2012/13, was a source of sediment to the harbour



Picture 16 Stream bank erosion protection - tree tying or layering works as both erosion protection fish habitat



Picture 17 Shows the river channel post stream bank erosion works

Research has shown that New Zealand waterways should have an optimum 15metre riparian strip or buffer zone between the active streambank and its floodplain, complete with vegetation cover, to provide:

- the best filtration of sediments/soil particles
- the best filtration of nutrients such as nitrogen and phosphorous
- the best soil stabilising effect through root structure
- canopy cover to depress common weeds
- habitat for native fauna and flora as well as connectivity to other areas by creating wildlife corridors
- shade for water thus reducing instream temperature.

Note: Cooler water temperatures increase oxygen levels, benefits instream fauna populations and decreases the likelihood for algae blooms (which prefer warmer temperatures).

<https://www.niwa.co.nz/publications/wa/vol14-no1-march-2006/sustainable-riparian-plantings-in-urban-and-rural-landscapes>

The reality for many waterways is often no fencing or fencing that is too close to the bank to provide the needed buffer zone between the active stream channel and its catchment area.

The council provides funding for riparian fencing and revegetation with the minimum distance for a buffer zone being 5 metres from the stream channel.

By setting back the fencing by at least 5 metres, this allows ample space for planting of native species as well as sterile willow hybrids and poplar poles within the riparian strip if needed. The fast growing and interlocking root systems of willow and poplar are used to stabilise the most active erosion sites along streambanks.

By having a more extensive riparian strip, planting can be multipurpose. Native grasses and plants such as cabbage trees provide shade and riparian habitat immediately along the channel; trees and shrubs can be planted behind these to provide wind breaks. Closer out to the fence, tree crops for firewood or timber can then be planted, e.g. eucalyptus species. This sequence also provides better nutrient cycling, e.g. the higher input of carbon in the form of woody material aids filtration of excess nutrients and denitrification (removal of nitrogen).

The head waters of the Manaia River and tributaries are covered in regenerating native bush which is ideal for this steep catchment.

14 Climate change effects

14.1 NIWA study – Climate change resilience of a Māori community

A study undertaken between 2010 and 2012 explored the specific risk, vulnerability, resilience and adaptation to climate-induced coastal change of the Māori community at Manaia (King et al., 2012). This involved assessing the exposure, sensitivity, and adaptive capacity of the community to present, past and future climate conditions and risks. It was expected that such information would help identify relevant options that could help eliminate and/or at least minimise vulnerabilities, and simultaneously enhance the different skills and capacities across the community to cope with (and adapt to) future climate conditions and challenges.

This study was part of a series of place-based studies and involved community members from the Manaia settlement in the Hauraki-Waikato region, the representative tribal body of Ngaati Whanaunga Incorporated Society, and NIWA's Māori Environmental Research and National Climate Centres. The most critical climate-induced changes identified for this community were sea level rise and river flooding.

The potential impacts and risks caused by **climate induced sea level rise** on the Manaia community are:

- increased risk of coastal flooding from rising sea levels and extreme weather events
- permanent inundation of low-lying coastal areas, including saltwater intrusion (salinisation) into freshwater resources and farm paddocks
- structural damage to privately owned buildings and key infrastructure, such as local roads and Manaia School, from higher water levels and periodic storms
- degradation of sacred places and sites resulting in loss of identity and whakapapa
- loss of hapū-owned farmland resulting in loss of economic opportunity
- increased coastal erosion and destabilisation of coastal slopes from rising sea levels and storms
- adverse impacts on ecology from erosion, sedimentation, and pollution from destruction of septic tanks and sewer lines
- danger of injury and loss of life in the case of extreme flooding events
- rising costs surrounding the maintenance, repair, and redesign of whānau homes and vital infrastructures to cope with such changes.

