Takaka Freshwater and Land Advisory Group

Summary of Interim Decisions for Water Quantity and Quality Management in the Takaka Freshwater Management Unit

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1 Executive Summary

This report summarises the process undertaken by the Takaka Freshwater and Land Advisory Group (FLAG) between July 2014 and September 2016 to reach interim decisions on water quantity and quality management in the Takaka Freshwater Management Unit (Takaka FMU) to enable development of a draft plan change and draft implementation plan for further discussion.

Whilst the decisions outlined in this report are not necessarily representative of the final decisions the Takaka FLAG will recommend to the Tasman District Council, they do provide a clear indication of the proposed management approach for freshwater in the Takaka catchments.

The Takaka FMU covers all catchment areas from the Wainui catchment in the east, to the Tukurua catchment in the west and all of the catchment areas that drain to the Takaka River and the Arthur Marble Aquifer. The Takaka FMU is split into 19 zones, which are typically surface catchment based or with boundaries that reflect the groundwater relationships with recharge areas and surface water bodies. Several of these zones overlap others because of the complex surface and ground water connections and management issues.

The National Policy Statement for Freshwater Management (NPS-FM) is a key driver behind the FLAG process and Council is obligated to fully implement the NPS-FM by 2025. The NPS-FM includes objectives and policies for the management of water quantity and quality, and outlines the process for determination of water values, attributes and setting of freshwater objectives within the National Objectives Framework (NOF, part of the NPS-FM).

Another key driver of the FLAG process is management of existing and future demand for water. Currently there are no formal (ie in the Tasman Resource Management Plan - TRMP) water allocation regimes in the Takaka FMU and there is unmet demand, with an informal waiting list for additional water allocation. The management of impacts on water quality from existing and future water and land use practices is also a driver for freshwater planning in the region.

The NPS-FM highlights the importance of healthy water through Te Mana o te Wai. Water is of great significance to tangata whenua. As kaitiaki, or guardians, tangata whenua believe that the maintenance of the mauri, or life-supporting capacity of water, is fundamental to ensuring the physical and spiritual survival of all living things. A water body with an intact mauri is able to sustain healthy ecosystems.

The FLAG have developed values and management objectives for water in the Takaka FMU, including the two compulsory national values from the NPS-FM. These are:

- Cultural and spiritual values
- Ecosystem health (compulsory under the NPS-FM)
- Municipal and domestic water supply
- Fishing and food gathering
- Livelihood and economic use
- Natural form and character
- Recreation, including swimming (Human health for recreation compulsory under the NPS-FM)
- Hydro-electric power generation
For these eight uses and values of water, the Takaka FLAG have identified 12 key attributes that are necessary to support and enable the values and uses. These are:

- Mauri
- Water clarity
- Macro-invertebrates
- Fine sediment
- Riparian and aquatic habitat (including loss of shading and loss of habitat)
- Dissolved Oxygen and Dissolved Organic Carbon (as indicators of aquifer health)
- Nutrients: Nitrate, Phosphorus and N:P ratio (for aquatic plant growth)
- Nuisance aquatic plants (eg over growth of weeds and algal blooms)
- E.coli (as an indicator of disease causing organisms)
- Flow – including river and spring flows (in particular at Te Waikoropupū)
- Groundwater levels (aquifers)
- Security of supply

Not all attributes are applicable in all FMU zones, and some attributes are more difficult to measure or assess than others. For some attributes no previous data is held for comparison with goals.

The values and the key attributes have been considered in FLAG discussions around management of water allocation and protection or enhancement of water health (quality and habitat) in the FMU.

The approach taken to water allocation seeks to protect instream ecological values and provide water for use with an acceptable security of supply for out-of-stream users. The assumption being that by protecting ecological values, most other values will in turn be protected.

An allocation regime has been developed by FLAG for each zone where there is sufficient water for out-of-stream use. These regimes identify a minimum river flow to protect instream ecological values, and an appropriate allocation limit (the amount of water available for use) that protects the health of water bodies, while also providing water at an acceptable security of supply for users. The allocation regimes also introduce new cease take provisions designed to avoid the effects of consented consumptive water takes on water bodies during periods of low flow.

Water quality in the Takaka FMU is generally very good and in many places is exceptional (eg Te Waikoropupū springs clarity). However, there are some localised areas where water quality is degraded within specific water bodies or water body reaches. Issues are seen with sediment, disease causing organisms (E.coli), nuisance plant growth (periphyton, phytoplankton and macrophytes), high water temperature, low dissolved oxygen and riparian and instream habitat loss.

The range of management options identified to manage risks to water quality includes both regulatory (eg policy or rules in the TRMP) and non-regulatory approaches, such as:

- Requirement for good land use practice, including management of sediment, effluent, nutrients, water use and riparian/waterbody areas
- Adaptive management, where management objectives are not being met, the management approach can be changed as needed
- On-site wastewater management – including education programmes and auditing of systems
- Stock exclusion from water bodies (focus on cattle, deer and pigs)
- Riparian and aquatic habitat restoration
• Existing and new monitoring for key attributes

A significant amount of work is still required in developing the draft plan change and non-regulatory implementation plan, including consideration of how the management methods can be practically and affordably implemented.

Full FLAG consensus has not been reached on all of the allocation regimes. FLAG are still receiving input from iwi and want to get feedback from the community before making final recommendations to Council. If FLAG does not reach consensus on a proposed plan change provisions, then the preferred options will be included in the recommendations to the Council’s Environment and Planning Committee (EPC) for their decision. The proposed plan change will then be publically notified for public submissions.

Further information on the FLAG process is available on the Council’s website (link below). If you would like to discuss any aspect of the process so far, you can contact one of the FLAG members or the FLAG coordinator Lisa McGlinchey.

- Takaka FLAG homepage
- FLAG biographies and email addresses
- Email the FLAG coordinator

Please provide any feedback on this summary report by Wednesday 23rd December to Lisa McGlinchey at lisamc@tasman.govt.nz

Please note: Due to public request, the date for feedback on this summary report has been extended to the 31 January 2017.
2 Introduction, disclaimer and how to be involved

This report summarises the process undertaken by the Takaka Freshwater and Land Advisory Group (FLAG) between July 2014 and September 2016 to reach interim decisions on water quantity and quality management in the Takaka Freshwater Management Unit (Takaka FMU). These interim decisions enable development of a draft plan change and draft implementation plan for further discussion with FLAG, iwi and the community.

The first sections of this document summarise the National Policy Statement for Freshwater Management (NPS-FM) and the National Objectives Framework (NOF), and outlines the Takaka Freshwater Management Unit and the associated values and management objectives for freshwater identified by the Takaka FLAG.

Section 5 outlines the general approach and assumptions involved in the consideration of water allocation, and Section 6 outlines considerations and methods for management of water health (quality and habitat) across the Takaka FMU. Further detail on the Arthur Marble Aquifer and Te Waikoropū springs is provided in Appendix 8.7.

(Note: text in this document that is underlined and in blue provide hyperlinks to online information sources.)

Please note:
The decisions outlined in this report are not necessarily representative of the final decisions the Takaka FLAG will select to recommend to the Tasman District Council for progression as a proposed plan change. The decisions do not always represent full consensus by the FLAG group. Where consensus has not been reached, the differing views have been summarised. Where there are different views, these will be included in explanatory notes or as options in the draft plan change.

Further consideration of the interim decisions, and final recommendations to Council, will be undertaken by the Takaka FLAG as part of the draft plan change review, which will include consideration of feedback received from local iwi, stakeholder groups and the local community.

2.1 How to be involved

Further information on the FLAG process is available on the Council’s website (link below). If you would like to discuss any aspect of the process so far, you can contact one of the FLAG members or the FLAG coordinator Lisa McGlinchey.

- Takaka FLAG homepage
- FLAG biographies and email addresses
- Email the FLAG coordinator Lisa McGlinchey at lisamc@tasman.govt.nz

Whilst you can provide feedback at any stage, if you have feedback related to this document and the interim decisions, please provide it to the FLAG Co-ordinator by 23rd December 2016 (email above).

Please note: Due to public request, the date for feedback on this summary report has been extended to the 31 January 2017.

FLAG and council staff are anticipating holding a community open day for information sharing, discussion and to get community feedback on the draft plan change in early 2017 – this will be advertised in the Golden Bay weekly and on the TDC website (refer section 7).
3 NPS-FM Framework and FLAG process

3.1 NPS-FM requirements and process

The National Policy Statement for Freshwater Management (NPS-FM) is a key driver behind the FLAG process and Council is obligated to fully implement the NPS-FM by 2025.

The NPS-FM includes objectives and policies for the management of water quantity and quality and identifies 13 national values, with Ecosystem Health values and Human Health for Recreation as compulsory for all water bodies.

Some attributes for the compulsory values are identified in the National Objectives Framework (NOF, part of the NPS-FM), which identifies acceptable attribute grade levels and national bottom lines that must be met (unless there are natural causes, or non-complying levels result from existing infrastructure identified in the NPS-FM).

NPS-FM policy CA1 and 2 (National Objectives Framework) identifies the process required in developing the quantity and quality freshwater objectives for all Freshwater Management Units. The process includes the following key steps:

1. Identify freshwater management units (FMU)
2. Identify values for each FMU
   a. considering the national values, and including the compulsory values
   b. including any other values having regard to local and regional circumstances
3. Identifying relevant attributes for each value (including those in the NOF)
4. Assigning an attribute state for the attributes (at or above the minimum acceptable state)
5. Formulating freshwater objectives (numeric and narrative) and adopting the most stringent for each attribute across the values
4 Takaka Freshwater Management Unit (Takaka FMU)

4.1 Takaka FMU Extent

The Takaka FMU covers all catchment areas from the Wainui catchment in the east, to the Tukurua catchment in the west and all of the catchment areas that drain to the Takaka River and the Arthur Marble Aquifer. A small part of the upper Riuwaka catchment is included as it overlies and therefore potentially recharges the Arthur Marble Aquifer.

The Takaka FMU is split into 19 zones, named for the general catchment area they cover. The zones are typically surface catchment based or with boundaries that reflect the groundwater relationships with recharge areas and surface water bodies. Several of these zones overlap others because of the complex surface and ground water connections and management issues. The zones allow water bodies to be managed at a local scale, reflecting the unique hydrological and ecological characteristics in each area.

Further information on the characteristics of the Takaka catchments is available in the report: Water Resources of the Takaka Water Management Area (Thomas and Harvey 2013).

4.2 Takaka FMU Zones

The zones that make up the Takaka FMU are shown in Figure 1 and listed below:

- Coastal Western Catchments:
  - Tukurua
  - Onekaka
  - Pariwhakaoho
  - Puremahaia
  - Onahau
- Takaka Township
- Waikoropupū River (this zone relates the catchment of the Waikoropupū river, not the springs, which are covered by the Arthur Marble Aquifer Recharge Zone)
- Anatoki (the lower part of this zone overlaps the confined part of the AMA)
- Waingaro (the lower part of this zone overlaps the confined part of the AMA)
- Upper Takaka River (this zone relates only to surface takes from the main stem Takaka River between Harwoods and just below Lindsay’s Bridge)
- Motupipi
- Rototai
- Pohara-Clifton
- Ligar Bay – Tata
- Wainui Bay
- Wainui North
- Arthur Marble Aquifer Recharge Zone (this zone overlaps other zones and relates to areas that may add water to the recharge of the unconfined parts of the Arthur Marble Aquifer, including the Upper Takaka River Zone, upper parts of the Waingaro and Anatoki Zones, the Middle Takaka area (not a specific zone), and upper parts of the Motupipi and Pohara-Clifton Zones)
- Confined Arthur Marble Aquifer Zone (this zone underlies zones north of the confined-unconfined aquifer boundary, which lies just north of Hamama and East Takaka, but relates only to groundwater takes from the confined part of the Arthur Marble Aquifer)
- Coastal Margin zone (this zone overlaps other zones in coastal areas where salt intrusion into groundwater is a potential risk. It relates only to groundwater takes)
Figure 1 Takaka Freshwater Management Unit and water management zones
4.3 Values and Uses of Water
The FLAG developed values and management objectives for water in the Takaka FMU through a series of individual and group exercises that explored personal values and beliefs, past and current economic and environmental uses and values of water, and potential future changes and risks that could affect water quantity and quality.

The outcomes of this process are summarised in the draft values and management objectives document available online on Council’s website and include the following values:

- Cultural and spiritual values
- Ecosystem health
- Municipal and domestic water supply
- Fishing and food gathering
- Livelihood and economic use
- Natural form and character
- Recreation (including swimming)
- Hydro-electric power generation

Ecosystem Health and Human Health for Recreation are both compulsory national values under the NPS-FM. In the NPS-FM the minimum standard for recreation is set at boating and wading, unless there are swimming values identified. The Takaka FLAG has decided that swimming is an important value during Nov-April, and so during this time, the minimum acceptable standard for recreation is primary contact including swimming and children’s play. The only national value not represented in some way in the Takaka FMU is that of Transport and Tauranga Waka or navigation.

4.3.1 Iwi values and uses and interests in water

4.3.1.1 Council responsibilities and obligations towards Māori
The Council has a number of responsibilities and obligations towards Māori under the Resource Management Act 1991, to be carried out through the Tasman Resource Management Plan. These responsibilities include:

- to recognise and provide for the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, and other taonga;
- to have particular regard to the concept of kaitiakitanga, and the ethic of stewardship;
- to take into account the principles of the Treaty of Waitangi;
- keep and maintain records of the planning documents that are recognised by each iwi authority and lodged with the local authority;
- to consult with the tangata whenua of the District in the preparation of resource management plans.

The Tasman Regional Policy Statement contains an explanation of general issues concerning the interests of the tangata whenua in relation to resource management, and of Council’s general approach to these issues and interests in relation to the use of land, coastal marine, water, river and lake, and associated resources.

FLAG and Council staff are holding meetings with each iwi to discuss how their values, uses and interests can best be reflected in the FLAG process and recommendations to Council.
4.3.1.2 Tangata Whenua in the Takaka FMU

There are eight iwi with interests associated with the Takaka FMU:

- Ngāti Tama ki Te Tau Ihu
- Te Ātiawa o Te Waka-a-Māui
- Ngāti Apa ki te Rā Tō
- Ngāti Kuia
- Ngāti Rārua
- Rangitāne o Wairau
- Ngāti Koata
- Ngāti Toa Rangatira

All eight iwi have statutory acknowledgements for the coastal marine area, which include the estuaries associated with the Takaka FMU.

Three of the iwi - Ngati Tama, Te Ātiawa and Ngati Apa - have statutory acknowledgements associated with the catchments of the Takaka River and its tributaries, and Ngati Kuia have statutory acknowledgement associated with the Anatoki catchment (refer Figure 2).

With respect to bodies of water such as lakes, rivers, and wetlands, the Statutory Acknowledgement excludes any part of the bed not owned or controlled by the Crown (Settlement Acts 2014).

Maps of each iwi statutory acknowledgement areas and the associated text outlining their respective associations are available on the Council website. Associations include reference to iwi beliefs around water and its valued place in the Māori world view, historic relationships with the Takaka area (eg ancient trails, urupa, kainga, mahinga kai, mahinga harakeke and cultivation sites) and treasured fish, bird and plant species that were important to their tūpuna (ancestors).

While the statutory acknowledgements provide legal recognition of the particular cultural, spiritual, historical and traditional association of an iwi with an area, and identify them as affected parties for resource consent processes, they are only one form of cultural redress used to settle historical Treaty claims and it is recognised that these may not necessarily cover all areas, or aspects, of interest to iwi within their respective rohe.
4.3.1.3 Iwi values and interests in water

The following is summarised from various sources, including discussions held throughout the FLAG process, the iwi statutory acknowledgements, Te Waikoropupū springs Management Plan and TRMP.

Water is of great significance to tangata whenua — it is an essential element to all life. As kaitiaki, or guardians, tangata whenua believe that the maintenance of the mauri, or life-supporting capacity of water, is fundamental to ensuring the physical and spiritual survival of all living things. A water body with an intact mauri is able to sustain healthy ecosystems.

