Collaborative decision making for freshwater resources in the Greater Heretaunga and Ahuriri Region

TANK Group Report 1

Interim Agreements

TANK

HBRC Plan No.

Naku te rourou nau te rourou ka ora ai te iwi

With your basket and my basket the people will live

(Collaborative effort will bring the best outcome)

TANK Group comment

As a group of individuals representing a range of sectors, we appreciate the opportunity to work together to manage our most precious resource – water. We come from different backgrounds and represent different interests but collectively as the TANK Group we have the same goal:

"*To enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from our water resources within an environmentally sustainable framework.*"

Most of the things we value have a connection with water: the environment, economy, our cultural identity and general health and wellbeing. To ensure that these values continue to be supported we have to work together. The collaborative process obliges us to listen carefully to one another, to learn from what we hear, and to find ways of reconciling our interests.

We recognise that the entire community's interests are at stake and we owe thanks to our networks who have entrusted us to provide a sound and strong voice. We will continue to seek their feedback to make sure that we are effectively and appropriately representing their aspirations.

We realise the importance of our task. The Greater Heretaunga and Ahuriri region is both the economic hub of Hawke's Bay and the place where many of us choose to live. Yet some of our waterways are in a degraded state and the risk to our futures of water shortages is very real – as the 2013 drought showed.

Not only do we need water to live and prosper, but our waterways are essential to our very existence. The proverb *Ko au te awa ko te awa ko au / I am the river and the river is me* resonates with us all. Water is a taonga and collectively we see ourselves as tangata kaitiaki, entrusted to protect our waterways and to use water efficiently to ensure that current and future generation's aspirations are met.

This First Report summarises our work to date and includes some important agreements we have come to. Over the last twelve months we have learned a great deal about the complexities of water management and we have enjoyed working together to unravel the complexities. We have embraced this challenge and we look forward to continuing to working together to ensure our water and waterways are protected – now and in the future.

Table 1. The TANK Collaborative Stakeholder Group

Aki Paipper	Ngāti Hori ki Kohupātiki
Brett Gilmore	Hawke's Bay Forestry Group
Bruce Mackay	Heinz-Wattie's
David Carlton	Department of Conservation
Christine Scott	HBRC Councillor
Dianne Vesty / Leon Stallard	Hawke's Bay Fruitgrowers Association
Hugh Ritchie	Federated Farmers
Ivan Knauf	Dairy sector
Jenny Mauger	Ngā Kaitiaki ō te Awa a Ngaruroro
Jerf van Beek	Twyford Irrigators Group
Johan Ehlers	Napier City Council
John Cheyne	Te Taiao Hawke's Bay Environment Forum
Marei Apatu	Te Taiwhenua o Heretaunga
Mark Clews	Hastings District Council
Mike Glazebrook	Ngaruroro Water Users Group
Mike Butcher	Pipfruit New Zealand
Morry Black	Matahiwi Marae
Joella Brown	Te Roopu Kaitiaki ō te Wai Māori
Neil Eagles	Royal Forest and Bird Protection Society (Napier)
Ngaio Tiuka	Ngāti Kahungunu Iwi Incorporated
Nicholas Jones	Hawke's Bay District Health Board
Peter McIntosh / Tim Hopley	Fish and Game Hawke's Bay
Peter Paku	Mana Whenua Ruahapia
Phil Holden	Gimblett Gravel Winegrowers
Scott Lawson	Hawke's Bay Vegetable Growers
Terry Wilson / Wayne Ormsby	Mana Ahuriri Iwi Incorporated
Tim Sharp	Hawke's Bay Regional Council
Vaughan Cooper	Royal Forest and Bird Protection Society (Hastings)
Xan Harding	Hawke's Bay Winegrowers

The TANK Group acknowledges the contributions of Adele Whyte, Dale Moffatt, Eileen von Dadelszen, Murray Douglas, Neil Kirton and Nikola Bass who were previous members of the group.

The Group also acknowledges the support provided by researchers in the Values, Monitoring and Outcomes Programme: Jim Sinner (Cawthron Institute), Suzie Greenhalgh (Landcare Research), Natasha Berkett (Cawthron Institute), Nick Craddock-Henry (Landcare Research) and Richard Storey (National Institute for Water and Atmospheric Research) and the facilitation of Robyn Wynne-Lewis (Core Consulting).

Figure 1: TANK Group field trip, February 2013

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Abbreviations used in this report

RMA	Resource Management Act 1991
NPSFM	National Policy Statement for Freshwater Management 2011
LAWF	Land and Water Forum
HBRC	Hawke's Bay Regional Council
RRMP	Regional Resource Management Plan
RPS	Regional Policy Statement
LAWMS	Land and Water Management Strategy
TANK	Tūtaekuri, Ahuriri, Ngaruroro, and Karamū catchments or collectively the Greater Heretaunga and Ahuriri area
TANK Group	The Greater Heretaunga and Ahuriri (TANK) Collaborative Stakeholder Group

1. Executive Summary

Hawke's Bay Regional Council (HBRC) is undertaking a change to the Regional Resource Management Plan (RRMP) with respect to water management for the Tūtaekuri, Ahuriri, Ngaruroro and Karamū catchments. The Greater Heretaunga and Ahuriri Plan Change will seek to implement the Hawke's Bay Land and Water Management Strategy and the National Policy Statement for Freshwater Management and will address specific water allocation and water quality issues in the four catchments, including for wetlands and estuaries.

Council is working with a collaborative stakeholder group to determine how these water bodies should be managed. The TANK Group (named after the four catchments) comprises 30 Hawke's Bay representatives from agricultural and horticultural sectors, tangata whenua, environmental and community interest groups, and government agencies. HBRC has given a good faith commitment to support any consensus recommendations from the TANK Group and to ensure the Plan Change is consistent with the Group's recommendations.

