Te Kaunihera o Te Tairāwhiti
GISBORNE
DISTRICT COUNCIL

# Mahere Whakamārama mo te Kohinga Wai o Ūawa

## Ūawa Catchment Plan
## Background Information Document

**July 2024**

*Photo credit: Mangahauini towards the coast, Phil Yeo Photography for GDC.*

# CONTENTS



# INTRODUCTION
# HE KUPU ARATAKI

This document outlines the background and key technical information to support the development of the Ūawa Catchment Plan.

It provides a snapshot of the Ūawa Catchment Plan area and its sub-catchments, in terms of the rivers' values, water quality and ecological health. The document provides a starting point for understanding the catchment area and a context to discussions on the setting of future freshwater objectives and associated limits. These discussions will support the development of the Ūawa Catchment Plan.

The rivers and aquifers are ranked as regionally and locally significant for the native species, irrigation, drinking water and mahinga kai values they support.

There are also several regionally significant wetlands and small lakes within the catchment. However, many of the rivers are heavily degraded. Most recently the impacts of Cyclone Gabrielle have been severe, but there have been longstanding issues of significant sedimentation since Cyclone Bola and E.coli bacteria levels are also high in many locations.

The Catchment Plan is being developed under the National Policy Statement for Freshwater Management 2020 (NPS-FM) and the Tairāwhiti Resource Management Plan (TRMP) review programme. These documents set the high-level direction for Council to manage land and water resources.

Some of the key terminology from the NPS-FM is attached as Appendix 1.

## WHAT IS A CATCHMENT PLAN?

A catchment plan is a tool that focuses on managing freshwater and landuses at a catchment scale. Catchment plans provide a way to:

- identify and understand the freshwater values relevant to the catchment area,
- set a vision for how we want to see the catchment area in the future, and
- outline the requirements and actions needed for achieving that vision.

The Ūawa Catchment Plan will provide a pathway for managing freshwater quality and quantity into the future. This pathway will be set in conjunction with tangata whenua, stakeholders and the community and will help Council make better decisions about land and water use within this area.

## WHERE DOES THE ŪAWA CATCHMENT PLAN APPLY?

The Ūawa Catchment incorporates the stream and river systems in and around Tolaga Bay and Tokomaru Bay. It includes the small coastal stream catchments from Waihau Bay to Koutunui Head –including stream systems flowing into Karaka Bay and Anaura Bay as well as the two main river catchment areas of the Ūawa and Mangahauini River systems. The Catchment Plan has a combined land area of 668 $km^2$. Within the Ūawa River system the key tributaries are the Waiau River, Mangaheia River, Mangatokerau River, and Hikuwai River.

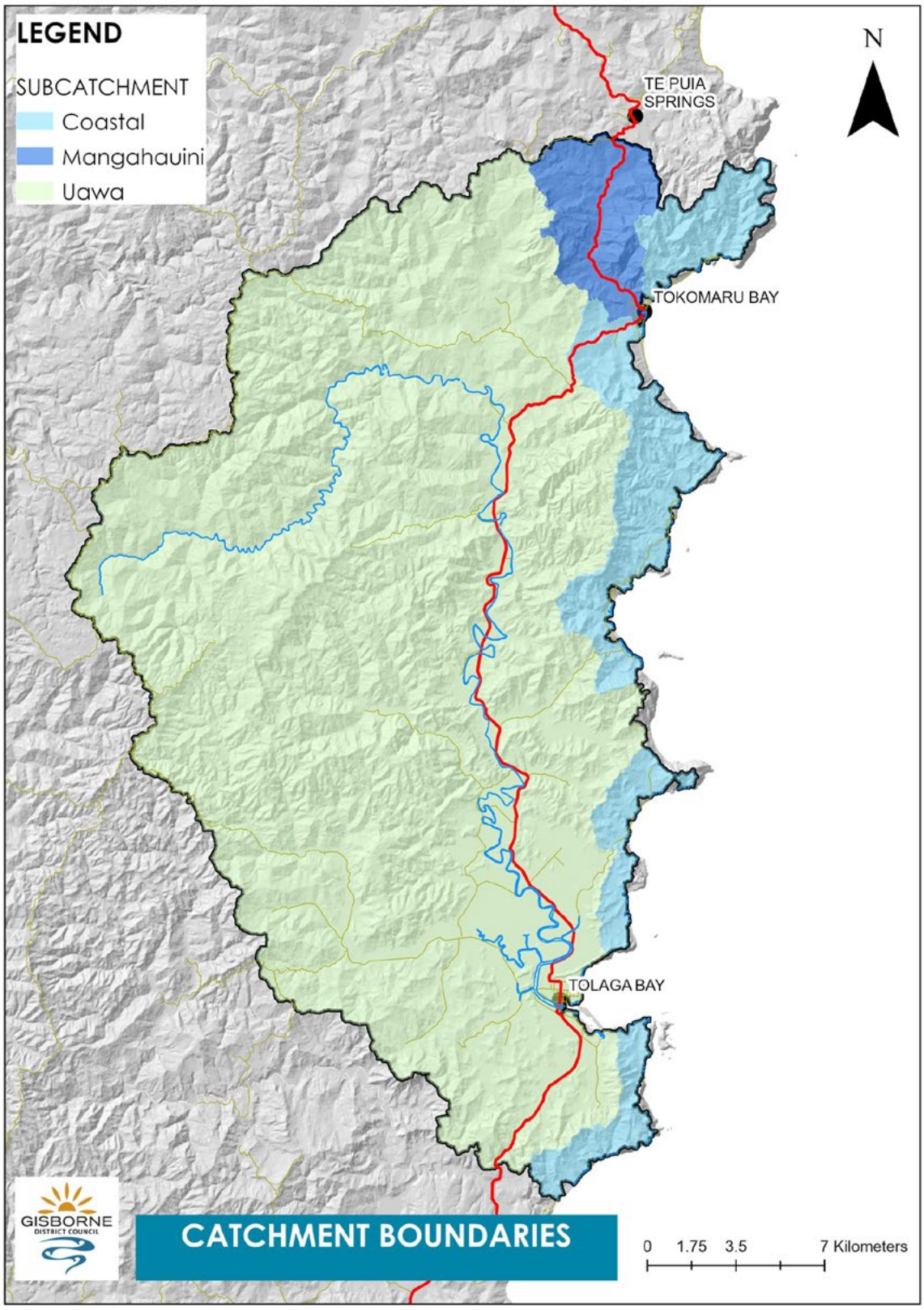



**Figure 1: Ūawa Catchment Area**

## TE MANA O TE WAI

Te Mana o te Wai is the fundamental concept of the NPS-FM. Te Mana o te Wai refers to the vital importance of water. Te Mana o te Wai recognises that protecting the health of freshwater protects the health and well-being of the wider environment – including people.

Te Mana o te Wai must protect the mauri of the wai. All freshwater management must give effect to Te Mana o te Wai, including the Ūawa Catchment Plan. Te Mana o te Wai sets out a hierarchy of obligations to ensure that freshwater is managed in a way that prioritises (in this order):

- the health and well-being of water
- the health needs of people
- the ability of people and communities to provide for their social, economic and cultural wellbeing.

The NPS-FM 2020 strengthens and clarifies Te Mana o te Wai by providing stronger direction on how Te Mana o te Wai should be applied when managing freshwater.

As a requirement, every regional council must engage with tangata whenua and communities to determine how Te Mana o te Wai applies to water bodies and freshwater ecosystems in the region.

## WHAT IS REQUIRED IN A CATCHMENT PLAN?

Catchment plans identify the freshwater values objectives, limits and targets that apply to waterways (or groups of waterways) within each catchment area. They will also set out any action plans and projects to achieve the objectives, limits and targets.