The potential impacts and risks caused by **climate induced river flooding** on the Manaia community are:

- danger to life in the case of extreme flood events – particularly for elderly residents living alone and school children at Manaia School
- damage or destruction of lifeline infrastructure such as roads, water, gas, sewerage, power, and communications
- costs from service disruption to water, power, gas, and communications
- road access likely to be impeded for certain whānau/households living on Goldfields Road and Marae Road
- damage to homes, machinery, and equipment, as well as community buildings such as the marae, school, health clinic

- loss of household contents and family records/heirlooms
- costs of clean-up, construction, and maintenance of protection structures
- households may find it more difficult to access adequate insurance cover in the face of increased flood risk
- altered river flows in association with newly configured rivers and streams
- loss of land holdings and farm stock as well as related economic opportunity/income
- destabilisation of properties and surrounding lands from flood runoff and erosion
- adverse health impacts: injury, stress, trauma, and sickness
- damage and loss of sacred sites/places resulting in loss of identity and whakapapa
- adverse impacts on ecology from erosion, sedimentation, and pollution from destruction of septic tanks and sewer lines
- increased pressure on formal and informal whānau-based support systems
- future development in low-lying areas of the flood plain by returning whanau.

14.2 Waikato Regional Council flood modelling 2009

Taken from 'Summary of Mike12 modelling' – Sarah Basher 2009

NOTE: there has been work in the catchment that will likely affect the flood modelling data.

In 2009, Waikato Regional Council engineers undertook a preliminary flood modelling exercise to look at the extent of flooding and the options to reduce impacts at Manaia. Exerts from this study are included below.

General observations from findings:

- The Manaia River along with the Tapa and Waharaparapa streams exceed their channel capacity and inundate the floodplain for an event smaller than the estimated annual event.
- The model indicates that the Manaia River floodplain can be inundated by the flows coming from the Tapa and Waharaparapa streams as well as the main Manaia River.
- Floodwaters are generally conveyed through the flow path around the Manaia River and the Tapa and Waharaparapa streams. Flood depths vary between 0.5m and 2.5m, while velocity varies from 0.05m/s (ponding) to 3.5m/s within the floodplain.
- The floodplain plays an important role in containing and conveying the floodwaters from the Manaia River for the 1% AEP (annual exceedance probability) event.

Climate change effects have been estimated following the methods outlined by the Ministry for the Environment (MfE) guidelines. The guidelines suggest that the temperature within the Waikato region is predicted to rise by up to 1.4°C by 2030 and by up to 3.8°C by the year 2080. The guidelines also suggest that rainfall intensity will increase by 7-8 per cent with every degree Celsius increase.

Based on the above, the rainfall intensities for a climate change scenario were estimated.

Future rainfall intensities

AEP Event	Manaia – future rainfall intensities 1 hour 30-minute event (mm/hour)					
	50%	20%	10%	5%	2%	1%
Manaia Catchment – 2030	25	31	37	43	54	65
Manaia Catchment – 2080	29	36	42	50	63	76

Events are described in terms of the Annual Exceedance Probability (AEP) = Probability that an event of a certain magnitude will occur in any one year.

Alternatively, events may be described in terms of the Annual Recurrence Interval (ARI) = period between floods of a certain magnitude based on the historic records of actual floods.

- 1% AEP = 1% probability that such an event could occur in any one year = 100 year ARI.
- 5% AEP = 5% probability that such an event could occur in any one year = 20 year ARI.
- 20% AEP = 20% probability that such an event could occur in any one year = 5 year ARI.
- 50% AEP = 50% probability that such an event could occur in any one year = 2 year ARI.

Flow estimates

The peak inflow has been determined using several methods: Rational, Relative Rational and the Revised Regional Flood Estimation and Kauaeranga Methods. The Kauaeranga Method was selected for design flow purposes below.

Manaia – hydrological summary including climate change

Event AEP	Flow (m ³ /s)						
	50%	20%	10%	5%	2%	1%	1% CC
Manaia River	167	242	287	337	389	428	549
Tapa Stream	53	65	84	98	113	137	176
Waharaparapa stream	33	40	57	66	77	85	127

Conclusion of this modelling work:

- The channels are overtopped in the annual flood event or less, which is consistent with capacities of natural (unmodified) rivers in New Zealand.
- The immediate floodplains play a vital role in conveying the flood flows beyond the annual flood; therefore, they should be maintained when considering flood control solutions.
- The areas of interest should be identified by the community for flood control/risk reduction considerations.
- Further modelling and assessment will be required when options are considered.

Should the community wish to pursue flood management options (noting that these have not been explored in depth for this work) then existing flood modelling information could be used as a basis for this. Council would need to look at feasibility of additional flood protection works here. There is currently no commitment to engage in a flood scheme for this area.

15 How regional council will support this work

In addition to the two primary works activities described below, Council will help seek additional funding sources, coordinate works activities, and connect other expertise throughout the organisation.

