WAIORA NORTHLAND WATER

Draft Mangere Catchment Management Plan

Contents

Introduction

The purpose of this draft Mangere Catchment Plan is to identify desired community solutions to issues/problems that are impacting on waterbody uses and values in the Mangere catchment.

This '*Draft'* Mangere Catchment Plan has been developed by a collaborative stakeholder group supported by Northland Regional Council and made up of members representing a range of parties with an interest in freshwater in the Mangere catchment. The Mangere Catchment Group identified catchment values, issues that impact on those values, and their objectives for improving their catchment. Both regulatory and non-regulatory methods have been considered to implement the objectives sought.

The *Draft* Mangere Catchment Plan has been developed at the same time as the *Draft* Regional Plan for Northland (available on the council's website at www.nrc.govt.nz/XXX). The Draft Mangere Catchment Plan should be read together with the Draft Regional Plan – the Draft Regional Plan sets out the region-wide objectives, policies and regulatory rules for fresh and coastal water management (among other things), while the Draft Mangere Catchment Plan provides a catchment specific approach using both regulatory (rules) and non-regulatory methods. Once finalised, the regulatory methods in the Draft Catchment Plan will be included in a section of the Regional Plan specific to Mangere. Both the Draft Mangere Catchment Plan and the Draft Regional Plan will be revised as needed following community feedback before being finalised.

Catchment overview

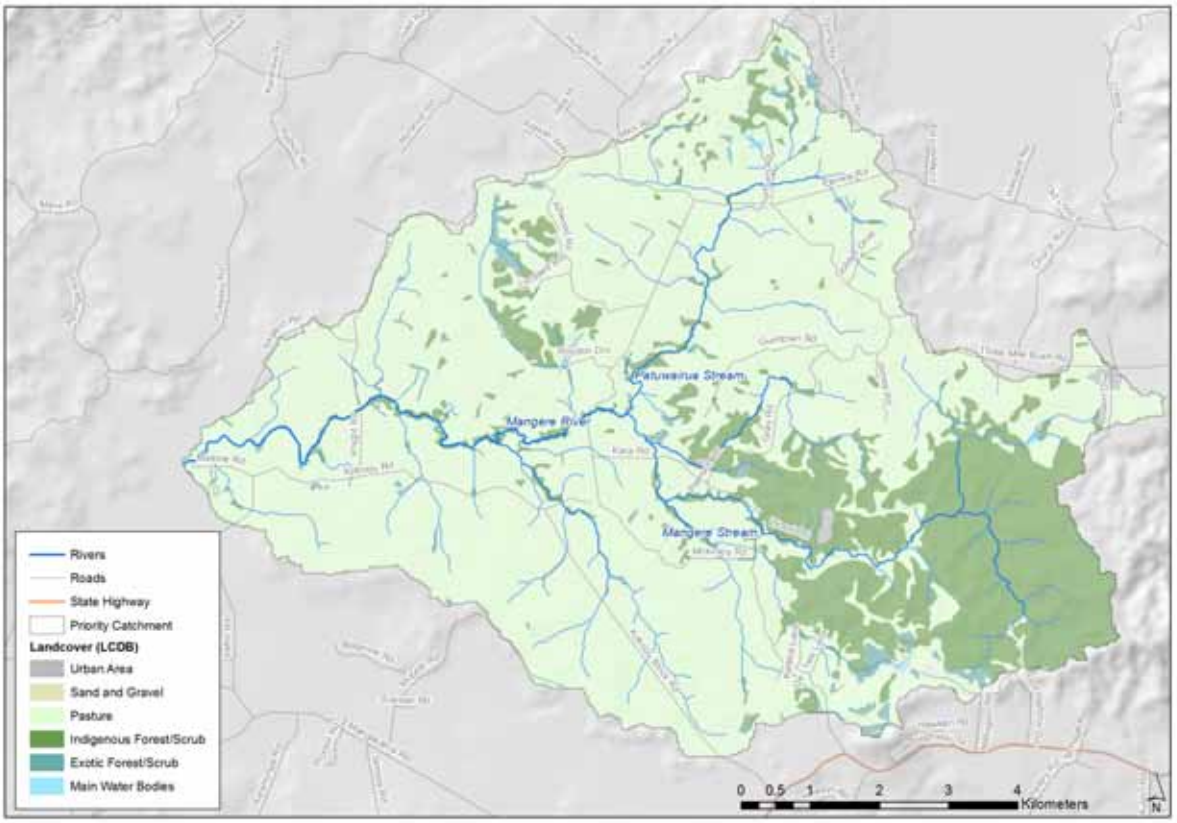
The Mangere catchment is located immediately west of Whangārei (see Figure 1 on p.4) and drains into the Mangere River. The catchment has four larger streams – the Waipui, Patuwairua, Mangapiu , and Mangere streams. There are some remnant river wetlands (swamps, marshes) but no natural lakes.

The Mangere River drains, via the Wairua River and Northern Wairoa River, to the Kaipara Harbour on Northland's west coast. The Wairua River and the Northern Wairoa have a high demand for water extraction. Some of the eastern arms of the Kaipara Harbour have experienced high rates of sediment deposition on beds and beaches which has altered the shellfish species present, food gathering opportunities and recreational use.

The catchment has an area of approximately 81km^2 (8100 hectares) and consists of private and public land. Most of the land and waterbody beds in the Mangere catchment are in private ownership. However, there are areas of public land (Department of Conservation reserves, paper roads, marginal strips and esplanade reserves) which provide

opportunities for recreational and cultural activities in water bodies – see Figure 1 in Appendix 1. The Pukenui Forest reserve is accessible to the population of Whangārei and is popular for walking. Existing paper roads, marginal strips and esplanade reserves provide further access to reaches of the Mangere Stream and Mangere River but public use for recreational and cultural activities is currently low.

Figure 1: Mangere Catchment and land cover.



The catchment topography is a mixture of hill-country with a slope over 15 degrees (41% of the catchment) and lowlands under 15 degrees of slope (59% of the catchment) – see Figure 2 in Appendix 1. Hill-country topography is generally more prone to hill-slope erosion. Larger river reaches in lowland topography are generally more prone to streambank erosion. Types and rates of erosion also depend on the underlying geology and soils as well as overlying land use/cover and are discussed in the following chapter.

Land use/cover is predominantly pastoral farming (77%) and indigenous forest (23%) – see Figure 1. Pastoral grazing occurs predominantly on lowland topography and is undertaken for commercial and cultural ('lifestyle') purposes. The majority of dairy farms occur on lowland topography south of the Mangere River – see Figure 3 in Appendix 1. Most lowland terrestrial wetlands (gumlands) have been drained and converted to pastoral use. Indigenous

forests occur predominantly on hill-country with a large area within the Pukenui Forest. Along the Mangere River, Mangere Stream and Patuwairua Stream is one of the largest remnant riparian indigenous forests (167 hectares) in the Whangārei Ecological District[1] which is considered of high conservation value.

Aquifers (Matarau, Three Mile Bush and Maunu) on the edges of the catchment contribute to groundwater recharge of stream base-flows – see Figure 4 in Appendix 1. River/stream base-flows are at their lowest in summer, peak in winter, with median flows in autumn and spring. Storm-flows occur frequently and play an important role in providing flow variation and controlling populations of aquatic species by removing and resetting plant, periphyton, invertebrate, and exotic fish populations. There are four privately owned in-stream dams in the catchment which capture and store seasonal base-flows and storm-flows for summer extraction. The stored water in two of these dams (Millington Road and Three Mile Bush Road) is not fully utilised. Catchment river flows are 'unregulated' – that is, flows are not controlled by intentional dam releases.

The catchment has a mixture of hard-bottom and soft-bottom river reaches. Soft-bottomed river reaches occur over soft-substrate geology and in lowland reaches where flow velocities decrease and sediment deposits. Recent alluvium soils makes up a significant proportion of the Mangere Stream and Mangere River reaches and are more prone to stream bank erosion – see Figure 5 in Appendix 1. Hard-bottomed stream reaches predominantly occur in hill-country reaches (greater than 15 degree slope) to the west of the catchment where flow velocities are high and overly hard substrate geology. However, there is a hard-bottomed reach of the Mangere River which flows over an old basalt lava flow near the Mangere Falls.

Aquatic species (periphyton, plants, invertebrates, fish, birds etc) have populated suitable habitat in hard-bottom and soft-bottom river reaches. Hard-bottomed river reaches support periphyton growth where there is sufficient light. Invertebrate in hard-bottom river reaches are expected to be naturally dominated by communities of mayflies, stoneflies and caddisflies.[2] Soft-bottom rivers support watercress growth, where there is sufficient light. Invertebrate in soft-bottom river reaches are expected to be naturally dominated by communities of snails, worms and chromatids, which are generally more tolerant of nutrient enrichment and sedimentation. Particular invertebrates of value that have been found in surveys include koura (freshwater-crayfish – food gathering and conservation value) and the freshwater crab (conservation value). The occurrence of fish species in the catchment is limited due to the climate and natural migratory barriers, including distance from the coast, the Wairua Falls (and Wairua Power Station) and the Mangere Falls. Native fish species found frequently include longfin eels (food-

[1] See Page 70, Department of Conservation, *Natural Areas of Whangarei Ecological District.*

[2] Page 17, Ministry for the Environment. A User guide for the Macroinvertebrate Community Index.

gathering and conservation value), shortfin eels (food-gathering), common bully (food-gathering), and crans bully. Exotic fish species that have been transferred include brown trout (gamefish) and gambusia (pest-fish). Waterfowl (gamefowl and food-gathering) are predominantly mallard ducks and pukeko.