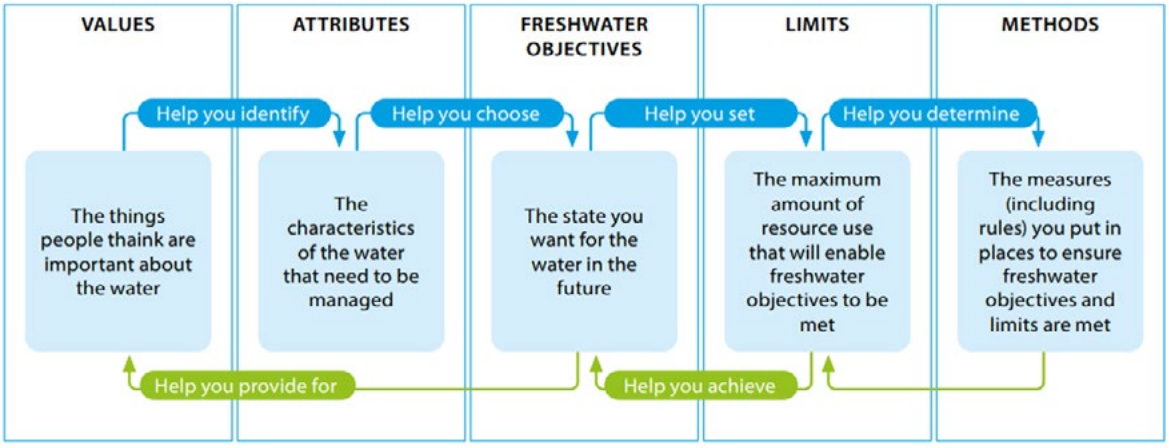
The NPS-FM provides a framework that must be followed to achieve this - the National Objectives Framework (NOF). It is intended to be a nationally consistent approach to setting freshwater objectives, with flexibility to recognise and provide for local circumstances

**The Ūawa Catchment Plan will implement the NPS-FM by:**

- Giving effect to Te Mana o te Wai.
- Identify values and set freshwater objectives according to the NOF.
- Meet community and mana whenua values and aspirations.
- Set the limits for use, water quality and water quantity and land management that achieve, protect and/or enhance the values identified in the catchment.
- Enable a holistic approach to land and water management, and a variety of regulatory and nonregulatory methods.

The following summarises the steps required to meet the NOF:

- Identify Freshwater Management Units (FMU) – whether and how we split up the Catchment Plan area for management.
- **Within each FMU identify:**
  - monitoring sites
  - swimming sites
  - locations of habitats of threatened species
  - outstanding waterbodies
  - natural wetlands
  - freshwater values for each FMU (e.g., ecosystem health, human contact, threatened species, mahinga kai, fishing, animal drinking water).
- Set environmental outcomes and objectives
- Identify water quality attributes for each value.
- Identify the baseline states for each attribute.




- Set target states for attributes.
- Set target states for environmental flows and water levels.
- Set limits for water quality attributes.
- Develop action plans to achieve the environmental outcomes.

The NPS-FM also requires that long-term visions are developed for each catchment. This includes:

- Setting ambitious but achievable goals.
- Identifying a timeframe to achieve those goals.
- Identifying how to give effect to Te Mana o te Wai.
- Identifying any Māori freshwater values that apply values identified in the catchment.
- Enable a holistic approach to land and water management, and a variety of regulatory and nonregulatory methods.

## OTHER NATIONAL REGULATION

In September 2020, the Resource Management (National Environmental Standards for Freshwater) regulations and the Resource Management (Stock Exclusion) regulations were introduced. The new regulations cover a range of activities that may relate to the Ūawa Catchment Plan area including standards for dairy farming, winter intensive grazing, stock exclusion, natural wetlands and culverts. The impacts of these new regulations and standards will be considered as we move through the process.

## MĀORI FRESHWATER VALUES

Mahinga kai was elevated to a compulsory value under the NPS-FM 2020 and is required to be implemented in the NOF by 2026. This gives greater recognition to values that Māori hold for freshwater and provides for tangata whenua1 to meaningfully exercise their freshwater interests and obligations.

Elevating mahinga kai to a compulsory value promotes Māori measures of freshwater health to the same status as other compulsory biophysical values.

While mahinga kai is a compulsory value, the NPS-FM 2020 provides for identification of any Māori freshwater values. It also requires that tangata whenua are enabled to identify their freshwater values and are involved in implementing the NOF and in decision-making. Māori freshwater values are specific to tangata whenua.

Mahinga kai is affected by environmental, social,

spiritual, and cultural issues, and is therefore understood and described in quantitative, semi-quantitative, and qualitative means. It is about tangata whenua place-based connections and relationships to water.

Accordingly, Council will partner with tangata whenua to ensure they are able to develop their Māori freshwater values (in particular mahinga kai) to the extent possible within regulated timeframes.

## CATCHMENT-SPECIFIC ENGAGEMENTS

Council will use a range of ways to seek community views during the development of the catchment plan. This will include engaging with tangata whenua, utilising existing community groups and working with a stakeholder advisory group through the detailed development of the catchment plan. The project enables everyone to input their thoughts and ideas into the development of the plan.

To give effect to the NPS-FM, Council must actively involve tangata whenua in freshwater management. Te Aitanga a Hauiti has mana over the Ūawa catchment. Preliminary engagement with Te Aitanga a Hauiti has been completed and the team is currently working to confirm an approach and work programme for 2024.

The output from the series of hui, as well as other community communication and engagement initiatives, is the completion of draft Catchment Plan.

The Freshwater Planning team will then take the draft Catchment Plan to elected members to approve for public notification. This starts a formal process for receiving submissions under the RMA. Once the submission process is completed, Council will submit its Freshwater Planning documents to the Chief Freshwater Commissioner who will then convene a Freshwater Hearings Panel to make recommendations to Council on the plans.

Wider stakeholder engagement is also essential in the development of the Ūawa Catchment Plan. A stakeholder questionnaire will be developed to understand stakeholder thoughts on freshwater issues in the first instance. Sector specific meetings will also be advertised as the plan progresses.

Dates for these consultation and engagements will be on the Ūawa catchment webpage when they are released.

## INDICATIVE TIMELINE

Under the NPS-FM Council must publicly notify its statutory freshwater planning instruments by the end of 2024. The severe weather events in early 2023 have challenged our ability to meet these timeframes. Government has recognised this challenge and has granted a two-year extension to freshwater legislative timeframes, though the new Government following the 2024 election has signalled a new deadline of December 2027 for all regional councils.

The Freshwater work programme is currently being reset with the focus on allowing for more meaningful engagement in 2024 to develop the catchment plan.

Council plans to have prepared a draft Ūawa Catchment Plan by mid-2025.

# DESCRIPTION AND KEY VALUES
# HE WHAKAMĀRAMA ME NGĀ UARATANGA MATUA

## CULTURAL HISTORICAL CONTEXT

The Ūawa River, also known as the Uawanui-a-Ruamatua, has great spiritual, cultural, traditional, and economic significance for Te Aitanga a Hauiti. Uawanui-a-Ruamatua means "The great landing place of Ruamatua" and evokes the traditions of Hawaiki and the deity, 'Rua of Great Abundance'. Te Aitanga a Hauiti have occupied the lands along the Ūawa River, its reaches and tributaries, for generations. Integral to the identity of Te Aitanga a Hauiti are the spiritual kaitieki residing in the river. The remains of the eponymous ancestor, Hauiti, were interred in a cave, Te Ana o Hauiti, on the southern bank of the river close to the present day Rawheoro Marae.

It is important to note that the Ūawa River and its tributaries upstream of the coastal marine area is within Ngāti Porou Statutory Acknowledgement (page 8).

The townships in this catchment are Tolaga Bay, Anaura Bay, and Tokomaru Bay. On 21 October 1769 the crew of Endeavour arrived at Anaura Bay, where Lieutenant James Cook recorded in-depth descriptions of Māori horticulture. Tolaga Bay has a slightly wetter climate than Turanganui-a-Kiwa/ Poverty Bay Flats, but there are still many crops which would be unable to be grown without irrigation. With the current boom in the horticulture sector there is significant interest in irrigation of crops at Tolaga Bay, with one consent issued and two lodged in the 2018-2019 water year.

The catchment was massively affected by the devastation caused by Cyclone Bola. As a consequence most of the worst eroding land was planted in forestry. Since harvest began landsliding and debris flow have been frequent in the catchment and there have been significant "slash events" following major flood events. The events have occurred in 2012, 2014, 2018, and the most recent post ex-tropical Cyclone Hale and Cyclone Gabrielle respectively in January and February 2023. The impacts of Cyclone Gabrielle on the Ūawa had come close to or if not more devastating to the impacts left by Cyclone Bola. Pakarae catchments and the upper Waimoko and Pouawa catchments.

## ŪAWA SUB-CATCHMENT

The Ūawa sub-catchment has a total land area of 55,982 hectares located on the east coast area north of Gisborne. There are two main river systems which make up the Ūawa Catchment – the Mangaheia and the Hikuwai.

The Waiau River rises from an altitude of 200 m, flowing for approximately 30 km in an easterly direction to the small settlement of Hikuwai. From there, the river is called the Hikuwai River, and flows in a southerly direction close to the settlement of Mangatuna. From the confluence there with the Mangatokerau River, it becomes the Ūawa River which flows for approximately 23 km passing through the township of Ūawa or Tolaga Bay to the Pacific Ocean.

The Hikuwai River is known for high flows in flood situation where the water level can quickly rise by more than 10 m as measured by a telemetry site at Hikuwai bridge. Flow, rainfall and a range of water quality parameters are measured at Willow Flat and Hikuwai Bridge sites on the Hikuwai river.