The mauri of water is sacred and is a link to the source of tribal creation traditions. In Māori mythology, water represents the lifeblood of Papatuanuku (the earth mother) and the tears of Ranginui (the sky father). Water symbolises the spiritual link between the past and the present and is regarded with great respect. Customary lore and practices, or tikanga Māori, regulate the way in which water resources are used and conserved in order to protect and sustain the mauri of the water body for future generations.

The interrelationship of the spiritual dimension with the physical can be illustrated by the many names that tangata whenua have for water and the way that they classify it. For instance:

- **Waiora**: Water of life, the purest form of freshwater. It gives and sustains life, can rejuvenate damaged mauri/life force and counteract evil. Waiora is of such spiritual significance that it is used in ceremonies such as baptism and dedication (Te Waikoropupū Springs falls within this classification).
- **Wai Māori**: Water that is used for everyday purposes, such as drinking.
- **Wai Mate**: Water that has lost its life-supporting capacity, or mauri. It has been damaged or polluted beyond its capacity to rejuvenate either itself or other living things. Wai-mate can contaminate the mauri/life force of other living things or other waters.
- **Wai Kino**: Water that has been spoiled or polluted, and that contains rocks or submerged snags. This water has the potential to be detrimental to life.
- **Wai Tapu**: Waters of death, water burial site. These waters are tapu (sacred) due to loss or other events and are subject to restrictions.

Rivers are a source of water and have a mauri and mana of their own. They are entities with a distinct essence and identity with which tangata whenua affirm their relationship to the environment. Tangata whenua have a relationship with the entire river system, not any one component. Rivers are the lifeblood of the land and therefore the well-being of a river reflects the well-being of the land and people who live around it.

Water bodies provide tangata whenua with mahinga kai and other cultural materials and taonga. Therefore, the maintenance of the quality and quantity of water is vital to sustain habitats important for mahinga kai. The mahinga kai custom involves the management and utilisation of the resources of waters for the sustenance of life, the mauri and human wellbeing.

Traditionally, the abundance of food found in water bodies reflected the wealth and mana of the tangata whenua and their success as rangatira and kaitiaki in preserving their local resources and cultural traditions. Tangata whenua have a long association with water bodies, therefore there are many wāhi tapu, or sacred places found in or next to water bodies. These wāhi tapu are of great significance to tangata whenua and are integral values to be protected in freshwater planning.
4.3.2 Livelihood and Economic water use and demand in the Takaka FMU

The main consumptive Livelihood and Economic uses of water in the Takaka FMU include:

- Product production:
  - pastoral farming: eg dairy, sheep, beef, deer
  - horticulture: eg kiwifruit, viticulture
  - aquaculture: eg land based salmon farming, marine mussel farming, marine spat catching
  - production associated industrial processing (eg Fonterra milk factory)
- Other: eg water bottling, commercial (eg café, hair dressers, etc) and other industrial uses

Non-consumptive Livelihood and Economic uses of water in the Takaka FMU include:

- Hydro-electric power generation (including the Cobb station and other smaller schemes)
- Tourism

In most zones, current demand for water is met, however in the AMA Recharge Zone (including the Upper Takaka, Middle Takaka and Waingaro areas), there is unmet demand with an informal waiting list for additional water allocation. There are currently 12 registrations on the waiting list totalling 312 L/s (litres per second) of additional water sought.

The issue of sustainable allocation of further water, and the proposed management of consumptive takes is outlined in Section 5.

4.3.3 Key Attributes for water quality and quantity management

Consideration of the attributes necessary to support and enable the values and uses identified in the Takaka FMU has identified a number of key attributes:

- Mauri
- Water clarity
- Macro-invertebrates
- Fine sediment
- Riparian and aquatic habitat (including shading and habitat)
- Dissolved Oxygen and Dissolved Organic Carbon (as indicators of aquifer health)
- Nutrients: Nitrate and Phosphorus (for aquatic plant growth)
- Nuisance aquatic plants (macrophytes, periphyton and phytoplankton)
- *E.coli* (as an indicator of disease causing organisms)
- Flow – including river and spring flows (in particular at Te Waikoropupū)
- Groundwater levels (aquifers)
- Security of supply

Other attributes have been discussed and considered by FLAG, as well as different ways of considering the same attribute (eg metrics such as, the concentration of *E.coli* that is safe for swimming, vs the percentage of time that safe *E.coli* levels are exceeded). There is a desire to include attributes that also reflect economic outcomes of water use and further work on this is planned.
Not all attributes are applicable in all zones, and some attributes are more difficult to measure or assess than others. For some attributes no previous data is held for comparison with goals.

The information available and current and desired states for these attributes are discussed in section 6.2.

Promotion of water use efficiency and water storage are also aspects of interest to the FLAG, but have not been considered as specific attributes. These aspects may be potential management approaches to issues around security (reliability) of supply (refer section 5.3) and water availability and both are currently promoted through polices and methods in the TRMP (refer policies 30.2.3.22, 30.1.3.22 and 30.2.3.24).
5 Water allocation management – approach and assumptions

There are currently no allocation regimes for any of the Takaka FMU zones within the Tasman Resource Management Plan (TRMP). An informal allocation limit was determined in 1991 for the Arthur Marble Recharge area, but this does not have legal status under the TRMP and did not include consideration of minimum flows, or provision for cease take within the contributing catchments. A brief summary of existing policy around water take consents is provided in Section 8.5.

In short, at present only seven of 79 consented consumptive water takes (refer 8.5.1) in the Takaka FMU have a cease take trigger, which requires them to stop taking water when rivers reach a certain low flow level. The FLAG proposal is to recommend that Council introduce minimum low flow limits and cease takes across the Takaka FMU for all consumptive takes that affect waterbodies at low flow. The proposed approach is explained in more detail below.

In the Takaka FMU, water allocation seeks to protect instream ecological values, by providing water for use within ecologically sustainable limits, and wherever possible, achieving an acceptable security of supply for out-of-stream users.

The assumption FLAG has made is that by protecting ecological values, most other values (associated with water being left in the river or aquifer) will in turn be protected. The goal is to achieve an ecologically sustainable allocation regime in each zone.

The ecologically sustainable allocation regimes are focused on avoiding any impact from consumptive water takes on river flows during times of low flow. It involves identifying the minimum river flow needed to protect the instream ecological values of the waterbody, then setting a suitable allocation limit that allows for consumptive water use, while protecting the minimum flow and avoiding rivers sitting at the minimum flow for prolonged periods (‘flat lining’). The allocation limit is a small portion of the median flows which protects the flushing effects of higher flows (refer Figure 3).

A cease take trigger is also set to stop consumptive water takes in order to protect the minimum flow. This means that when a river reaches a certain low level trigger everyone has to stop taking water, except for domestic and municipal water supplies (human health) and stock drinking water (animal welfare).

In some cases, the proposed allocation limit has been reviewed and decreased, to reach an acceptable security of supply for users.

Under FLAG’s proposed approach consented water takes will only be able to take water when there is sufficient flow in the river, and will only take a very small portion of typical river flows.

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Figure 3 Schematic diagram of allocation components - showing allocation limit (yellow) relative to other flow levels
For groundwater takes that can reduce flows in rivers connected to the groundwater, a similar approach may be taken with cease takes of groundwater linked to associated river flow triggers. For other groundwater takes, triggers may be based on other objectives, such as prevention of seawater intrusion or prevention of effects on other neighbouring bores. In some groundwater situations ‘cease take’ may not be justified due to the high water availability – i.e. if there is not a measurable effect from the allocated takes during dry periods.

5.1 Ecologically sustainable water allocation method
Following establishment of the values and management objectives by the FLAG, and discussion of considerations for allocation and water quantity management, further expert advice was sought on potential impacts on instream ecological values.

In June 2015, Council contracted Dr Roger Young, a Freshwater Ecologist with the Cawthron Institute, to help the FLAG consider the instream ecological values in different parts of the catchment, and recommend an approach that could be used to set minimum flows and allocation limits to protect these values.

Dr Young’s dossier is available on the Cawthron website. He has been involved in freshwater ecological work throughout New Zealand, and has been involved in various projects related to freshwater management in the Takaka catchments.

Dr Young provided a qualitative classification of the significance of ecological values for each river using a low-moderate-high-significant scale.

A summary report outlining Dr Young’s methodology is expected to be publicly available at the end of December 2016.

The characteristics considered by Dr Young in his ecological value assessments included: the river type and available habitat, the river flow features, including how quickly the river drops during dry periods, water quality, fish passage access and food availability and the specific habitat needs of the fish species expected to be found in the river (including trout and whitebait fisheries).

Dr Young considered these aspects, and in consultation with Council’s ground water scientist (Joseph Thomas) and surface water scientist (Trevor James), suggested appropriate minimum flow and allocation limit ranges, and a single recommended minimum flow and allocation limit for each zone – from here on referred to as the ‘recommended regime’.

5.1.1 Historic Flow Method
Based on advice from Dr Young and TDC staff, FLAG have used the ‘Historic Flow Method’ to inform what minimum flows should be set.

The Historic Flow Method uses a percentage of the 7-day Mean Annual Low Flow (7day-MALF) established for each river to determine an appropriate minimum flow, based on the assumption that the ecological values at a site are provided for by the natural flow regime and naturally lowest flows.

(Note: All references to MALF in the text are in reference to the 7-day MALF unless otherwise stated. For information on what the 7-day MALF is and how it is calculated, and further information on the Historic Flow Method see Appendices 8.3 and 8.4.)
The Historic Flow Method utilises a risk management approach, where in high value areas minimal risk is accepted and in lower values areas more risk is accepted.

The recommended ranges are:

- Minimum flow equals a percentage of the naturalised 7-Day MALF
  - High value sites 90-100% (of MALF)
  - Lower value sites 70-80%

- Allocation limit equals a percentage of the naturalised 7-Day MALF
  - High value sites 10-20%
  - Lower value sites 30-50%

Dr Young has provided his professional opinion on ecologically sustainable regimes for all zones in the Takaka Water Management Catchments where allocation limits are intended to be set. The minimum flows identified in the recommended regimes range between 70% and 90% of MALF and allocation limits between 10 and 20% of MALF.

Dr Young, Joseph Thomas and Trevor James have also provided further advice on the ecological risk and appropriateness of alternative regimes discussed by FLAG where these have differed from the recommended regimes due to existing consented takes, concerns about security of supply, and greater protection being sought for water values considered to be of particular significance to the local community.

FLAG interim decisions on allocation regimes to date have either agreed with the recommended regime or selected a regime that is more ecologically conservative - with one exception for existing takes in the Upper Takaka River (refer Table 2).

5.2 Cease take

A significant component of sustainable flow regime management is the use of cease take triggers to stop consumptive water takes at low flows and avoid flows being drawn below the minimum flow by consumptive takes.

Once rivers reach the cease take triggers, consented consumptive water takes are stopped and no longer impact flow levels (refer section 8.5 for calculation of cease take triggers). Any further reductions in river flow during drought will be through the natural flow recession processes – ie rivers may still drop below the minimum flow naturally.

Currently, only seven of 79 consented consumptive water takes in the Takaka FMU have flow related cease take triggers as part of their consent conditions (3 in Upper Takaka, 1 at Waitui, 1 in Onekaka, 2 in Ellis Creek). Having cease takes for all consented consumptive water takes that affect minimum flows, in all zones, will improve the protection of instream ecological values during periods of low flow. However, the new cease takes will reduce the security of supply for existing consent holders who are not currently subject to cease takes.

Cease take provisions DO NOT apply in the following situations:

- Non-consumptive takes, such as hydro-electric power generation, where the water taken is returned to the same water body after use
• Takes from storage (i.e. where the storage is filled during high flow times and taken for use during low flow times)
• Consumptive takes from groundwater resources, where there is abundant water and takes do not affect surface water body flows or groundwater levels
• Consented community water supplies - as basic water requirements for maintenance of public health are afforded the highest priority through the TRMP priority policy (refer 30.2.3.1).
• Small domestic water takes and stock water supplies, which are permitted in the TRMP (refer 31.1.2.1) and do not require resource consent (the RMA [sec 14-3-b] still requires that these takes do not have an adverse effect on the environment).

Cease take to avoid salt intrusion into aquifers will be applied to groundwater takes within the Coastal Margin Zone.

The Council also has powers under Sec 329 of the RMA 1991 to issue water shortage directions for any takes (including community water supplies and permitted takes) and any discharges to water, in order to manage the use of water and rationing or cease take during serious temporary water shortages and to protect water resources.

5.3 Security of Supply
When the minimum flow, allocation limit and any cease take triggers are identified, the security of supply for the regime can be determined.

Security of supply is a measure of how reliable a water take is. In FLAG discussions of what reliable meant, it became clear that it was not only important how often water takes were ceased, but also for how long each cease take would apply. A cease take period longer than 3 to 5 days at critical times was considered to be restrictive for pastoral irrigation uses.

The critical period for water use will be different for different productive uses (i.e different crops) depending on their water needs at different points in their growing cycle. Typically cease takes occur in the drier months from December to March. Further work on this is planned to assist water users in understanding the effect on security at key times.

Several metrics have been used by FLAG to describe and consider the security of supply. These have compared the proposed regimes to the historic flow record for each river and determined:

1) Between November to April - the percentage of time that rivers flowed above the cease take trigger
2) The number of years that would have had cease takes longer than 3 days and the number of these events occurring
3) The number of years that would have had cease takes longer than 5 days and the number of these events occurring

For many catchments in Takaka, water supply is reliable most of the time, but in particularly dry times, when cease takes do occur they are likely to be for extended periods at a time (i.e. infrequent, but relatively long cease takes occur). The consequence for those reliant on a high supply security is that they may need to install water storage, find alternative supplies or change management practices when longer cease takes apply.
5.3.1 FLAG consensus summary – allocation
Full FLAG consensus has not been reached on all interim allocation regimes, concerns are held by some members regarding either security of supply, or minimum flow protection (e.g. Anatoki, Upper Takaka, AMA Recharge zones). The draft plan change will be progressed based on the interim regimes, however all of these interim regimes will be reviewed as part of the draft plan change review.

5.4 Rationing
Rationing steps are used to incrementally reduce water usage, enabling water users to have access to part of their allocation when flows are getting low, but reducing how quickly minimum flow is reached. This approach reduces the environmental impact of takes during lower flows, while also avoiding or reducing the economic and social impacts of cease takes.

Regimes with rationing steps and cease take still protect the same minimum flow, as the same regime with only a cease take.

Rationing can be used only where river flow recessions allow for this – i.e. when river levels drop relatively slowly during dry periods. A single rationing step of a 50% cut in consented takes has been identified as an option for the Anatoki, Waingaro, Motupipi and Lower Takaka Rivers. A rationing step was initially suggested for the AMA Recharge Zone, but further review of the flow recession timeframes show this is too fast to warrant rationing. Further detail is provided in Table 2.

5.5 Opportunity costs for community benefit and future choice
Concern has been raised by some FLAG members over the potential loss of community benefit and future choice (an opportunity cost), in allocating large amounts of water up to the ecologically sustainable limits where demand is currently low. An example of this is the Takaka Township Zone.

The concern is that companies could apply for substantial amounts of this available water and use it for end uses that, while generating minimal or no environmental adverse effects, may provide little or no economic or social benefit to the local community. In addition, there is no current mechanism to withdraw and reallocate this water in the future to uses that do benefit the local community. In this sense, the current situation of ‘controlled activity status’ for water take renewals -meaning applications cannot be declined - is considered by some to create a private tradable item, which the community are currently giving away for free.

This topic is also a national level debate and these concerns are being echoed elsewhere in the country. Much of the discussion centres around the export of water for bottled drinking water, but there may be many other uses that only provide limited local benefits, including the use of water for production of other exported products. The nature of the export business can differ greatly in terms of the local benefits provided (i.e. through job creation, local spending and product supply) and the adverse effects produced (i.e. water quality pollution through point source or diffuse sources).

Some FLAG members would like a mechanism by which the community can ensure they see benefit from their local resources. Staff are not confident that such a mechanism currently exists within Council powers under current legislation, and as such, this issue may be outside the scope of the FLAG work. There may also be challenges in justifying any such approaches through the RMA 1991 Schedule 1 process. Staff intend to look further at these issues during plan change drafting.
5.6 Allocation Regime Summary

The interim allocation regimes for each zone are summarised in Table 2.