Land erosion modelling

Sediment modelling (SednetNZ) has been undertaken to identify the sources of sediment in Mangere and the estimated annualised yields of soil erosion and loads entering the river network – see Figure 3. The SednetNZ model is useful for broadly predicting critical source areas of erosion. However, on the ground surveys are needed to identify if erosion is actually occurring or is being controlled. The total sediment volume from the whole catchment is estimated at 13,008 tonnes per year from 81km^2 (8100 hectares):

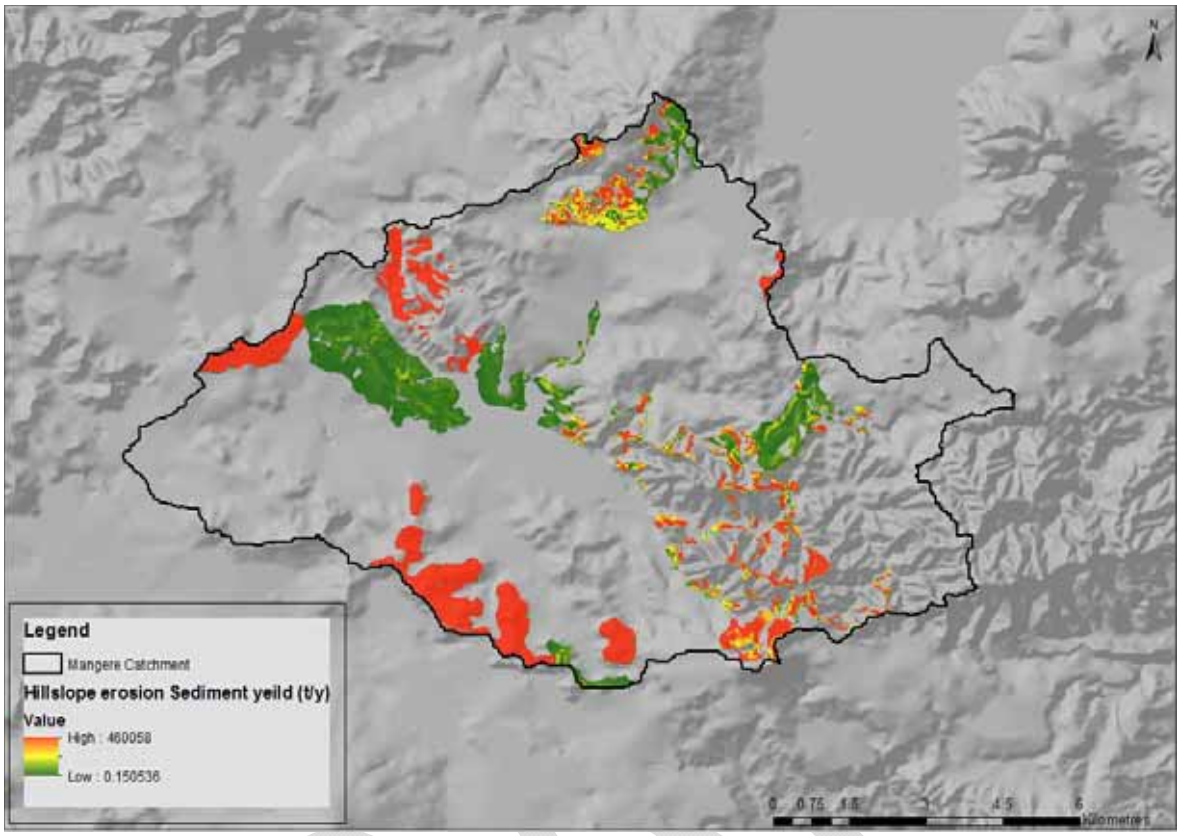
- 4032 tonnes/year (31%) of this comes from *streambank erosion; and*
- 8976 tonnes/year (69%) comes from *hill-slope erosion.*

Hill-slope sediment yield is based on four main erosion processes: gully erosion; surficial (overland) erosion; earthflow erosion; and landslide erosion – See images in Appendix 3. Yield is determined to a large extent by topography (lowland and hill-country) and vegetation (pasture and woody vegetation):

- 59% of the catchment (4779 hectares) is in lowland topography (less than 15 degrees actual slope):
  - 59% of the catchment (4779 hectares) is lowland vegetated in pasture – contributing 690 tonnes/year (0.14 tonnes/ha/year); and
  - 0% of the catchment is lowland woody vegetation;
- 41% of the catchment (3321 hectares) is in hill-country topography:
  - 23% of the catchment (1863 hectares) is hill-country woody vegetation – contributing 2065 tonnes/year (1.11 tonnes/ha/year); and
  - 18% of the catchment (1458 hectares) is hill-country pasture – contributing 6210 tonnes/year (4.26 tonnes/ha/year).

Pastoral hill-country is a significant source of hill-slope-erosion – 69% of the catchment's hill-slope erosion comes from 18% of the catchment area. Figure 3 shows predicted high yielding and low yielding areas within pastoral hill-country due to other factors, such as the soil and underlying geology. It is estimated that 90% of pastoral hill-slope erosion comes from approximately 25% (45) pastoral properties. Rates of hill-slope erosion may be overestimated where land holders have already undertaken measures to reduce erosion – such as planting of poplars or willows.

Figure 2: Indicative hill-slope erosion sediment yields from pastoral hill-country land (estimated using SEDNET).



Water quality monitoring

Rivers: a number of river water quality indicators have been monitored by the Northland Regional Council (council) in the Mangere catchment to understand the condition of the water for human health and aquatic ecological health – see Table 1 and Figure 3. The following (in bold) are substances which must be monitored under the National Objectives Framework[3]:

- ***E.coli*** concentrations are an indicator of pathogen concentrations. Pathogens can cause human infections if swallowed while undertaking immersion activities and are caused by faecal matter contamination. High concentrations of *e.coli* (or pathogen) concentrations, during river base-flows ('annual medians'), can be caused by the direct discharges of faecal matter. Sources of direct discharges of faecal matter are likely to be farm dairy effluent, livestock, or waterfowl. Monitoring shows that *e.coli* concentrations in the catchment are highest in the southern lowland areas where the concentration of dairy farms is highest. There are no swimming sites within the Mangere

[3] The National Objectives Framework (NOF) is part of the National Policy Statement for Freshwater Management. The framework provides a nationally consistent approach to managing attributes (characteristics) which affect freshwater uses/values.

catchment which are monitored under the council's Northland Swimming Water Quality Monitoring Programme.

- High ***ammonia*** concentrations and low ***dissolved oxygen*** concentrations can cause toxicity and hypoxia in sensitive fish and invertebrate species. High *ammonia* and low *dissolved oxygen* concentrations, during river base-flows ('annual medians'), can be caused by the decomposition of organic matter in water. Sources of organic matter include faecal matter discharges, silage pits and offal pits[4]. The council also monitors sensitive macro-invertebrate populations (*MCI*) as these are a biological indicator of organic enrichment. Monitoring shows that high *ammonia* and low *dissolved oxygen* concentrations in the catchment generally coincide with high *e.coli* concentrations.
- ***Nitrate*** concentrations can cause toxicity in sensitive fish and invertebrate species. High *nitrate* concentrations can be caused by the deposition of urine and its leaching through porous geology or aquifers to surface waterbodies. Monitoring shows that *nitrate* concentrations in the catchment are not at a level that could cause toxicity in sensitive fish and invertebrate species.
- ***Periphyton*** 'blooms' (excess organic matter accumulation) can hinder recreational/cultural activities and water supplies. The subsequent decay of blooms can also cause *ammonia toxicity* and *hypoxia* in sensitive fish and invertebrates. Periphyton monitoring has not been undertaken in the catchment as there are few hard-bottomed river reaches with sufficient light (less than 60% shading) to support blooms[5]. *Periphyton* take their nutrients up from the water column and growth can also be managed with nutrient concentration limits (*dissolved reactive phosphorus* and *dissolved inorganic nitrogen*). However, concentrations that are necessary to limit blooms depend on the frequency of storm-flows and the degree of shading.
- *Turbidity* is a measure of water cloudiness which can be caused by the presence of organic matter or inorganic (soil) particles. Sources of *turbidity,* during base-flows (annual medians), can be caused by discharges of organic matter, livestock access to streams or works within streams. Monitoring of *dissolved reactive phosphorus* suggests catchment geology (naturally high phosphorous levels) is a significant source. *Dissolved reactive phosphorus* and sediment tend to bond and 'travel' together and concentrations are also elevated where the proportion of inorganic particles in *turbidity* are high.

[4] See page 26 and page 29, Ministry for the Environment. A Draft Guideline to Attributes.

[5] Page 56, MfE New Zealand Periphyton Guideline: Detecting , Monitoring and Managing Enrichment of Streams.

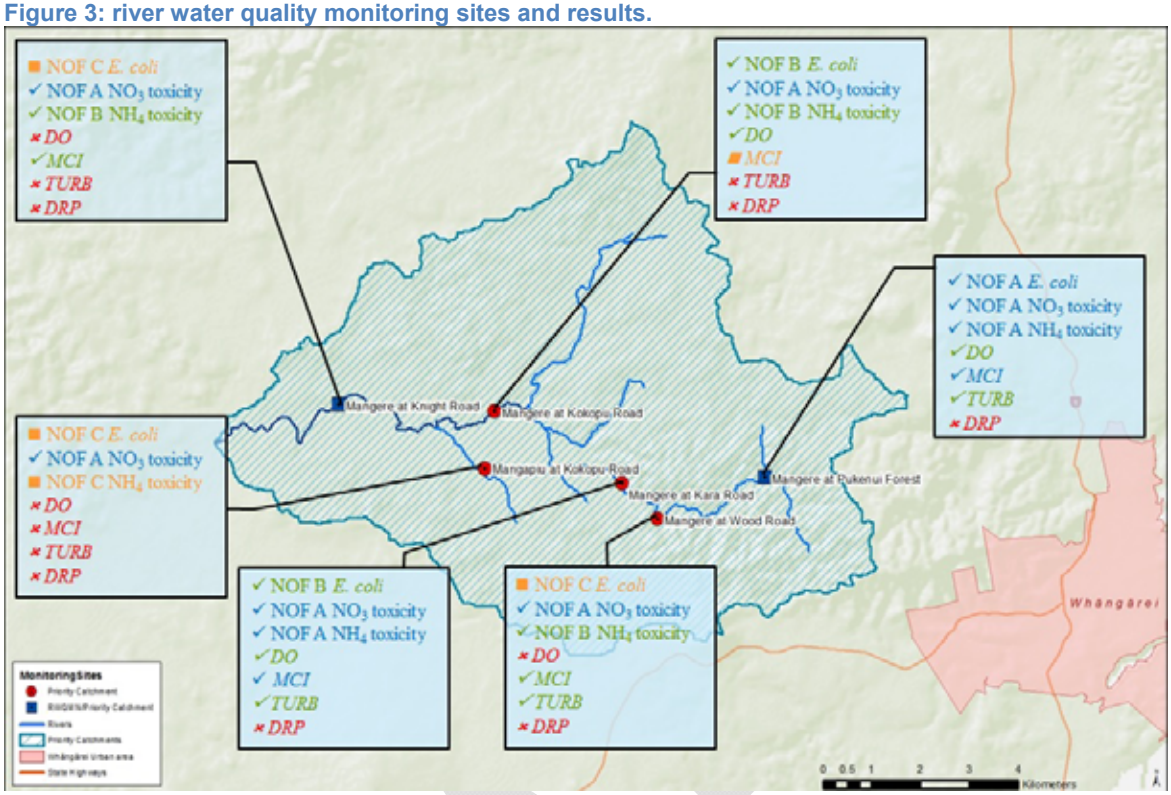
Council trend analysis showed a number of meaningful improvements in *E. coli* and nutrient levels over the past 10 years. However, when the time period for analysis is reduced to the last five years, results indicate a levelling off with no meaningful improvement[6]. Dairy NZ trend analysis also identified improving trends in *E.coli*, *Ammoniacal Nitrogen*, and *Dissolved Reactive Phosphorus* from 2007 to 2010[7]. However, from 2011 – 2015 the only significant improvement was a reduction in *Turbidity*[8].