### Geology

The majority of the upper Hikuwai River has a strong pre-disposition for being easily eroded by natural processes. Weak geological structures, steep slopes, climatic conditions and lack of vegetation results in significant amounts of material continually entering the riverbed. A proportion of this material is argillite which provides reasonable metal for roading. A large amount is softer mudstone however, which disintegrates rapidly.

### Land-use activities

Flat land in Ūawa subcatchment represents the single largest area of arable flats outside of the Turanganui-a-Kiwa/Poverty Bay Flats. The land is mainly used for annual cropping but some locations have also been developed for grapes and kiwifruit. Key limitations on developing permanent horticulture are the lack of a flood control scheme and low availability of freshwater. The flat grade of the Hikuwai and Mangaheia Rivers means that seawater flows inland a long way. Irrigation water for crops has had to be piped several hundred meters to avoid the saline characteristic of the water in the Hikuwai River.

The Waiau and Mangatokerau sub-catchment areas are almost entirely in plantation forestry, about 50% of the Mangaheia sub-catchment area is in plantation forestry. About 45% of the Hikuwai subcatchment is in plantation forestry. The settlement of Tolaga Bay occupies an area of approximately 70 hectares (0.125%) of the catchment.

The catchment was massively affected by the devastation caused by Cyclone Bola and as a consequence most of the worst eroding land was planted in forestry. Since harvest began landsliding and debris flow have been frequent in the catchment and there have been significant "slash events" which have occurred with increasing frequency since 2010. Approximately 45% of harvesting has occurred in the catchment to date.

## WATER VALUES

### Freshwater ecology

There have been only limited studies of freshwater ecosystem values across the catchment and these values have been heavily impacted by severe weather and ongoing sedimentation. Tuna (long fin eel) are found in the main rivers and the catchment traditionally has been regarded as a stronghold for them, as well as home to short fin eel also. Other indigenous fish species include inanga (whitebait), giant bully, and common bully.

### Wetlands

There are numerous small wetlands and lakes within the Ūawa Catchment. The Nuhiti Wetland in the Nuhiti forest highlands is a regionally significant wetland.

### Gravel extraction

Waiau River and Hikuwai River are both locations where gravel extraction consents are in place.

### Recreation

The Ūawa River is an important recreational area for the Tolaga Bay community. There are many swimming holes through the river system – some tragically lost due to sedimentation from recent events. The Ūawa River is also used for water skiing and waka ama.

## MANGAHAUINI STREAM SUB-CATCHMENT

The Mangahauini sub-catchment is approximately 2,500 hectares and covers the area north-west of and flowing into Tokomaru Bay. The highest elevation of the catchment is 539 m above sea level. The Mangahauini River flows through farmland, exotic forest and reverting indigenous scrub throughout the catchment. The Mangahauini River is the largest of five catchments flowing into Tokomaru Bay between Mawhai Point and Koutunui Point.

Major floods occurred in 1916, 1924, 1950, 1963 and the 2022 flood washed away part of the State Highway 35 bridge at Tokomaru Bay, which was last rebuilt in 1966. The new bridge is downstream from its predecessor.

### Geology

The geology of the catchment area is a mix of frittered mudstone, bedded mudstone, sandstone, with crushed argillite. Easy slopes have a mantle of moderately weathered tephra. Like all of the East Coast this soft rock geology means that erosion is very common. Much of the catchment area was planted in pine forestry following Cyclone Bola.

### Land cover / Land use

The catchment is a mix of sheep and beef farming, forestry and native forest areas. The township of Tokomaru Bay is situated on the flat land by the river mouth.

## WATER VALUES

### Freshwater ecology

There have been few studies into the freshwater ecology of the Mangahauini River. However the area is known to be part of the wider East Coast stronghold area for tuna and also home to short finned eels. There are likely to be a range of other native fish species such as inanga and bullies as well as some kokopu species present in the catchment.

### Recreation

The Ūawa River is an important recreational area for the Tolaga Bay community. There are many swimming holes through the river system – some tragically lost due to sedimentation from recent events. The Ūawa River is also used for water skiing and waka ama.

### Food gathering / Mahinga kai

Traditionally the Mangahauini River has been an important source of mahinga kai for local mana whenua. Tuna from the river in particular is highly valued.

## SMALLER COASTAL CATCHMENTS

The coastal catchments include a wide range of small streams, wetlands and lakes from Waihau Bay to Koutunui Head including:

- Moanapohatu, Waitangaru, Waionanga, Waihakeke, Waihau, Wairua, Hapenui, Māhanga, and Takirau Streams flowing into Waihau Bay
- Whakamarino Stream flowing into Wairere Beach
- Waitapu and Waikirikiri Streams flowing into Karaka Bay
- Waihekura, Kopunui. Waiokahu and Kaiaua Streams flowing into Kaiaua Bay
- Raponga Stream flowing to Mārau Beach
- Anaura, Waipare and Karoronui Streams flowing into Anaura Bay
- Waioue, Waihirere, Karorotuau Streams flowing to the coast from the Nuhiti Forests
- Waihoa, Waikare, Waikoko, Te Puka, Waitekeo, Mangamate, Waima and Waihi Streams flowing into Tokomaru Bay.

### Geology and Land use

The geology of the coast sub-catchments is similar to the rest of the catchment plan area. This soft rock geology means that erosion is very common. There are however large areas of land that retain original native forest in these catchments, as well as mixed pastoral farms and some forestry. Overall however these coastal catchments retain much more of the indigenous vegetation cover than the rest of the catchment plan area.

## WATER VALUES

### Freshwater ecology

The coastal catchments are made up of small streams and have not been the subject of any specific freshwater ecology assessments. However many of the streams flow from bush catchments, and have few barriers to fish movement between the sea and the coast. As such they are expected to be important reservoirs of freshwater biodiversity. Tuna and inanga are likely to be widespread as well as species such as bullies and a range of kokopu species. Streams flowing out of large forests such as between Tokomaru Bay and Koutunui Head and from between Waihoa and Nuhiti may well be the locations of rarer species such as native lamprey.

### Significant recreation areas

The stream mouths and lagoons along this stretch of coastline are important swimming and recreational areas. Areas such as the Waitakeo Stream, Waiotu Stream, Anaura Stream/Lagoon, and Hawai Stream are all popular summer swimming spots.

### Wetland systems

There are many small lakes and wetlands within these coastal catchments often arising from springs in the headwaters of stream systems.

# HYDROLOGY
# MĀTAI AROWAI

### Rainfall

Gisborne District Council (GDC) has rain gauges at five sites in the Ūawa Catchment Plan area.

These are:

- Tokomaru Bay at School
- Hikuwai River at No. 4 Bridge
- Hikuwai River at Willowflat
- Ūawa at SH35 Bridge
- Mangaheia at Willowbank
- Tuahu Station

Historically the area receives about 1800 mm of rain per annum and is prone to heavy rain events due to its location sandwiched between the Raukumara Range and the coast. While on average August is the wettest month, like the rest of Tairāwhiti the catchment plan area is at risk of summer heavy rain events as cyclones come down from the tropics. Cyclones Hale and Gabrielle are the most recent of these and climate change projections suggest such events will increase in their frequency.

Table 1 uses the rainfall data available in Council's database as of 19 February 2024. Council carries out periodic reviews of these data and the values may change.

**Table 1. Summary of rainfall data (2012-2023) for various sites in the Ūawa catchment**

| Site | Mean Annual Rainfall (mm) | Maximum Annual Rainfall (mm) | Minimum Annual Rainfall (mm) | No. of years discounted from analysis |
|---|---|---|---|---|
| **Hikuwai River at No 4 Bridge** | 1907 | 3707 | 1107 | 3 |
| **Hikuwai River at Willowflat** | 1660 | 2853 | 1107 | 2 |
| **Mangaheia at Willowbank** | 1526 | 3154 | 717 | 2 |
| **Tuahu Station** | 1745 | 2955 | 1308 | 2 |
| **Ūawa River at SH35 Bridge** | 1357 | 3804 | 701 | 0 |

### River water levels and flows

River water level and flow data are available from Council's monitoring sites on the Mangaheia River at Willowbank and on Hikuwai River at Willowflat (see Table 2). Flow is inferred from water level using rating curves. The rivers in the Ūawa Catchment Plan area can generally be described as small on a regional scale.

Table 2 uses the flow data available in Council's database as of 19 February 2024. Council carries out periodic reviews of these data and the values may change. The statistics have been derived using mean daily flow data.

There has been no analysis completed on any of the catchments to confirm the requirements for freshwater habitat and flow conditions. As such, the default values of 90% of Mean Annual Low Flow (MALF)3 and an allocation of 30% of MALF would apply. For scheduled rivers in the TRMP, the values are 100% of MALF for minimum flow and 30% of MALF for allocation applies.