Table interpretation:
- Column 1 shows the zones and respective water bodies
- Column 2 shows the allocation regime selected –
  - This shows the minimum flow percentage of the 7-Day MALF (e.g., 90%), followed by the allocation limit percentage of the 7-Day MALF (e.g., 10% - which gives a regime of 90:10).
  - Where a regime different to that recommended by Dr Young and Council staff was selected by FLAG – the recommended regime is shown in square brackets (e.g., [80:20]) and the cell is shaded light blue.
  - Where an interim decision has yet to be made by FLAG the cell is shaded purple
- Column 3 shows the amount of additional available water for the regime (i.e., the allocation limit less the existing consented takes). These are shaded green for more available water (darker for larger volumes), orange for those with no additional water available and red where a claw-back of existing allocation is required to meet the regime.
  - Where there is no interim decision, the possible range of water available under the allocation options discussed by FLAG are shown
- Column 4 includes comments relating to the decisions around each regime, including key concerns voiced during the process.

Further detail on the allocation regimes in each zone is available on Council’s FLAG website under the September 2016 update to Council (Allocation zone summaries link).

Existing consented takes would either be subject to the new provisions upon renewal, or could be reviewed prior to expiry under s68(7) of the RMA 1991 to make them compliant with the new rules. In some cases, existing consents are proposed to be ‘grandfathered’ at their current operating conditions. (‘Grandfathered’ means the consents continue to operate as they did before the new rules came in – this could be in perpetuity or up until a set time-frame).

Cease take provisions will apply to most of the allocation regimes shown and will apply to all new consented consumptive takes that adversely affect low flows – with the exception of community water supplies.

The cease take triggers are listed in Table 3. Further detail on cease takes applying in the AMA recharge zone associated with protection of Te Waikoropupū springs is provided in appendix 8.7.
5.6.1 FLAG consensus summary – allocation approach

Full FLAG consensus has not been reached on the approach to allocation, in particular the setting of minimum flows to be protected. The differing viewpoints are summarised below:

Table 1 FLAG consensus summary – historic flow method allocation approach

<table>
<thead>
<tr>
<th>Majority of FLAG members agree:</th>
<th>Remaining FLAG members preference:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determination of minimum flows to be protected should follow Dr Roger Young’s recommended approach within a range of 70% to 100% of MALF depending on ecological considerations.</td>
<td>All minimum flows to be protected should be set at 100% of MALF.</td>
</tr>
<tr>
<td>This approach is linked to associated instream ecological values and would provide for very low to medium risk to instream values, depending on ecological needs as identified by Dr Young.</td>
<td>This approach uses MALF for each river and would provide for very low risk to instream values.</td>
</tr>
<tr>
<td>Security of supply is reduced from current levels due to cease take, but is maximised within sustainable ecological limits.</td>
<td>Security of supply would be significantly reduced from current levels and also from those identified for the interim regimes.</td>
</tr>
</tbody>
</table>

So whilst the table below shows the interim decisions, there is still a view within FLAG that 100% of MALF should be the minimum flow for all water bodies.

The draft plan change will be progressed based on the majority FLAG view. Feedback on the interim decisions from iwi, stakeholders and the local community may assist FLAG in reaching consensus on the approach. However, if after FLAG review of the draft plan change, consensus is still not achieved, both approaches will be included in the FLAG recommendations to the Council’s Environment and Planning Committee (EPC) for a decision regarding content of the proposed plan change to be notified.
Table 2 Water allocation regimes by zone for the Takaka Freshwater Management Unit (as of May 2016)

<table>
<thead>
<tr>
<th>Zone</th>
<th>Selected Regime [recommended]</th>
<th>Allocation Limit (L/s)</th>
<th>Additional Water Available (L/s)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMA Recharge (TWS)</td>
<td>96:10 [90:10]</td>
<td>766</td>
<td>355</td>
<td>Zone includes Upper Takaka, Waingaro and Anatoki Zones, Middle Takaka area and tributaries in Upper Takaka. Concern expressed over minimum flow level and security of supply applying to takes in Middle Takaka and tributaries.</td>
</tr>
<tr>
<td>Waingaro</td>
<td>80:20</td>
<td>550</td>
<td>184</td>
<td>Regime dependent on the final decisions made for the AMA Recharge. Concern expressed over minimum flow level.</td>
</tr>
<tr>
<td>Upper Takaka (main stem only)</td>
<td>60:10 and 70:15 [70:20]</td>
<td>357</td>
<td>118</td>
<td>Regime dependent on the final decisions made for the AMA Recharge. 60:10 to apply to existing takes (time period to be determined), new takes to operate at 70:15. Concern expressed over minimum flow level protection under both 60:10 and 70:15 regimes.</td>
</tr>
<tr>
<td>Anatoki</td>
<td>90:10 [80:20]</td>
<td>171</td>
<td>91</td>
<td>Some concern expressed over consistency of approach compared to Waingaro Zone and security of supply.</td>
</tr>
<tr>
<td>Takaka Township</td>
<td>No interim decision [80:10]</td>
<td>271 or 541</td>
<td>135 or 405</td>
<td>Concern over potential loss of community benefit and future choice. Options for reservation and consideration of community benefit are being explored, as are changes to the activity status for any consent applications to take water. Alternative regime suggested is 90:05.</td>
</tr>
<tr>
<td>Motupipi (surface water only)</td>
<td>80:20</td>
<td>46</td>
<td>2</td>
<td>Applies only to surface water takes. No further takes from groundwater in this zone.</td>
</tr>
<tr>
<td>Coastal Western Catchments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pariwhakaoho</td>
<td>90:10</td>
<td>19</td>
<td>19</td>
<td>Concern expressed that some in community do not consider allocation in Pariwhakaoho is sustainable.</td>
</tr>
<tr>
<td>Onahau</td>
<td>90:10</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Puremahaia</td>
<td>90:10</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Onekaka</td>
<td>90:12 (existing takes) [90:10]</td>
<td>13.9</td>
<td>0</td>
<td>Advice from Dr Young is that the current allocation (~90:12) is acceptable as the difference from the recommended regime (90:10) is very small (ie 2.3L/s) and is unlikely to cause measurable effects. Existing takes grandfathered.</td>
</tr>
<tr>
<td>Tukurua</td>
<td>90:10</td>
<td>3.9</td>
<td>-3</td>
<td>The regime will require a 3L/s reduction in the community supply allocation at consent renewal – this has been discussed, but not confirmed with the consent holder.</td>
</tr>
<tr>
<td>Waikoropupū Catchment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waikoropupū R</td>
<td>Existing takes</td>
<td>57.3</td>
<td>0</td>
<td>Applies below the confluence of Waikoropupū River and Campbell Creek. Existing takes grandfathered to current allocations.</td>
</tr>
<tr>
<td>Campbell Creek</td>
<td>90:10</td>
<td>35</td>
<td>35</td>
<td>Applies to Campbell Creek above the confluence with the Waikoropupū River</td>
</tr>
<tr>
<td>Wainui</td>
<td>90:10</td>
<td>61</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Pohara-Clifton</td>
<td>Existing takes</td>
<td>32.89</td>
<td>0</td>
<td>Existing takes grandfathered to current allocations.</td>
</tr>
<tr>
<td>Rototai</td>
<td>Existing takes</td>
<td>19.2</td>
<td>0</td>
<td>Existing takes grandfathered to current allocations.</td>
</tr>
<tr>
<td>Confined AMA</td>
<td>50 L/s</td>
<td>50</td>
<td>43</td>
<td>Allocation based on &lt;1% of estimated flow to sea. A 1km exclusion area around TWS is also proposed. Remaining concerns on potential effects on TWS.</td>
</tr>
<tr>
<td>Wainui North</td>
<td>(to be confirmed) Existing takes</td>
<td>1.9</td>
<td>0</td>
<td>Existing takes grandfathered to current allocations.</td>
</tr>
<tr>
<td>Ligar Bay-Tata</td>
<td>No regime specified - general policy applies</td>
<td>None defined</td>
<td>0</td>
<td>The streams in this zone are very small, with no existing consented takes or known demand, and there are no flow measurement sites to provide data for regime determination.</td>
</tr>
</tbody>
</table>

Low flow cease take provisions will apply in all zones with allocation regimes to all consented consumptive takes where these are considered to have an adverse effect on groundwater levels or surface water flows, but excluding community water supplies for public health reasons. Salt intrusion cease take provisions will also apply to all consented groundwater takes within the Coastal Margin Zone.
<table>
<thead>
<tr>
<th>Zone</th>
<th>Selected Regime</th>
<th>Location of MALF for allocation limit calculation</th>
<th>Location of cease take trigger measurement</th>
<th>Cease Take Trigger [and method]</th>
<th>Rationing Trigger [and method]</th>
<th>Where cease take applies</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMA Recharge (TWS)</td>
<td>96:10 [90:10]</td>
<td>Te Waikoropupū Spring (GW6013)</td>
<td>Te Waikoropupū Spring (GW6013)</td>
<td>7661 [MF+AL]</td>
<td>none</td>
<td>All takes* in Middle Takaka, Upper Takaka tributaries, all AMA takes</td>
</tr>
<tr>
<td>Waingaro</td>
<td>80:20</td>
<td>Site upstream of Takaka River confluence</td>
<td>Hanging Rock</td>
<td>3143 [MF+50%AL]</td>
<td>3418 [MF+AL]</td>
<td>All takes* in Waingaro catchment</td>
</tr>
<tr>
<td>Upper Takaka (main stem only)</td>
<td>70:15 [70:20]</td>
<td>Harwoods</td>
<td>Harwoods</td>
<td>2023 (B takes) [MF+AL]</td>
<td>none</td>
<td>New (B) surface takes from Takaka River main stem only</td>
</tr>
<tr>
<td>Anatoki</td>
<td>90:10 [80:20]</td>
<td>One Spec Road</td>
<td>Happy Sam’s</td>
<td>2026 [MF+50%AL]</td>
<td>2111 [MF+AL]</td>
<td>All takes* in Anatoki catchment</td>
</tr>
<tr>
<td>Takaka Township</td>
<td>No interim decision [80:10][90:05]</td>
<td>Gravel Crusher</td>
<td>Gravel Crusher</td>
<td>(RY=4602 or 5008) [MF+50%AL]</td>
<td>(RY=4873 or 5143) [MF only]</td>
<td>Surface water takes from the lower Takaka River</td>
</tr>
<tr>
<td>Motupipi</td>
<td>80:20</td>
<td>Reilly’s Bridge gauge site</td>
<td>Correlated to fire station bore</td>
<td>6783mm [MF+50%AL]</td>
<td>6824mm [MF+AL, 50% cut]</td>
<td>Surface water takes from the Motupipi River</td>
</tr>
<tr>
<td>Coastal Western Catchments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pariwhakaoho</td>
<td>90:10</td>
<td>SH60</td>
<td>Correlated to Happy Sams</td>
<td>195 [MF+AL]</td>
<td>none</td>
<td>All takes* in catchment</td>
</tr>
<tr>
<td>Onahau</td>
<td>90:10</td>
<td>SH60</td>
<td>Correlated to Happy Sams</td>
<td>67 [MF+AL]</td>
<td>none</td>
<td>All takes* in catchment</td>
</tr>
<tr>
<td>Puremahaia</td>
<td>90:10</td>
<td>SH60</td>
<td>Correlated to Happy Sams</td>
<td>23 [MF+AL]</td>
<td>none</td>
<td>All takes* in catchment</td>
</tr>
<tr>
<td>Onekaka 90:12 (existing takes)</td>
<td>90:10</td>
<td>SH60</td>
<td>Correlated to Happy Sams</td>
<td>116 [MF+10%MALF] (=90:10)</td>
<td>none</td>
<td>All takes* in catchment</td>
</tr>
<tr>
<td>Tukurua</td>
<td>90:10</td>
<td>SH60</td>
<td>Correlated to Happy Sams</td>
<td>39 [MF+AL]</td>
<td>none</td>
<td>All takes* in catchment</td>
</tr>
<tr>
<td>Waikoropupū Catchment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waikoropupū R</td>
<td>Existing takes</td>
<td>Upstream of confluence with Takaka River</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>Campbell Creek</td>
<td>90:10</td>
<td>Upstream of confluence with Waikoropupū River</td>
<td>Correlated to Happy Sams</td>
<td>353 [MF+AL]</td>
<td>none</td>
<td>All takes* in catchment</td>
</tr>
<tr>
<td>Wainui</td>
<td>90:10</td>
<td>Wainui River Bridge</td>
<td>Based on gauging at bridge</td>
<td>613 [MF+AL]</td>
<td>none</td>
<td>All takes* in catchment</td>
</tr>
<tr>
<td>Pohara-Clifton</td>
<td>Existing takes</td>
<td>na</td>
<td>No data</td>
<td>No data</td>
<td>na</td>
<td>Consent specific</td>
</tr>
<tr>
<td>Rototai</td>
<td>Existing takes</td>
<td>na</td>
<td>Consent based</td>
<td>Salinity based</td>
<td>na</td>
<td>Consent specific</td>
</tr>
<tr>
<td>Confined AMA</td>
<td>50 L/s</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>Wainui North, Ligar Bay-Tata</td>
<td>No regimes specified - general policy applies</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>Na</td>
<td></td>
</tr>
</tbody>
</table>

*"all takes" refers to all consented consumptive takes where these are considered to have an adverse effect on groundwater levels or surface water flows, but excluding community water supplies for public health reasons.
6 Water quality management - approach and assumptions

6.1 Summary of water quality state

Water quality in the Takaka FMU is generally very good or exceptional and most of the FMU zones are considered to be in a ‘maintain existing quality’ state (refer green in Figure 4).

Of particular note, Te Waikoropupū springs is Wahi Tapu and recognised as an outstanding water body with extremely high water clarity to be protected.

Water quality at popular swimming spots is also particularly important and needs to be maintained both for local enjoyment and tourism opportunities.

Onekaka River has one of the highest measured native fish diversities in New Zealand (13 species in one reach) and the other coastal western catchments are expected to be of a similarly high ecological value as Onekaka.

Water clarity for rivers in the Takaka FMU is also well above the national average.

In general, nutrient concentrations are low. Even the waterways with the highest nitrate and ammonia concentrations in the Takaka FMU are well below levels considered toxic to fish and stream invertebrates. However, these waterways can also have high coverage of filamentous green algae.

Fine sediment content of stream beds is also generally low, but can be high in spring-fed streams and is occasionally an issue downstream of poorly controlled land disturbance activities.

There are several water bodies or parts of water bodies with existing localised recurrent issues where water quality needs to be improved (refer orange in Figure 4). These are summarised in Table 4.
<table>
<thead>
<tr>
<th>Water body or reach</th>
<th>FMU Zone</th>
<th>Issue to be addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Takaka Limestone Aquifer</td>
<td>Motupipi and Pohara-Clifton Zones</td>
<td>Potentially elevated nitrate (levels to be reviewed in 2016 groundwater survey - awaiting analysis)</td>
</tr>
<tr>
<td>Te Kakau Stream</td>
<td>Takaka Township Zone</td>
<td>Dissolved oxygen, aquatic weed growth, temperature, shading and habitat</td>
</tr>
<tr>
<td>Lake Killarney</td>
<td>Takaka Township Zone</td>
<td>Water clarity and phytoplankton blooms</td>
</tr>
<tr>
<td>Motupipi River and tributaries</td>
<td>Motupipi Zone</td>
<td>Nitrates, phytoplankton blooms, sedimentation, temperature and dissolved oxygen, shading and habitat</td>
</tr>
<tr>
<td>Pohara Creek and Beach</td>
<td>Pohara – Clifton Zone</td>
<td>Recurrent bacteria alerts for bathing quality.</td>
</tr>
<tr>
<td>Tukurua River mouth and beach</td>
<td>Tukurua Zone (Coastal Western Catchments)</td>
<td>Recurrent bacteria alerts for bathing quality.</td>
</tr>
<tr>
<td>Small unshaded creeks in pastoral lowland areas (eg Ellis Creek)</td>
<td>All</td>
<td>Riparian and aquatic habitat loss and lack of shading (causing temperature and aquatic weed growth issues).</td>
</tr>
</tbody>
</table>

There are also diffuse risks to water quality across the FMU, from both current and future land uses (including potential for intensification), which the FLAG are seeking to manage.