Table 1: river water quality monitoring sites and result.

Water quality monitoring site	National Objective Framework (NOF) attributes			RMA 1991[9]	Ecological indicators		ANZECC[10] guideline value	
	Escherichia coli (*E. coli*/100mL)	Nitrate nitrogen (mg/L)	Ammoniacal nitrogen (mg/L)	Dissolved oxygen (% saturation)	Macro-invertebrates	Stream habitat	Turbidity (NTU)	Dissolved reactive phosphorus (mg/L)
	Annual median A ≤260 B >260 ≤540 C >540 ≤1000 D >1000	95th percentile A ≤1.5 B >1.5 ≤3.5 C >3.5 ≤9.8 D >9.8	Annual maximum A ≤0.05 B >.05 ≤0.4 C >0.4 ≤2.2 D >2.2	Annual median ≥80	MCI score (indicator of 'organic enrichment')	% rating compared with reference site	Annual median <5.6	Annual median <0.01
Mangere at Pukenui Forest	A	A	A	Above	127	100%	Below	Above
Mangere at Wood Road	C	A	B	Below	114	50%	Below	Above
Mangere at Kara Road	B	A	A	Above	122	81%	Below	Above
Mangere at Kokopu Road	B	A	B	Above	97	34%	Above	Above
Mangapiu at Kokopu Road	C	A	C	Below	64	30%	Above	Above
Mangere at Knight Road	C	A	B	Below	101	53%	Above	Above

[6] Mangere Catchment Water Quality Update; Northland Regional Council; April 2016.
[7] Water Quality Status and Trends – Mangere River; Dairy NZ; March 2014.
[8] Technical Memo; Dairy NZ; March 2016.
[9] The council has monitored *dissolved oxygen* concentrations but the methodology differs from the new National Objective Framework guidelines.
[10] Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000 Guidelines)

Figure 3: river water quality monitoring sites and results.



Water quantity modelling

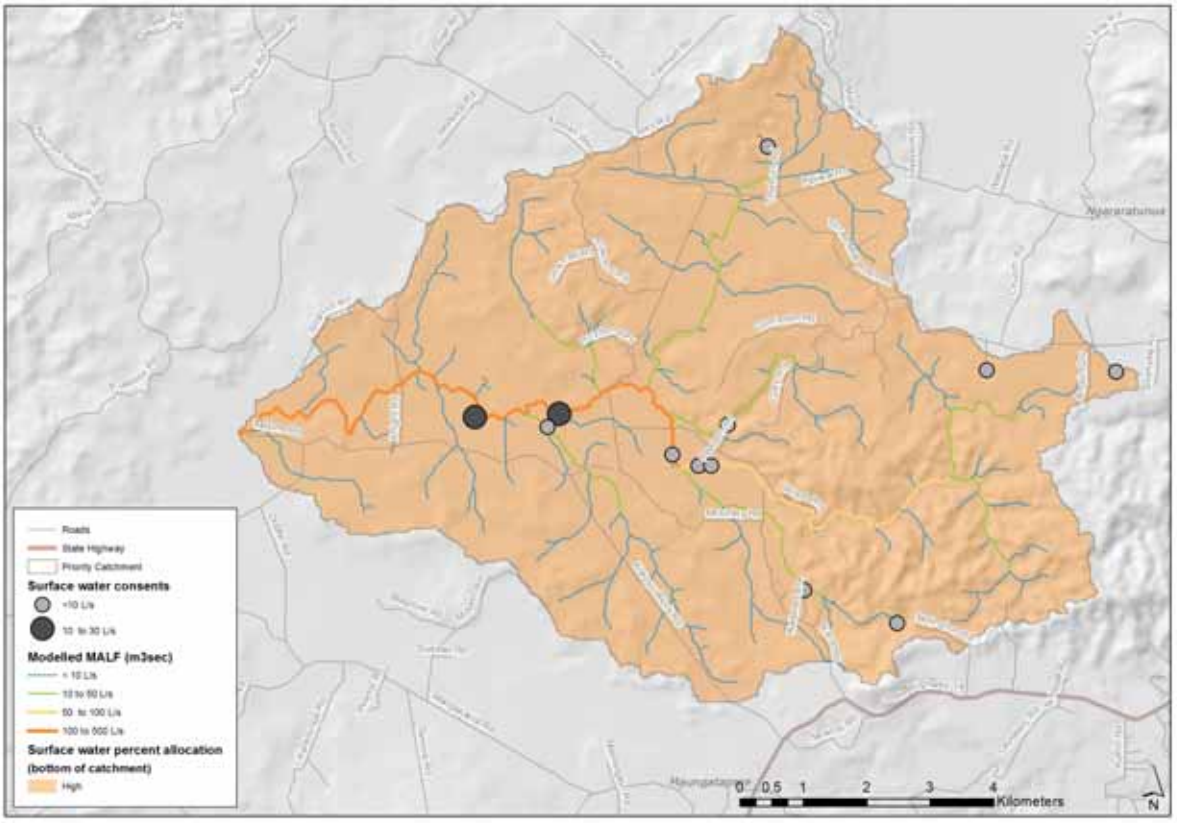
The taking and use of water is a regulated activity under the RMA and cannot be undertaken unless expressly authorised by the RMA or a rule in a regional plan. The RMA authorises the taking of a reasonable volume of water for specific uses – these include livestock drinking, individual domestic use and firefighting. Regional plans authorise the taking of small volumes of ground or surface water for any use without consent (a *permitted activity*). All other water takes require a consent and are classified in the Regional Plan as a *discretionary activity* (can be refused).

The greatest demand for water is for extraction from summer river base-flows. However, there are also two consented groundwater takes and four dams in the catchment. The four in-stream dams capture and store seasonal base-flows and storm-flows. Stored water in three of the dams is extracted and used for on-farm irrigation – stored water in one of the dams is currently unused.

Rivers: the council has modelled what the river summer base-flows (known as Mean Annual Low Flows) would be in the catchment without extracted water takes. Modelled Mean Annual Low Flows and the location of consented water takes are shown in Figure 4. The Mangere River at Knights Road is predicted to have a mean annual low flow (MALF) of 126L/s in summer without any water extraction. The model does not account for increased river flows due to deforestation, which generally increase storm-flows rather than base-flows.[11]

[11] Page 7, Landcare Research, Forestry and Water Yield: The New Zealand Example.

Figure 4: predicted summer base-flows (mean annual low flows) – without extraction.



Maximum volumes of river extraction that occur during summer have been estimated for different uses:

- Livestock drinking is estimated to be 873m^3/day (or 10.1L/s).
- Dairy shed use is estimated to be 449m^3/day (or 5.2L/s).
- Irrigation is estimated (from consented volumes) to be 4294m^3/day (or 49.7L/s) – the two largest irrigators take 3110m^3/day (or 36L/s) of this near the bottom of the catchment.

The total estimated allocated volume of extraction for all users is 65L/s (or 52% of MALF). This indicates a high demand for water that could significantly affect in-stream flows or other users.

Requirements to maintain minimum flows in stream during summer are imposed to limit the amount of water that can actually be taken. Conditions of existing consents held by the two largest irrigators on the Mangere River at the bottom of the catchment require water extraction to stop if it will result in river flows dropping below 90L/s (or 72% of MALF) at Knights Road.

The Northland Regional Council has grouped rivers in the region into four different Freshwater Management Units (FMU) for managing river water quantity, based on their uses, values and sensitivity to extraction. Each FMU is subject to different limits on the taking of water – how much water should remain in rivers (minimum flow) and the total amount that can be extracted (allocation limit). These limits will be included in the Draft Regional

Plan and serve to protect in-stream values and reliability of supply for water users. The limits are expressed as a percentage of the river's mean annual low flow (MALF). The Mangere catchment is identified as 'small rivers' FMU. The 'small rivers' FMU has proposed allocated volume limits of 40% of MALF or the existing allocation level, and minimum flow limits of 80% of MALF or the existing minimum flow level (see Figure 6 in Appendix 1). In the Mangere catchment the allocated volume limits would therefore be 52%; and the minimum flow limits would be 72%.

Catchment objectives (the outcomes sought)

Table 2 identifies draft objectives (broad and specific) to address the significant issues identified by the Mangere Catchment Group for the sustainable management of the catchments resources – see Appendix 2 for further details on issues and how these can impact on uses and values.

Table 2: Mangere catchment uses and values, and issues and objectives

Uses and values	Issues that impact uses and values[12]	Broad (high-level) objectives	Specific (low-level) objectives
Ecosystem health • Hard-bottomed and soft-bottomed habitat. • Native species: . birds, fish, invertebrates, plants, perpihyton.	• Pastoral hill-slope erosion. • Livestock access to waterbodies. • Farm dairy effluent discharges to waterbodies. • Water extraction from summer base-flows. • Populations of exotic/pest fish species. • Deforested waterbody margins. • Transfer of native fish.	**Improve fresh and coastal habitats for native aquatic species.**	• Maintain hard-bottomed river reaches and reduce sediment loads to the Kaipara Harbour by reducing pastoral hill-slope erosion. • Improve habitat for *turbidity* sensitive fish and invertebrate during base-flows by reducing sediment and organic matter discharges from: o livestock access to waterbodies; and, o farm dairy effluent and domestic discharges to waterbodies • Improve habitat for *dissolved oxygen* and *ammonia* sensitive fish and invertebrate by reducing organic matter and nutrient discharges from: o livestock access to waterbodies; and, o farm dairy effluent and domestic discharges to waterbodies. • Maintain native fish habitat by maintaining current levels of water extraction from summer base-flows. • Improve native fish populations by maintaining the transfer of native fish.