The key aspects of the Plan Change that the TANK Group is tasked with making recommendations to Council on are:

- Flow regime, including low flow restrictions on takes
- Water allocation (including for municipal and domestic supply)
- Security of water supply for water users
- Policies, rules on groundwater /surface water connectivity
- Surface water and groundwater quality limits
- Tangata whenua involvement in freshwater decision making
- Use of Mātauranga Māori in monitoring and reporting
- Wahi tapu register
- Policies, rules and incentives on:
    - riparian management & stock exclusion
    - water storage
    - water efficiency
    - water sharing/transfer
    - nutrient loss/allocation
    - good irrigation practices
    - stormwater management
    - other agricultural practices

This report summarises the TANK Group's work between October 2012 and December 2013 and includes the Group's provisional agreements listed below. For background and context around the agreements please refer to the detail in the body of the report. Many of these agreements are related to 'next steps' – and will be further developed by the group through 2014 and beyond as technical information comes available and the Plan Change is drafted. Drafting is scheduled to be completed by December 2015 for Plan Change notification in December 2016 (Figure 2).

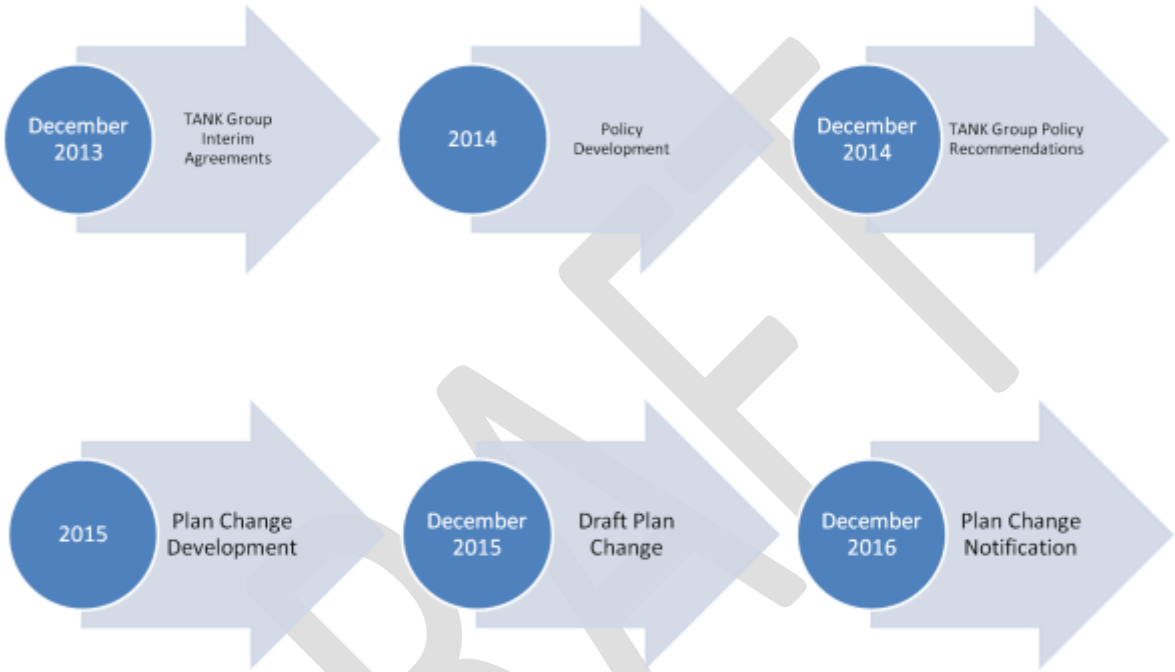


Figure 2: Plan Change Timeline

TANK Group Interim Agreements

Regional Plan Changes

1. The TANK Group will review the Tukituki Plan Change once it is completed and consider whether to use the same approaches where the same issues arise in the Greater Heretaunga and Ahuriri Plan Change so that, where appropriate, the RRMP is consistent across catchments.

Values

2. The TANK group will use the values identified in each of the catchments to assess the consequences of policy options and seek to identify options that provide for each of these values.

3. The TANK group will recognise spatial variation of catchments and their values in the limit-setting process, by setting objectives and limits for sites and reaches within catchments where appropriate.

Minimum flows

4. Minimum flow setting needs to take into account the impacts on environmental, cultural, social and economic values using other methodologies (e.g. Mātauranga Māori; economic models).
5. The TANK Group supports the use of RHYHABSIM for minimum flow setting where appropriate, to assess the implications of different flow regimes on the level of habitat retention for agreed species.

Water allocation

6. The TANK Group recognises that the RRMP needs to give effect to the NPSFM by ensuring that water is not over-allocated.
7. The TANK Group believes that alternative methods for determining total water allocation limits should be explored as a possible substitute for a simple sum of all authorised abstractions.
8. The TANK Group considers that monthly, rather than weekly, allocation volumes for water take consents are appropriate (as well as a 'rate' of take).

Groundwater

9. The RRMP needs to be informed by a better understanding of the groundwater resources so that limits can be set. The TANK Group supports ongoing HBRC groundwater investigations and considers that these investigations should include:
    a. Water balance (How much water can sustainably be abstracted?)
    b. Aquifer recharge from surface water
    c. Relationship with surface water (stream connectivity, depletion effects and ecology)
    d. Areas of concern (quantity and quality)
    e. Specific detailed investigations into the effects of individual takes in the unconfined and semi-confined areas of the Heretaunga aquifer
    f. Nutrient and contaminant pathways
    g. The significance of stygofauna
10. The TANK Group believes that supplementation of surface water flows from the confined aquifer should be explored.

Good irrigation practices

11. The TANK Group considers that all water consent holders should be required to provide evidence to HBRC (at a frequency to be determined) that they are compliant with industry IGP irrigation practices.

Municipal water use efficiency – interim agreements

12. The TANK Group considers that municipal water suppliers should have demand management and conservation strategies.
13. The TANK Group believes that some restrictions on urban and permitted domestic water supplies are appropriate in certain circumstances, such as when other abstractors from the same or connected resources are experiencing significant water restrictions and/or bans.

Global consents and water sharing

14. The TANK Group encourages HBRC to continue to work with water user groups to assist with setting up global consents.
15. The TANK Group would like to see a process for instantaneous transfers of water consents and will aim to identify the circumstances where this would be appropriate.