Primary contacts for works services are the senior catchment management officer and river management officer – both dedicated to the western and northern Coromandel. Their roles are to provide both technical advice and support, and act as a conduit to other council services.

15.1 Fencing and planting

The council works with landowners to permanently fence off areas to prevent stock access. This may be for a variety of reasons, but it is commonly done to reduce grazing of streamside vegetation and reduce damage done by stock tread.

The council will fund grants up to 35 per cent of the labour and material costs when a landowner carries out fencing and planting. Planting may be native species or exotic soil conservation species e.g. poplar, eucalyptus, or pin oak.

An Environmental Programme Agreement (EPA) outlines what the works are that a landowner wishes to undertake with WRC funding.

This may be:

- retirement of bush blocks so native species regeneration can occur once grazing of the understorey is prevented
- retirement of wetlands or seep areas for habitat restoration or simply to keep stock out of areas where they become bogged or cause pugging which accelerates soil erosion
- retirement of streambanks to improve water quality by reducing stock tread and direct contamination of the water through stock effluent
- retirement of steep slopes and gullies to make stock management more efficient and to decrease the impact stock tread has on soil slip and erosion
- planting steep slopes and soil slips with species that help reduce the impact of soil slip erosion, sheet erosion and sedimentation into water channels.

15.2 River management

River works funding

Landowners have the primary responsibility for maintaining the streambanks on their property and undertaking routine maintenance works for this purpose. There is also a need for co-ordination of activities along the river and for undertaking more significant works.

Through the Coromandel Zone programme of works, funding is available to assist with river works. This project was set up on the basis that river management would be carried out within two basic categories. They are as follows.

1. Routine river management

This includes:

- annual inspections of the main rivers and streams and responding to enquiries
- removal of isolated whole trees, stumps or limbs that have fallen into the channel, or are likely

to and could create an obstruction to flow or exacerbate erosion

- assisting with fencing of eroding portions of channels
- planting and maintaining vegetation to help prevent erosion
- undertaking simple erosion control work within channels
- spraying vegetation
- small erosion control work to maintain channels in their present locality and to reduce the sediment input caused by streambank erosion.

For routine river management, Waikato Regional Council may contribute to most of the cost, with landowners expected to be involved by carrying out some of the works as an 'in kind' contribution, particularly where they receive direct benefit.



Picture 18 Manaia River, erosion protection works in the 2019/20 season

2. River improvement

River improvement entails similar activities to routine river maintenance, but is usually of a larger scale than river management, e.g. large works specific to one landowner and/or involving a number of properties over a reach of a stream or river, and providing an increased level of benefit or service.

Activities include:

- removal of willow trees over a reach of a stream
- significant erosion protection or stabilisation works
- co-ordinated upgrade of a reach of a river or stream.

For this category, council will contribute up to 50 per cent of the cost, with landowners contributing a minimum of 50 per cent.

Waikato Regional Council staff will work with members of the community to:

- build capacity and understanding around river management works and the permitted vs discretionary activities in this space

- train and develop skills within the community to support and deliver river management works such as maintenance of vegetation, willow and poplar management and planting, gravel management under PA (permitted activity) rules.

15.2.1 Flood mitigation

For some, the impetus for this plan has been flood mitigation. This plan is not a flood management plan or proposal. However, through coordinated management and restoration of the Manaia River it is expected that there will be flood mitigation benefits. Detailed analysis, modelling and flood investigation would be needed to address all issues. This was looked at in the early 2000.

16 Funding

The council and the landowner may also work with other funding agencies if the landowner chooses to do so.

Funding organisation	Projects best suited	Fund use/description
Waikato Regional Council	Manaia main channel, Tapa Stream works, upper river channel and Manaia River tributaries	River works funding.
Biodiversity Forum	Planning/funding	Informs and helps groups with applications to these various public funds when available.
Foundation North – GIFT	River edge erosion downstream from Manaia bridge	To mitigate erosion along riverbank and plant in coastal areas natives.
Te Puni Kōkiri Whenua Māori Fund	Need for social/economic development	Creation of a wetland area for harakeke, tuna habitat, native garden.
Mātauranga Kura Taiao Fund	Need for social/economic development	To preserve the customs, history and stories associated with Māori land and tikanga and designed to reclaim, revive, preserve, and promote the use of traditional Māori knowledge and practice in indigenous biodiversity management.
Million Metre Streams Project	Oxbow area fenced and developed	Used to crowd fund planting of new environmental projects.
Greenfund Initiative	Oxbow – funding/volunteers	Greenfund supports the NZMCA's strategic goals of promoting the sustainable protection of our natural environment, while creating opportunities for member involvement.