[12] Refer to Appendix 2 for more detail.

Uses and values	Issues that impact uses and values[12]	Broad (high-level) objectives	Specific (low-level) objectives
			• Improve native fish and invertebrate habitat by reducing populations of exotic/pest fish species. • Improve habitat for birds and temperature sensitive fish and invertebrates by maintaining riparian forests along the Mangere River, Mangere Stream and Patuwairua Stream.
Recreational/cultural Activities • Food gathering exotic species – *watercress, ducks.* • Food gathering. • Swimming. • Walking. • Wading. • Education. • Kaitiaki – transfer of native species.	• Public reserves. • Fishing reserves. • Transfer of native fish. • Farm dairy effluent discharges to waterbodies. • Livestock access to waterbodies. • Water extraction from summer base-flows.	**Improve waterbodies for recreational and cultural activities.**	• Improve access along the Mangere River, Mangere Stream and Patuwairua Stream margins by supporting the creation of esplanade reserves. • Improve native eel populations for non-commercial purposes by reducing commercial harvesting. • Improve native fish populations by maintaining the transfer of native fish. • Maintain the quantity of water available for food gathering and immersion activities by maintaining current levels of water extraction from summer base-flows. • Improve the quality of water for immersion activities by reducing discharges of pathogens from: o Effluent discharges to waterbodies; and o Livestock access to waterbodies.
Water removal • Ground water drainage (base-flows). • Storm water run-off (storm-flows). • Wastewater disposal.	• Farm dairy effluent discharges to waterbodies. • Livestock access to waterbodies. • Grazing of waterbody margins.	**Improve the ability of waterbodies to remove contaminants in water and accommodate stormflows**	• Improve the assimilative capacity of water during base-flows by reducing contaminants from: o Effluent discharges to rivers; and o Livestock access to waterbodies. o Maintaining riparian vegetation to act as a filter • Improve the ability of rivers to accommodate stormflows by maintaining river bed capacity and riparian margins / wetlands..

Uses and values	Issues that impact uses and values[12]	Broad (high-level) objectives	Specific (low-level) objectives
Water supply • Domestic use. • Livestock drinking. • Dairy shed – wash-down & cooling. • Irrigation – pasture. • Horticulture. • Dams and storage. • Small business/industry.	• Water extraction from summer base-flows. • Damming/extraction, of storm-flows and seasonal base-flows.	**Improve water availability and the security of water supplies.**	• Maintain the reliability of water supplies for existing users by maintaining current levels of water extraction from summer base-flows. • Improve water availability by increasing the damming/extraction of stormflows and seasonal (autumn-spring) base-flows. • Increase efficient use of extracted water.
Land use • Pastoral farming –. • Quarrying • Horticulture.	• Pastoral hill-slope erosion. • Damming/extraction, of storm-flows and seasonal base-flows.	**Improve the productive capacity of land in the Mangere catchment.**	• Maintain productive soils by reducing pastoral hill-slope erosion. • Improve summer production by increasing the damming/extraction of stormflows and seasonal (autumn–spring) base-flows.

Implementation

The following section outlines the draft implementation methods identified by the Mangere Catchment Group to achieve the draft objectives. Specific regulatory measures identified by the group may be included in the new regional plan and apply specifically to the Mangere catchment in addition to those in the draft Regional Plan.

Table 3: Mangere catchment proposed implementation methods (regulatory and non-regulatory) to achieve objectives.

Issues and current management approach	Draft Regional Plan methods (to be confirmed)	Draft Mangere Catchment Plan approach
Livestock access to waterbodies Currently there are no regional rules requiring stock be excluded from rivers and lakes. Dairy farmers have largely excluded livestock from streams wider than 1m and deeper than 30cm through industry good practice and supplier contracts.	The Draft Regional Plan stock exclusion rules for rivers apply to: Dairy (milking) & pigs – • Permanently flowing rivers and drains greater than 1m wide and 30cm deep at operative date of plan • All permanently flowing rivers and drains by 1 January 2025 Dairy support, beef and deer – • Permanently flowing rivers and drains greater than 1m wide and 30cm deep in the lowland FMU by	**Regulatory:** Also apply stock exclusion rules to hill country FMU in the Mangere catchment: Dairy support, beef and deer to be excluded from all permanently flowing rivers and drains in the hill country FMU by 1 January 2025 **Non regulatory:** • Encourage stock exclusion where not required by a rule (this would be intermittently flowing steams or by an earlier date). • Encourage water quality improvement / erosion control plans where not required by a rule.

Issues and current management approach	Draft Regional Plan methods (to be confirmed)	Draft Mangere Catchment Plan approach
	January 1 2025. • All permanently flowing rivers and drains in the lowland FMU by January 1 2030 (see Figure 2 in Appendix 1).	
Grazing of waterbody margins Current regional rules permit stock access and grazing within the 'riparian management zones' (0-20m) if it is the grazing of pasture. Approximately 63% of the catchments river reaches have pastoral vegetation. It is uncertain how many reaches have set aside grass filter strips.	None.	**Regulatory:** • None. **Non regulatory:** • Encourage stock exclusion within 1-2 metres of waterbodies with land management advice.
Deforested waterbody margins Current regional rules restrict the removal of woody vegetation in waterbody margins unless it is for the purpose of: forestry; controlling streambank erosion; maintaining river flows; or, infrastructure (200m^2). Approximately 37% of the catchment's river reaches have woody vegetation. This is predominantly in hill-country and in remnant riparian forests along the Mangere River, Mangere Stream and Patuwairua Stream. The remnant riparian forests are identified as being of significant ecological value within the Whangārei district.	The Draft Regional Plan rules restrict the removal of more than 200m^2 of woody vegetation within 5m of permanently flowing rivers.	**Regulatory:** • As per regional plan. **Non regulatory:** • Support the identification of the Mangere River, Mangere Stream and Patuwairua Stream as a priority area for the creation of riparian forests by community groups.

Issues and current management approach	Draft Regional Plan methods (to be confirmed)	Draft Mangere Catchment Plan approach
Farm Dairy Effluent discharges to waterbodies Current regional rules provide for farm dairy effluent discharges to land as a permitted activity (subject to conditions). Where farms cannot meet the permitted rules resource consents are required for discharge of treated effluent to water in accordance with conditions. There are currently 21 dairy farms in the catchment: seven rely solely on discharge to land; 15 have consent to discharge to land and/or water – one of these has no provision for land application. There are currently no discharges of human effluent to water.	Improved controls on dairy effluent discharges to land (greater storage and stormwater separation).	**Regulatory:** • As per regional plan. **Non regulatory:** • None.
Pastoral hill-slope erosion Currently there are no regional rules to manage pastoral hill-slope erosion. Critical erosion areas have been modelled for the Mangere catchment (using SednetNZ). This indicates that most of the pastoral hill-slope erosion comes from a portion of hill-country (see Figure 2). The current approach to managing hill slope erosion is working with land owners to address erosion on a voluntary basis through Farm Erosion control plans, with some financial assistance provided (for example, for poplars).	There are no rules specifically targeting critical sources of erosion or requiring erosion control plans in the draft plan.	**Regulatory:** Erosion control plans for critical areas of erosion in pasture to be compulsory by 2025 (See Figure 2 – Red / orange areas) – Draft rule: Pastoral land use in erosion prone areas – draft rule: *"**Pastoral land use** after 1 January 2025 in a mapped **erosion prone area** is a controlled activity if an **erosion control plan** has not been developed for the land.* *Matters of control* • *The effectiveness of measures to control or mitigate sediment from areas of gully, landslide and earthflow erosion.* • *The location, timing and prioritization of measures to control or mitigate sediment from areas of gully, landslide and earthflow erosion* • *Information and monitoring requirements*

Issues and current management approach	Draft Regional Plan methods (to be confirmed)	Draft Mangere Catchment Plan approach
		Meaning of words: *"**Pastoral land use** means: effective grazing area and includes all contiguous land areas in herbaceous species including isolated trees. It excludes those forested areas which achieve 100% canopy closure or other woody vegetation which prevents pastoral growth* ***"Erosion control plan** means: a Regional Council approved plan which specifically identifies gully, landslide, and earthflow erosion and remediation measures".* ***"Erosion prone land** means: "Erosion prone land means: an area of land identified as erosion prone on Regional Plan maps which identifies land subject to a high risk of gully, landslide and earthflow erosion - but not surficial and stream bank erosion."* **Non regulatory:** • 50-100% subsidy for poplars/willows associated with erosion control plan implementation (case-by-case basis). • Encourage erosion control plans on other areas of land subject to erosion.
Water extraction from summer base-flows Current regional rules apply a minimum flow (the lowest level rivers can be reduced as a result of extraction of water – typically around 70-84% of Mean Annual Low Flow), but do not provide a 'hard' limit on the total volume that can be extracted (an allocation limit). Allocation limits	The draft regional plan identifies the Mangere catchment as being within the 'small rivers' freshwater management unit (FMU). The 'small rivers' FMU is proposed	**Regulatory:** Retain the current minimum flow and allocation volume as limits - That is, do not aim to reduce allocation or increase minimum flows from the current: o A minimum flow limit of 72% MALF. o An allocated volume limit of 52% of MALF.