**Table 2: Summary of flow data at monitored sites in the Ūawa catchment.**

| Site | Catchment area ($km^2$) | River Flow ($m^3/s$) | | | | | | Record used for flow statistics | No. of years discounted from analysis of MALF |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Median | Upper Quartile | Lower Quartile | Q5 (flow exceeded 5% of the time) | 7-Day MALF | | |
| **Mangaheia at Willowbank** | 41.08 | 1.021 | 0.258 | 0.604 | 0.106 | 3.536 | 0.046 | Jul-1989 to Jun-2023<br>MALF (Jul-1989 to Jun-2022) | 7 |
| **Hikuwai River at Willowflat** | 306.56 | 9.006 | 2.503 | 6.368 | 0.873 | 31.467 | 0.391 | Jul-1975 to Jun-2023<br>MALF (Jul-1994 to Jun-2022) | 2 |

### Groundwater

There have been significant investigations into the groundwater system around Tolaga Bay. Council has identified that there is a small shallow unconfined sand aquifer that underlies part of the township. This has been contaminated with E.coli and is currently not suitable for drinking, though is used by some households for supplementary supply. Being a shallow aquifer it will be recharged from rainwater and therefore if sources of E.coli are controlled, the improvements in water quality would result. The investigations to date have not identified the specific recharge areas for the aquifer.

A deeper marine gravel aquifer is also found under the Ūawa Catchment, but this is saline and due to the low gradient of the rock formation it is expected that saline intrusion of groundwater has occurred across the whole valley.

### Water allocation

Water takes in the Ūawa sub-catchment fall into two categories:

- Permitted takes for stock water and domestic use.
- Consented takes mainly for irrigation.

Due to the small size of the rivers and the saline wedge being a long way inland, there are only small volumes of water available for use. A groundwater system is also found under the Ūawa catchment which is particularly used to supply domestic water within Tolaga Bay township. The larger aquifer outlined above is saline and not suitable for freshwater uses.

# WATER QUALITY INFORMATION
# HE WHAKAMĀRAMA KOUNGA WAI

## MONITORING SITES

Council undertakes monthly State of the Environment (SOE) water quality monitoring at sites throughout the region. This involves a monthly collection of water quality samples using national standardised methodology. Samples are sent to a lab for analysis of a range of chemical, physical and bacterial parameters. Field data such as water temperature and clarity are recorded at the same time.

Biomonitoring sites are also included in the monitoring network. These sites are sampled annually in summer. A field assessment of the habitat quality deposited sediment and density of periphyton is conducted, and a sample of macroinvertebrates and periphyton are collected. The samples collected are analysed in a laboratory.

## WATER QUALITY

An analysis of the monthly water quality monitoring data for 2017/18 -2021/22 is shown in Appendix 3. This includes a comparison with the NPS-FM attribute states.

The NPS-FM attribute states provide a nationally consistent reference for a range of water quality and ecosystem health indicators. Contaminant levels are graded into a series of bands with A-Band being the lowest contaminant level and hence being indicative of good water quality (for that parameter). Lower bands are indicative of progressively higher contaminant concentrations and hence lower water quality. D-Band represents the level at which contaminant concentrations occur at levels that have been identified as being unacceptable nationally – these are called national bottom lines. Where a site is indicated as being below a national bottom line, actions are required to improve water quality over time.

It is worth noting that a site may have good water quality for some parameters, but poor water quality for others. This may reflect the nature of the contributing catchment and its geology and land use.

## WATER QUALITY OVERVIEW

The following summary is the overview of the monthly SOE water quality monitoring results:

### Aquatic ecosystem health

The analysis of data shows that aquatic ecosystem health across all monitored sites is poor. It should be noted that there are no monitoring sites in the Mangahauini catchment and only one in the coastal catchments, and this is an area where further information is needed.

However in all the sites within the Ūawa-Hikuwai-Mangaheia River system, aquatic ecosystem health metrics fall below national bottom lines. The only site that meets all bottom lines for aquatic ecosystem health is the Makomuka Stream at Waiapu Road – but this is still in the C band with poor health of aquatic ecosystems.

Periphyton levels at the monitored sites are variable. The Mangaheia River site falls below the National Bottom line while the other sites appear to have generally low levels of periphyton.

### Nutrients and physical water quality

In relation to nutrients at the two sites monitored – Mangaheia and Hikuwai Rivers, the levels are generally good. Both monitoring sites show long term trends of improvement for nitrate and ammonia, and more recently for dissolved reactive phosphorus.

Dissolved oxygen levels in both streams are however poor – being in the C band for both sites. This is probably a reflection of the low summer flows – combined with an absence of riparian vegetation. In the Mangaheia River periphyton blooms are also implicated.

Suspended fine sediment levels (visual clarity) from the monitoring period are good – falling within the A band. However, a degrading trend in the Mangaheia River is observed. In contrast with suspended fine sediment levels, deposited sediment levels in many of the monitored sites are particularly poor. Five of the monitored sites fall below the national bottom line, and in the case of the Mangakino Stream and Mangaheia River sites the median deposited sediment values are 100% - effectively the entire river bottom has been smothered. This has arisen from the 2018 winter storm event – and subsequent events where vast quantities of sediment have been deposited on riverbeds. The water column recovers from these events and the water clears, but the deposited sediment will generally be remobilised if the bed is disturbed.

### Bacteria

E.coli is monitored monthly at the Mangaheia and Hikuwai Rivers sites. At both these sites E.coli is in the C Band with a degrading trend in the Mangaheia River. Alongside this there is monitoring of 5 sites over summer during the swimming season – two streams at Anaura Bay, Ūawa River, Waiotu Stream and the Mangahauini River.

Long term monitoring of these sites shows that with the exception of the Anuara Bay South lagoon, E.coli is an issue as during summer, with:

- Ūawa River is suitable for swimming 81% of the time.
- Mangahauini River and Anaura Bay lagoon north are suitable for swimming only 48% of the time.
- Waiotu Stream at Waiotu Road Bridge at Tokomaru Bay is suitable for swimming only 41% of the time.
- Anuara Bay South lagoon is suitable for swimming 98% of the time.

## GAPS IN MONITORING DATA

Water quality and ecosystem health is assessed at representative rivers across Tairāwhiti as it is not feasible or affordable to collect this information everywhere. It is also noted that assessing attribute states under the NPS-FM can require monitoring to be undertaken differently to that collected in current monitoring programmes.

In developing catchment plans, the best available information is utilised – including applying relevant and applicable information from similar catchments elsewhere.

As the catchment planning process progresses, key information gaps will be identified and programmes to collect the information will be put in place to help inform future versions of the catchment plan.