Staged reductions

16. The TANK Group considers that HBRC should investigate the benefits of staged reductions of water abstraction in the Greater Heretaunga and Ahuriri region. For staged reductions:
    a. A global consent for a surface water zone would be preferable
    b. Incentives will be needed to participate in a staged reduction policy (e.g. lower minimum flow restrictions)
    c. Telemetry will be required for all water users participating in a staged reduction policy.

Water storage

17. The TANK Group believes farming practices which maximise water retention in the landscape is likely to reduce irrigation demand and hence reduce the need for large scale water storage in the Greater Heretaunga and Ahuriri region.
18. To maintain current levels of food and fibre production, the TANK Group considers that water storage will be required if allocations are reduced and/or minimum flows are increased.
19. The TANK Group encourages HBRC to make allocations at high flows more easily available on-farm and/or community storage and distribution through the consenting process.

Nutrient management

20. The TANK Group agrees that nutrient management is necessary to maintain life-supporting capacity, avoid proliferations of undesirable algal growths, avoid toxicity to aquatic species and protect drinking water supplies.
21. The TANK Group believes that all farmers should be required to provide evidence to HBRC that they are compliant with industry IGP nutrient management practices.
22. The TANK Group considers that policy and management measures should target "hot-spot" areas where the values identified by the TANK Group are being compromised or at risk of being compromised by excessive nutrients. These areas need to be identified as well as the critical source areas for nutrients.
23. The TANK Group agrees that farm environmental management plans, which may go beyond IGP, should be mandatory for all landowners in "hot-spot" areas.
24. The TANK group recommends that monitoring of ground water nutrients take into account appropriate temporal lags between nutrient management practice and measured nutrient concentrations in ground water samples

Stock exclusion

25. The TANK Group supports exclusion of cattle from waterways in the Greater Heretaunga and Ahuriri region.
26. In catchments where stock (other than cattle) in streams is proven to be a problem, wider stock exclusion should be considered.

Stormwater

27. The TANK Group recommends the re-establishment of the Regional Stormwater Working Group (with possible inclusion of some TANK members) to review and where necessary update the Regional Stormwater Strategy.
28. The relevant agencies involved in stormwater management should investigate options including:
    a. Controls on zinc roofing e.g. require all new roofing to be painted
    b. Bylaws on design, operation and management of industrial sites
    c. Education and knowledge transfer
    d. New developments to be required to include sustainability attributes e.g. Low Impact Urban Design and Development
    e. Joining up networks with historical problems

Wetland management

29. The TANK Group recognises the importance of wetlands in the Greater Heretaunga and Ahuriri region and believes that measures should be undertaken to support the preservation of remaining wetlands, consistent with other policy documents such as the Regional Policy Statement and the NPSFM.
30. The TANK Group considers that wetlands should be identified and categorised to determine ecological significance and that wetlands deemed ecologically significant should be given protection that is consistent with the NPSFM.

Estuarine management

31. The TANK Group believes that the estuaries in the Greater Heretaunga and Ahuriri region should be managed so that popular activities including swimming and food gathering are able to be safely undertaken during normal climatic conditions (i.e. outside periods of high rainfall when bacteria concentrations are naturally high). Some areas may require improvements over an extended timeframe to meet community aspirations.

Tūtaekuri

32. The TANK Group is concerned about the excessive periphyton growth in the lower Tūtaekuri and requests that HBRC investigate and report back to the Group on causes of these growths and possible measures to reduce them.
33. The TANK group will consider whether to recommend confirming or amending the existing minimum flow and allocation.

Ahuriri

34. The TANK Group considers the Ahuriri Estuary to be a site of ecological, cultural and recreational significance and recommends that all reasonable measures are undertaken to support these uses and values including restoring suitability for food gathering. .
35. The TANK Group is concerned about sediment, nutrient, bacteria and contaminant inputs to the Ahuriri Estuary and requests that HBRC investigate and report back to the Group on sources of these and possible measures to reduce them.
36. The TANK Group is concerned about poor water quality in the urban streams and requests that HBRC investigate and report back to the Group on causes of the poor water quality and possible measures to improve it.

Ngaruroro

37. The TANK Group considers that management of the Ngaruroro catchment may be able to be based around four zones: upstream of Whanawhana; Whanawhana to Fernhill; Fernhill to the coast; and the Waitangi estuary.
38. Further monitoring and investigations are recommended to better identify the sources of water clarity degradation and nutrients in the Ngaruroro catchment.
39. Improved understanding of groundwater and surface water linkages and stream depletion effects is needed before adjustments to the existing flow regime can be agreed.
40. The main minimum flow on the Ngaruroro River (2400 l/s at Fernhill) should be reviewed and assessed for how well it is providing for in-stream values including ecological, recreational and cultural values.
41. Any changes to minimum flow and groundwater / surface water linkage rules need to consider impacts, especially security of supply and economic impacts, on water abstractors including irrigators and processors.

Karamū

42. The TANK Group is concerned about poor water quality, sediment, excessive macrophytes and lack of riparian vegetation in the Karamu system and its effects on cultural, ecological and recreational values including food gathering. The Group requests that HBRC investigate and report back to the Group on causes of the poor water quality and possible measures to improve it.
43. Improved understanding of groundwater and surface water linkages and stream depletion effects is needed before adjustments to the existing flow regime can be agreed.
44. Any changes to minimum flow and groundwater / surface water linkage rules need to consider impacts, especially security of supply and economic impacts, on water abstractors including irrigators and processors.

2. Introduction

Hawke's Bay Regional Council (HBRC) is undertaking a change to the Regional Resource Management Plan (RRMP) with respect to water management for the Greater Heretaunga and Ahuriri region in Hawke's Bay. The area under review is the water catchments of Tūtaekuri, Ahuriri, Ngaruroro and Karamū (Figure 1) and includes the Heretaunga Plains, the major urban centres of Napier, Hastings and Havelock North and the estuarine and coastal receiving environments.

The Greater Heretaunga and Ahuriri Plan Change will seek to implement the Hawke's Bay Land and Water Management Strategy and the National Policy Statement for Freshwater Management and will address specific water allocation and water quality issues in the catchment.