Issues and current management approach	Draft Regional Plan methods (to be confirmed)	Draft Mangere Catchment Plan approach
protect: the reliability of supply for existing water users; and, aquatic habitat (limiting the period when a river could be held at minimum flow). Currently, the total volume of water allocated for extraction from rivers in the Mangere catchment is high at around 52% of Mean Annual Low Flow. The actual minimum flow that must be maintained in rivers by those extracting water is 72% of Mean Annual Low Flow.	to have the following limits: • A minimum flow limit of 80% of MALF (or the existing consented minimum flow – 72%) • An allocated volume limit of 40% of MALF or the existing (52%)allocated volume level	**Non-regulatory:** • None.
Damming/extraction of stormflows and seasonal base-flows Current regional rules allow the diversion of storm run-off to an off-stream dam as a permitted activity. Any extraction or damming of stormflows in a stream or river requires consent. There is expected to be a large number of small off-stream paddock dams capturing run-off for livestock drinking. There are also 4 privately owned in-stream dams of significant size that have consent to divert and store water. Water stored in two of these dams is not fully utilised.	The draft regional plan allows off-stream dams less than 20,000m^3 catching storm run-off as a permitted activity. New dams in intermittent or permanently flowing streams will require consent. The draft plan will also allow flow harvest under certain conditions (when rivers are at high flows)	**Regulatory:** • As per regional plan. **Non-regulatory:** • Encourage off-stream storage and flow harvesting
Transfer of native fish The harvest and transfer of native fish species to a location where they already exist is the responsibility of the Ministry for Primary Industries	Not applicable – transfer of native fish is a Ministry for Primary Industries function.	**Non-regulatory:** • Support the transfer of native fish species by tangata whenua within the catchment.

Issues and current management approach	Draft Regional Plan methods (to be confirmed)	Draft Mangere Catchment Plan approach
under the *Fisheries Act 1996.* The transfer of eels and banded kokopu occurs from below the Wairua falls to streams in the Mangere catchment		
Fishing reserves The commercial harvest (and total allowable catch) of fresh and marine fish species is the responsibility of the Ministry for Primary Industries under the *Fisheries Act 1996*. Commercial harvesting of eels does occur in the catchment. However, the Department of Conservation, as the land holder, restricts commercial eel harvesting in public reserves (Pukenui Forest).	Not applicable – creation of Fishing Reserves is a Ministry for Primary Industries function.	**Non-regulatory:** • Support the creation of a fishing reserve (taiapure or mataitai reserves) by tangata whenua within the catchment.
Exotic/pest fish species Exotic or pest fish species can be addressed through regional pest management plans. The regional council can also support community efforts to address pests through community pest control areas (CPCAs). Fish surveys have identified the presence of Gambusia and trout. Transfer of trout is authorised by the Department of Conservation and implemented by Fish & Game. Trout have been released in the Mangere catchment in the past.	Not applicable – transfer of exotic fish is Department of Conservation and Fish & Game function. Control of pest fish is a Department of Conservation and Northland Regional Council function.	**Non-regulatory:** • Seek formal restrictions on the release of exotic fish species (trout) from Fish & Game/Department of Conservation. • Support the exclusion and reduction of Gambusia populations
Public reserves The creation of public reserves (esplanade reserves) in waterbody margins is the	Not applicable – creation of public reserves (esplanade reserves) is a	**Non-regulatory:** • Support the identification of the Mangere River, Mangere Stream and Patuwairua Stream as an

Issues and current management approach	Draft Regional Plan methods (to be confirmed)	Draft Mangere Catchment Plan approach
responsibility of the district councils under the Resource *Management Act 1991*. There are public reserves in the Pukenui Forest and in reserves along the Mangere Stream and Mangere River.	Whangarei District Council function.	esplanade priority area for the creation of esplanade reserves by the district council.

Conclusion

The recommendations of the Mangere Catchment Group can be grouped into two types of approaches – recommended regulatory rules (that is, mandatory obligations) and recommended non-regulatory actions (that is, voluntary measures). The Mangere Catchment Group considers that the combination of regulatory and non-regulatory methods outlined in this draft catchment plan provide a good balance of approaches and will, over time, achieve the objectives/outcomes sought.

Regulatory measures will only have effect if they are adopted into statutory documents by local authorities or other agencies with regulatory powers. The Mangere Catchment Group has considered the regulatory rules in the Draft Regional Plan. In doing so, the group has recommended variations of the livestock exclusion rule and the inclusion of a pastoral hillslope erosion rule to achieve the draft objectives they have identified for the Mangere catchment. These are:

1. **Livestock access to waterbodies**: The catchment group has recommended rules requiring the exclusion of livestock from hill-country as well as lowland areas. This means livestock (excluding sheep and goats) would need to be excluded from permanently flowing rivers by specified dates. This has been recommended taking into consideration that:
    a. The draft Regional Plan would not require stock exclusion (other than dairy milking and pigs) in hill country rivers/streams on the basis of cost (fencing and reticulation), benefit (typically lower stocking rates) and practicality (rugged terrain).
    b. Livestock (except sheep and goats) exclusion from rivers/streams is a desired outcome in the catchment.
    c. Lowland and hill-country rivers with permanently flowing rivers/streams should be targeted.
    d. There is a case for a departure from the regional approach/rules as:
        i. The Mangere catchment has a comparatively small area of ‘easier’ hill country than other Northland hill-country areas; and
        ii. The Mangere catchment hill-country area has a lower density of rivers/streams (26.46km of rivers/1416 hectares = 1km of river/53.5 hectares) compared to the lowland areas (124.84km of river/4800 hectares = 1km of river/38.5 hectares).

2. **Pastoral hill-country erosion**: The catchment group has recommended rules requiring Erosion Control Plans for pastoral land use in erosion-prone areas’. This has been recommended taking into consideration that:
    a. There is no proposal in the draft Regional Plan to reduce pastoral hill-slope erosion.

b. Reducing pastoral hill-slope erosion is a desired outcome in the catchment.
c. Areas of land with the highest rates of pastoral hill-slope erosion should be targeted.
d. A voluntary approach should be used prior to a regulatory one, whereby land holders in pastoral hill-slope erosion-prone areas would be encouraged to take action to reduce hill-slope erosion on pasture by:
    i. The council providing assistance to identify and manage hill-slope erosion (by development of an Erosion control plan prepared by a council officer); and
    ii. The council providing assistance to implement measures to reduce erosion – by subsidising poplars and willows.
e. A window of opportunity prior to 1 January 2025 is a reasonable amount of time for land owners to voluntarily address sediment but the catchment group considers there should be a regulatory measure applied beyond this date to ensure action is taken.
f. After this period land holders in pastoral hill-slope erosion-prone areas without an Erosion Control Plan will be required to lodge a resource consent and will be required to bear the costs – including for identifying erosion (a land owner may need to engage an appropriately qualified expert) and implementing a plan to reduce erosion.

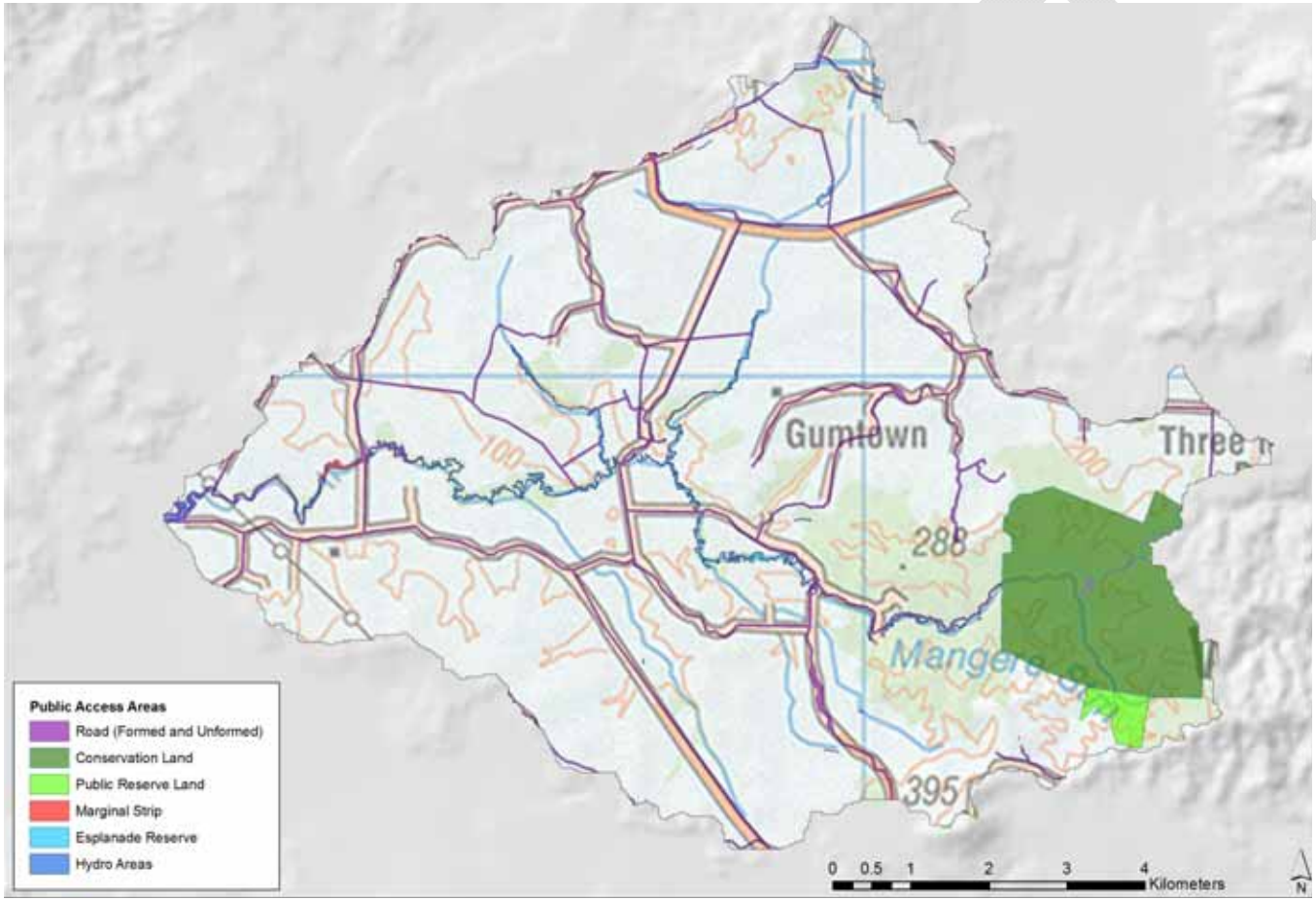
The recommended non-regulatory actions identified by the Mangere group do not impose any direct obligations or costs on land holders. They therefore do not require the same level of explanation as outlined above. However, implementation of recommended non-regulatory actions may come at a cost to the wider community. Any recommended Northland Regional Council actions which involve additional or reprioritisation of local government funding must first be approved by the council under Local Government Act procedures. A brief description of the recommended actions and who is responsible for implementation is described in the table below.