Risks of concern to FLAG include discharges of sediment, disease causing organisms (effluent and excreta) and nutrients (in particular nitrates which exacerbates algal growth), and the loss of aquatic and riparian habitat, particularly for smaller low land streams and those close to the coast (these can have high biological diversity, but can be more adversely affected by loss of shading and riparian habitat).
6.2 Water quality parameters of concern
As discussed earlier in section 4.3.3 the water quality attributes of concern in the Takaka FMU are:

- Mauri
- Water clarity
- Macro-invertebrates
- Fine sediment
- Riparian and aquatic habitat loss (including loss of shading and habitat/biodiversity)
- Nuisance aquatic plants (macrophytes, periphyton and phytoplankton)
- Dissolved Oxygen and Dissolved Organic Carbon (as indicators of aquifer health)
- Nutrients: Nitrate and Phosphorus (for aquatic plant growth)
- E.coli (as an indicator of disease causing organisms, Enterococci at marine sites)

Long term information for the state of many of these water quality attributes is available in Council’s State of the Environment (SOE) monitoring of rivers, groundwater, estuaries and bathing water.

The SOE summary reports are available on Council’s website (links below):

- River Water Quality Report Part 4 – Takaka Water Management Area 2015
- Bathing Water Quality End-of-Season Reports (since 2009)
- Motupipi Estuary Reports

In addition, further information is available from summary groundwater surveys which occur every 10 years (currently awaiting analysis of 2016 survey), spot sampling done by Council, including one-off investigations, consent compliance monitoring and monitoring done by other organisations such as the Department of Conservation and the recent Te Waikoropupū water sampling funded by the Friends of Golden Bay.

Despite the wide range of monitoring undertaken, data is not always available for all sites in the FMU, or for all attributes, for which data would be useful. The amount of data is limited by the monitoring budgets allocated to the Takaka FMU, which has a flow-on effect to Council rate charges district wide. Consideration of further sampling and prioritisation of this will be undertaken by staff as part of the implementation plan development recommended to Council.

6.2.1 Desired states (freshwater objectives) for key attributes
The desired states, or freshwater objectives (refer NPS-FM), for the key attributes have yet to be finalised by FLAG. The desired state sets the goals for water quality management, which, when compared to the current state, shows if and where changes must be made to improve water quality. These may take time to implement or to see an observable improvement. An example of this is the delay in benefits from riparian planting while plants grow. There is no timeframe attached to reaching the desired state levels - this is something FLAG and staff will look at during the implementation plan development.

The current and draft desired states for the key attributes (where known) are summarised in Table 5 and the management methods identified for water quality are outlined in section 6.3. Table 8 summarises the management methods relevant to each key attribute.
## Table S DRAFT Summary of current and desired states for key water quality attributes in Takaka FMU

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Metric and unit</th>
<th>Current State (based on available data)</th>
<th>Desired State (draft) (to be confirmed by FLAG)</th>
<th>Status summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mauri</strong></td>
<td></td>
<td>• General: not yet defined – to be discussed with iwi</td>
<td>General: clarity in SOE B band or above (&gt;3m). No decreasing trends in annual medians. TWS: to be discussed.</td>
<td>Monitor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sites of concern: not yet defined – to be discussed with iwi</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TWS: not yet defined – it is assumed mauri has improved with greater respect given to the springs, exclusion of swimming contact and enhancements made to reserve under the DOC management plan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Water clarity</strong></td>
<td></td>
<td>• General: river water clarity varies across the FMU, but in general is higher on average than elsewhere in the district. FMU range 2m–22m.</td>
<td>General: To be discussed: Sites meet SOE A or B bands. No declining trends attributive to water quality or water abstraction.</td>
<td>Maintain (at sites of concern)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sites of concern: Lake Killarney (re phytoplankton), Motupipi River (re phytoplankton), Powell Creek, Winter Creek.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TWS: Current state unknown. Black disc not possible without use of mirrors/divers - as done in 1993 (63m). Attempts to measure by other means has proven difficult. Coloured Dissolved Organic Matter (which produces 'colour' that reduces clarity) could be a low cost proxy for clarity. Measures of CDOM in the springs have shown levels similar to Blue Lake and equivalent to over 70m water clarity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Macron - invertebrates</strong></td>
<td></td>
<td>• General: wide range of MCI results, limited sites in SOE. Western coastal sites in excellent-good range.</td>
<td>General: To be discussed: Sites meet SOE A or B bands. No declining trends attributive to water quality or water abstraction.</td>
<td>Maintain (at sites of concern)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sites of concern: Watercress Creek, Motupipi River, Powell Creek.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TWS: main spring not sampled, monitoring in Te WaiKoropu River since 1988 does not show any noticeable effect on MCI (Stark 2015)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fine Sediment</strong></td>
<td></td>
<td>• General: Unknown – to be investigated.</td>
<td>General: to be discussed, lowland streams &gt;1m and &lt;10m wide; Te Kakau Stream, Motupipi River and tributaries, Ellis Creek (except those that go completely dry).</td>
<td>Maintain (at sites of concern)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sites of concern:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TWS: not measured and methods invasive, but known issues at main spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Riparian and Aquatic Habitat</strong></td>
<td></td>
<td>• General: Samples site generally within SOE A to C bands. SOE SBSV sampling focused on high risk sites.</td>
<td>General: to be discussed, lowland streams &gt;1m and &lt;10m have at least X% riparian cover.</td>
<td>Improve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sites of concern: Motupipi Estuary, Motupipi River, Powell Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TWS: main spring has developing riparian cover and excellent aquatric habitat</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nuisance Aquatic Plants</strong></td>
<td></td>
<td>• General: Filamentous green algae generally low, phytotheny scores generally good in SOE A or B bands, other localized issues with epiporphosphen and phytoplankton blooms.</td>
<td>General: Sites meet the SOE A or B bands for filamentous green algae. Aquatic weed growth does not adversely affect dissolved oxygen or clarity objectives. TWS: to be discussed</td>
<td>Maintain (at sites of concern)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sites of concern: Te Kakau Stream, Motupipi River, Powell Creek, Watercress Creek, Takaka River at Harloups, Lake Killarney.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TWS: DOc monitors growth of plants in spring (eg Gallum palustre). Changes in Te WaiKoropu River since 1988 attributed to freshes and drought low flows, but not to water quality (Stark 2015).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dissolved Oxygen</strong></td>
<td></td>
<td>• General: Limited site data available – focused on sites of concern</td>
<td>General: Sites meet the SOE A or B bands. No declining trends. TWS: to be discussed. Seasonal baseline may be needed.</td>
<td>Maintain (at sites of concern)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sites of concern: Te Kakau Stream, Motupipi River (due to weed growth)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TWS: 1970’s: 5%–65%, April-May 2016: 50%–53% (difference is within measurement error margins). There may be greater variation during peak plant production (ie February) – baseline needed to confirm seasonal variation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dissolved Organic Carbon (DOC)</strong></td>
<td></td>
<td>• General: limited sampling has shown levels are below detection limits</td>
<td>General: TWS: Samples remain below detection limits.</td>
<td>Maintain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TWS:</td>
<td></td>
</tr>
<tr>
<td><strong>Nitrogen for aquatic plant growth</strong></td>
<td></td>
<td>• General: values vary across water bodies: o For nitrate nitrogen: typically in NOF A or B bands for toxicity (&lt;1.0 and 2.4mg/L, respectively) both above and below ANZECC trigger levels for investigation of effects on aquatic plant growth. o For DIN: The Harwoods mean (from SOE) is 0.03 mg/L, while lower catchments range from 0.15 (Onekaka) to 1.79 (Watercress).</td>
<td>General and TWS: to be discussed further (non-consensus in FLAG)</td>
<td>Maintain (at sites of concern)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sites of concern: to be confirmed based on desired states, Motupipi River, Powell Creek, Takaka Limestone Aquifer – the effect on aquatic plant growth is also dependent on the nitrate to phosphorus ratio and other factors such as shading. TWS: for nitrate nitrogen: 2016 Feb-Oct (FoGB data) median = 0.40 mg/L (DIN not applicable to TWS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Phosphorus for aquatic plant growth</strong></td>
<td></td>
<td>• General:</td>
<td>General and TWS: to be discussed. Possible triggers: Annual median for nitrate nitrogen remains below 0.5, 0.44 or 0.3mg/L.</td>
<td>Maintain (at sites of concern)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o For DRP: most SOE samples (limited sites) DRP is less than 0.01mg/L o For Total P: values vary across water bodies – all below 0.03. The Harwoods mean (from SOE) is 0.007mg/L, while lower catchments range from 0.006 (Kotinga) to 0.03 (Motupipi river and Powell Creek). o Sites of concern: for DRP: Motupipi River, Powell Creek, Watercress Creek. For Total P: to be determined based on desired states o TWS: for DRP: 2016 May-Oct (FoGB data) median = 0.006 mg/L. (Total P not applicable to TWS).</td>
<td>(for aquatic plant effects, nitrate and phosphorus need to be considered together including assessment of actual effects)</td>
<td></td>
</tr>
<tr>
<td><strong>E.coli for swimming</strong> (or Entero cocci at marine sites)</td>
<td>E.coli per 100mls [at baseflow]</td>
<td>• General: 2015–16 bathing season: sites met regulations 97% of time. Sites of concern:</td>
<td>Bathing water sites meet guidelines for swimming (&lt;260 E.coli/100ml) at least 98% of time over summer (Nov–April).</td>
<td>Maintain (at sites of concern)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sites of concern: Tukura river mouth and beach, Pohara Creek and beach, Motupipi River, Onekaka River.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TWS: not applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E.coli for drinking water</strong></td>
<td>E.coli per 100mls</td>
<td>• General: Groundwater meets drinking water standards – secure bores do not require further treatment. Surface water typically requires some treatment to meet drinking water standards (can be due to natural sources eg birds). Sites of concern: none TWS: not applicable (although levels meet drinking water standards)</td>
<td>Water used for drinking water meets drinking water standards (&lt;1 E.coli/100ml) with no increased need for treatment of source water to meet the standards.</td>
<td>Maintain</td>
</tr>
</tbody>
</table>

1 Nitrate NOF bands not corrected for hardness which raises band thresholds considerably.
2 Refer values from Instream plant and nutrient guidelines NIWA 2016, science panel report (available Dec 2016) and ANZECC guidelines.
6.3 Water Quality Management Approaches

In considering how to manage water quality issues and risks, the Takaka FLAG, with advice from Council staff, have focused on identifying the likely root causes of current water quality issues and potential sources of future risk in the FMU, so that management target to root cause.

Figure 5 illustrates the example of poor dissolved oxygen levels in the Te Kakau stream. The cause of the low dissolved oxygen is over growth of aquatic weeds (i.e. Lagarosiphon). The aquatic weed growth is in turn caused by excess sunlight and water temperatures, and exacerbated by a lack of flushing flows and potential elevated nutrients from runoff or groundwater. The excess light and water temperatures are caused by a lack of shading from riparian trees and shrubs. The most appropriate long term solutions to the dissolved oxygen problem is therefore planting of the stream banks to provide shading, and addressing any potential nutrient sources (refer Figure 5).

In considering the root causes of current water quality issues, and the relationships between different key attributes, the Takaka FLAG have identified the following water quality management approaches for use in the Takaka FMU:

- Requirement for Good Management Practice (all land uses in all zones)
- Adaptive management (changing management if objectives are not met)
- Onsite wastewater management (including education and auditing of systems)
- Water body stock exclusion
- Riparian and aquatic habitat restoration
- Existing and new monitoring

These methods are outlined in sections 6.3.1 to 6.3.6.
6.3.1 Requirement for Good Management Practice (GMP)

The proposed management aim is to ensure all landowners, throughout the Takaka FMU, are operating at industry agreed good practice levels.

Practical approaches for achieving this could be through a regulatory regime that requires Good Management Practice (GMP) utilizing industry support and auditing programs (eg Supply Fonterra, NZ GAP, NZ FAP) where possible, or a combination of regulatory and non-regulatory approaches.

Good practice for different industries has yet to be agreed for land uses in Takaka, although work has been occurring around the country looking at what good management means. In addition to local knowledge, there are a number of useful resources available from different industry sector groups, government organisations and regional councils, for example:

- **Industry-agreed Good Management Practices relating to water quality** (18 September 2015) developed by Dairy NZ, Beef and Lamb NZ, Horticulture NZ, Deer Industry NZ, NZ Pork and the Foundation for Arable Research as part of the Matrix of Good Management project in Canterbury

The Takaka FLAG (and the Waimea FLAG) have highlighted that there is a strong desire to avoid over-regulation and the associated costs to all parties. However, it is also acknowledged that some regulation is required to ensure desired behavioural changes across all sectors and spectrums to achieve the desired management objectives.

It is proposed that GMP focus on five key areas:

1. Nutrient management
2. Sediment management
3. Effluent management (eg disease causing organisms as indicated by *E.coli*)
4. Efficient and resilient water use
5. Riparian management, including:
   - Stock exclusion and fencing setbacks
   - Restoration and replanting

The three key aspects to consider in each of these areas is:

- What does good practice mean for each industry with respect to this factor?
- What are the risks for this factor?
  - for physical context (eg high rainfall, leaky soils, erodible soils), and
  - for industry practice (eg those practices which result in discharge of contaminants, etc)
- What unintended adverse effects might there be? eg loss of trees in seeking efficient water use
- How to achieve the desired outcomes in an affordable and practical way?
  - Can existing industry programmes be used in regulatory frameworks?

Council is also undertaking a review of the land disturbance rules in the TRMP, which may influence sediment management and vegetation clearance across the district.
6.3.1.1 Good Management Practice - further work needed
A significant amount of work is needed to progress development of a good management practice regulatory framework including (for example):

- Understanding good and best practice for each industry and how best to incorporate this into the regulatory framework, or whether it is best managed in a non-regulatory way, and how to achieve the desired outcomes across all businesses:
  - There are legal difficulties in linking industry programmes with permissive regulation (refer Willis 2016 for further information on this)
- Consideration of approaches used in other regional council plans and how successful these have been
- Understanding the key risk factors for local areas and for specific industry practices - with the aim of targeting management to the high risk factors
- Determination of minimum content requirements for farm management plans (where relevant) that meet the outcome requirements for the Takaka FMU.

6.3.1.2 Urban Land Use GMP
Council staff are also undertaking a catchment management planning project that will look at implementation of the NPS-FM in urban areas, which may provide further direction for freshwater management in the Takaka urban area.

6.3.2 Adaptive management
The FLAG has discussed the concept of adaptive management as a useful approach for managing future risks to existing good water quality, particularly where water quality is currently in a ‘maintain’ state. The basic process involves identifying triggers for attributes at risk and appropriate actions to take if the triggers are breached.

Staff will develop a framework that provides for this approach as part of the plan change drafting, including consideration of appropriate triggers and action options if triggers are breached.

6.3.2.1 FLAG Consensus Summary - approaches to manage water quality risks
FLAG discussions for adaptive management have centred on management of the Arthur Marble Aquifer and subsequent risks to Te Waikoropupū springs (refer appendix 8.7).

Most FLAG members agree that water quality should be managed through land use controls, however a remaining philosophical difference around the FLAG table is whether allocation of water should also be used as a tool for controlling water quality.

The driver behind wanting to use allocation as a tool for managing water quality comes from the agreed assumption that further water availability in the Takaka catchments will result (at least in the short to medium term) in dairy land use intensification through enabling an extension of the milk producing period over the summer months and this creates an increased nitrate leaching risk.

The driver behind using land use controls alone as a tool for managing water quality comes from the agreed assumption that land use intensification (and its potential effects) can be achieved through means other than irrigation from allocated water takes, such as supplementary feed, fertiliser use and
irrigation from water storage. In addition, nitrate leaching is largely driven by high rainfall and is greatest over the winter months when irrigation is not occurring. Land use controls aim to manage the activities that are creating the effect – at the source.