Freshwater Improvement Fund	Whole of catchment	The Freshwater Improvement Fund supports projects that help communities manage fresh water within environmental limits. Funding will increase iwi/hapū, community, local government, or industry capability and capacity in relation to freshwater management.
-----------------------------	--------------------	--

16.1 Funding options

There are a variety of organisations that can help with funding for various projects.

Financial contributions from other organisations help reduce the landowner's overall financial outlay for retirement/restoration works on their land.

There are a variety of organisations that can help with funding for various projects, and Waikato Regional Council has numerous funds.

Catchment New Works is funding for landowners who wish to carry out land management works such as riparian, bush and wetland fencing, and planting or soil conservation works. This requires an Environment Programme Agreement (EPA) to be sign by the landowner or multiple landowners per property title.

Community groups can acquire funding for projects such as the **Small-Scale Initiative Fund** for community groups and/or individuals wishing to undertake pest control for up to \$5000.

The **Environmental Initiatives Fund** (EIF) provides one-off grants up to \$40,000 towards projects which directly enhance and/or benefit the environment or provide environmental education.

The **Natural Heritage Fund** is for bigger projects, with grants over \$40,000. The NHF helps private landowners, local government, community groups and others protect high value ecosystems.

The **Biodiversity Forum** is an agency that informs and helps groups with applications to these various public funds when available. Their website is useful for allowing community groups to see what is available and what may fit their project regarding the various private or government agencies. <http://www.waikatobiodiversity.org.nz/>

Ngā Whenua Rāhui is a funding programme that protects the natural integrity of Māori land and preserves mātauranga Māori. Ngā Whenua Rāhui offers two funds:

- Ngā Whenua Rāhui Fund provides protection for Māori landowners using 25-year renewable kawenata (covenants).
- Mātauranga Kura Taiao Fund seeks to preserve the customs, history and stories associated with Māori land and tikanga. The fund supports whānau, hapū and iwi projects designed to reclaim, revive, preserve, and promote the use of traditional Māori knowledge and practice in indigenous biodiversity management.

<https://www.doc.govt.nz/ngawhenuarahui>

Te Puni Kōkiri Whenua Māori Fund supports Māori landowners to explore different uses of land and ways of boosting its productivity. The fund offers support for trustees of Māori freehold land, including blocks for which the Māori trustee is responsible for, or owners of a Māori freehold land block if there are seven (7) owners or fewer.

Queen Elizabeth II Trust (QEII) is the most common NGO (non-government organisation) that provides funding and permanent protection for retired land.
<http://www.openspace.org.nz/>

The **Freshwater Improvement Fund** supports projects that help communities manage fresh water within environmental limits. Funding will increase iwi/hapū, community, local government, or industry capability and capacity in relation to freshwater management.

Community Environment Fund is there to empower New Zealanders to make a positive difference to the environment. It supports projects that strengthen environmental partnerships, raise environmental awareness, and encourage participation in environmental initiatives in the community.

The **Million Metres Streams Project** is the result of discussions with people, businesses and organisations across the country who have committed to work together to accelerate the riparian restoration activity in New Zealand by injecting a new stream of resource. This project can be used to crowd fund planting of new environmental projects.
<https://millionmetres.org.nz>

The **Greenfund Initiative** is an NZMCA (New Zealand Motor Caravan Association) initiative that helps fun grassroots environmental and conservation projects throughout New Zealand which offer opportunities for member participation.
<https://www.nzmca.org.nz/the-greenfund-initiative>

Foundation North – GIFT is a fund that encourages breakthrough insights, innovations and solutions to the complex environmental issues facing the Hauraki Gulf.
<https://www.foundationnorth.org.nz/funding/gift-gulf-innovation-fund-together/>

Trust Waikato funds initiatives that increase community vibrancy, quality of life, resilience, participation and inclusiveness in the community and environment.
<https://www.trustwaikato.co.nz>