Recommended non-regulatory action	Description	Who
Support the identification of the Mangere River, Mangere Stream and Patuwairua Stream as an esplanade priority area for the creation of esplanade reserves by the district council.	Support the continued identification of the Mangere River, Mangere Stream and Patuwairua Stream reaches as an Esplanade Priority Area in any future district plans for the purposes of conservation, access or recreation.	Whangarei District Council.
Support the identification of the Mangere River, Mangere Stream and Patuwairua Stream as a priority area for the creation of riparian forests by community groups.	Support the identification of the Mangere River, Mangere Stream and Patuwairua Stream reaches as a significant ecological area for enhancement by land holders (public or private) and the community.	Whangarei District Council reserves and land holders.
Encourage stock exclusion where not required by a rule.	The council should promote stock exclusion in all catchment rivers and encourage exclusion where rules do not apply.	Northland Regional Council land advisory and communications.
Encourage stock exclusion within 1-2 metres of waterbodies with land management advice.	The council should promote stock exclusion and setback from all rivers and encourage exclusion where rules do not apply.	Northland Regional Council land advisory and communications.
Encourage erosion control plans in streams where stock exclusion is not required by a rule.	The council should give priority to applications for Erosion control plans (in any year) to Land holders who exclude stock (from streams and/or margins) where they are not required to do so by a rule.	Northland Regional Council land advisory.
Encourage Erosion control plans in pastoral hill-slope erosion-prone areas prior to 2025.	The council should give priority to applications for Erosion control plans (in any year) to land holders in pastoral hill-slope erosion-prone areas – until 2025 (see also recommend regulatory actions).	Northland Regional Council land advisory.
Encourage erosion control plans on other areas of land subject to erosion.	The council should give secondary priority to applications for Erosion control plans (in any year) to land holders who are not in pastoral hill-slope erosion-prone areas.	Northland Regional Council land advisory.
50-100% subsidy for poplars/willows associated with erosion control plan implementation (assessed on a case-by-case basis).	The council should give priority to applications for subsidised willows and poplars to those who have a Erosion control plans.	Northland Regional Council land advisory.

Recommended non-regulatory action	Description	Who
Support the transfer of native fish species by tangata whenua within the catchment.	Support any future licence applications (to the Ministry for Primary Industries) by tangata whenua to transfer native fish in the catchment.	Tangata Whenua, Ministry for Primary Industries.
Support the creation of a fishing reserve by tangata whenua within the catchment.	Support any future reserve applications (to the Ministry of Primary Industries) by tangata whenua to better improve the harvesting of native fish (eels) in the catchment.	Tangata Whenua, Ministry for Primary Industries.
Seek formal restrictions on the release of exotic fish species (for example, trout) from Fish & Game/Department of Conservation.	That the council/tTangata whenua seek a formal written agreement from Fish & Game/Department of Conservation to restrict further releases of exotic fish species above the Mangere Falls.	Northland Regional Council governance, tangata whenua, Fish & Game, Department of Conservation.
Support the exclusion and reduction of Gambusia populations.	The council should provide for exclusion and reduction of Gambusia populations.	Northland Regional Council pest management.
Encourage off-stream storage.	That the council should promote schemes in the Mangere catchment for the taking and storing of water from seasonal base-flows or stormflows.	Northland Regional Council hydrology and communications.

Appendix 1

Figure 1: public reserves: conservation land, public reserve land, marginal strips, paper roads, and esplanade reserves[13]



[13] Access to hydro areas is only available when they are adjacent to public reserves – see Walking Access NZ.

Figure 2: hill-country topography (>15°) freshwater management unit and lowland topography (<15°) freshwater management unit.

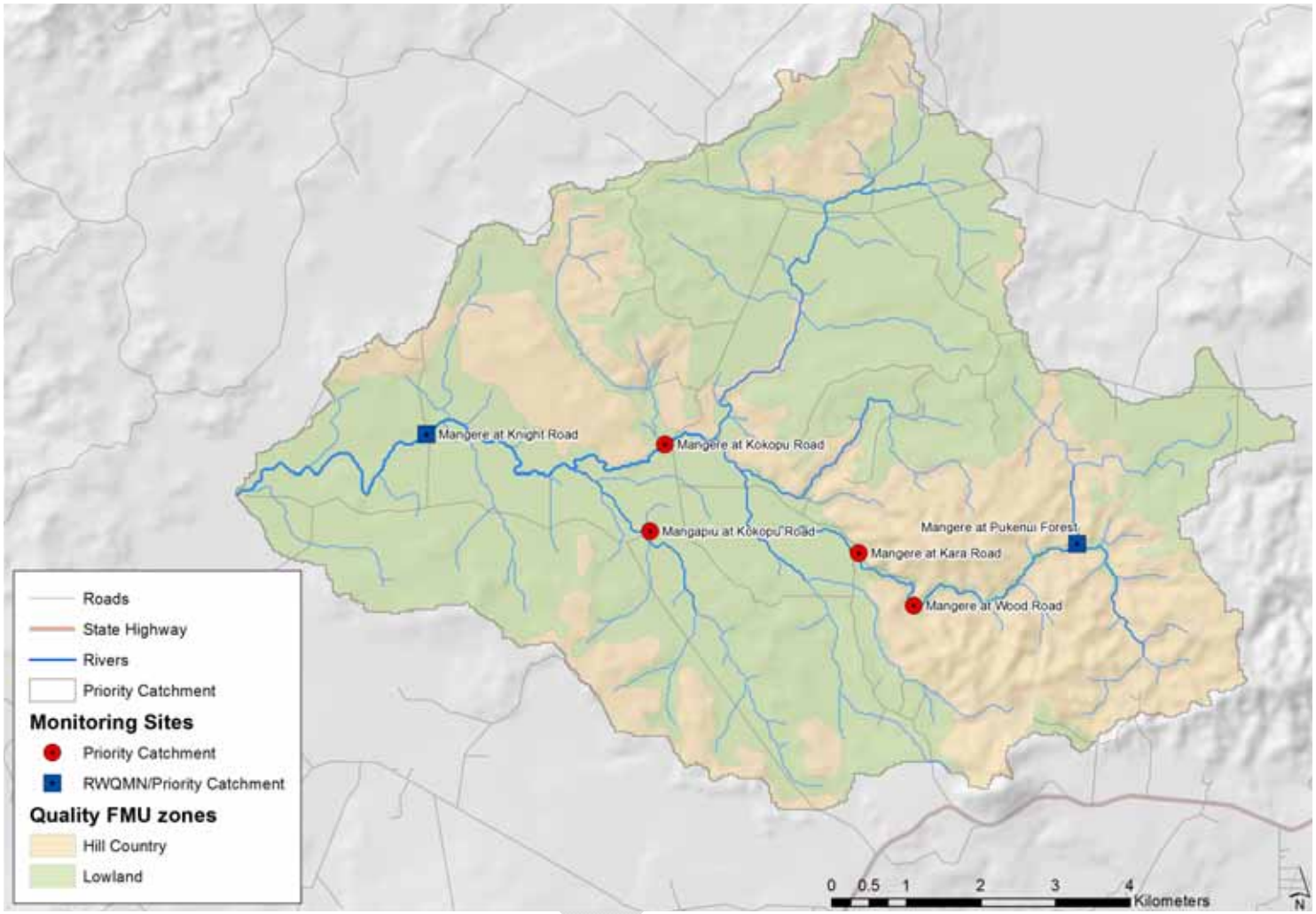
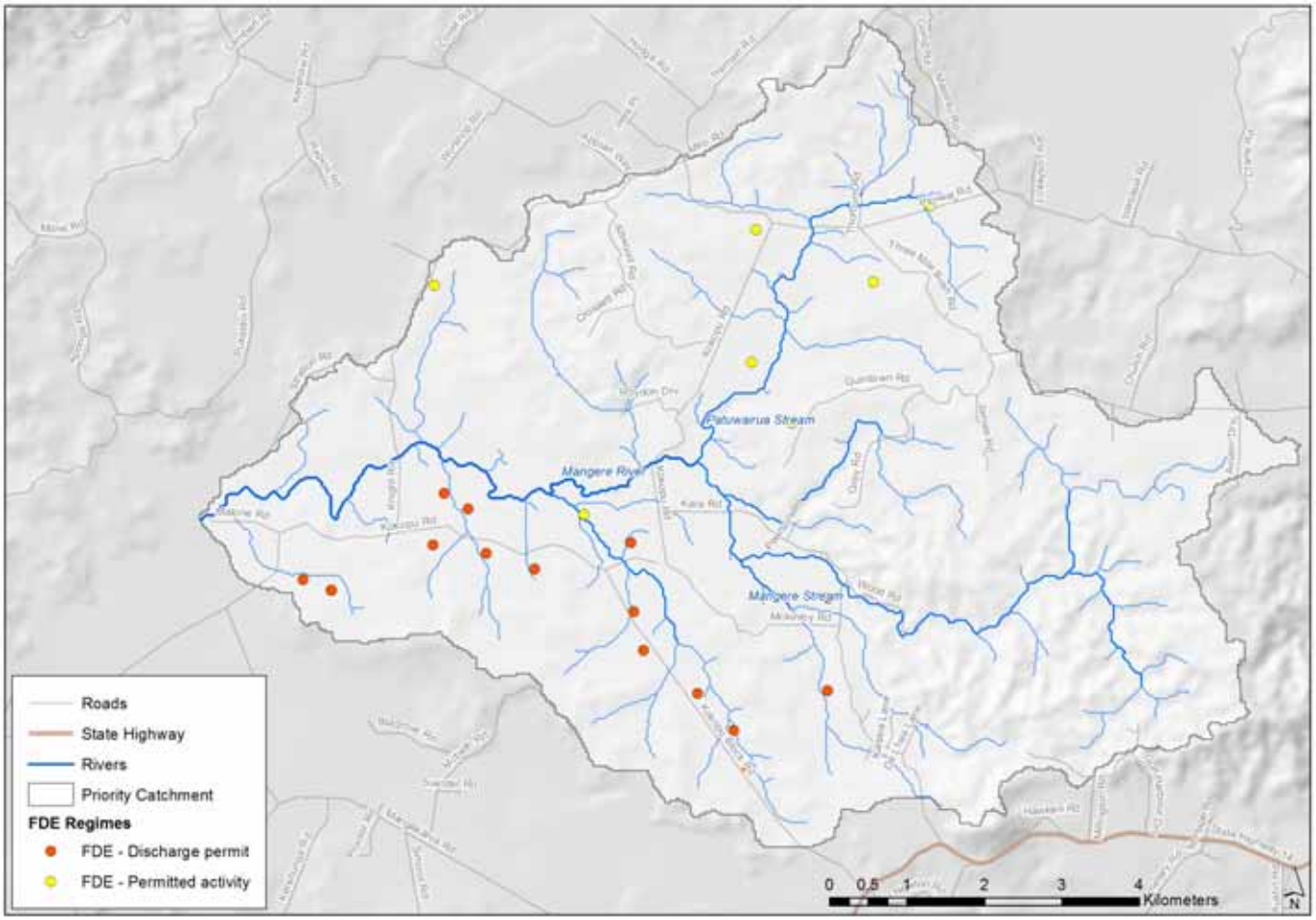


Figure 3: locations of dairy shed discharges – land only discharges (non-consented) and discharges to rivers (consented).[14]



[14] There are only discharges of human effluent to land in the catchment.