Staff recommend using land use controls (at least in the first instance). The reasons for this are that:

- Attributes of concern such as fine sediment, *E.coli*, nuisance plant growth and riparian habitat loss are not limited to specific land uses, or only to irrigated farming, and would not be addressed through water allocation restrictions. These issues must be controlled through good management practice requirement, and promotion and support of change through non-regulatory processes.
- It is assumed that not all farms are operating at a GMP level for all aspects, so there is room for water quality improvement with the regulatory requirement for all farms to meet GMP.
- The monitoring results to date, do not show a clear relationship between land use and nitrate levels in key water bodies – instead the effects from land use are an agreed assumption (ie there is an effect, but we cannot definitively attribute a specific amount of observed nitrate to a particular land use).

### 6.3.3 On-site Wastewater Management

Failing onsite wastewater systems (eg old or poorly maintained septic tanks) could be a source of both nutrients and disease causing organisms in the Takaka FMU. FLAG is proposing to include onsite wastewater management education and auditing in the implementation plan (non-regulatory methods) that will accompany the draft plan change for the Takaka FMU.

Higher risk areas identified in the Takaka FMU include those overlaying the Takaka Limestone Aquifer (Pohara-Clifton Zone and Motupipi zone) and areas with known surface karst features (eg sinkholes).

#### 6.3.3.1 Onsite Wastewater - further work needed

Council does not have any formally-developed education material about wastewater system maintenance, however compliance staff do provide some information to landowners.

This approach is a non-regulatory approach, with no proposed changes to the TRMP and has been identified by council staff previously. Discussions with relevant budget administrators has identified that development of an education resource and distribution of this as part of an education programme can be absorbed within existing Community Development budgets and this work is currently being progressed by council environmental policy staff.

### 6.3.4 Waterbody Stock Exclusion

Either separately, or as part of Good Management Practice, it is proposed that stock are excluded from waterways. The interim FLAG decision is to follow the proposal in the NPS-FM Next Steps document as summarized below.

*Table 6 Stock exclusion deadline table from Next Steps document (MfE 2016)*
The Next Steps document identified water bodies for stock exclusion as:

- **Permanently flowing waterways and drains greater than 1 metre wide and 30 centimetres deep, (and smaller ones on the plains, but giving these landowners until 2020 to comply)**
- **Natural wetlands, but not including damp gully heads or places where water temporarily ponds, or built structures, such as effluent ponds, reservoirs or channels.**

In the Takaka Catchments, dairy stock have already been excluded from all waterways identified in the Clean Streams Accord (greater than 1m wide and 30cm deep). It is not clear what the Next Steps document specifically intended by “smaller ones on the plains”, however for dairy land use in Takaka 30% of streams smaller than the accord waterways have also been stock excluded.

Over 200 potential sinkholes have been identified in the Takaka Valley – particularly between Lindsay’s Bridge and Hamama on the western side of the Takaka River. Takaka FLAG have briefly discussed stock exclusion applying to closed and open karst sinkholes (those that do and don’t hold water respectively), but have not yet made a recommendation on this. Open sinkholes have the potential to be sources of contamination into groundwater, but the contamination risk has not yet been discussed or quantified, but is likely to be different for different types of sinkhole. There may be direct pathways leading to aquifer systems or there may be filtering of water through soils (overburden) lying inside sinkholes. On some farms sinkholes may represent a significant portion of paddock areas. Some farmers have already taken the initiative to exclude stock from sinkholes on their properties.

### 6.3.4.1 Current council financial subsidy

Council has an annual budget of $120,000 per year for provision of fencing materials for stock exclusion across the whole district, as well as some planting of willows and poplars for erosion control. Taking into account the different types of fencing and other uses of the funds, this budget enables approximately 27km of fencing per year. Only a portion of which is used in the Takaka Catchments. So far in the Takaka FMU, approximately 63km of fencing has been subsidized through the Council fund between 2001 and 2015, averaging 4.4 km per year. This estimate does not include other fencing wholly paid for by landowners or through some other funding source.

The administration of this budget is under review, including the methods for prioritizing funding and links with riparian restoration efforts.
Funding recommendations will form part of the Takaka FMU implementation plan.

6.3.4.2 Stock Exclusion - further work needed
Further work is required to progress stock exclusion through regulation and the implementation plan including:

- Continuing to work with industry groups to promote and provide advice to landowners on fencing and fencing setbacks, taking into account:
  - Maximizing benefits to waterways, while minimising fencing requirements and productive land loss
  - Riparian planting and stream restoration requirements
  - Minimising ongoing maintenance of stock excluded margins
  - Avoiding fencing losses or the need to shift fencing in the future
- Review of the current fencing subsidy fund, including how this fund is prioritized and extent of funds relative to the extent of fencing required and timelines sought to achieve stock exclusion
- Understand and review how stock exclusion links with riparian restoration efforts, and review funding opportunities available to council, community groups and landowners to better enable stock exclusion to support riparian restoration efforts
- Review what role Council plays in supporting landowners and in supporting and growing existing or new community-led restoration networks (refer also section 6.3.5 below).

6.3.5 Riparian and aquatic restoration
Riparian vegetation of smaller lowland streams has been identified by Council’s freshwater expert Trevor James, as the single greatest thing that can be done to improve the ecological health of Tasman’s waterways.

The benefits of riparian and aquatic restoration to stream ecosystem health and other water values, include shading of water and improvement of water quality, provision of food and habitat to both aquatic and terrestrial plants and animals, increased appeal for recreation and natural character, potential for improved mahinga kai and fishing values and improved biodiversity.

The key management approach for riparian habitat loss is to promote and support enhancement and restoration of riparian vegetation cover. Many such projects are already occurring across the district and in the Takaka FMU (for examples see Council’s video Our Waters in Common).

An aspirational restoration goal for the Takaka FMU, that has been discussed by FLAG is to focus on all perennial lowland streams between 1 and 10 metres wide (refer orange area in Figure 6), as these are the streams that benefit most from riparian cover, and particularly those close to the coast which can have very high ecological values and high biodiversity. This goal is large and not readily achieved by landowner, community groups or Council alone.
FLAG proposes that riparian and aquatic restoration be a non-regulatory method, with Council support of landowners and community-land owner networks.

There is the potential for use of a ‘back stop’ rule, which could require riparian planting to be done by some future date for productive land uses to continue as a permitted activity. An example of this approach is in Taranaki Regional Council’s draft freshwater plan, however this follows a significant non-regulatory programme operating since 1996.

6.3.5.1 Riparian restoration - further work needed
To develop the Takaka FMU implementation plan, further work is required to understand the scope and extent of the riparian planting goal, how long this might take to achieve within existing planting networks and funding, and options for how this can be affordably achieved within acceptable time frames.

Staff are exploring options for funding and support of community-landowner partnership frameworks that may enable this to occur.

Further tasks include:
- Estimation of the length of stream network to be planted and numbers of plants per year required to achieve this over different time frames
- Prioritisation of planting effort to help meet water quality and ecosystem health management objectives
- Review of the existing restoration networks functioning in Golden Bay and Tasman District and their capacity and role in reaching the desired goal
- Review of funding opportunities available to council, community groups and land owners to better enable restoration efforts and how separate funds might be combined to fund distinct projects
- Review what role Council plays in supporting landowners and in supporting and growing capacity of existing or new community-led restoration networks.

6.3.6 Existing and new monitoring
This is a non-regulatory approach, with no proposed changes to the TRMP. New monitoring may result in requirement for additional Council funding, or changes to the current State of the Environment monitoring programmes.
6.3.6.1 Existing monitoring in Takaka FMU

Existing, ongoing and regular monitoring in the Takaka FMU occurs as part of the State of the Environment (SOE) monitoring programme. Other sampling is done on a project basis to investigate specific issues.

Existing regular water quality sampling in the Takaka FMU is summarised below:

Table 7 Summary of existing monitoring in Takaka FMU

<table>
<thead>
<tr>
<th>Water body type</th>
<th>Frequency</th>
<th>Number</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>River water quality</td>
<td>Monthly (since July 2016 – quarterly prior to this)*</td>
<td>11 sites (2010-2014) 5 sites since July 2016</td>
<td>Up to 14 attributes Data collected at base flow. Reference site at Harwoods prior to 2016.</td>
</tr>
<tr>
<td>Bathing water quality</td>
<td>Weekly / twice weekly between November and March</td>
<td>5 sites (Tukurua, Pohara and, Payne’s Ford - every year); (Paton’s Rock, Tata Beaches every 2nd year)</td>
<td>E.coli, water clarity, periphyton in freshwater and Enterococci in marine waters Sampling frequency increased if alert triggers breached. Site selection driven by risk and popularity.</td>
</tr>
<tr>
<td>Groundwater quality</td>
<td>Quarterly (4 times per year)</td>
<td>3 sites (Bores: WWD6342, WWD6601, WWD6013)</td>
<td>Tested for 15-20 attributes Takaka Gravel at Takaka township Takaka Limestone near Central Takaka Arthur Marble at Te Waikoropupū springs.</td>
</tr>
<tr>
<td>Groundwater quality (synoptic)</td>
<td>Once every 10 years</td>
<td>~60 sites</td>
<td>Done in 1996, 2006, 2016 (awaiting results analysis for 2016) Tested for 5-17 attributes Results will be included in the next SOE groundwater report update.</td>
</tr>
<tr>
<td>Water usage</td>
<td>Seasonally, based on weekly returns</td>
<td>86</td>
<td>Undertaken for compliance checks against consent conditions</td>
</tr>
<tr>
<td>Estuary quality</td>
<td>Reports for 2007, 2008 and 2015</td>
<td>Motupipi Estuary</td>
<td>Includes broad scale and fine scale habitat mapping and sedimentation</td>
</tr>
</tbody>
</table>

* This was changed to provide consistency with the other regional councils for national reporting, and meets the minimum statistical requirements recommended for attributes in the NPS-FM National Objectives Framework.

The SOE summary reports are available on Council’s website (links below):
- River Water Quality Report Part 4 – Takaka Water Management Area 2015
- Bathing Water Quality End-of-Season Reports (since 2009)
- Motupipi Estuary Reports

6.3.6.2 Proposed new monitoring in Takaka FMU

A number of new monitoring requirements have been identified for the Takaka FMU to assess the state of key attributes and whether the planning approach is achieving the management objectives.
and maintaining or improving water quality. Further work is required to understand the scope and costs of any new monitoring proposed:

The new monitoring identified includes:

- **Special projects:**
  - Assessment of water body mauri (locations and method require input from iwi)
  - Baselines in Te Waikoropupū springs (to be discussed with iwi) for:
    - Water clarity
    - Dissolved oxygen
    - Nuisance plant growth
  - Onsite Wastewater Warrant of Fitness assessments (refer section 6.3.3)

- **New parameters** added to existing regularly monitored SOE sites:
  - Water clarity, dissolved oxygen at Te Waikoropupū main spring site
  - Dissolved Organic Carbon at Lindsay’s Bridge
  - Periphyton and nutrients at Payne’s Ford

- **New sites** added to River water quality SOE monitoring programme:
  - Lindsay’s Bridge (this site was added to the rivers SOE in July 2016).
  - Payne’s Ford #2 (Nitrate, Dissolved Reactive Phosphorus)
  - New sites or baselines at Waitapu Bridge, Te Kakau stream, Haldane Rd and Lake Killarney
  - Reinstate Abel Tasman site
  - Powell Creek (temperature – as an indicator of riparian shading)
  - Waingaro River - U-S Takaka River confluence (clarity, nuisance aquatic plants [periphyton])

- **New sites** added to Bathing water monitoring programme:
  - Payne’s Ford #2 (*E.coli*, nuisance aquatic plants [periphyton])
  - One Spec Rd (clarity, *E.coli*, nuisance aquatic plants [periphyton])

### 6.4 Water quality management summary

The water management approaches that are relevant for each key attribute are summarized in Table 8.
<table>
<thead>
<tr>
<th>Attribute</th>
<th>GMP Requirement</th>
<th>Existing or new Discharge rules</th>
<th>Existing or new Land disturbance rules</th>
<th>Riparian &amp; aquatic habitat Restoration</th>
<th>Stock Exclusion</th>
<th>Onsite W/w Education</th>
<th>Takaka Urban CMP</th>
<th>Special Investigations and Projects</th>
<th>Ongoing or New Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMU Wide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mauri</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Water clarity</td>
<td></td>
<td>As for: fine sediment and nuisance aquatic plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macro-invertebrates</td>
<td></td>
<td>As for: fine sediment and riparian/aquatic habitat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine sediment</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Riparian/aquatic habitat (including loss of shading and habitat)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Nuisance aquatic plants (macrophytes, periphyton and phytoplankton)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Dissolved Oxygen (rivers)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Nitrate (for aquatic plant growth)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Phosphorus (for aquatic plant growth)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>E.coli (as an indicator of disease causing organisms)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
7 Where to from here?

Below is an approximate time frame for the remaining work in the FLAG process:

- October-December 2016: Seek iwi, stakeholder and public feedback on proposed approach
- November-December 2016: Ecological value and Science Panel reports to be finalized
- October 2016 – March 2017: Develop draft plan change and implementation plan
- January 2017 – March 2017: Develop RMA 1991 Section 32 evaluation report looking at costs and benefit and implications
- April 2017 workshop with FLAG on draft plan change, implementation plan and evaluation report
- February 2017 – April 2017: Seek iwi, Stakeholder and Public feedback
- May 2017 workshop with Council on draft plan change, implementation plan and evaluation report
- June 2017 FLAG recommendations provided to Council Environment and Planning Committee
- Mid 2017: either: draft plan change, implementation plan and evaluation report publicly circulated for feedback; OR: public notification of proposed plan change and RMA 1991 Schedule 1 plan change process

7.1 How to get involved and have your say

Anyone can provide input at any time prior to the draft plan change being publicly notified by contacting a member of FLAG or the FLAG coordinator.

- FLAG biographies and email addresses
- Email the FLAG coordinator Lisa McGlinchey at lisamc@tasman.govt.nz

Once the proposed plan change is publicly notified there is also another opportunity to lodge a submission on the proposed plan change and the policy and rules.

Please feel free to approach FLAG members to talk about their work, and to provide feedback on this summary document to the FLAG co-ordinator by the 23rd of December 2016. Please note: Due to public request, the date for feedback on this summary report has been extended to the 31 January 2017.

Further information on the FLAG process is available on the Council’s website (link below).