Tane's Tree Trust is a non-profit charitable trust focused on encouraging the use of New Zealand indigenous tree species for biodiversity, landscape enhancement and cultural benefits, and provides the option for sustainable production of high-quality timber and other resources.
<https://www.tanestrees.org.nz/>

Tree Trust improves the community environment by investing in people. The Tree Trust programme aims to give youth the chance to gain work experience, boost their self-confidence and find positive direction.
<http://treetrust.org/>

9Wire is an innovation pipeline for all stages of development with wrap-around, bespoke support that follows creators along their journey to get their environmental solutions from the blackboard to the world. 9Wire is not just about improving the known but inventing the unknown.
www.9wire.co.nz

One Billion Trees is the Government's set goal to plant one billion trees by 2028. The One Billion Trees Programme will deliver improved social, environmental, and economic outcomes for New Zealand. Results from this fund will include indigenous regeneration, planting for water quality or erosion control, sustainable employment, and more resilient landscapes. One Billion Trees includes:

- direct grants for landowners to plant trees on their land or revert land to native forest – grants are intended to cover some, but not all, the costs of planting or reversion
- partnership funding for organisations and community groups who have ideas to support tree planting and improve how they grow and plant trees – partnership co-funding pays for part (normally half) of the costs of a project.

Organisations such as the regional council can apply for partnership funding. This can be for research, technology and innovation, workforce initiatives, seedling, and nursery production, or to provide project support for catchment restoration initiatives.

Partnership arrangements can include a collective of Māori landowners who can combine land under a trust and have one trust work on behalf of the collective to achieve greater scale in tree planting projects. This can also include a group of neighbours with smaller properties combining their land resources to apply for funding to plant a forest.

<https://www.mpi.govt.nz/funding-and-programmes/forestry/planting-one-billion-trees/>

17 References/Bibliography

Malengreau B, Skinner D, Bromley C, Black P 2000. Geophysical characterisation of large silicic volcanic structures in the Coromandel Peninsula, New Zealand. *New Zealand Journal of Geology and Geophysics* 43(2):171-186.

Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF 2009. Land use capability survey handbook: A New Zealand handbook for the classification of land. 3rd edition. Ag Research Hamilton, Lincoln, Landcare Research, GNS Science Lower Hutt. http://www.landcareresearch.co.nz/_data/assets/pdf_file/0017/50048/luc_handbook.pdf

18 Appendices

18.1 Appendix 1 – Manaia Draft Actions

What we heard/saw	Goal	Action(s)	Cost (est)	Total Estimated	WP or not	Who	Priority	Notes	Map ref	
Decline in stream and river water quality	Community would like to get river back to being swimmable. We heard that tamariki want to be able to swim in awa with aspiration of being able to dive in swimming holes. Iwi want to gather kai from awa and surrounds. Whanau lament loss of river species due to water quality, sedimentation, and fish habitat. Farmers need education and help to fence river and stream edges to keep stock out of water. Stock are using awa for water source as the waterways are not fenced and farmers do not have water to paddocks. Tapa (Tupa) Stream needs to be fenced off to protect sedimentation flowing into Manaia River.	To restore awa to how it was in the 1950s by decreasing sedimentation and encouraging native river species back to awa. That all iwi/landowners/community work to improve water quality by fencing all waterways and keeping stock out of them. To have a Tapa (Tupa) Stream Enhancement Project to fence entire stream and plant retired land in natives.	Work with Manaia community to develop and deliver a Manaia River Restoration Plan that ensures continuing improvement of river and streams and awa habitat and protects land from flooding.			HCMP - Manaia River Restoration Plan	HCMP team	2019		
		Fence off Tapa (Tupa) Stream – seek landowner approval to retire some of the land around this stream so fencing is stepped back and not in and out of the nooks and crannies.	\$6000 for a 4-wire electric fence @ \$6 per metre. Planting 0.5 hectares 2000 plants @ \$5.50 each = \$11,000	\$27,000.00	Aspirational	RMO/CMO	2020/22		9	
		Water reticulation where stock access to waterways is lost through fencing.	\$350 per trough and \$300 for alkathene and fittings per site.	\$8000	Work Programme	CMO /LMAS/Landowners	2019/20	This was identified where Waharaparapa Stream enters Manaia River	1-11	
		Source a training provider to train community in pole planting and native planting. Training will ensure ongoing work on projects is sustainable.	Approx. cost \$1000 per day (4 days allowed for)	\$4000	Work Programme	RMO/CMO	2020/21			
		Infill existing poplar/willow pole planting on Manaia River with natives so poles can eventually be removed.	4000 plants per hectare at \$5.50 per plant (includes first year releasing) \$22,000 per hectare 2ha allowed for	\$44,000	Work Programme	Community/ School	2020/25		2,3,5	
		Work with landowners/iwi to develop a maintenance action plan for areas where native planting has been completed.	Charge out rate per hour is \$120 – also maintenance is captured in biosecurity (weed control) as well. 5 years at \$6000/annum	\$30,000	Work Programme	CMO	2020/21		1-11	