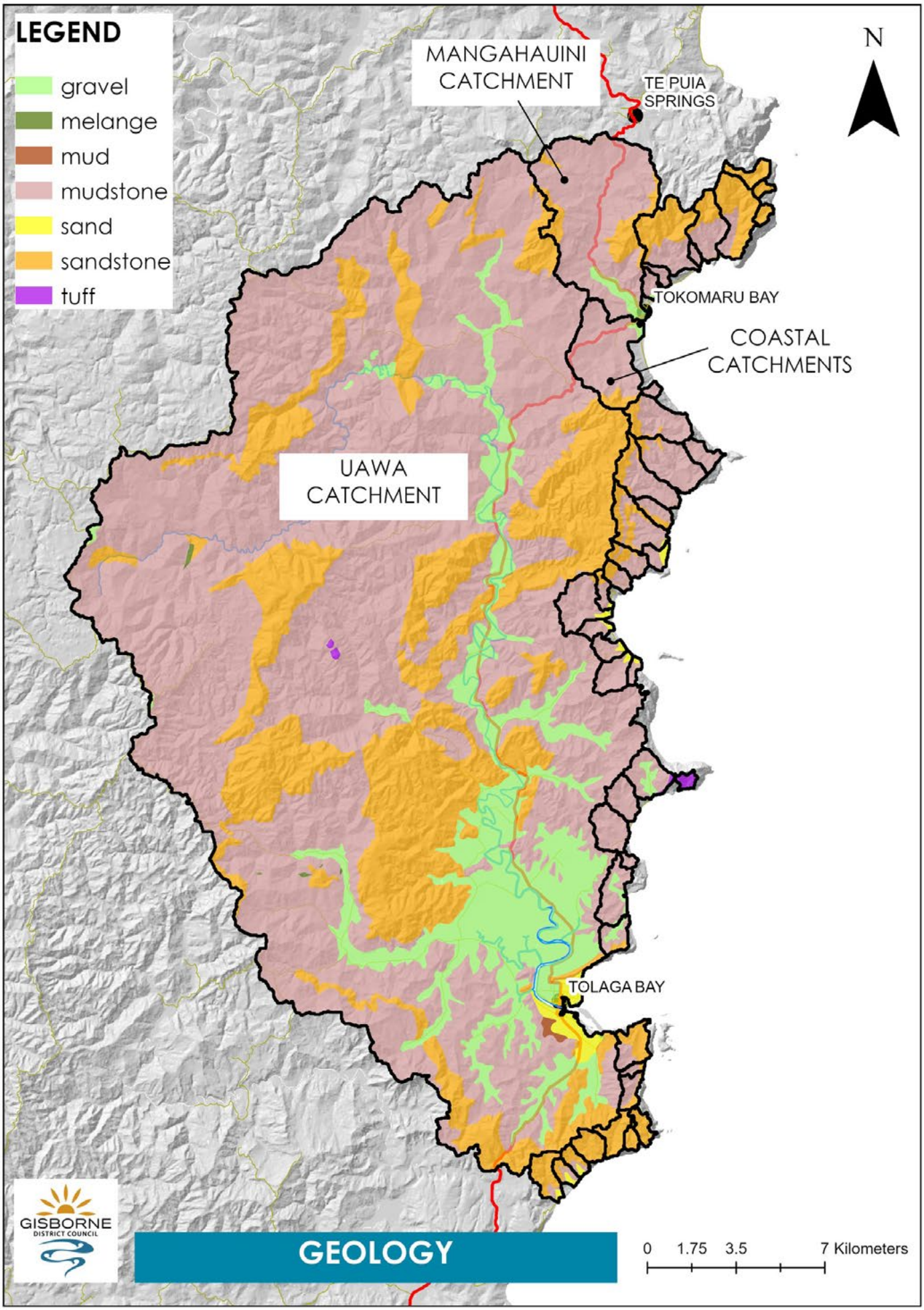
Key information gaps relate to the water quality in the Mangahauini and Coastal catchments part of the Ūawa Catchment Plan area. Future monitoring requirements will need to be confirmed and prioritised through the catchment plan process.

# HE KUPU PITI
# APPENDICES

## APPENDIX 1: GLOSSARY OF TERMS

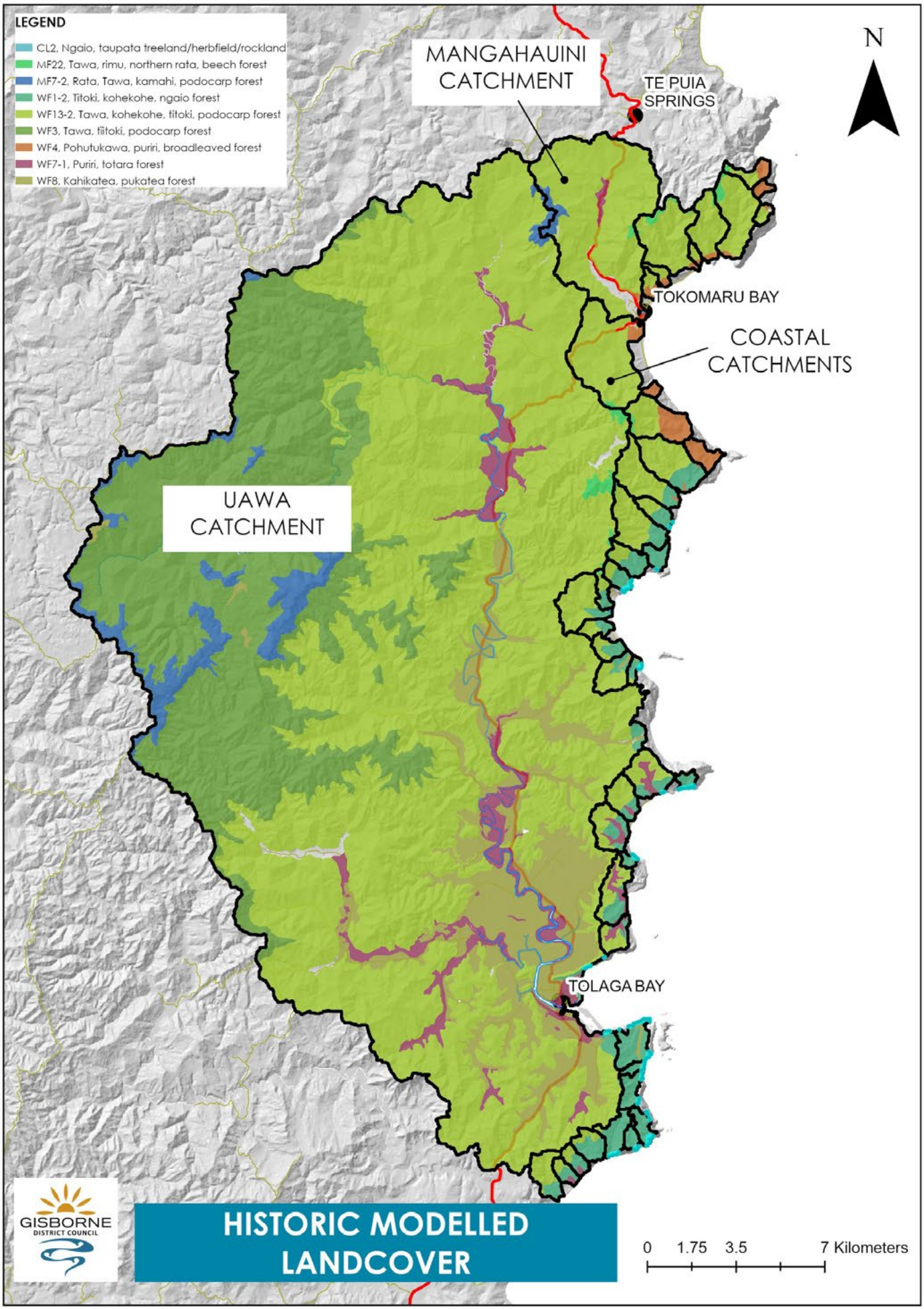
| | |
|---|---|
| **Action Plan** | A part of the Catchment Plan which identifies how we are going to get attributes that are degraded from their current state to where we want them to be. Can include rules or other types of methods. |
| **Attribute** | A water quality indicator used to help us understand if the values of the water are being provided for e.g. the amount of E.coli bacteria in the water tells us if it is safe for swimming. This will be measured in a standard way. E.g. E.coli is measured in cfu/100 mL of water. |
| **Target Attribute state** | What we want the water quality to be like for that indicator. |
| **Baseline state** | What the water quality was like on 7 September 2017. |
| **Catchment Plan** | A regional plan under the Resource Management Act that determines how freshwater and land uses within specific catchment areas are managed. |
| **Degraded** | Water quality that is below a national bottom line or is not achieving a target attribute state. |
| **Degrading** | Water quality that is showing a deteriorating trend. |
| **Environmental outcome** | A desired outcome that a regional Council identifies for a freshwater value and then includes as an objective in its regional plan. |
| **Freshwater Management Unit (FMU)** | A management area (e.g. site, river reach, water body, part of a water body or groups of water bodies). They are often quite big – for example the Waipaoa Catchment has 4 Freshwater Management Units. |
| **Freshwater values** | The sorts of things and uses we value waterbodies for. e.g. ecosystem health, human contact, threatened species, mahinga kai, fishing, animal drinking water. |
| **Limit** | A type of rule for water. Can be the amount of pollutant allowed in the water e.g. amount of nitrate nitrogen, or a flow limit –e.g. a minimum flow below which water takes cannot occur. |
| **National Bottom Line** | An attribute state that we are not allowed to let water quality fall below. |
| **Outstanding waterbody** | A water body or part of a water body that has outstanding values and is identified for special protection. |
| **Over-allocation** | Where resource use exceeds a limit or where an FMU is degraded or degrading. |
| **Primary contact site** | An area where lots of people swim or do things which mean they are likely to end up drinking the water or getting spray in their mouth. |