Figure 4: aquifers influencing catchment river base-flows.

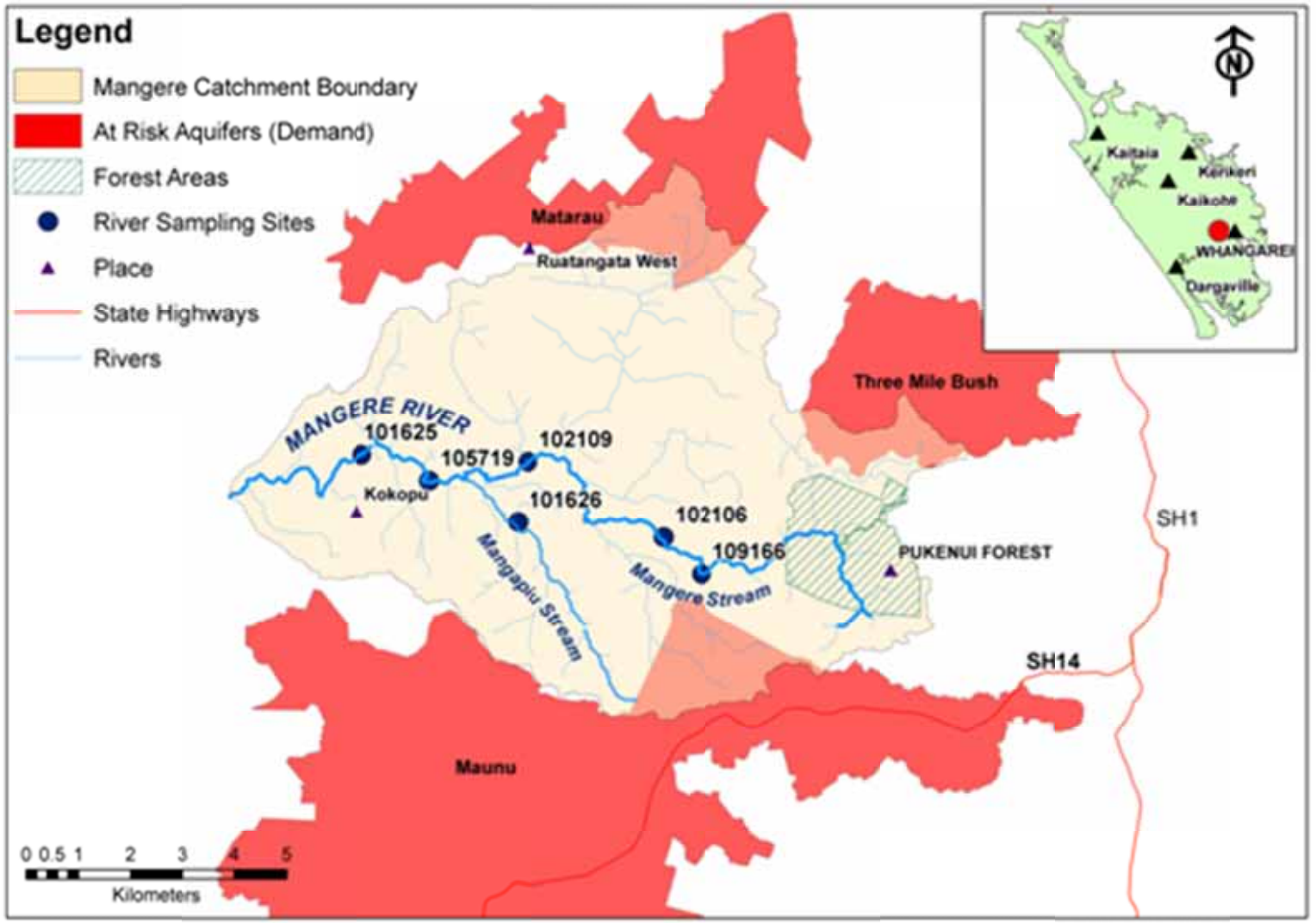


Figure 5: geology in the catchment.

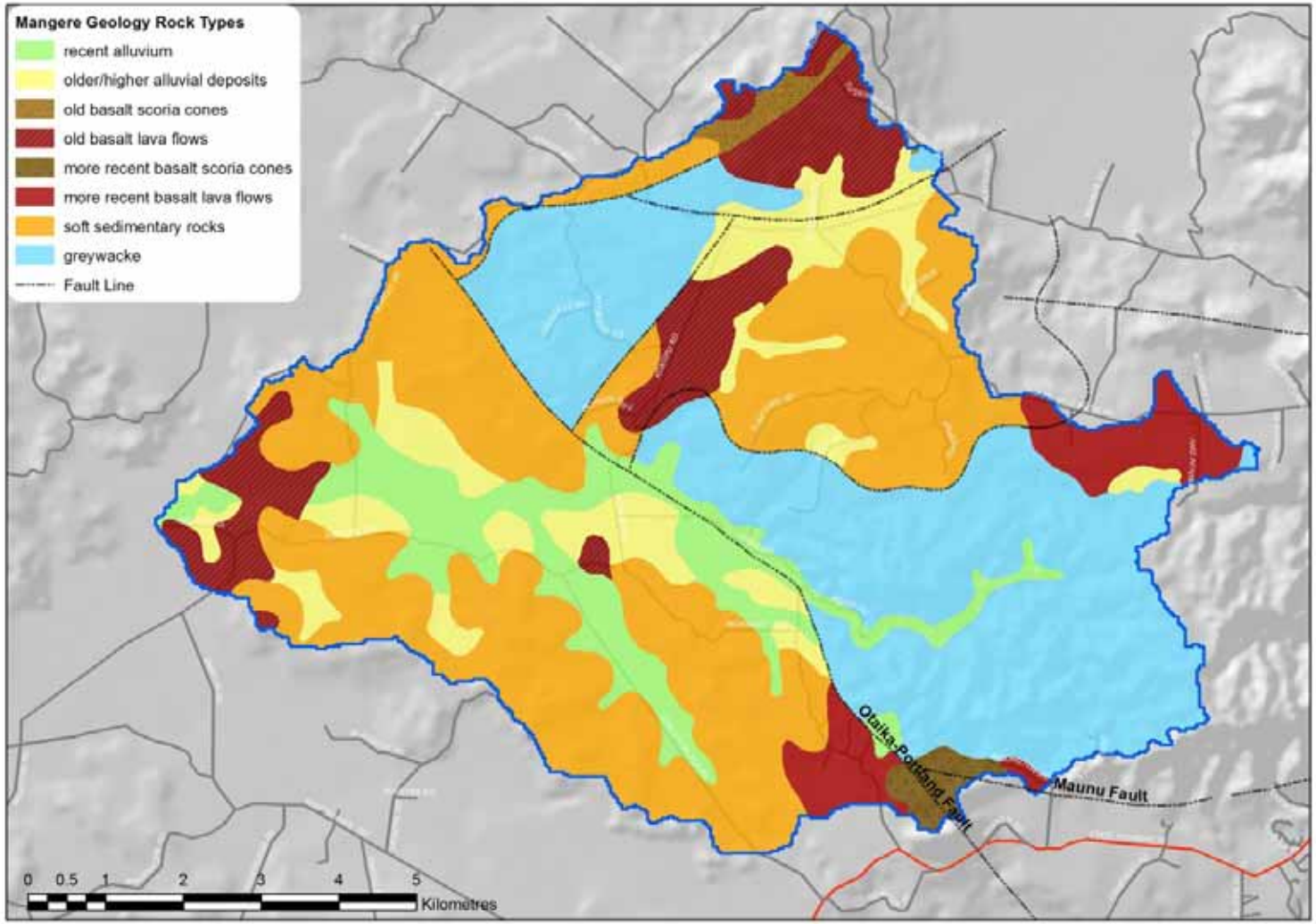
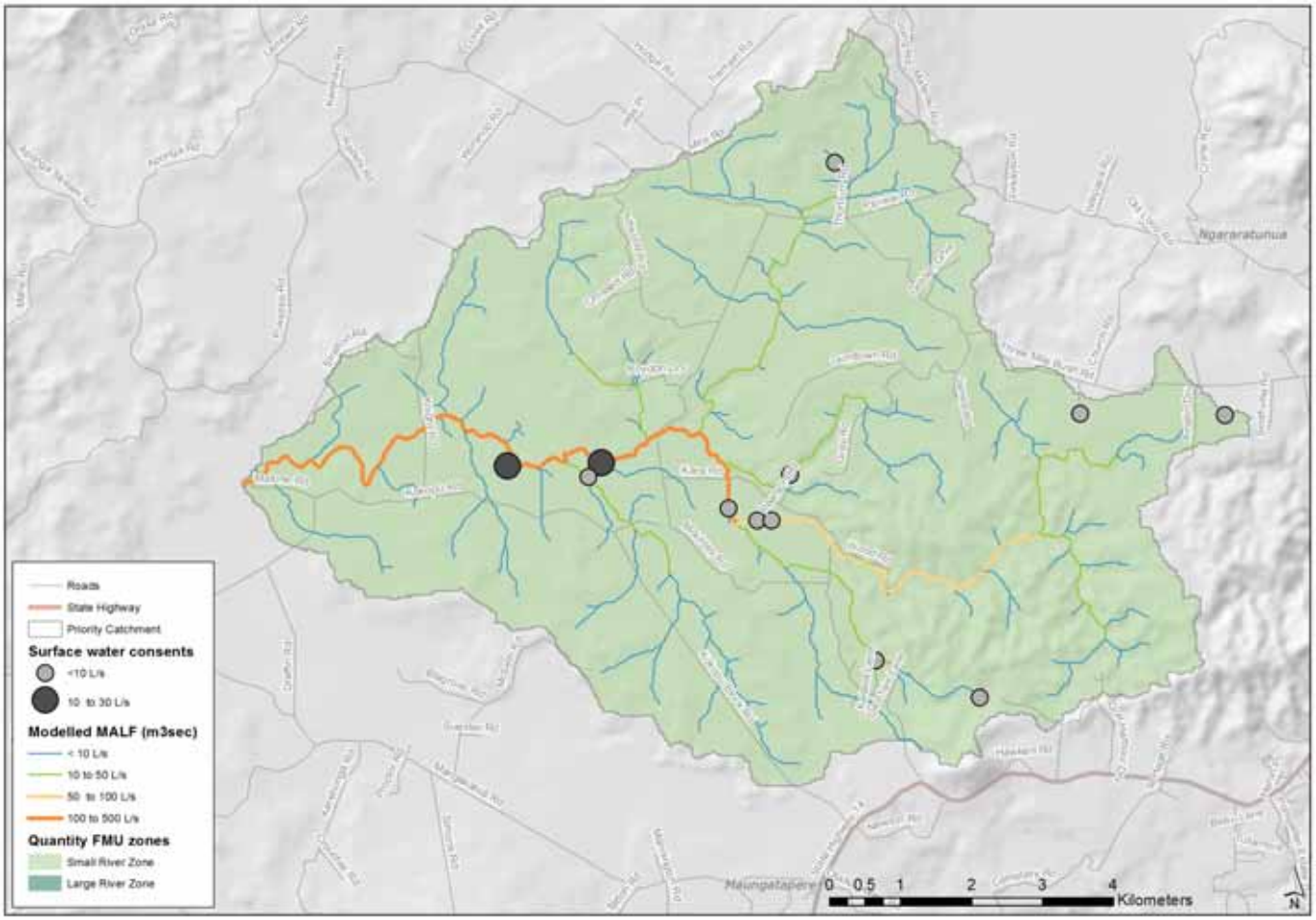