			Plant up retired areas with native trees, i.e. miro/matai, and showcase these.	\$5.50 - \$7.50 per plant (includes two releases). Have allowed for 2ha.	\$60,000	Project	CMO /Community/School	2020/21	Native controlled harvesting as source of income	1-11
Issue	What we heard/saw	Goal	Action	Cost (est)	Total Estimated	WP or not	Who	Priority		
Flooding/river improvement/river management	Community aspiration to return river to the way it was in the 1950s. Concern how upstream river affects flooding in lower reaches and events have become more regular and more severe. There is a need for controlled and regular gravel removal along Manaia River. Landowners are affected by flooding and access to properties is at times affected. Ensure any/all river works are effective and do not adversely impact at next corner or get blown out at next weather event. Question why river improvement work is needed before doing it – what is the impact of not doing works, what are the long-term effects on the river, the land, the people? Marae access is affected by flooding and road is disappearing.	To undertake work to mitigate flooding along river and on landowner property. To have river works planned to ensure effective river management.	Investigate and identify where effective gravel traps and gravel management will improve flood management; budget and plan when work can be undertaken and maintain on cyclic programme. Erosion has occurred in a few areas within the Manaia River. Ongoing gravel management will be carried out and extracted gravel used for river management work along river.	Gravel management work Transport \$155 per shift Excavators (13-16T) \$1650 per day Trucks \$1400 per day Erosion control work. Rock costs approx. \$60 per ton (delivery from Whitianga) Transport/excavator cost as above Long reach excavators \$2000 per day Layering transport \$155 per shift Excavators (13-16T) \$1650-\$2000 per day depending on operation Blockage removal approx. \$1650 per day Have allowed \$40k/annum for 5 years	\$200,000	New	RMO	2022/23		2,3,5
			Implement a continuous effective gravel/sediment management removal programme which includes ongoing gravel management and extraction	Refer to costs above		Work Programme	Iwi / RMO	2019/21		2,3,5
			Open the subsidiary stream mouths into Manaia River so they flow naturally into main tributary	Refer to costs above		Work Programme	RMO	2019/20		9,10

			Remove gravel out of the river rather than transferring it within the river and ensure landowner's in-kind contribution removes gravel from the floodplain	Refer to costs above		Work Programme	RMO	2019/2025	NB: (still gravel piles from summer 2016 and more summer 2017)	2,3,5
Issue	What we heard/saw	Goal	Action	Cost (est)	Total Estimated	BAU or not	Who	Priority		
Monitoring	Community would like to see increased monitoring of awa as a way of measuring change in environment. There is a desire to understand/monitor/grow ika/inanga numbers. We heard that it is important for WRC to identify correct landowners and spokespeople. 1080 in their waterways was mentioned at hui but was not seen as a community action. Monitoring of mangroves with removal if required and continuing maintenance was raised by a landowner.	Monitoring set up to access awa health and measure restoration of water quality. Increased monitoring and data collection on kai moana. Identify correct landowners prior to work. Regular monitoring for 1080 in waterways. Monitor mangroves. Keeping commercial operators honest.	Establish baseline monitoring of Manaia River and tributaries for water quality and understand and record changes/trends.			SAS to provide water quality testing training	Water Quality monitoring programme School/marae might be interested in this?	2020/25	Zone Manager will bring to SAS attention	1-3,5
			Work with community/school to establish a fish survey programme and monitor river species numbers in awa.			SAS to provide fish monitoring training	IWI/RMO/SAS/Community/School			1-3,5
			Provide coastal plan review team contact details for input into plan review and discussion on mangrove removal	WRC labour			ZM/SAS	2020/25	Only raised once at hui and more about monitoring not removing mangroves	
			Mussel farm depot on Goldfields Road monitoring and check compliance	WRC labour			TCDC/RUD		As above	
Issue	What we heard/saw	Goal	Action	Cost (est)	Total Estimated	BAU or not	Who	Priority		
Compliance	Keep local industries honest, reduce dumping, e.g. tyres	Ensure understanding of rules. Grow the concept of kaitiaki to include local management of compliance to reduce dumping	Keep commercial operators honest							