## APPENDIX 2: MAPS



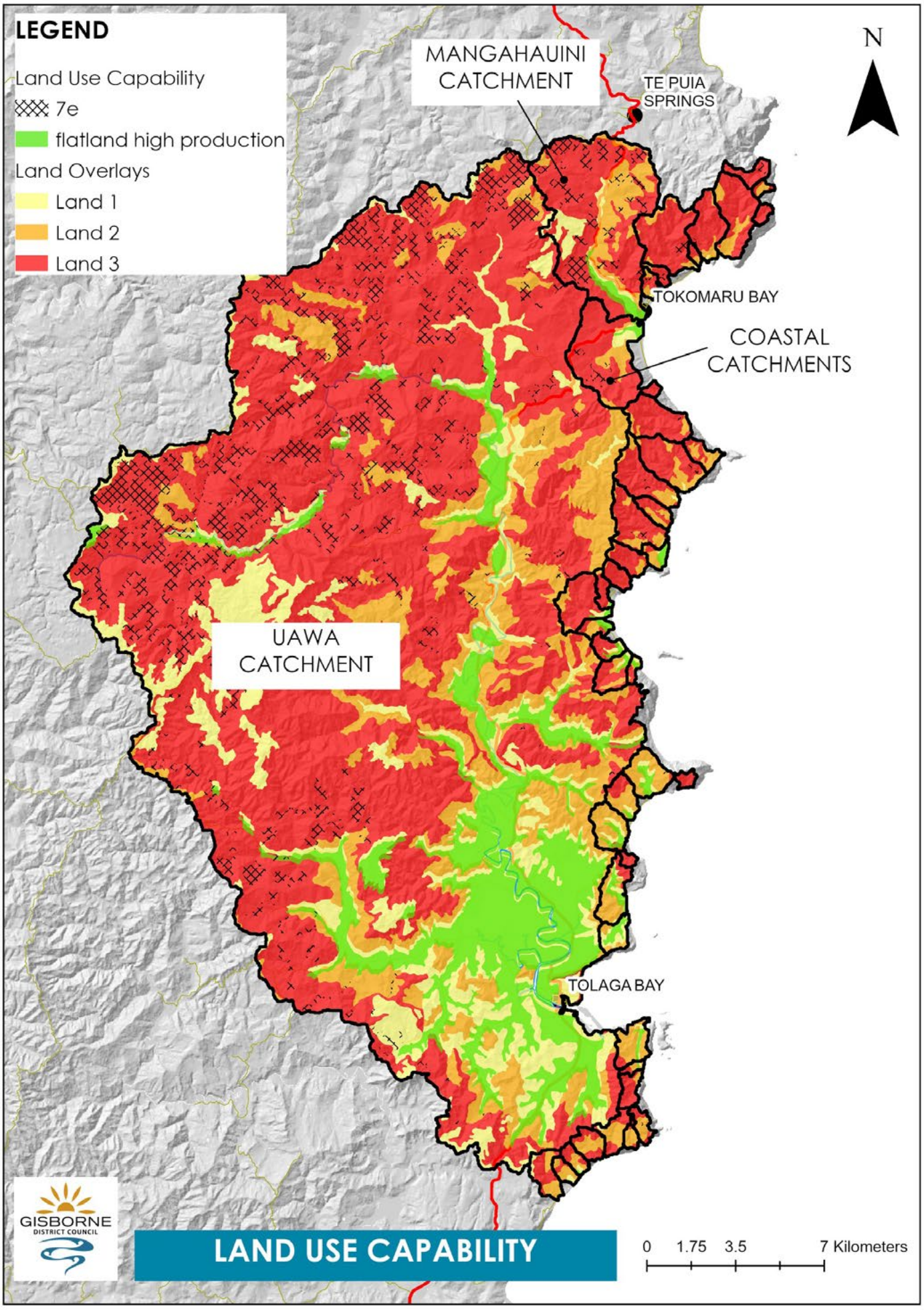

Map 1: Geology

## APPENDIX 2: MAPS



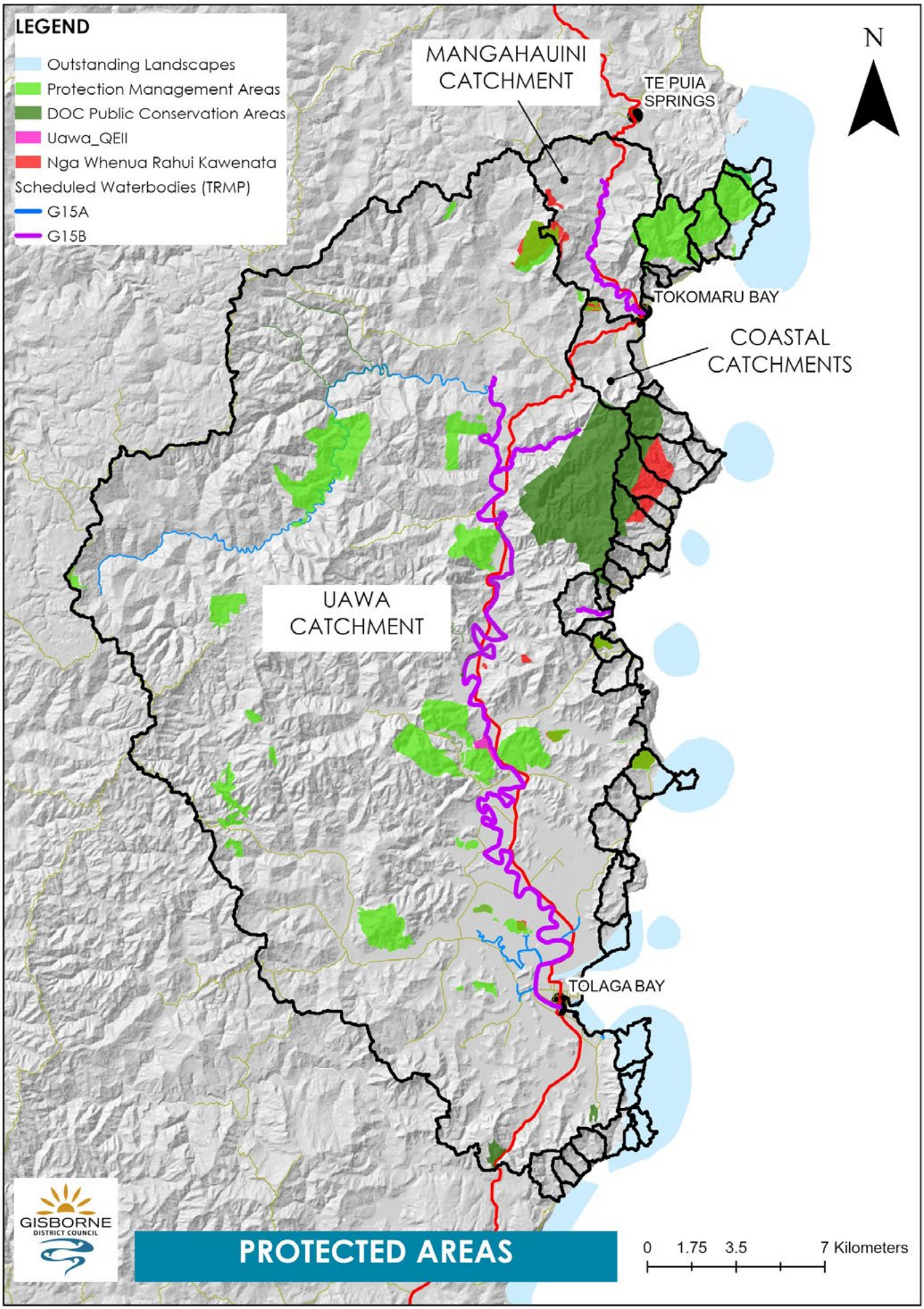

Map 2: Historic indigenous vegetation types

## APPENDIX 2: MAPS



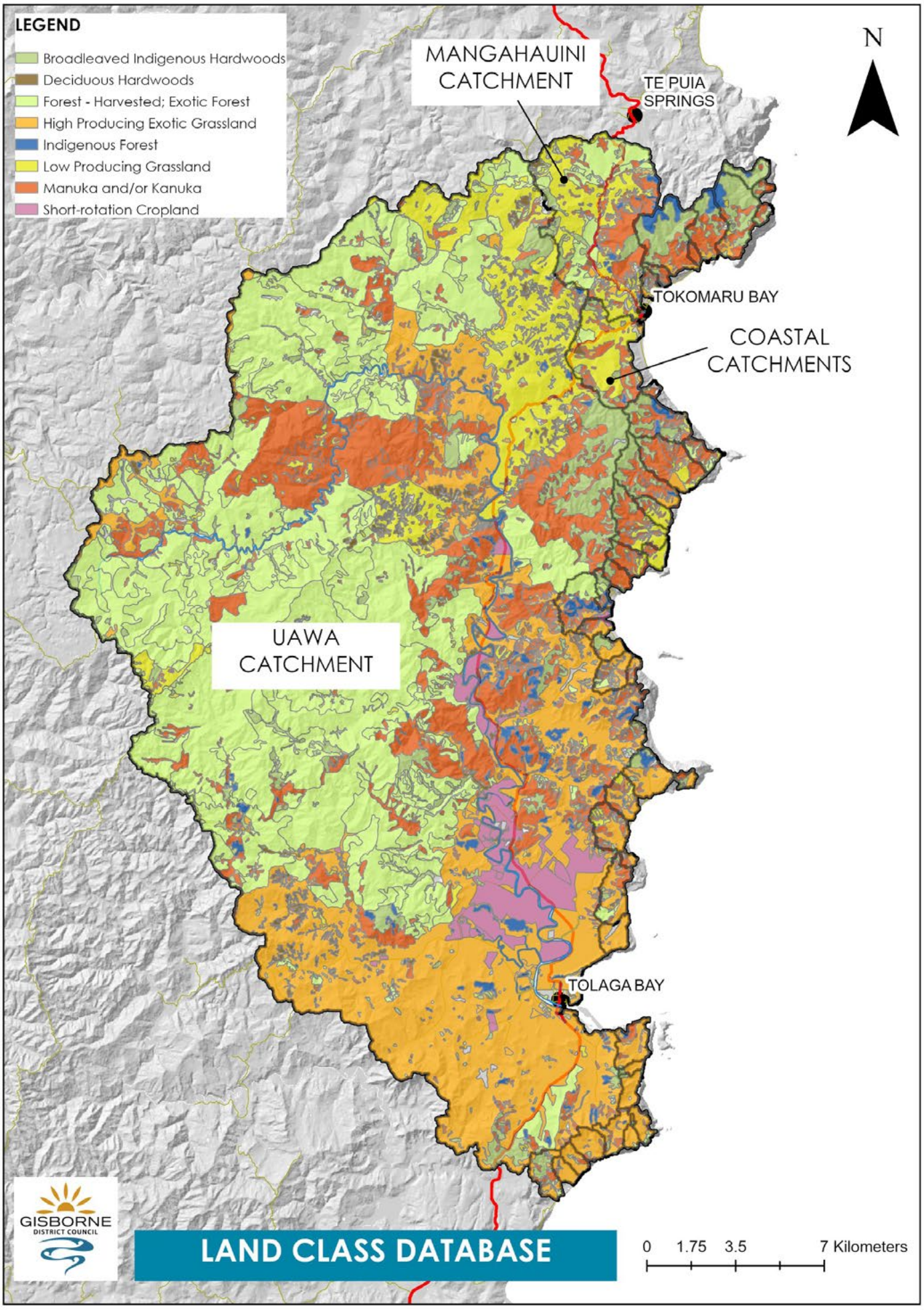

Map 3: Land overlay and LUC classification map

## APPENDIX 2: MAPS




Map 4: Key natural values

## APPENDIX 2: MAPS




Map 5: Land use and vegetation types

## APPENDIX 3: WATER QUALITY AND AQUATIC ECOSYSTEM HEALTH DATA

| Site | Ammonia (mg/L) | Nitrate (mg/L) | Dissolved Reactive Phosphorus (mg/L) | Suspended Fine Sediment (Visual Clarity) (metres) | Deposited Sediment (% cover) | Dissolved Oxygen (%) | E.coli (cfu/100mL) | MCI | QMCI | ASPM | Periphyton (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ūawa Catchment Area** | | | | | | | | | | | |
| **Hikuwai Bridge at Willowflat** | Median 0.015<br>95th Percentile 0.072 | Median 0.006<br>95th Percentile 0.313 | Median 0.006<br>95th Percentile 0.013 | Median 1.17m | Median 35% | Median 97.8% | Median 94<br>95th Percentile 1200 | Median 80 | Median 4.0 | Median 0.13 | Median 16.00 |
| **Mangaheia River at Paroa Rd Bridge** | Median 0.011<br>95th Percentile 0.033 | Median 0.005<br>95th Percentile 0.296 | Median 0.008<br>95th Percentile 0.022 | Median 1.13m | Median 100% | Median 91.2% | Median 62<br>95th Percentile 1130 | Median 71 | Median 3.9 | Median 0.085 | Median 239.89 |
| **Makokomuka Stream at Waiapu Rd** | | | | | Median 37% | | | Median 97 | Median 4.6 | Median 0.31 | Median 24.55 |
| **Hikuwai River at No 4 Bridge** | | | | | Median 10.78% | | | Median 92 | Median 4.1 | Median 0.205 | Median 7.65 |
| **Waiau River at Tauwhareparae** | | | | | Median 7.69% | | | Median 92 | Median 4.6 | Median 0.21 | Median 11.27 |
| **Mangakino Stream at Mangatokerau Road** | | | | | Median 100% | | | Median 95 | Median 4.1 | Median 0.30 | Median 113.40 |
| **Kaitawa Stream at Wharf Road** | | | | | Median 85% | | | Median 71 | Median 2.3 | Median 0.12 | Median 16.55 |
| **Coastal Catchment Area** | | | | | | | | | | | |
| **Karoronui Stream at Anaura Bay Rd** | | | | | | | | Median 105 | Median 4.2 | Median 0.38 | |

### National Objectives Framework Assessment Results for Monitoring Sites in the Ūawa Catchment Plan Area – 2017/18 – 2021/22

## APPENDIX 5- WATER QUALITY EXPLANATIONS

| Parameter | Explanation |
|---|---|
| **Phosphorus** | Phosphorus is an element with the symbol P that attaches to soil particles and is naturally present in water in low concentrations. Together with nitrogen, it is an essential nutrient for plant life and is measured as either total phosphorus (TP) or dissolved reactive phosphorus (DRP). |