The Greater Heretaunga and Ahuriri region is large and diverse, and the water related issues complex. Because of this complexity, the Council has asked a group of Hawke's Bay residents to make recommendations on how these water bodies should be managed. The TANK Collaborative Stakeholder Group (named after the four catchments) comprises 30 Hawke's Bay representatives from agricultural and horticultural sectors, tangata whenua, environmental and community interest groups, and government agencies.

The TANK Group has held 11 full day meetings plus other small group meetings and workshops over the past 14 months to discuss the issues and to seek sustainable solutions to the region's freshwater challenges. HBRC has given a good faith commitment to support any consensus recommendations from the TANK Group and to ensure the Plan Change is consistent with the Group's recommendations.

This report summarises the work of the TANK Group to date. The report documents a number of provisional agreements. These include statements of values, objectives and some performance measures. The merits of current and alternative policy options (for influencing outcomes) have also been discussed at length. Without having comprehensively tested the consequences of adopting various options against objectives for each catchment, there has been agreement on the merits of a number of approaches that the group wish to document and use as a basis for further analysis and consultation. The group has also identified a number of information gaps that limit our ability to come to an agreement or to predict the consequences of implementing policy options. Priorities for research and monitoring are identified. Many of these agreements are related to 'next steps' – and will be further developed by the group through 2014 and beyond as technical information comes available and the Plan Change is drafted. The purpose of this report is to:

- Summarise land and water issues in the Greater Heretaunga and Ahuriri region
- Inform interested parties about land and water management in the Greater Heretaunga and Ahuriri region
- Summarise the process used by the TANK Group for identifying values and objectives and evaluating policy options for setting freshwater limits
- Confirm agreements of the TANK Group to date and clarify areas for further discussion

Figure 3 Greater Heretaunga and Ahuriri Catchments

3. Context

Hawke's Bay Regional Council is reviewing the current provisions of the Regional Resource Management Plan (RRMP) for the management of surface water and groundwater resources in the Greater Heretaunga and Ahuriri region. The Greater Heretaunga and Ahuriri Plan Change will be required to give effect to, and be consistent with, the following higher level documents:

- Resource Management Act
- National Policy Statement for Freshwater Management
- National Environmental Standard for Sources of Human Drinking Water
- Hawke's Bay Land and Water Management Strategy
- Regional Policy Statement
- HBRC's Long Term Plan

Resource Management Act

The Resource Management Act 1991 (RMA) is the key legislation governing the management of New Zealand's freshwater resources. Under the RMA, regional and unitary councils are responsible for making decisions on the allocation and use of water within their boundaries and for managing water quality. Central government can guide and direct regional councils under the RMA using tools such as national policy statements and national environmental standards.

National Policy Statement on Freshwater Management

The National Policy Statement on Freshwater Management (NPSFM) came into effect on 1 July 2011. The NPSFM requires regional councils to set freshwater objectives, water allocation limits and water quality targets for every water body, so that overall quality of freshwater in the region is maintained or improved. For the most part, it is the Regional Council's responsibility to implement the NPSFM and the primary policy instrument for doing this is the regional plan.

The NPSFM requires councils to set objectives and apply corresponding limits/levels to types of water bodies or areas and/or to have catchment and sub-catchment specific objectives and limits/levels, where the characteristics of catchments and sub-catchments demand different priorities. These limits may relate to water quantity allocations, minimum flows, and a variety of water quality parameters.

Every regional council must implement the NPSFM as promptly as is feasible so that it is fully completed no later than 31 December 2030. The Hawke's Bay Regional Council has identified a programme of activities for the preparation of regional plan changes and the associated resource investigations. In September 2012, the Council adopted its programme of progressive implementation steps to fully implement the NPSFM by 2030. This includes a number of catchment based plan changes, one of which is the Greater Heretaunga and Ahuriri Plan Change. The implementation programme builds on work and projects already underway before the NPSFM came into effect, as well as incorporating a number of new workstreams.

National Environmental Standard for Sources of Human Drinking Water

The National Environmental Standard for Sources of Human Drinking Water (the NES) 2008 aims to reduce risks to the quality of water bodies from which drinking-water supplies are taken. The NES requires regional councils to consider the effects of activities on these water sources in their decision making. Hence the Greater Heretaunga and Ahuriri Plan Change will need to be consistent with the NES.

Hawke's Bay Land and Water Management Strategy

As well as giving effect to the NPSFM, the Council's future work programme of plan changes will seek to implement relevant parts of the 2011 Hawke's Bay Land and Water Management Strategy (LAWMS). The LAWMS provides a common focus for the management of land and water in Hawke's Bay in order to achieve improved economic and environmental outcomes. The overall vision of the LAWMS is:

> *In Hawke's Bay, land and water are highly valued, used wisely and sustainably managed*
>
> *– by all, for all.*

A range of outcomes are anticipated from implementation of the LAWMS. Plans and policies prepared under the RMA are an important means to implement the LAWMS, albeit they are not the only tools to be used to implement the strategy.

Regional Resource Management Plan (including Regional Policy Statement)

The Regional Resource Management Plan (RRMP) provides a framework within which the sustainable management of the region's natural and physical resources can be undertaken, and sets

out a policy framework for managing resource use activities in an integrated manner across the whole of the Hawke's Bay region.

This RRMP has legal force under the RMA. That is, the regional rules contained within it have the force and effect of a regulation under the Act. The Regional Council must have regard to the provisions of the RRMP when considering applications for resource consents. In addition, territorial local authorities within Hawke's Bay must ensure that their district plans are not inconsistent with the provisions of this RRMP.

The RRMP currently contains broad freshwater management objectives, water quality guidelines (both at a regional and catchment specific level for a number of parameters) and water allocation limits and minimum flows for specific reaches of river in a number of catchments. However, these need to better align with the NPSFM and also have appropriate regard to the LAWMS – both of which have emerged since the RRMP was finalised in 2006.

Over the past few years, the Council has been advancing a catchment-based approach to RRMP plan changes to address specific resource management issues in the region. The NPSFM Implementation Programme continues that approach. Change 5 to the Regional Policy Statement is the lead initiative of the Regional Council's NPSFM Implementation Programme. Change 5 goes some way to inform the establishment of freshwater objectives by setting out a framework within which values, objectives and limits can be developed and included in regional plans.