Issue	What we heard/saw	Goal	Action	Cost (est)	Total Estimated	WP or not	Who	Priority		
Decline in native flora and fauna	<p>Manaia community would like to return the awa to how it used to be and deliver restoration plans to return native flora and fauna to the catchment. There is an appetite from those who attended hui for a discussion about developing a wetland. WRC to scope projects that enable flora and fauna to return to Manaia River. WRC to identify funding streams and help community to access them. Iwi want to make living in Manaia more sustainable/viable, provide jobs alongside improving the environment. Planting native trees and providing bird habitat will restore numbers. Community would like to work with WRC to retire land along river and streams and plant native trees and plants. Evidence that lace bug is spreading through woolly nightshade. We heard there is room for better coordinated approach to pest control. Iwi need more resources to be effective in pest and plant control. We heard that there is a gap in knowledge of those on land, and education on species and native plants will help.</p>	<p>Ensure native flora and fauna be around for future generations. Develop a Manaia River wetlands restoration project. Establish a native nursery. Plant natives and bring back native birds. Native planting along entire river. Effective plant and pest control to complement planting and river management.</p>	<p>Fence off the oxbow above the school – possible school or marae project to plant natives and pā harakeke/pā raupo in this wetland. Opportunity to grow oxbow area into a sanctuary space for learning about plants, critters, and water inhabitants, Rongoa, and an opportunity for a community project and tamariki to plant it.</p>	<p>\$1200 (f) 4 wire electric 200m \$11,000 planting up ox bow (2000 plants @ \$5.50 per plant) Weed control 120 hours @ \$55 per hour contractor or \$40 landowner = \$6600</p>	\$18,800.00	Aspirational	HCMA/CMO /community/school/marae	2021/23		6
			<p>Tapa (Tupa) Stream – connecting the wetland with biodiversity corridor along river Approx. 1000m of Tupa (Tapa) stream is unfenced or has minimum fencing</p>			Aspirational	HCMA/CMO /Community/School/Marae	2021/24	Community may have knowledge of other pā harakeke to draw from	9
			<p>To restore green houses and utilise for school or marae or community native nursery as a social enterprise.</p>	<p>Options include: Trees for Survival approach through EnviroSchools (Becky Dove) or Ngati Hako trial of a 10m x 10m square nursery. Pauline Clarkin has offered to share learning with this. <i>NOTE seed source would need to be carried out in March so need to schedule this and find someone to support seed gathering process.</i></p>	\$4,000.00	Aspirational	CMO /Community/School	2021/23	This would ensure a supply of plants for Manaia community and could supply to wider Coromandel. Could invite someone from Miranda nursery/Ngāti Hako to come talk to iwi if they see this as viable	1-11
			<p>Fence off river edge to link unfenced areas along riparian edge – likely the area will regenerate on its own accord. Noticed a bit of a monoculture of native plants – stock exclusion will encourage young plants to grow</p>	<p>\$6 per metre for a four-wire fence electric – probably no more than 1000m as main river is mostly fenced</p>	\$5,000.00	Work Programme	CMO/RMO	2020/22	Pockets of native bush currently exist but riparian fencing has not been completed.	1-3,5,9

			(fencing could even be hot wire fencing, so removable when stock is not in the space). Noticed that stock had been provided access – grass has been maintained.							
			Weed control along main channel and tributaries - kaikuyu, woolly nightshade, black berry, moth plant	Estimated at 2 weeks per year \$10,800 x 5 years	\$54,000	Work Programme	Biosecurity officer		<p>Moth plant growing on true left side of river in mid reach. Check how community wants to work, may not want herbicides.</p> <p>Zone Manger to bring to attention of Biosecurity team</p>	1-3,5-11
			Establish pest control and pest management of rats, rabbits, possum, dogs, cats (pukeko – depending on numbers to ensure plantings survive)	Trap network along Tupa and Manaia rivers both sides as first set. Would include new wetland areas. Working towards an RTC of <5% for species recovery approx. 10km of line 100 x 145 per trap	\$15,000		Biosecurity officer/community		Zone Manger to bring to attention of Biosecurity team	all
			Planned weed control programme and annual works programme	Approx. cost \$1000 per day (4 days allowed for)			ZM			all
			Predator control – on public land (mountains to sea approach)	\$300,000						
			Constructed wetlands development including expertise, administration resource costs.	\$40,000						
			Establish fish spawning habitat and monitoring programme with focus of exposed or engineered areas			Work Programme 2020/21	RMO/SAS/Community/School		Senior school might be interested in this?	