| **Dissolved Reactive Phosphorus** | This is a measure of the dissolved (soluble) phosphorus compounds that are readily available for use by plants and algae. Dissolved reactive phosphorus concentrations are an indication of a waterbody's ability to support nuisance algal or plant growths (algal blooms). |
| **Nitrogen** | Nitrogen is a naturally occurring substance, with the chemical symbol N. In its gas form (N2), nitrogen makes up about 80% of the Earth's atmosphere. In other forms it is one of the most important fertilisers for plant growth. It is also found in amino acids that make up proteins, in nucleic acids (that make up DNA) and in many other organic and inorganic compounds.<br><br>Nitrogen is a great fertiliser but too much of it can cause aquatic weeds and algae to grow too fast. This increased plant growth can reduce oxygen in the water during nighttime when dead plant material decomposes. This can eventually remove the oxygen present in lakes, posing a threat to aquatic life. Nitrite-nitrogen and ammonia become toxic at high concentrations which are more likely under certain temperature and pH conditions. This can cause direct harm to fish and macroinvertebrates.<br><br>The most common sources are wastewater treatment plants, run-off from pasture, croplands and fertilised lawns, leaky septic systems, run-off from animal manure/urine, and industrial discharges. |
| **Nitrate** | A highly soluble molecule made up of nitrogen and oxygen with the chemical formula NO32-. It is a very important plant fertiliser but because it is highly water soluble, it leaches through soils very easily, particularly after heavy rainfall. It is one of the most common contaminants in waterways in rural and urban areas. NO3-N can be transformed to other forms of nitrogen. Sources of NO3-N include excessive application of inorganic fertilizer, septic tanks and leaking sewage systems. Nitrate also enters waterways as a result of nitrification of the ammonia in animal waste by bacteria in soil. |
| **Nitrite** | Nitrite-nitrogen is an ion with the chemical formula NO2-. Concentrations of nitrite-nitrogen are normally low compared to nitrate-nitrogen and ammoniacal nitrogen. However, too much nitrite-nitrogen can be toxic. In drinking water it can be harmful to young infants or young livestock. |
| **Ammoniacal Nitrogen** | Also called total ammoniacal nitrogen, covers two forms of nitrogen; ammonia (NH3) and ammonium (NH4). NH4-N can be transformed to other forms of nitrogen and is a very important plant fertiliser but is less mobile in the soil than nitrate-nitrogen. It enters waterways primarily through point source discharges, such as raw sewage or dairy shed effluent. It is toxic to aquatic life at high concentrations. |
| **Dissolved Inorganic Nitrogen** | This is the sum of nitrite (NO2), nitrate (NO3) and ammonia (NH3). |