Takaka FLAG homepage
## Appendices
### 8.1 Glossary and abbreviations

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMA</td>
<td>Arthur Marble Aquifer</td>
</tr>
<tr>
<td>Confined aquifer</td>
<td>Confined aquifers are those in which an impermeable dirt/rock layer exists that prevents water from seeping into the aquifer from the ground surface located directly above.</td>
</tr>
<tr>
<td>Consumptive water use</td>
<td>A water use that takes water from a water body and does not return it to that same water body – eg a water take for irrigation</td>
</tr>
<tr>
<td>Council</td>
<td>Tasman District Council</td>
</tr>
<tr>
<td>DoC</td>
<td>Department of Conservation</td>
</tr>
<tr>
<td>FLAG</td>
<td>Takaka Freshwater and Land Advisory Group</td>
</tr>
<tr>
<td>FMU</td>
<td>Freshwater Management Unit</td>
</tr>
<tr>
<td>FoGB</td>
<td>Friends of Golden Bay</td>
</tr>
<tr>
<td>L/s</td>
<td>litres per second</td>
</tr>
<tr>
<td>MALF (7day)</td>
<td>Mean Annual Low Flow – the average of the lowest flows in each hydrological year of data (for a 7day MALF the low flow in each year is determined from a running average over 7 days).</td>
</tr>
<tr>
<td>MfE</td>
<td>Ministry for the Environment</td>
</tr>
<tr>
<td>mg/L</td>
<td>Milligrams per litre</td>
</tr>
<tr>
<td>MPI</td>
<td>Ministry for Primary Industries</td>
</tr>
<tr>
<td>MPN</td>
<td>Concentration of total or faecal coliform bacteria reported as Most Probable Number per 100 mL (MPN/100 mL)</td>
</tr>
<tr>
<td>NOF</td>
<td>National Objectives Framework – part of the NPS-FM</td>
</tr>
<tr>
<td>Non-consumptive water use</td>
<td>A water use that takes water from a water body for temporary use before returning it to the same water body – eg a water take for power generation</td>
</tr>
<tr>
<td>NPS-FM</td>
<td>National Policy Statement for Freshwater Management</td>
</tr>
<tr>
<td>TWS</td>
<td>Te Waikoropupū springs</td>
</tr>
<tr>
<td>Unconfined aquifer</td>
<td>Unconfined aquifers are those into which water seeps from the ground surface directly above the aquifer.</td>
</tr>
</tbody>
</table>
8.2 References

<table>
<thead>
<tr>
<th>Ref in text</th>
<th>Reference description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNS 2001</td>
<td>GNS 2001. <em>Hydrogeology of the Takaka River Catchment and assessment of the effects of Cobb Power Station operation on groundwater in the catchment</em> (refer chapters 2 and 3)</td>
</tr>
<tr>
<td>Settlement Acts 2014</td>
<td>• <em>Ngāti Kōata, Ngāti Rārua, Ngāti Tama ki Te Tau Ihu, and Te Ātiawa o Te Waka-a-Māui Claims Settlement Act 2014</em> (New Zealand);</td>
</tr>
<tr>
<td></td>
<td>• <em>Ngāti Apa ki te Rā Tō, Ngāti Kuia, and Rangitāne o Wairau Claims Settlement Act 2014</em> (New Zealand); and</td>
</tr>
<tr>
<td></td>
<td>• <em>Ngati Toa Rangatira Claims Settlement Act 2014</em> (New Zealand).</td>
</tr>
<tr>
<td>Thomas and Harvey 2013</td>
<td>J T Thomas, M M Harvey July 2013. <em>Water Resources of the Takaka Water Management Area.</em> Tasman District Council</td>
</tr>
<tr>
<td>Willis 2016</td>
<td>Gerard Willis, Enfocus, August 2016. Independently audited self-management - A thinkpiece on the use of primary sector environmental management programmes within the Resource Management Act framework. (Note: this document will be available in the future on the Ministry for Primary Industries’ website)</td>
</tr>
</tbody>
</table>
8.3 What is a 7 day MALF?

The 7-day MALF is based on the total historic flow record held for each river, and is the average of the lowest running 7-day average flows in each hydrological year of the historic record (refer Figure 7). The longer the historic record, the more robust the calculation of the 7-day MALF. All references to MALF in the text are in reference to the 7-day MALF unless otherwise stated.

The 7-day MALF was used in preference to the 1-day MALF for four reasons:
1. The 7-Day statistics have consistently been used as the critical low flow statistic in TDC plans for rivers elsewhere in the region e.g. TRMP Water - Chapter 30, Policies 30.1.3.13 and 30.1.3.15
2. The proposed National Environmental Standard on Ecological Flows (2008) specified a 7-day MALF
3. 7-Day MALF smooths out short-term flow variability
4. There are advantages for assessing TDC water usage compliance as TDC typically uses weekly usage to assess compliance with allocation.

*Figure 7 Determination of the 7-day MALF*

**Determination of the 7-day Mean Annual Low Flow (7-day MALF)**

Data typically gathered every 15 minutes

- Calculate the average flow over 7 days = ●
- Do this each day to create a running average for each hydrological year of record (1July-30June)
- Identify the lowest running 7-day average each year for every year of record = ●
- Take the average of all of these low flows over the entire record period (eg 15 years) = ●

This gives us the **7-day Mean Annual Low Flow** (7-day MALF) for the total sampling record.
8.4 Historic Flow Method

The Historic Flow Method (percentage of MALF method) was recommended to the FLAG because it is not subject to recent criticism (Hayes et al. 2016) about the biological realism of more complex hydraulic habitat models that have often been used for decision making on water allocation management.

The Historic Flow Method can also be applied more widely across a range of waterbodies than more complex approaches because it doesn’t require detailed site specific information on how water depths and velocities respond to flow. Such information is time consuming and expensive to gather.

The Historic Flow Method requires measured or estimated flow statistics and it assumes that there is a positive linear relationship between flow and habitat availability. More complex models consider the possibility that some locations may become too deep and fast to support aquatic life at moderate-high flows, thus allowing for a non-linear relationship between habitat quality and flow.

A comparison of the Historic Flow Method and complex hydraulic methods (Roygard 2010) found that 90% of physical habitat retention, as determined from complex hydraulic models, was achieved by:

- 95% of the 1-day MALF in small streams (MALF < 0.46 m³/s)
- 85% of 1-day MALF in medium rivers (MALF 0.46-3.7 m³/s)
- 80% of 1-day MALF in larger rivers (MALF >3.7 m³/s).

The Historic Flow Method utilises a risk management approach, where in high value areas minimal risk is accepted and in lower values areas more risk is accepted.

The ranges recommended by Dr Roger Young are:

- Minimum flow equals a percentage of the naturalised 7-Day MALF
  - High value sites 90-100%
  - Lower value sites 70-80%
- Allocation limit equals a percentage of the naturalised 7-Day MALF
  - High value sites 10-20%
  - Lower value sites 30-50%

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2 Roygard JK 2010: Section 32A report presented at Horizons Regional Council hearing on behalf of Horizons Regional Council relating to the Proposed One Plan.
8.5 Existing water take permit renewal and new permits

Upon consent expiry, water take consent renewal for the same activity (within prescribed timeframes) has controlled activity status in the TRMP (rule 31.1.2.2) - meaning the consent must be granted, however there is no guarantee of continuation of the same consent operating conditions (i.e. consent conditions can be changed upon renewal).

The benefit to existing consent holders of controlled activity status for renewals is long term certainty for investment. This does not stop allocations being clawed back should new information identify adverse effects needing to be addressed. However, in over-allocated situations, consented allocations are typically reduced rather than removed completely – and unused water would not be reallocated to other consumptive users.

Three ways that consented allocation can be put ‘back in the pot’ are:

- if the consent lapses because it was not exercised,
- if the consent is voluntarily relinquished by the consent holder, or
- the Council reviews consent allocations pursuant to a ‘bona fide’ review, which changes the operating conditions of consents and reduces the consented amount to below the allocation limit making this water available for new applications.

New permits to take water where there are no allocation limits (the current situation for Takaka) are restricted discretionary activities, meaning they can be declined. New permits that are within an allocation limit in the TRMP are controlled activities and must be granted if they comply with the rule conditions (rule 31.1.2.3).

Under RMA 1991 s124B renewals of existing consents have priority over new applications for water use permits. For new applications, the current RMA presumption is ‘first in first served’ unless the Plan states otherwise (for example reserving parts of allocation limits for specific end uses such as community water supplies).

Provided sustainable allocation limits are set, the RMA leaves open the question of whether any uses or values may be reserved or preferentially allocated through policy-making under plans.

The RMA exempts minor individual domestic or stock-watering needs or firefighting needs from having to obtain a water permit, provided there are no adverse effects on the environment, but otherwise creates no priority for these uses.

The Tasman Regional Policy Statement (section 7.4) sets out how Council will allocate and reserve water. In particular, policy 7.1 and policy 7.5 identify that ‘The Council will adopt a cautious approach to setting sustainable limits to water allocation for abstractive purposes [....] Council will allocate water on a priority in time basis within the sustainable limits of available water except where water has been reserved for identified needs’ and that ‘Council will only protect or reserve water for future uses or values where:
(i) there is sufficient evidence of a significant future public need for water; and
(ii) that need may be provided for without adverse effects on existing significant natural, recreational or cultural values and features of the relevant water body.’
The appropriateness of these policies for the Takaka catchment, will be assessed based on the interim decisions of FLAG.

8.5.1 Existing permits summary
There are a total of 92 consented water take permits in the Takaka FMU, 79 of which are consumptive and 3 are from storage (these will also be counted in the consumptive takes for when storage is filled).

Of the consumptive consents, 39 are from surface water and 40 are from groundwater. There are two permits for takes directly from the Arthur Marble Aquifer – one from the confined area and one from the unconfined area. The rest of the groundwater takes are from the Takaka Gravel Aquifer, the Takaka Limestone Aquifer and a few from small shallow coastal aquifers.

How these permits are potentially affected by the proposed allocation regimes and cease takes will depend on the water body they are from, how they affect this water body at low flow, and the water uses involved (refer section 5.2). A summary of the permit types is outlined in the following table:

<table>
<thead>
<tr>
<th>Consent Type</th>
<th>Water uses</th>
<th>Water sources</th>
<th>Number in FMU</th>
<th>Total water (l/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumptive</td>
<td>Domestic, stock water or community water supply</td>
<td>Groundwater</td>
<td>7</td>
<td>4.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface water</td>
<td>11</td>
<td>22.77</td>
</tr>
<tr>
<td></td>
<td>Productive use (eg irrigation, commercial)</td>
<td>AMA</td>
<td>2</td>
<td>34.47 (UC:27.80, C:6.67)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Groundwater</td>
<td>29</td>
<td>360.76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface water</td>
<td>25</td>
<td>797.90</td>
</tr>
<tr>
<td></td>
<td>Mixed use (eg both productive and domestic uses)</td>
<td>Groundwater</td>
<td>2</td>
<td>2.87</td>
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<tr>
<td></td>
<td></td>
<td>Surface water</td>
<td>1</td>
<td>0.41</td>
</tr>
<tr>
<td>Mixed Consumptive (C) and Non-consumptive (NC)</td>
<td>Water supplies, salmon, irrigation and hydro electric</td>
<td>Surface water</td>
<td>2</td>
<td>C: 2.20</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NC: 0.23</td>
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<tr>
<td>Non-consumptive</td>
<td>Hydro-electric power generation (including Cobb Dam), salmon farming, dredging</td>
<td>Surface water</td>
<td>10</td>
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<tr>
<td>Takes from Storage</td>
<td>Community water supply, other</td>
<td>Surface water</td>
<td>3</td>
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</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td></td>
<td><strong>92</strong></td>
<td><strong>4874.95</strong></td>
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<td>Surface Water consumptive</td>
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<td>Groundwater consumptive</td>
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<td><strong>402.52</strong></td>
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<td>Surface water non-consumptive</td>
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<td>Groundwater non-consumptive</td>
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<td><strong>0</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td>Surface water take from storage</td>
<td></td>
<td></td>
<td><strong>3</strong></td>
<td><strong>30.03</strong></td>
</tr>
</tbody>
</table>
8.6 Cease take trigger calculation

The actual cease take trigger that is applied in each zone also depends on the arrangement of the flow recording site, versus the water takes and the nature of the river flows (refer Figure 8).

For the majority of the zones the flow-monitoring site is located above the takes and the cease take trigger is calculated by adding the minimum flow and the allocation limit. If the monitoring sites are below the takes the cease take is just based on the minimum flow.

While the monitoring site for the AMA Recharge (Te Waikoropupū springs) Zone is below the takes, it is technically impossible to naturalise the flow record at the Te Waikoropupū springs site since abstractions in the AMA recharge area (including river takes in the upper Takaka Zone) have a complex relationship and because of the influence of the Cobb Dam releases on flows. Further, there is a substantial amount of water that leaves the AMA somewhere other than the Te Waikoropupū springs (thought to be out to sea). For these reasons, the same cease take method of minimum flow plus allocation limit has been used to determine the cease take trigger.

The other exception is for the Motupipi Zone which is a gaining river (ie part of the river flow comes from groundwater springs). In this zone the cease take trigger is based only on the minimum flow.

For practical implementation purposes, the cease take trigger levels in some zones has been correlated to another site that has a telemetered monitoring site. For example, this is the case for the western coastal catchments where the local river cease take flows have been correlated to flows at the Anatoki River site at Happy Sam’s to enable consent holders to use the online data available for Happy Sam’s to determine their take status.

Figure 8 Schematic of flow recorder location relative to water takes in determining Cease Take calculation methodology
8.7 Arthur Marble Aquifer and Te Waikoropupū springs

The Takaka FMU has some unique and very complex water resources. The special nature of Te Waikoropupū springs is appreciated by the local community and the site is Wahi Tapu (sacred place) for local iwi.

Protection of the values of Te Waikoropupū springs (in particular water clarity and mauri), and the Arthur Marble Aquifer that feeds them, has been given ongoing consideration by FLAG throughout the process. Given the unique characteristics, the key attributes, desired states, risks and management approaches differ from other zones in the FMU and are therefore outlined separately in this section.

8.7.1 Management Zones

The Arthur Marble Aquifer (AMA) has been separated into two management zones:

- the **AMA Recharge Area** covering the unconfined part of the aquifer (where surface and soil water can flow into the aquifer) and
- the **AMA Confined area** which is overlain by an impervious geological layer that prevents surface water interaction with the aquifer.

The boundary between the unconfined and confined areas crosses the Takaka valley approximately from East Takaka through Hamama.

*Figure 9 AMA Recharge (pink) and Confined (blue) Zones*

The two zones have been used to reflect the different considerations for water allocation and quality management in these areas. However, management in both zones aims to allow for sustainable water use and protection of the Arthur Marble Aquifer and Te Waikoropupū springs.

The **AMA Recharge Zone** is the most complex zone in the FMU and includes all rivers and all contributing catchment areas that flow into the unconfined part of the Arthur Marble Aquifer (AMA). This catchment area recharges the groundwater that flows through to the confined part of the AMA, part of which flows out at Te Waikoropupū springs (TWS).

The **AMA Recharge Zone** includes catchment areas in the Upper Takaka Zone and Middle Takaka area, and the upper parts of the Waingaro, Anatoki, Motupipi and Pohara-Clifton Zones. All rivers and tributaries in the Anatoki and Waingaro Zones, and the main stem of the Upper Takaka River are also subject to their respective zone allocations and water quality provisions.

The **Confined AMA Zone** extends under the other catchment zones in the north. Unlike the Recharge Zone there is no connection between the Confined Zone and the other zones (and their respective land
uses) that overlap it. For allocation management only water takes that take from the Arthur Marble Aquifer are considered. Currently there is only one water take permit in the confined AMA, with the rest of the water takes in the northern zones being from surface water or the Takaka Gravel and Limestone aquifers.

8.7.2 What are the key concerns in the AMA and Te Waikoropupū?
The AMA is a very large aquifer that covers an area of around 260km² (around 180km² unconfined, and ~80+km² confined). The thickness of the marble is variable and is considered to be at least 500m and possibly 1000m. Contaminants can discharge into the aquifer through direct river recharge or from diffuse infiltration through soils overlying the unconfined part of the aquifer.

Water in the aquifer is not thought to be uniformly mixed, either vertically or horizontally, and water (including contaminants) is likely to follow various pathways through the aquifer depending on localised conditions, however these pathways are not known.

Te Waikoropupū springs is the main surface outflow of the AMA (the rest flowing out to sea in Golden Bay). Te Waikoropupū springs and the Scenic Reserve are of outstanding natural, cultural, historic and scenic value, both nationally and internationally. In particular, it is renowned for having some of the clearest freshwater in the world. They are a precious taonga (treasure) to iwi and many others in the wider community. Te Waikoropupū springs are a registered wāhi tapu (sacred place) under the Historic Places Act 1993. Management plans for the springs have been developed in 1985, 1996 and the latest in 2009 by the Department of Conservation in consultation with Manawhenua ki Mohua and Tasman District Council. The current policy within the TRMP supports the implementation of the Management Plan (refer policy: 27.6.1.7, 27.6.3.2, 28.3, 28.4, and Sch.30A).

The key concerns in the AMA Recharge Zone are:

- Risks to, and protection of, the water quality in both the confined and unconfined parts of the Arthur Marble Aquifer
- Risks to, and protection of, the function of the aquifer and the stygofauna community (animals that live in groundwater systems) which are thought to play a role in creation of the outstanding water clarity in Te Waikoropupū springs
- Recognition and protection of Te Waikoropupū springs as Wahi Tapu (sacred place) and their importance to iwi and the local community
- Risks to the water flows and water quality – especially mauri, water clarity, and aquatic ecology of Te Waikoropupū springs and protection of those.
- Reliable security of supply for Economic and Livelihood values and uses of water in the AMA recharge area.