HBRC proposes to publicly notify a change to the relevant sections of the RRMP for the Greater Heretaunga and Ahuriri catchments by December 2016.

The TANK Group believes that the catchment-based plan changes being undertaken for the RRMP need to be consistent wherever possible. Many of the people involved in the plan change deliberations are the same across the Hawke's Bay catchments and many of the same issues are being addressed.

The first catchment under review is the Tukituki (Plan Change 6) and plan change deliberations are well advanced. The TANK Group considers that re-litigation of many of the issues in the Tukituki may not be necessary and that agreements reached in Plan Change 6 may be able to be used in the Greater Heretaunga and Ahuriri Plan Change. However, it is also possible that the Greater Heretaunga and Ahuriri Plan Change could improve the approaches taken in Plan Change 6 and the TANK Group wishes to keep these options open.

Regional Plan Changes – interim agreement

1. The TANK Group will review the Tukituki Plan Change once it is completed and consider whether to use the same approaches where the same issues arise in the Greater Heretaunga and Ahuriri Plan Change so that where appropriate the RRMP is consistent across catchments.

4. The TANK Collaborative Stakeholder Group

Collaboration is at the core of this Plan Change process. The aim is to provide the Council with consensus stakeholder recommendations regarding objectives and policies for the plan change (and perhaps other related actions). For its part, the Regional Council has given a good faith commitment to implement consensus recommendations providing that they are consistent with the higher level documents noted above. It is hoped that this process will produce policy recommendations to the HBRC that are broadly supported by the community and underpinned by science.

Using a collaborative approach to freshwater planning is a key recommendation of the Land and Water Forum (2012) which notes that although collaborative planning is unlikely to be cheaper in the short term, significant benefits are likely. The process should help to increase the quality of and commitment to freshwater planning and policy documents, increase the agility of the planning framework, and streamline consent requirements for proposals that accord with agreed objectives. The Land and Water Forum believes that if done well –and effectively "dovetailed" with existing legal processes – a collaborative approach to freshwater governance has the potential to lead to longer term solutions that are more resilient and adaptive to change, and avoid more costly, drawn-out and divisive decision-making processes. In the longer term, then, a collaborative plan and policy making process may be faster, more efficient and more equitable than the status quo process.

The members of the Greater Heretaunga-Ahuriri Collaborative Stakeholder Group (TANK Group) reflect a broad range of interests in freshwater management in the TANK catchments, and provide a cross-section of values, understanding and perspectives. The goal is for the group to be as representative as possible while accepting that it needs to be kept to a size that can work effectively together. To extend the collaborative dialogue further, TANK members are engaging with their organisations and wider social networks to explain what is happening in the collaborative process and to get feedback from them on the matters under consideration. Interested members of the public can contact their representative or any of the Regional Councillors on the TANK Group if they would like to know more or express a view.

Figure 4: Mike Glazebrook talking to the TANK Group at Te Tua Station, February 2013

TANK Group members are expected to represent the interests of their organisations and networks in the search for consensus. Each member has to consider whether supporting a consensus, even if the recommendations are not everything they or their organisation would like, is better than the uncertain outcome they would face if they choose instead to contest the issues through an adversarial process. Thus, rather than simple advocacy for particular views, TANK Group members are expected to genuinely explore, consider, and deliberate on solutions that accommodate the broad range of interests that the Group members represent, and to refrain from divisive tactics. To this end, the group has a protocol for collaborative deliberation and an independent facilitator.

In this process, the TANK Group and Regional Council are being supported by a team from Landcare Research, the Cawthron Institute and the National Institute for Water and Atmospheric Research (NIWA), funded through a research grant from central government. Their objective is to learn how to design and support collaborative processes that accommodate diverse values and deliver improved outcomes from freshwater management, so that these lessons can be shared with other communities and councils around New Zealand.

5. Mana whenua

To be completed

Since the time of kupe, tangata whenua have long valued the life-sustaining capacity afforded from our rich and diverse waterways. The taonga tuku iho (treasures handed down by our ancestors) of whenua (land), nga wai katoa (all waters), mahinga kai and all living things, have, for mai rā anō (time immemorial) determined the location of hapū, marae and whanau.

Figure 5: Marae locations

6. The TANK Group decision making process

The TANK group is identifying and assessing the issues and options for freshwater management in the Greater Heretaunga and Ahuriri catchments. In many ways, the group is performing the "section 32 analysis" (consideration of alternatives, costs and benefits) required under the Resource Management Act.

To do this, the TANK Group is utilising a Structured Decision Making process. This consists of group members identifying their "Values" and "Objectives", as well as "Performance Measures", and "Management Variables" (see Table 2 for a hypothetical example), which are used to identify "Policy Options" and estimate the "Consequences" of these options (see Table 3 for a hypothetical example). These terms are briefly defined as:

- **Values:** Activities, uses or sources of value (from freshwater systems), "things that matter".
- **Objective:** A desired outcome in a thing that matters (e.g. increase the suitability of water for swimming, generally or in a particular location).
- **Performance measures:** A specific metric for consistently assessing the consequences of taking an action or set of actions (i.e. criteria for evaluating options). These may later be used to measure and report on the actual outcomes achieved once policies are implemented.
- **Management Variables:** Aspects of freshwater management that can be directly controlled or indirectly influenced by the Hawke's Bay Regional Council (e.g. allocation limits) in order to achieve management objectives.
- **Policy Option:** An action or set of actions, using the Management Variables available, that could be taken to advance the achievement of one or more objectives.
- **Consequence:** An expected result of taking an action or set of actions, i.e. of implementing an option.

Using this framework, the TANK Group has begun the process of identifying and assessing options for the four catchments. Some policy options will be generic across the Greater Heretaunga and Ahuriri area (e.g. a target for security of supply for water users), whereas others will be specific to a catchment or reach (e.g. a flow setting or water quality limit based on a particular use or value). Each option is assessed to estimate its likely consequences in terms of stakeholder values as

represented by the performance measures. The group then tries to refine the policy options to find ways that better meet the full set of values, so that everyone has a reason to support it.