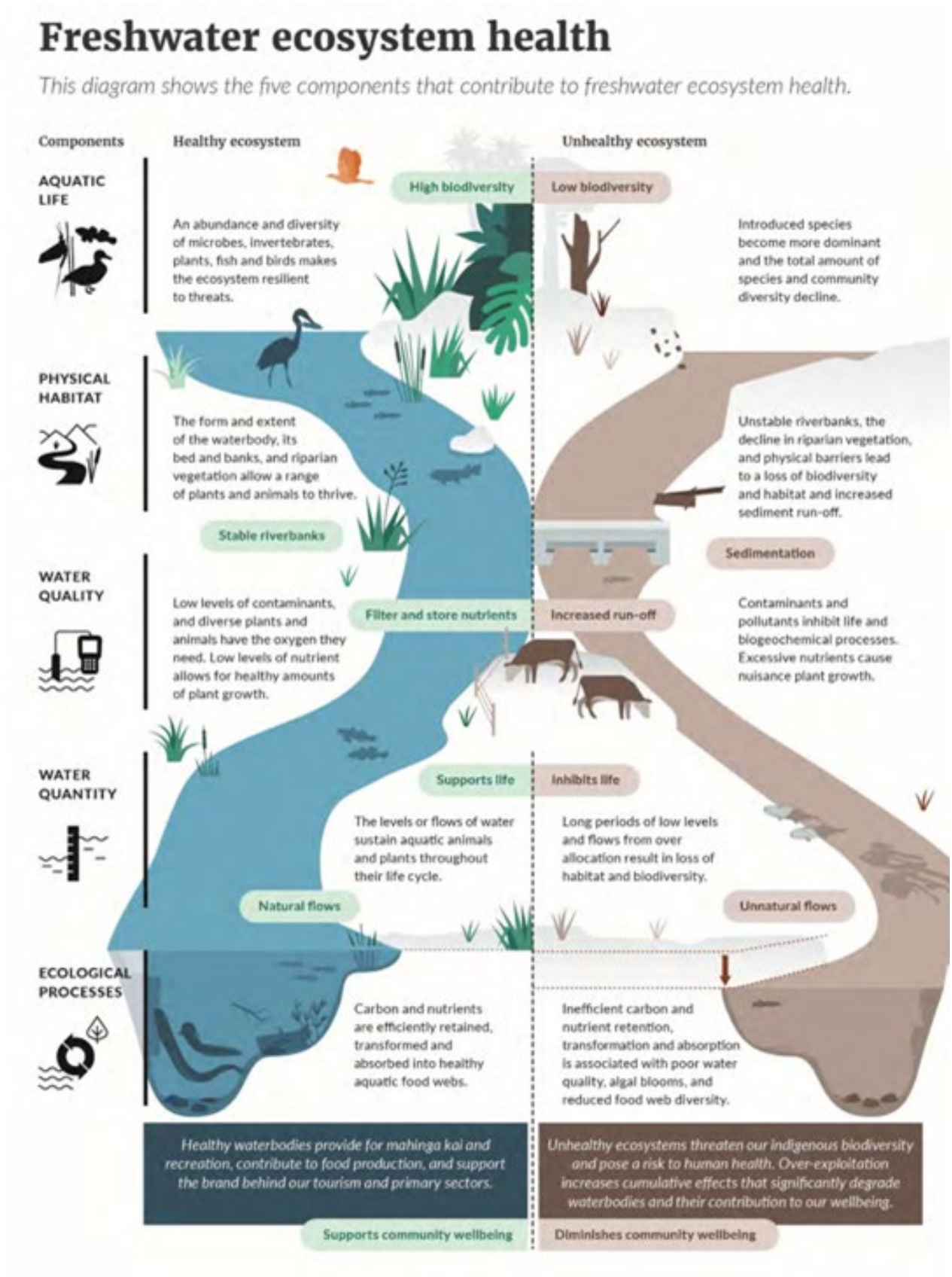
## APPENDIX 5- WATER QUALITY EXPLANATIONS

| Parameter | Explanation |
|---|---|
| | Water clarity refers to the ability of light to travel through water and has two important aspects: light penetration and visual clarity.<br><br>Light penetration is important as it controls the amount of light in the water needed for aquatic plants to grow. Visual clarity indicates how much suspended sediment (soil) is in the water.<br><br>Poor water clarity can have many adverse effects on stream and lake ecosystems. For example, murky water can make the water unsuitable for drinking by stock and make areas unsafe for swimming. High sediment can also harm aquatic life by clogging their gills which reduces their ability to take up oxygen. As fine particles settle in slower-moving downstream areas, the spaces between rocks and gravel are filled making the bottom habitat unsuitable for fish and other aquatic species. Poor water clarity will also affect the amount of light reaching the river bottom, potentially limiting plant growth. |
| **Turbidity** | Turbidity is an index of cloudiness of water and measures how light is scattered by fine particles in waterways. Turbidity is an alternative measurement for suspended sediment and/or visual clarity and is measured in nephelometric turbidity units (NTU). |
| **Suspended Sediment** | As erosion occurs, tiny particles of clay, silt or small organic particles are washed into waterways. These tiny particles can be supported in the water current and are termed suspended sediment. The faster the water is moving the larger the amount and size of suspended sediment particles it can carry. Soil type in the catchment can affect the amount of suspended sediment. |
| **Deposited Sediment** | Deposited sediment is a measure of the percentage of the stream bed covered in fine sediment. Deposited sediment smothers the stream bed and can change and degrade habitat, change the assemblage of macroinvertebrate species and reduce fish habitat and fish species. |
| **Dissolved Oxygen** | The oxygen content of water. Dissolved oxygen is important for fish and other aquatic life to breathe. For example, water quality guidelines recommend that water should be more than 80 percent saturated with DO for aquatic plants and animals to be able to live in it. |
| **E.coli** | E. coli (Escherichia coli ) is a type of bacteria commonly found in the guts of warm-blooded mammals (including people) and birds. High E. coli concentrations in freshwater can be harmful to humans.<br><br>Common sources of E. coli bacteria are untreated human wastewater discharges, stormwater run-off and animal waste. E. coli survives outside the body and can survive for up to four to six weeks in fresh water making it a useful indicator of faecal presence and therefore of disease-causing organisms in a river or lake. Faecal concentrations are typically higher in pastoral streams but even near-pristine streams are not totally free from E. coli because of faecal deposition by birds and wild animals. |
| **Macroinvertebrates** | Any organisms without a backbone or internal skeleton large enough to be visible to the naked eye (>500µm), such as insects, worms, and snails. Macroinvertebrates are sampled to provide an indication of stream water quality. Generally, the greater the diversity, the better the water quality in the stream.<br><br>Macroinvertebrate communities are widely used as indicators of stream ecosystem health because they include a wide range of species, each with relatively well-known sensitivity or tolerance to stream conditions. The most common stream health indices are taxa richness, percentage of EPT taxa and the macroinvertebrate community index (MCI). |

## APPENDIX 5- WATER QUALITY EXPLANATIONS

| Parameter | Explanation |
|---|---|
| **MCI (Macroinvertebrate Community Index)** | MCI stands for Macroinvertebrate Community Index which is an index where macroinvertebrates are used for monitoring and reporting on stream health in New Zealand. The MCI assigns a score to each species or taxon (from 1 to 10), based on its tolerance or sensitivity to organic pollution, then calculates the average score of all taxa present at a site. It is a semi qualitative sampling method, which means it will tell you which species are present or absent in your sample.<br><br>The MCI is based on the tolerance or sensitivity of species (taxa) to organic pollution and nutrient enrichment. For example, mayflies, stoneflies and caddis flies are sensitive to pollution, and are only abundant in clean and healthy streams, whereas worms and snails are more tolerant and can be found in polluted streams. Most benthic invertebrate taxa were assigned a tolerance value ranging from 1 (very tolerant) to 10 (very sensitive).<br><br>An invertebrate sample is typically collected from within a representative section of a stream (a reach). Higher MCI scores indicate better habitat and water quality at the sampled site. In theory MCI values can range between 0 and 200, but in practice it is rare to find MCI values greater than 150 and only extremely polluted or sandy/muddy sites score under 50. |
| **QMCI (Quantitative Macroinvertebrate Community Index)** | Similar to MCI but includes an assessment of the abundance of the different species. |
| **% EPT Taxa** | The invertebrate community is usually dominated by three orders of insects: the mayflies, stoneflies, and caddis flies. Together, these insects are known as EPT, referring to their scientific names Ephemeroptera, Plecoptera and Trichoptera, respectively. These freshwater insects are generally intolerant of pollution, so the fewer found in a sample, the poorer the stream health.<br><br>The percentage of EPT-taxa (or %EPT) is most commonly calculated by counting the total number of mayfly, stonefly and caddis fly taxa in a sample, then dividing that number by the taxa richness and multiplying by 100. This is known as the %EPT by taxa.<br><br>A high percentage of EPT taxa indicates good stream health. However, in some New Zealand streams there are naturally few mayflies, stoneflies, or caddis flies present. Ecologists need to be aware of these factors when using the %EPT to assess the ecological health of a river or stream |
| **ASPM (Average Score Per Metric)** | The Average Score Per Metric is made up of a combination of metrics that are found to have low variability among undeveloped reference sites in native forest: number of sensitive species: mayflies + stoneflies + caddisflies (EPT), percentage of sensitive taxa -%EPT, tolerance of taxa to pollution – MCI. |

## APPENDIX 5: FRESHWATER ECOSYSTEM HEALTH EXPLANATION



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