A Water Conservation Order (WCO) proposal has been submitted to the Minister for the Environment as an approach for managing the Arthur Marble Aquifer and the springs. A WCO can impose restrictions or prohibitions on the exercise of specified regional councils’ powers under the RMA 1991 (as they relate to water). The creation of an order is a process run by the Minister for the Environment, using a special tribunal. WCOs do not affect or restrict any resource consent already granted, or lawful use established in respect of the water body, before the order is made (i.e. they are
not retrospective, unlike regional rules). Information on the differences between WCOs and Regional Plans is included in appendix 8.7.

8.7.2.1 Influence of contributing catchments on flow at Te Waikoropupū springs

From research into the various contributions to groundwater and flows at Te Waikoropupū springs (GNS 2001, Edgar 1998, Mueller 1991 and 1992, Stewart & Thomas 2008, Thomas and Harvey 2013) it has been estimated that the various catchments contribute varying amounts of flow, both to groundwater and to contribution of flow at Te Waikoropupū springs – and that these contributions vary depending on the aquifer and river conditions at the time:

- **The Takaka River** can lose up to 100% of flow to groundwater, with the river going dry below Lindsay's Bridge, however estimates range from 47-55% (Mueller vs Edgar) of flows influencing Te Waikoropupū springs flow. For accounting purposes, it is conservatively assumed that 100% of water takes from the Upper Takaka River affect Te Waikoropupū springs.

- Water released from the **Cobb Dam** for power generation purposes has a significant effect on flows in the Upper Takaka River and subsequently on flows at the springs. The 7-day MALF at the main spring is 7661 L/s. Aqualinc have estimated that the 7-day MALF in the main spring is increased by 790 L/s by water released from the Cobb Dam.

- **The Waingaro River** both loses and gains water, and the net loss to groundwater is estimated to be 0% to 12%, depending on conditions (ie 6% ± 6%). For accounting purposes, it is conservatively assumed that 8% of the water takes in the whole Waingaro Zone (not just the part over the unconfined AMA) affects Te Waikoropupū springs.

- The **Anatoki River** both loses and gains water to groundwater, but not over the unconfined part of the AMA, and comparison of river flows with flows at the springs show the Anatoki River is not a source of recharge to the springs, as increased flows in the Anatoki River do not show any related increase in flow at the springs. As such water takes from the Anatoki are excluded from accounting in the AMA Recharge.

Consumptive water takes from the **Confined AMA Zone** have not been included in the AMA Recharge zone accounting. This is because the AMA Recharge regime is based only on flows through Te Waikoropupū springs and not on the total aquifer flows –ie. it does not include consideration of the amount of aquifer water going out to sea.

The new approach to determining which takes are managed under which zone, reflects the better understanding of how the various catchments contribute to flows at Te Waikoropupū springs.

In summary, the accounting of water takes for the AMA Recharge Zone includes:

- 100% of consumptive takes in the Upper Takaka Zone
- 100% of consumptive takes in the Middle Takaka Zone
- 8% of consumptive takes in the whole of the Waingaro Zone

But excludes:

- Consumptive takes from the Anatoki Zone
- Consumptive takes from the Unconfined Aquifer
This is considered by Council staff to be a conservative approach, as:

1. It uses 100% of consumptive takes from the Upper and Middle Takaka Zones, despite only 47-55% of these takes having been estimated to affect Te Waikoropupū springs, and
2. It calculates the contributions based on the whole of the Waingaro zone, not just the area overlying the unconfined part of the aquifer. This has been done because theoretically the takes in the lower zone, could be shifted to locations in the upper part and therefore begin to affect Te Waikoropupū springs.

The catchment accounting for the informal (no legal status) and proposed regimes are summarized below:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Allocation Limit [AL] (L/s)</th>
<th>Contributing catchment percentages (based on accounting outlined above)</th>
<th>Existing consented water takes [ET] (L/s)</th>
<th>Available water [AL less ET] (L/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current (informal)</td>
<td>500</td>
<td>100% of existing takes in Upper Takaka, Middle Takaka, Confined AMA and the upper part of the Waingaro zone.</td>
<td>499</td>
<td>~1</td>
</tr>
<tr>
<td>Proposed</td>
<td>766</td>
<td>100% of existing takes in Upper Takaka, Middle Takaka and 8% of existing takes in the total Waingaro Zone</td>
<td>410</td>
<td>356</td>
</tr>
</tbody>
</table>

### 8.7.3 Water Allocation Discussions and Decisions

An ecologically sustainable level of water allocation for the AMA Recharge and Te Waikoropupū springs was recommended by freshwater ecologist Dr Roger Young as between 90 and 100% MALF for minimum flow, and 10 and 20% MALF for allocation limit. From this range, a 90:10 regime was recommended. This regime was based on flows at the main spring and has a minimum flow of 90% of MALF (6895 L/s), and an allocation limit set at 10% of MALF (766 L/s).

A cease take trigger (based on the minimum low flow – refer section 8.5 for explanation) for all new and existing consented takes (excluding community water supplies) was identified at 90% of MALF (6895 L/s) to be measured at the main spring.

### 8.7.4 FLAG interim regime and cease take trigger

FLAG considered whether Fish Creek was a better site for measurement of the cease take trigger. Staff advised FLAG that there is poor justification for the benefits against the costs of a cease take measured at Fish Creek. A main spring-based trigger also protects Fish Creek Springs, and security of supply is less effected by a trigger at the main spring, as Fish Creek naturally dries up on occasion. The potential benefits on flow protection and ecological values would not be physically measurable.

FLAG considered several options for the cease take trigger level and where it would apply for protecting Te Waikoropupū. Aspects of security of supply, consistency between regimes and environmental objectives were considered.

FLAG decided that for the purposes of the draft plan change development, the allocation regime for the AMA Recharge area would be determined by flows at the main spring at Te Waikoropupū springs.
and would use a 96:10 regime, to try and achieve a similar security of supply with that in the Upper Takaka Zone.

The 96:10 regime is more ecologically conservative that the recommended regime, and has a minimum flow of 96% of MALF (7350 L/s), an allocation limit set at 10% of MALF (766 L/s), and a cease take trigger (based on the minimum low flow to be protected) of 96% of MALF (7350 L/s), measured at the main Te Waikoropupū Spring.

For practical application, the trigger would be measured through the ground water level in the telemetered bore next to the spring, which has been correlated to flow from the spring.

The 96:10 regime has a similar overall November to April security of supply as that for the existing consented takes in the Upper Takaka main stem (95.9%), however the frequency of cease takes longer than 3 and 5 days consecutive duration is greater (7 events in 4 of 17yrs and 6 events in 4 of 17yrs respectively, compared to 2 events in 2 of 17yrs and 1 event in 1 of 17 yrs for Upper Takaka – refer to the zone by zone allocation summaries for further information), which may be of concern to existing water users in the affected zones.
8.7.4.1 Cease take application

FLAG agreed with the staff recommendations that the Te Waikoropupū cease take should not apply to takes in the Upper Takaka (main stem), Waingaro and Anatoki Zones and that these zones should be controlled through their respective regime cease takes (refer to the blue areas in Figure 10). The key reasons for this are based on the relative contributions and relationship to TWS flows (refer section 8.7.2.1).

FLAG agreed with the staff recommendations that the Te Waikoropupū cease take should apply to existing and new takes (excluding community water supplies) in the Middle Takaka area, tributary takes in the Upper Takaka Zone and any takes from the AMA that are not covered by another regime cease take (refer to the red areas in Figure 10). This is because takes in these areas do not have a separate regime proposed with provision for cease take, so could affect Te Waikoropupū springs in drought conditions. Further consideration of the implications for security of supply in these areas is needed.

Figure 10 Application of cease take measured at Te Waikoropupū Spring (TWS)
8.7.5 FLAG consensus summary – AMA Recharge Allocation Regime

Full FLAG consensus has not been reached on the approach to allocation, minimum flows and cease take for the AMA Recharge area and Te Waikoropūpū springs.

The differing viewpoints are summarised below:

<table>
<thead>
<tr>
<th>Majority of FLAG members agree:</th>
<th>Remaining FLAG members preference:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water quality (nitrate) is in a maintain state where ecological effects are not observable, further allocation is unlikely to significantly affect this given proposed land use controls and adaptive approach.</td>
<td>Water quality (nitrates) has increased to thresholds of concern and further allocation is likely to affect this.</td>
</tr>
<tr>
<td>Allocation can occur within the ecologically sustainable limits identified by Dr Roger Young, in conjunction with requirement for good land use practice within the regulatory regime and use of an adaptive management approach to manage risk to water quality.</td>
<td>Allocation limits in the AMA Recharge area should not be increased until land managers can show land use practice changes result in a reduction of nitrate concentrations at the springs (proposed target of 0.3mgNO₃-N/L). The TRMP would include good land use practice within the regulatory regime.</td>
</tr>
<tr>
<td>No attributable cause and effect link between Nitrate levels in the springs and existing water use. Agreed assumption that land use is contributing to nitrate.</td>
<td>Sources of nitrate are uncertain so should be very cautious (but are assumed to be related to water and land use).</td>
</tr>
<tr>
<td>A further 356l/s of water would be available which will cater for the existing waiting list registrations in the contributing zones and some additional future use. This is likely to result in extension of the dairy milking period, however it is expected that this will take some time to be taken up due to infrastructure costs, etc.</td>
<td>No further water would be available within the AMA Recharge zone or any of the contributing zones until nitrate levels in the springs reduced to the proposed target. This may have economic impacts for water users in these catchments. Intensification could still occur through use of water storage or supplementary feeding.</td>
</tr>
<tr>
<td>Risks to water quality will be managed through good practice requirements and application of adaptive management approach should nitrate levels reach the triggers (yet to be defined)</td>
<td>Proponents anticipate that nitrate levels in the springs will reduce to target levels, given no additional water use and implementation of good practice for existing land uses.</td>
</tr>
</tbody>
</table>

It is intended to review the decisions made around allocation for the zones, once the plan change has been drafted and FLAG members can see how land use and discharge control methods can be used to manage risks to water quality. The FLAG can then determine whether this, and the proposed adaptive management approach, adequately addresses any risks.

The FLAG have decided that, if they cannot reach consensus, then the preferred options will be included in the recommendation to the Environment and Planning Committee (EPC) along with the case for each option and feedback received on the proposals from iwi and the community. The EPC will then decide which option will be progressed to the proposed plan change stage.
8.7.6 Water Quality Discussions and Decisions

As outline previously, the AMA is a very large aquifer with the upper catchment parts interacting with both ground and surface water sitting above the aquifer (unconfined) and the lower catchment part (below Hamama) separated from the ground and surface waters above the aquifer by an impermeable geology layer (confined). Contaminants can enter into the AMA through direct river recharge or from diffuse infiltration through soils overlying the unconfined parts of the aquifer. This water can then move through the aquifer into the confined parts of the aquifer and subsequently out at Te Waikoropupū springs or the sea.

Water in the aquifer is not thought to be uniformly mixed, either vertically or horizontally, and water (including contaminants) are likely to follow various pathways through the aquifer depending on localised conditions, however these pathways are not known.

Water quality for the springs has been measured in the bore adjacent to the springs as part of the TDC Groundwater State of the Environment monitoring programme since 1990. This looks at groundwater attributes, and does not include surface water related attributes, such as water clarity, macro-invertebrates and aquatic plants. The main spring has not been included in the surface water quality monitoring programme, so these attributes have not been monitored by TDC.

The Department of Conservation is responsible for the administration of the springs and surrounding reserve and has undertaken some monitoring of aquatic plant growth in the springs. The 2009 Te Waikoropupū springs Management Plan outlines the objectives, policies and methods regarding management of the springs and reserve, including management of aquatic plant pests.

8.7.6.1 Key water quality parameters of interest

The FLAG have identified the following parameters of interest for water quality and health of the Arthur Marble Aquifer and Te Waikoropupū springs:

- Mauri
- Water clarity
- Dissolved Oxygen and Dissolved Organic Carbon (as an indicator of aquifer function/health)
- Nitrate Nitrogen, Dissolved Phosphorus, N:P ratio (for aquatic plant growth)
- Nitrate Nitrogen (toxicity)
- *E.coli* (as an indicator of disease causing organisms)
- Macro-invertebrates
- Aquatic plants (macrophytes and periphyton)
- Flow at Te Waikoropupū main spring and Fish Creek Springs

In addition to this, recent work by NIWA (Oct 2016) has indicated that use of Coloured Dissolved Organic Matter (CDOM) may be a practical proxy for water clarity in Te Waikoropupū springs as this substance affects clarity and attempts to directly measure clarity using other means (ie transmissometer) and without using divers, has proven difficult due to the unique conditions in the springs.

Further discussion on these attributes is given in section 6.2.
8.7.6.2  Attribute states summary – Te Waikoropupū springs

Most of the key attributes are considered to be in a ‘maintain state’ at the springs (refer Table 12), with existing measurements being within the desired ranges, although nitrate nitrogen is near/at the upper end of the desired range which is cause for concern for some FLAG members.

For some attributes (mauri, water clarity, dissolved oxygen) insufficient information is held to confidently know if they are in a ‘maintain’ or ‘improve’ state, and further data gathering for these is proposed.

In early 2016, Dairy NZ (on behalf of the local irrigators group and for use by FLAG), commissioned a science panel of independent freshwater scientists to look at the available data and identify agreed conclusions about the health of Te Waikoropupū springs. Further information on the Science Panel and their outputs are included in appendix 8.9.