Table 2: Hypothetical example of the decision making process

Values =>	Objectives =>	Performance Measures	Management Variables
Primary Production	Create new jobs in Hawke's Bay	New full-time jobs in horticulture & farming	Minimum flow; allocation regime & volume
Trout fishing	Improve river for trout fishing	Trout habitat as % of maximum	Minimum flow; nutrient levels; riparian vegetation
Mauri of river	Restore mauri of river	Cultural health index	Minimum flow; stock exclusion; nutrient levels

Table 3: Hypothetical examples of the consequences of different Policy Options

	Option A: Raise min flow Nutrient cap	Option B: Current min flow Stock exclusion	Option C: Reduce min flow Stock exclusion
New full-time jobs in horticulture & farming	Loss of x jobs (how many?)	No change in jobs	Gain of x jobs (how many?)
Trout habitat as % of maximum	90% of trout habitat	70% of trout habitat	50% of trout habitat
Cultural Health Index	Good	Fair	Fair – Poor

To support the Structured Decision Making process, the TANK Group has also been developing models called Bayesian Belief Networks (BBNs). These networks are used to try and capture our understanding of the cause-effect relationships between management variables and performance measures, often using "intermediate variables" for complex, indirect relationships. The BBNs can be used in a diagrammatic form (called an "influence diagram") or they can be developed to show *how much* one component, or "node", affects another, and to reflect uncertainty. This is achieved by attaching probabilities based on available science (or best judgements where scientific knowledge is not available) to different possible states of each node, for example the probability of Trout fishing

(the node) being “poor”, “fair”, “good”, or “excellent”. Once the BBNs are agreed upon they can be used by the Group to estimate the consequences of alternative policy options. In this way the BBN itself does not make the decision, but rather supports decision-making, and also helps to show how decisions were made and what assumptions were made in the process.

The TANK Group created BBNs (in influence diagram form) in small group sessions based around tangata whenua, social, ecological, and economic themes (Figure 6). Figure 7 shows the relationships between the fundamental “objectives”, “sub-objectives”, “performance measures”, and “management variables” (note Figure 7 is a small, incomplete part of the overall BBN included for indicative purposes only).. These were then merged with BBNs of the other three themes to show how all of these matters are connected. The next step is to quantify this comprehensive BBN for each of the catchments so the group can use it to assess consequences of policy options. The TANK group is not proposing to use the BBN to automatically generate optimum or preferred policy choices. Rather it is hoped that the BBNs will assist in making judgements transparent to all stakeholders as well as allowing TANK group members to understand the consequences of different judgements about cause-effect relationships and their probabilities.

Figure 6: Developing an influence diagram

Excerpt from an influence diagram

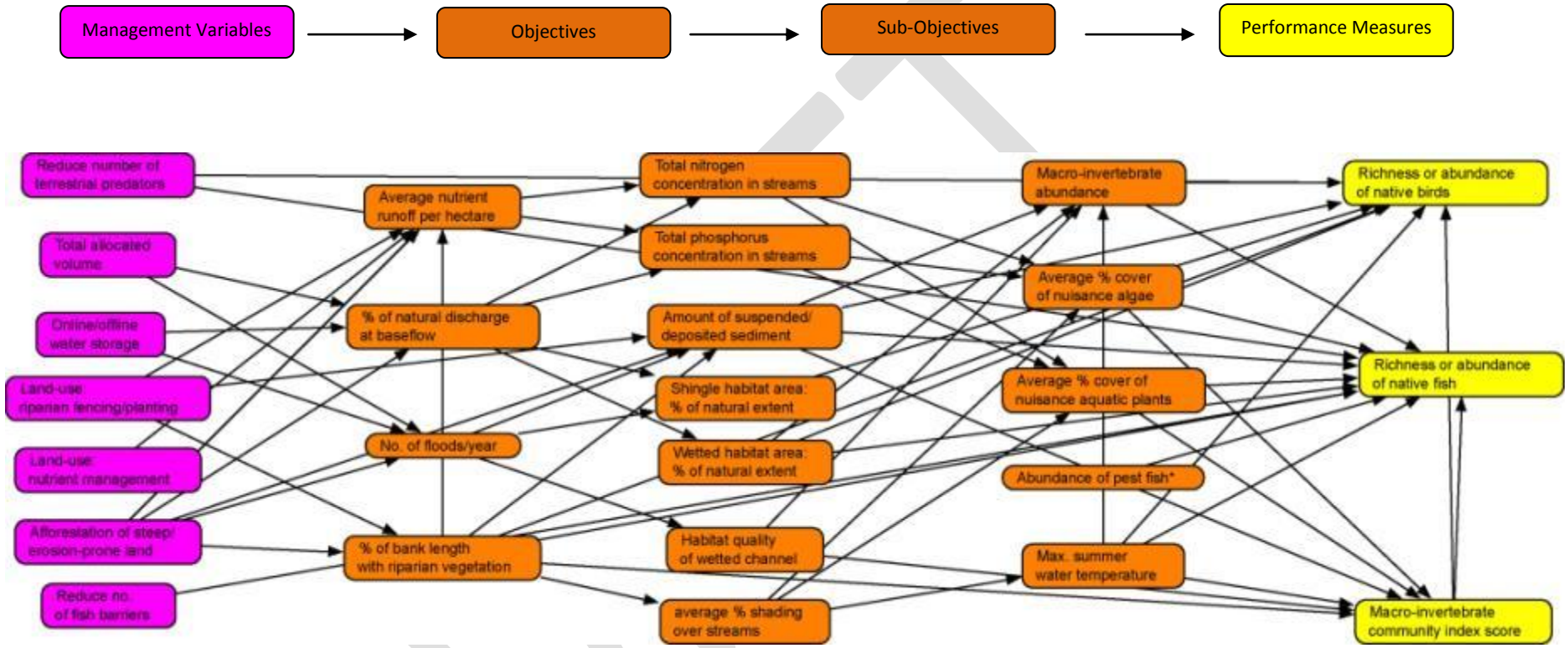


Figure 7: Example of an influence diagram (NB: this is not a complete influence diagram)

7. TANK Group Values, Objectives, Performance Measures and Management Variables

This section outlines the Values, Objectives, Performance Measures and Management Variables being developed by the TANK Group as part of the Structured Decision Making process for freshwater limit setting. Some have been discussed in detail and agreement has been reached by the Group (as noted in the text); others are still being refined as more information becomes available.