Issue	What we heard/saw	Goal	Action	Cost (total)	Total Estimated	BAU or not	Who	Priority		
Lack of infrastructure/community involvement	Iwi, community, landowners want to learn environmental best practice and be actively involved. Community want to identify economic/sustainable businesses. Rubbish collection box to ensure rubbish does not go into awa. Community engaged to use it, collector to empty box. Tamariki can paint it. Education of tangata whenua/monitor. The community would like to develop an area for communal use. Raise level of main road. See oncoming traffic. NZTA, TCDC, WRC resourcing. Culverts under road. Raised at hui – possibility of moving the Marae Road to the inside of the power poles and plant up existing roadway with a pathway to navigate to river accesses.	Grow community education/involvement in environmental work. Everyone to understand tikanga / waahi tapu. Uphold tikanga on awa. Identify tapu areas. Grow local employment opportunities that benefit the environment. Tidy up the environment. Picnic area for communal use. Mitigate flooding in lower catchment. Marae Road always repaired to ensure marae access.	Once plan written and actions confirmed visit kura and gauge willingness/interest to be involved in environmental projects	Staff time		Work programme				
			Investigate cottage industries i.e. bees, gardens, kai, weaving	Unknown		Aspirational	Manaia Community/TCDC/WRC			4,11
			Clean up environment from historic waste and future proof waste disposal	Allowance made of \$5000 labour and \$3000 dump fees	\$8,000.00		Mania community/ZM/TCDC	2019/22	Dump accessible from Goldfields Road – old cars, household rubbish, tyres, tin	all
			Explore Continuous Cover Forestry Options with Tane Tree Trust and David Bergin. Support from Andrea Julian	External funding opportunity						
			Monitoring – build on 2015 stream mouth monitoring programme and faecal source tracking	1500 per sample, 10 samples each summer for 10 years	\$150,000.00					
			Community to work with TCDC to ensure waste disposal is sustainable	N/A		Work Programme	ZM/TCDC/Iwi	2020/21		
			Talk to NZTA as to viability of large fit-for-purpose culverts under road, strategically placed with floodgates to stop seawater flowing into Manaia (one at Goldfields Road, and two in proximity of 'old' river course), investigate design options	N/A			ZM/NZTA	2020/21		2,3
Issue	What we heard/saw	Goal	Action(s)		Total Estimated	WP or not	Who	Priority	Notes	Map ref

Way we work	The landowners want to know who they can go to understand what WRC does and who can help them. Community would like to see closer working relationship with agencies and WRC, DOC, TCDC.	To work with community to build enduring relationships that ensure river work and maintenance is ongoing. To have open communication lines to all officers and actively engage community regarding work done on river. Cross agency/iwi collaboration.	Ensure farmers know who their point of contact is at WRC. Our offices will be proactive by making themselves available to assist farmers/landowners	N/A		Standard Practice	RMO/CMO		Assess scale of works and soft options	
			Use vegetation and soft engineering as first option for riverbank erosion reparation. Sites XYZ have been included for estimate	MRT – See cost above, costs depend on length of sites		Standard Practice	RMO/CMO			
			Establish a minimum 5m riparian strip with native planting along entire river channel for Manaia River	Initial costs above		Standard Practice	RMO/CMO	2020/25		
			Plan for blockage removal and undertake erosion control, possible channel training/vege groynes	MRT – see cost above depends on the site		Work Programme	RMO	2019/25		
			Hold annual meetings between agencies to identify current situation, capture communities wish and prioritise work. Opportunity to check in collectively	N/A		Annual	ZM			
			Ensure communication on operational work along Manaia River with iwi is across agencies	N/A		Work Programme	Iwi/TCDC/WRC	2019/21		