Some FLAG members have expressed concern over the recommendations made by the Science Panel. It is proposed these are further discussed with Dr Roger Young once the final Science Panel report is available (anticipated in October 2016), before FLAG finalise their definition of any attribute trigger levels to be used in the draft plan change.
Table 12 DRAFT Attribute State Summary - AMA Recharge as measured at Te Waikoropupū springs

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Current State</th>
<th>Desired State (to be confirmed by FLAG)</th>
<th>Status summary (maintain, improve, monitor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Flow: (TWS Main Spring, Fish Creek Spring)</td>
<td>No direct protection of minimum flows.</td>
<td>A minimum flow of 96% of main spring MALF = 7350 L/s. Protected by cease takes in contributing catchments.</td>
<td>Improve (then maintain)</td>
</tr>
<tr>
<td>River water minimum flows (Upper Anatoki and Waingaro, Middle Takaka, Upper Takaka tributaries)</td>
<td>Minimal or no protection of minimum flows, as no cease takes for most consents</td>
<td>Cease takes in place for all consumptive consents where abstraction affects minimum flows (excluding domestic, stock water and community water supplies).</td>
<td>Improve (then maintain)</td>
</tr>
<tr>
<td>Mauri</td>
<td>Not yet defined – it is assumed mauri has improved with greater respect given to the springs, exclusion of swimming contact and enhancements made to reserve under the DoC management plan.</td>
<td>Healthy mauri for all water bodies. (requires further discussion with iwi).</td>
<td>Monitor</td>
</tr>
<tr>
<td>Water clarity</td>
<td>Current state unknown. Black disc not possible without use of mirrors/divers - as done in 1993 (63m). Attempts to measure by other means has proven difficult. Coloured Dissolved Organic Matter (which produces ‘colour’ that reduces clarity) could be a low cost proxy for clarity. Measures of CDOM in the springs have shown levels similar to Blue Lake and equivalent to 70m water clarity.</td>
<td>To be discussed. Baseline needed?</td>
<td>Maintain (Monitor to obtain baseline?)</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>1970’s: 58%–65%, April-May 2016: 50%–53% (difference is within measurement error margins). There may be greater variation during peak plant production (ie February) – baseline needed to confirm seasonal variation.</td>
<td>To be discussed. Seasonal baseline may be needed.</td>
<td>Maintain (Monitor to obtain baseline?)</td>
</tr>
<tr>
<td>Nitrogen for aquatic plant growth</td>
<td>For nitrate nitrogen: 2016 Feb-Oct (FoGB data) median = 0.40 mg/L. The effect on aquatic plant growth is also dependent on the nitrate to phosphorus ratio and other factors such as shading.</td>
<td>To be discussed further (non-consensus in FLAG) Possible triggers: Annual median for nitrate nitrogen remains below 0.5, 0.44 or 0.3mg/L. (for aquatic plant effects, nitrate and phosphorus need to be considered together including assessment of actual effects)</td>
<td>Maintain (no increase)</td>
</tr>
<tr>
<td>Phosphorus (DRP) for aquatic plant growth</td>
<td>For DRP: 2016 May-Oct (FoGB data) median = 0.006 mg/L.</td>
<td>To be discussed. Possible triggers: Annual median for DRP remains below 0.01 mg/L.</td>
<td>Maintain</td>
</tr>
<tr>
<td>Nitrate : Phosphorus ratio for aquatic plant growth</td>
<td>1970-2014 data median N:P ratio = 18:1 70% of ratios suggesting Phosphorus limited.</td>
<td>No change to phosphorus limitation.</td>
<td>Maintain</td>
</tr>
<tr>
<td>Nitrate toxicity</td>
<td>Due to hardness of water the toxicity of nitrate is much lower than for the NOF grades.</td>
<td>This desired state of this attribute defers to the lower nitrate level desired for aquatic plant growth. Maintenance of the lower level will also maintain Nitrate in the ‘A’ grade for toxicity.</td>
<td>Maintain</td>
</tr>
<tr>
<td>Macro-invertebrates</td>
<td>Main spring not sampled, monitoring in Te Waikoropupū River since 1988 does not show any noticeable effect on MCI (Stark 2015)</td>
<td>To be discussed: No declining trends attributable to water quality or water abstraction.</td>
<td>Maintain</td>
</tr>
<tr>
<td>Aquatic plants</td>
<td>DoC monitors growth of plants in spring (eg Galium palustre). Changes in Te Waikoropupū river since 1988 attributed to freshes and drought low flows, but not to water quality (Stark 2015).</td>
<td>To be discussed: No change attributable to aquifer water quality or water abstraction.</td>
<td>Maintain</td>
</tr>
<tr>
<td>Temperature</td>
<td>No indication of change (11.7°C)</td>
<td>No change attributable to aquifer water quality or water abstraction.</td>
<td>Maintain</td>
</tr>
<tr>
<td>E.coli</td>
<td>Main spring and Dancing Sands &lt;1 MPN/100ml Fish Creek Spring 2 MPN/100ml Very good water quality at springs (drinkable).</td>
<td>No change attributable to aquifer water quality or water abstraction.</td>
<td>Maintain</td>
</tr>
</tbody>
</table>

1 Nitrate NOF bands not corrected for hardness which raises band thresholds considerably.
2 Refer values from *Instream plant and nutrient guidelines* NIWA 2016, science panel report (available Dec 2016) and ANZECC guidelines.
8.7.6.3 Nitrate attribution

Current information is insufficient to attribute a specific portion of the observed nitrate in receiving water bodies to any specific land use, but catchment modelling and use of research data from elsewhere on both human and natural sources, can be used to give rough estimates of the likely attributive sources of nitrate in the catchment.

Catchment modelling has been undertaken by staff from Aqualinc and Landcare Research and subsequently reviewed and discussed further by the FLAG Nitrate Subgroup - a subset of FLAG members and staff set up to look more in-depth at the issue of nitrate and nitrate sources.

While nitrate levels are generally low in most of the surface and ground waters in the Takaka catchments, there is an agreed assumption that a portion of the nitrate measured in Te Waikoropupū springs is coming from productive land use in the valley.

Previous consideration of the potential sources and possible contributions of nitrate within the Takaka catchments has highlighted the following likely contributions:

- **irrigated dairy land use (valley):** 34%
- **dryland dairy and lower intensity farming (valley):** 53%
- **bush and forestry:** 6%
- **native grassland and scrub:** 6%
- **other natural sources (eg aquifer rock):** currently assumed 0%

Significant uncertainty exists - with consideration of the recent nitrate monitoring, identifying up to 70% of nitrate in the deeper parts of the aquifer potentially coming from karst upland areas. Members of the nitrate subgroup are doing further work looking at nitrate attribution to the springs.
Table 13 Te Waikoropupū Water quality attribute management methods

<table>
<thead>
<tr>
<th>Attribute</th>
<th>GMP Requirement</th>
<th>Existing or new Discharge rules</th>
<th>Existing or new Land disturbance rules</th>
<th>Riparian &amp; aquatic habitat Restoration</th>
<th>Stock Exclusion</th>
<th>Onsite W/w Education</th>
<th>Special Investigations and Projects</th>
<th>Ongoing or New Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Te Waikoropupū springs and AMA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water clarity (TWS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coloured Dissolved Organic Matter (CDOM)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Dissolved Oxygen (as indicators of AMA health)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Dissolved Organic Carbon (as indicator of AMA health)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Nitrate (TWS) (for aquatic plant growth)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Phosphorus (TWS) (for aquatic plant growth)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
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<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
## 8.8 Water conservation orders and regional plans under the RMA

<table>
<thead>
<tr>
<th><strong>Water Conservation Order</strong></th>
</tr>
</thead>
</table>
| **Purpose?** | An order made under Part 9 of the RMA to recognise and sustain:  
a) outstanding amenity or intrinsic values which are afforded by waters in their natural state:  
b) where waters are no longer in their natural state, the amenity or intrinsic values of those waters which in themselves warrant protection because they are considered outstanding.  
[RMA 1991 Section 199] |
| **What does it do?** | An order can impose restrictions or prohibitions on the exercise of specified regional councils' powers under the Act (as they relate to water). The specified powers are the control of the taking, use, damming, and diversion of water, and the control of the quantity, level, and flow of water in any water body [section 30(1)(e) of the RMA] and the control of discharges of contaminants into or onto land or water, and discharges of water into water [RMA 1991 section 30(1)(f)].  
Restrictions or prohibitions can relate to—  
a) the quantity, quality, rate of flow, or level of the water body; and  
b) the maximum and minimum levels or flow or range of levels or flows, or the rate of change of levels or flows to be sought or permitted for the water body; and  
c) the maximum allocation for abstraction or maximum contaminant loading consistent with the purposes of the order; and  
d) the ranges of temperature and pressure in a water body.  
[RMA 1991 Section 200] |
| **Who is it made by?** | The Governor-General by Order in Council on recommendation of the Minister. |
| **How is it made?** | Any person can apply to the Minister. [RMA 1991 Section 201] If an application is accepted, the Minister appoints a special tribunal to hear the application. [RMA 1991 Section 202-203] The tribunal publicly notifies the application and any person may make submissions to the tribunal. [RMA 1991 Section 204 and 205] The tribunal will hold a hearing. After the hearing the tribunal reports to the Minister for the Environment, and the report can be challenged by any person who submits to the Environment Court. [RMA 1991 Sections 208 and 209] If a submission is received, the Environment Court will run an inquiry and then report to the Minister for the Environment. The Minister will make a recommendation to the Governor-General based on the report of the special tribunal (if no submissions to the Environment Court) or the report of the Environment Court. |
| **Does it affect Resource Consents?** | Does not affect or restrict any resource consent granted, or lawful use established in respect of the water body, **before** the order is made. [RMA 1991 Section 217]  
Once a water conservation order is operative, a consent authority: [RMA 1991 Section 217]  
a) shall not grant a water permit, coastal permit, or discharge permit if the grant of that permit would be contrary to any restriction or prohibition or any other provision of the order:  
b) shall not grant a water permit, a coastal permit, or a discharge permit to discharge water or contaminants into water, unless the grant of any such permit or the combined effect of the grant of any such permit and of existing water permits and discharge permits and existing lawful discharges into the water or taking, use, damming, or diversion of the water is such that the provisions of the water conservation order can remain without change or variation:  
c) shall, in granting any water permit, coastal permit, or discharge permit to discharge water or contaminants into water, impose such conditions as are necessary to ensure that the provisions of the water conservation order are maintained. |
| **How long do they last for?** | Until revoked. A person can apply to amend or revoke the order at any time. However, the Minister may not consider any such application until two years after the order is made. [RMA 1991 Section 216(1)] |
### Regional Plan

<table>
<thead>
<tr>
<th>Purpose?</th>
<th>The purpose of the preparation, implementation, and administration of regional plans is to assist a regional council to carry out any of its functions in order to achieve the purpose of the RMA. [RMA 1991 Section 63]</th>
</tr>
</thead>
</table>
| What does it do? | A regional plan must include objectives, policies and rules for a region, and may state a number of other matters as set out in the RMA. [RMA 1991 Section 67]  
Regional rules are for the purpose of carrying out the regional council functions under the RMA, and achieving the objectives and policies of the plan. [RMA 1991 Section 68(1)]  
Relevant functions for water include: [RMA 1991 Section 30(1)]  
- Taking, use damming and diverting of water  
- Discharges of contaminants into or onto land, water  
- Control of the use of land for the purpose of  
- The maintenance and enhancement of the quality of water in water bodies, and  
- The maintenance of the quantity of water in water bodies, and  
- The maintenance and enhancement of the ecosystems in water bodies  
Rules can relate to maximum or minimum levels or flows, or the control of the range, or rates of change, of levels or flows of water, or rates of use of water, or minimum standards of water quality. [RMA 1991 Section 68(7)] |
| Who is it made by? | Regional council or unitary authority |
| How is it made? | In accordance with the process set out in Schedule 1 of the RMA. [RMA 1991 Section 65(2)] |
| Does it affect Resource Consents? | Where a regional plan includes a rule relating to maximum or minimum levels or flows or rates of use of water, or minimum standards of water quality or air quality, or ranges of temperature or pressure of geothermal water, the plan may state, —  
(a) whether the rule shall affect, under section 130, the exercise of existing resource consents for activities which contravene the rule; and  
(b) that the holders of resource consents may comply with the terms of the rule, or rules, in stages or over specified periods) [RMA 1991 Section 68(7)] |
| How long do they last for? | Regional plans must be reviewed within ten years of being made. [RMA 1991 Section 79 (1)]  
Following review, whether it is amended or not, the regional plan or changed regional plan must then by publicly notified and go through the RMA Schedule 1 process. [RMA 1991 Section 79(6) and (7)] |
| Relationship to the National Policy Statement for Freshwater Management 2014? | Must give effect to the National Policy Statement for Freshwater Management. [RMA 1991 Section 67(3)] |
| Relationship to water conservation orders? | A regional plan must “not be inconsistent with” a water conservation order. [RMA 1991 Section 67(4)] |
8.9 Science Panel Recommendations for Te Waikoropupū springs

In early 2016 Dairy NZ (on behalf of the local irrigators group and for use by FLAG), commissioned a science panel of key freshwater scientists to look at the available data and identify agreed conclusions about the health of Te Waikoropupū springs. The panel included the following scientists:

- Roger Young (Freshwater Ecologist with Cawthron)
- Chris Hickey (Eco-toxicologist and Environmental Chemist with NIWA)
- John Stark (Macroinvertebrate and Plant specialist with Stark Environmental)
- Graham Fenwick (Ecologist and Crustacean Systematist with NIWA)
- Graham McBride (Water Quality Statistician with NIWA)
- Joseph Thomas (Groundwater scientist with Tasman District Council)
- Andrew Fenemor (Scientist & Programme Leader with Landcare Research)
- Magali Moreau-Fournier (Groundwater Geochemist with GNS)

The interim findings of the Science Panel were provided by Dr Roger Young to FLAG, staff and local irrigators at a meeting on the 28 July 2016. The final summary report is expected in Nov-Dec 2016.

In summary, with regard to comparison with various guidelines and triggers, the Science Panel summarised that:

- All parameters are below the ANZECC trigger values, except for dissolved oxygen, but this is expected for a groundwater fed spring flow, as groundwater is naturally lower in dissolved oxygen than surface waters.
- NPS-FM NOF parameters (NO3-N toxicity, NH4-H toxicity, E.coli) are all in their respective ‘A’ bands, except for dissolved oxygen, but this is expected for a groundwater fed spring flow, as groundwater is naturally lower in dissolved oxygen than surface waters.
- Nitrate and E.coli meet the NZ Drinking Water Standards. Levels of chloride and hardness are above the standards.
- E.coli meets the microbiological guidelines for recreation.
- In reference to the ‘natural state’ (ie current state) or ‘status quo’ of the springs, the only parameters with potential levels of concern are Nitrate Nitrogen, Dissolved Oxygen, Water Clarity and Aquatic Plants.
The Science Panel identified current states and recommended bottom line trigger levels for the following attributes:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Summary of Current State</th>
<th>Recommendation</th>
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| Nitrate Nitrogen                               | Trends vary over the time periods considered eg:  
• 46 year trend increasing by 0.9% per year (entire data record) 
• 20 year trend increasing by 0.25% per year  
• 10 year trend decreasing by 1.50% per year                                                                                                                                  | ≥0.5mg/L annual median       |
| Dissolved Reactive Phosphorus (DRP)            | Concentrations generally very low – no indication of change.                                                                                                                                                             | ≥0.1mg/L annual median       |
| N:P ratio                                      | Ratio suggests that phosphorus likely to be controlling algal growth                                                                                                                                                     | None recommended             |
| Dissolved Oxygen                               | Very little daily variation. Concentrations were 58-64% saturation in the early 1970’s and between 50-53% saturation over a one month sampling logger deployment in April/May 2016. This could indicate a decrease, but getting accurate dissolved oxygen measurements is notoriously difficult and variability among well calibrated meters can be in the order of 5-10%. Therefore, the slight decrease in DO between the early 1970’s and now, may be real but is within the error bounds of measurement techniques. | ≤45% saturation (current seasonal variation unknown) |
| Water Temperature                              | No change over time. Consistently at 11.7°C                                                                                                                                                                              | None recommended             |
| Water Clarity                                  | Previously measured at 63m visibility – highest ever reported at the time (1993). No more recent data available. Clarity sampling has been taken downstream above the salmon farm – this has shown a decline over time, but data is not necessarily reflecting the main spring as it includes influence from Fish Creek and the upstream reach of Te Waikoropupū River. | <50m (measurement issues)    |
| Dissolved Organic Carbon (DOC)                 | Undetectable in springs (very clear water), measured in upper Takaka River during Cobb reconsenting in 1999 at 2mg/L – relatively low and not a concern.                                                                   | None recommended             |
| Faecal Bacteria                                | Main spring and Dancing Sands <1 MPN/100ml  
Fish Creek Spring 2 MPN/100ml  
Further downstream 1-23 MPN/100ml  
Very good water quality at springs (drinkable). Some minor contamination further downstream (possibly from runoff and bird populations) | None recommended             |
| Aquatic Plants                                 | Identified *Galium palustre*, a non-native aquatic plant found in main spring - first recorded in 2005, distribution re-measured in 2012                                                                                   | None recommended             |
| Invertebrates                                  | No monitoring of macro-invertebrate in main spring. Sampled regularly above salmon farm since 1986  
The health of Te Waikoropupū Springs and the upper reaches of the Springs River has not changed noticeably from 1986 to 2014 (22 years)                                                                  | None recommended             |
The science panel identified the following attributes as critical and secondary respectively:

- **Critical attributes for Te Waikoropupū springs and the AMA**
  - Water Clarity
  - Dissolved oxygen
  - Nitrate nitrogen
  - Dissolved phosphorus

- **Secondary measures**
  - Invertebrates
  - Macrophyte cover
  - Dissolved organic carbon
  - Temperature
  - Manganese
  - Nitrite nitrogen
  - pH
  - Conductivity
  - Chloride

These attribute lists include several secondary measures not specifically considered by the FLAG (blue text) and excludes mauri (not in the panels field of expertise).

The science panel identified the following potential risks to the aquifer and springs:

- Sediment and potential effects on water clarity
- Nutrients and potential effects on periphyton growth
- Pathogens
- Organic matter and potential effects of lowering dissolved oxygen
- Climate change and potential effects on temperature and flow fluctuations
- Invasive species, such as didymo, aquatic weeds
- Water abstraction