Figure 8: TANK Group discussions

Values

Any freshwater policy setting process needs to take into account multiple community values and interests. The TANK Group has identified important freshwater values for the Greater Heretaunga and Ahuriri region, many of which apply throughout the region. The list of values considered important by TANK stakeholders are either properties of freshwater or well-beings supported by the use of fresh water and include (in no particular order):

- Life-Supporting Capacity
- Human health and wellbeing
- Food and fibre production and processing
- Industrial & commercial use
- Mauri, Wairua and Taonga
- Kaitiakitanga and Mana
- Whakapapa and Wahi tapu
- Habitat /Indigenous biodiversity
- Food gathering
- Swimming and wading (Primary Contact recreation)
- Kayaking and boating (Secondary Contact recreation)
- Trout fishing
- Amenity & tourism
- Household and urban water supply (for drinking and other uses)

There are other values to consider when developing freshwater management policies, which while not freshwater "values" in the sense of the list above, are important aspects to take into account. These include:

- Urban development
- Flood protection
- Urban stormwater management
- Net benefit of policies
- Costs to ratepayers

The values associated with water are numerous and seeking win-wins across all values is challenging – but not impossible. All of the above values are important and the TANK Group believes that the RRMP can and should aim to support them. However, the individual catchments have very different characteristics, and thus the significance of values varies. The TANK Group has discussed the spatial variation of values and identified where values are competing, which is where pressure on freshwater is greatest and the management response is most difficult (see Section 8: Catchment specific topics). The freshwater limit setting process needs to take account of this variation across the region.

Values – interim agreements

2. The TANK group will use the values identified in each of the catchments to assess the consequences of policy options and seek to identify options that provide for each of these values.

3. The TANK group will recognise spatial variation of catchments and their values in the limit-setting process, by setting objectives and limits for sites and reaches within catchments where appropriate.

Objectives

Once Values were identified, the TANK Group undertook the task of developing Objectives for supporting them. Objectives can be high level or 'fundamental objectives' and also 'sub-objectives' which support fundamental objectives. The TANK Group has identified Objectives which will underpin its recommendations for the Plan Change. These are shown in Table 4.

Performance measures

To determine whether the Group's Values and Objectives are likely to be met via policy options, the impacts are estimated with Performance Measures. The Performance Measures that the TANK Group is using were initially identified through the influence diagrams described above, and then further refined by thinking about how they could be defined and linked to Management Variables through other parts of the complete "system", i.e. the relationships between people and the environment.

The TANK Group's Values, Objectives and related Performance Measures are brought together in Table 4.

Table 4: Values, Objectives and Performance Measures identified by the TANK Group's

VALUES	OBJECTIVES	PERFORMANCE MEASURES
• Life-Supporting Capacity • Mauri and Taonga • Habitat /Indigenous biodiversity •	Safeguard the life-supporting capacity and enhance the mauri of waterways	• Macroinvertebrate assemblage incl. community index score • Mauri • Richness and abundance of native fish • Area of wetlands • Condition of wetlands • Mahinga kai quality and availability • Richness and abundance of native birds
• Food gathering • Household and urban water supply (for drinking and other uses)Human health and wellbeing	Improve the health of Hawke's Bay communities	• Reported cases of water-borne disease/yr • Potable water quality in groundwater • Potable water quantity (days of restrictions/yr) • Potable water quantity (Number of people with vulnerable supplies)
• Food and fibre production and processing • Amenity & tourism • Household and urban water supply (for drinking and other uses)	Improve the Hawke's Bay economy	• Number of jobs in water-dependent sectors • Total profit in water-dependent sectors • Certainty of water supply for water-dependent sectors (Number of years with ≤5 days full water restrictions) • Net benefit of policy measures
• Food gathering • Swimming and wading (Primary Contact recreation) • Kayaking and boating (Secondary Contact recreation) • Trout fishing • Amenity & tourism	Improve recreational freshwater opportunities	• Number of sites*days suitable for swimming • Water flows for whitewater boating • Water flows for flat-water boating • Aesthetics of waters • Angler days • Income from freshwater related tourism
• Kaitiakitanga and Mana • Mauri and Taonga	Recognise Māori interests in freshwater and improve opportunities for Māori to access and use freshwater resources	• Tangata whenua involvement in governance • Use of Mātauranga Māori in Council monitoring and reporting • Maori water allocations
• Whakapapa and Wahi tapu	Increase identification, recognition and protection of wahi tapu and wahi taonga.	• Wahi tapu register • Tangata whenua involvement in governance

Management Variables

The TANK Group has also identified a long list of Management Variables that could be incorporated in policy options to help achieve desired objectives. Some of these are within the control of HBRC while others are steps that landowners, city and district councils, industry bodies and others could initiate themselves. Within the things that HBRC can do, some are central to the Plan Change for the Greater Heretaunga and Ahuriri area – such as minimum flows, allocation limits, water quality limits and measures to achieve these – while other Management Variables are things that HBRC could do outside the RRMP, such as removing barriers to fish passage, increasing its technical assistance to farmers, assisting with water storage proposals or funding riparian planting[1].

The Management Variables directly linked to the Plan Change, i.e. those which the Council is asking the TANK Group to make recommendations on, are as follows:

The **TANK Group** will be making recommendations to Council on these **Management Variables**

- Flow regime
- Water allocation (including for municipal and domestic supply)
- Security of water supply setting
- Policies, rules on groundwater /surface water connectivity
- Surface water and groundwater quality limits
- Tangata whenua involvement in freshwater decision making
- Use of Mātauranga Māori in monitoring and reporting
- Wahi tapu register
- Policies, rules and incentives on:
    - riparian management & stock exclusion
    - water storage
    - water efficiency
    - water sharing/transfer
    - nutrient loss/allocation
    - good irrigation practices
    - stormwater management
    - other agricultural practices

[1] The full list of Management Variables is documented in Appendix 1.