Figure 6: water quantity freshwater management unit zone – small rivers.



Appendix 2

	USES AND VALUES OF WATERBODIES IN THE MANGERE CATCHMENT					
POTENTIAL ISSUES	**AQUATIC ECOSYSTEMS** PLANTS – watercress FISH – eels, bully, banded kokopu INVERTEBRATES – koura	**CULTURAL USES** KAITIAKI – Transfer of native fish	**RECREATIONAL USES** EELING DUCK SHOOTING WADING SWIMMING	**WATER SUPPLY USES** LIVESTOCK DRINKING FARM DAIRY SHEDS DAMMING IRRIGATION	**WATER REMOVAL USES** FLOODWATER (STORMFLOWS) GROUNDWATER (BASE-FLOWS) WASTEWATER	**LAND USE** PASTORAL HORTICULTURE EXTRACTIVE INDUSTRIES SMALL BUSINESS
Pastoral hill-slope erosion *Hill-slope erosion rates under particular vegetation, soils and topography.*	***Negative impacts:*** *increased risk of sedimentation of hard-substrate downstream stream/estuary beds.*					***Positive impacts:*** *Reduced planting and management of trees.* ***Negative impacts:*** *Reduced: pastoral production, livestock shade/fodder, timber production.* *Increased loss of productive soils due to hill-slope erosion.*
Livestock access to waterbodies *Treading sediment losses during base-flows.* *Discharges of faecal*	***Negative impacts:*** *increased risk of habitat avoidance by turbidity sensitive fish and invertebrate species.*		***Negative impacts:*** *increased risk of immersion infections.*	***Positive Impacts:*** *Reduced need to install water supply infrastructure (dams, troughs,*	***Negative Impacts:*** *Increased load of base-flow contaminants (suspended sediment, pathogens, organic matter, nutrients) in*	***Positive impacts:***: *reduced need for access infrastructure (fences, culverts,*

matter (pathogens and organic matter) and urine. *Taking of water for livestock drinking needs.*	*Increased risk of habitat avoidance by ammonia and dissolved oxygen sensitive fish and invertebrate species.* *Increased risk of periphyton 'blooms' (on hard-substrate).*			*reticulation etc).*	*rivers.*	*bridges etc).*
Grazing of waterbody margins *Filtration of contaminants from storm run-off.*	***Negative impacts:*** *increased risk of sedimentation in downstream/estuary hard-substrate beds.*				***Negative impacts:*** *increases loads of stormflow contaminants.*	***Positive impacts:*** *increased pastoral production.*
Deforested waterbody margins *Stream bank erosion from loss of root structure.* *Sunlight and heat in waterbodies due to loss of canopy.*	***Negative impacts:*** *increased risk of sedimentation of downstream hard-substrate stream/estuary beds.* *Increased risk of heat stress in sensitive fish and invertebrate species.* *Increased risk of periphyton blooms (on hard-bottom reaches).*		***Negative impacts:*** *reduced scenic and wilderness value.*		***Positive impacts:*** *reduced need for river flow maintenance.* ***Negative impacts:*** *increases need for nutrient limits to control periphyton blooms (on hard-substrate reaches).*	***Positive impacts:*** *reduces need for planting and management of trees.* ***Negative impacts:*** *reduced shading, fodder and wood.* *Increased loss of productive soils due to stream bank erosion.*
Populations of waterfowl in waterbodies	***Negative impacts:*** *increased risk of habitat avoidance by ammonia and*		***Positive impacts:*** *increased hunting and gathering*		***Negative impacts:*** *increases loads of base-flow*	***Negative Impacts:*** *Reduced pastoral production*

Grazing of pasture. *Discharges of faecal matter (pathogens and organic matter) and urine.*	*dissolved oxygen sensitive fish and invertebrate species.* *Increased risk of periphyton 'blooms' (on hard-substrate).*		*opportunities.* ***Negative impacts:*** *increased risk of immersion infections.*		*contaminants in rivers.*	
Farm dairy effluent eischarges to waterbodies *Discharges of faecal matter (pathogens and organic matter) and urine.*	***Negative impacts:*** *increased risk of habitat avoidance by ammonia and dissolved oxygen sensitive fish and invertebrate species.* *Increased risk of periphyton 'blooms' (on hard-substrate).*		***Negative impacts:*** *increased risk of immersion infections.*		***Positive impacts:*** *reduces the need for wastewater infrastructure (storage, irrigation etc).* ***Negative impacts:*** *increases loads of base-flow contaminants in rivers.*	***Negative impacts:*** *increases artificial fertiliser use on land.*
Waterbody wetlands *Filtration of contaminants from base-flows and stormflows.* *Temporary storage of peak stormflows.*	***Positive impacts:*** *reduces risk of downstream sedimentation of hard-substrate stream/estuary beds.* *Reduced risk of down-stream habitat avoidance by ammonia and dissolved oxygen sensitive fish and invertebrate species.*		***Positive impacts:*** *reduces risk of immersion infections.*		***Positive impacts:*** *reduces stormflow volumes.* *Reduces loads of base-flow and stormflow contaminants in rivers.*	***Negative impacts:*** *reduced pastoral production.*
Water extraction from summer base-flows *In-stream (aquatic species and waterbody activities) needs.*	***Negative impacts:*** *reduces fish and aquatic species habitat.* *Increased risk of*		***Negative Impacts:*** *reduces populations of hunting and gathering*	***Positive impacts:*** *reduces need to install water supply infrastructure*	***Negative impacts:*** *increases concentration of base-flow contaminants.*	***Positive Impacts:*** *enables land use over summer.*

Out-of-stream (water supply) needs.	*periphyton 'blooms' (on hard-substrate)* *Increased risk of habitat avoidance by ammonia and dissolved oxygen sensitive fish and invertebrate species.*		*species.* *Reduces immersion opportunities.*	*(storage).* ***Negative Impacts:** reduces water available to other users.*		
Damming/extraction of stormflows or seasonal base-flows (autumn-spring)	***Positive impacts:** can maintain or increase habitat for fish and aquatic species.* ***Negative impacts:** dams can prevent fish passage.*		***Positive impacts:** dams can provide opportunities for waterbody activities.*	***Negative impacts:** requires construction of water supply infrastructure (storage).*	***Positive impacts:** dam releases can be used to remove periphyton blooms (on hard-substrate reaches).*	***Positive impacts:** enables sustained or intensified production over summer.* ***Negative impacts:** requires construction and operation of individual or community infrastructure.*
Populations of exotic/pest fish *Predation or competition with native fish species by trout and gambusia.*	***Negative impacts:** reduced populations of native fish species due to predation and competition.*		***Positive impacts:** increased recreational fishing and hunting opportunities.*			
Fishing reserves *Mataitai reserves.* *Taiapure reserves.*	***Positive impacts:** increased population of breeding adults.*		***Positive impacts:** reduced availability of mahinga kai for recreational or cultural harvesting.*			

Transfer of native fish *Kaitiaki activities.*	***Positive impacts:*** *increased population of adults.*	***Positive impacts:*** *practising of culture.*	***Positive impacts:*** *increased availability of mahinga kai for recreational or cultural harvesting.*			
Public reserves *Esplanade reserves.* *Infrastructure reserves.*	***Positive impacts:*** *enables community conservation.*		***Positive impacts:*** *enables community access and use.*	***Positive impacts:*** *enables community owned dams and water.*	***Positive impacts:*** *enables community wetlands and/or vegetated margins.*	***Positive impacts:*** *enables land holder management of waterbodies.* ***Negative impacts:*** *reduces landholder use of waterbodies.*