8. TANK region-wide topics

Figure 9: Field trip to the Ngaruroro River

Managing the four catchments holistically is important due to the interconnected nature of the rivers, streams and groundwater (the Heretaunga aquifer underlies the four catchments and the Ngaruroro and Tūtaekuri Rivers contribute to both surface water and groundwater in the Karamū catchment). Although the limits will vary by catchment or by management zone within or across catchments, the approaches taken to set them will be the same.

This section summarises TANK Group discussions on topics which apply to all four catchments. Many of the topics concern Management Variables which, when set in policy, will have an effect on a range of Values and Objectives. The consequences of these policy settings on the Values and Objectives will be assessed using the Performance Measures noted above.

8.1. Minimum flows

Minimum flows are a Management Variable which will have an effect on a range of Values and Objectives including those associated with life-supporting capacity, mauri, habitat, recreation and the economy. As a result there are multiple Performance Measures which the TANK Group will use to assess the impacts of minimum flows including richness and abundance of native fish, mahinga kai quality and availability, potable water quantity, flows for boating and number of jobs in water-dependent sectors.

The determination of minimum flows needs to include assessments of impacts on fish habitat and other ecological, cultural and recreational values, as well as the impacts on irrigators, processors,

and the wider community. Much of this work is still to be undertaken, so the TANK Group is not currently in a position to make any definitive recommendations. However, some agreements have been reached.

The pressures associated with minimum flow setting vary throughout the four catchments:

- In the Ahuriri there is no surface water abstraction and therefore there are few problems for setting minimum flow limits
- Methodologies for setting minimum flows in systems like the Karamū are not well developed
- The Tūtaekuri minimum flows provide high levels of ecological habitat retention and security of supply for irrigators
- In the Ngaruroro, much is still to be understood about the current minimum flow and any need for change.

RHYHABSIM (River Hydraulics and Habitat Simulation model) is a method used by scientists to estimate the quantity of fish habitat in a river as a function of flow. When using RHYHABSIM to inform decisions about minimum flows, the key factors are the species of interest and the level of habitat retention required. The TANK Group supports the use of RHYHABSIM but considers it important to also translate the application of minimum flow thresholds into an equivalent predicted impact on fish abundance. It is also important to know how other human influences (e.g. nutrients) affect fish populations.

As noted above, full impact assessments across the four well-beings (using Performance Measures) need to be undertaken to support minimum flow setting.

Minimum flows – interim agreements

4. The minimum flow setting needs to take into account the impacts on environmental, cultural, social and economic values using other methodologies (e.g. Mātauranga Māori; economic models).
5. The TANK Group supports the use of RHYHABSIM for minimum flow setting where appropriate, to assess the implications of different flow regimes on the level of habitat retention for a range of species.

8.2. Water allocation

Water allocation is a Management Variable linked to minimum flow which will have an effect on a range of Values and Objectives including those associated with human health and access to public water supplies, kaitiakitanga and mana, and food and fibre production and processing. As a result there are multiple Performance Measures which the TANK Group will use for assessing the impacts of water allocation including potable water quantity, certainty of water supply for water-dependent sectors, and Maori water allocations.

The rate of take is the key parameter for managing the allocation of surface water resources because of the direct effect that taking from rivers has on the flow in the river. For the allocation of groundwater, it is the annual volume that is a key management parameter. The rate of take for groundwater is relevant when assessing interference effects on other groundwater users.

The current RRMP allocation framework HBRC provides for 95% security of supply to water users. It provides an allocation limit for a river that is the difference between the 7-day average flow that is exceeded 95% of the time over the summer months and the minimum flow. On average, this means that water users are likely to be under restriction no more than 5% of the time, i.e. have 95% security of supply. Up until 1999 (proposed RRMP notified) consents were granted on existing use determined by the crop and area of land to be irrigated. Since the RRMP was notified, water allocation for irrigation has been largely based on the crop water requirements for a 1 in 5 year drought event using the Morgan methodology.

The NPSFM requires that the Regional Council not over-allocate water. Determining actual allocation status is difficult without detailed abstraction data. As more water use is metered and telemetered, Council is able to get a better understanding of the status of water allocation. By the methodology used in the RRMP, the Tūtaekuri catchment is under-allocated, the Ngaruroro fully allocated and the Karamu over-allocated by virtue of many reaches having a zero allocation limit. However, these are conservative estimates as they assume all consented water is used concurrently when it is unlikely that all irrigators will irrigate at full capacity at the same time. Recently collected telemetry data shows that this is not the case. Some members of the TANK Group believe actual water use is less than the allocation limit and therefore current takes are not putting the catchments into an actual over-allocation state. The suggestion is that a different methodology for determining the allocation limit may be required.

Consented water allocations in Hawke's Bay are given a maximum rate of take (instantaneous) and a weekly or monthly allocation volume. The maximum rate of take is supported by the TANK Group but weekly allocations are, in practice found to be impractical to manage at a user level. As such, monthly allocations are supported by the TANK Group.

Water allocation – interim agreements

6. The TANK Group recognises that the RRMP needs to give effect to the NPSFM by ensuring that water is not over-allocated.
7. The TANK Group believes that alternative methods for determining total water allocation limits should be explored as a possible substitute for a simple sum of all authorised abstractions.
8. The TANK Group considers that monthly, rather than weekly, allocation volumes for water take consents are appropriate (as well as a 'rate').

8.3. Groundwater investigations

There are around 2000 groundwater takes in the Greater Heretaunga and Ahuriri region (Figure 10). Improved understanding of groundwater resources and functions is a fundamental requirement to inform the setting of many of the Management Variables identified including flow regime, water allocation and policies, and rules on groundwater /surface water connectivity. To give effect to the NPSFM, a sustainable level of groundwater abstraction needs to be determined and an allocation limit set.

What do we need to know about **groundwater?**

- Water balance
- Aquifer recharge
- Relationship with surface water
- Quality / quantity concerns
- Effects of takes
- Nutrient and contaminant pathways
- The significance of stygofauna

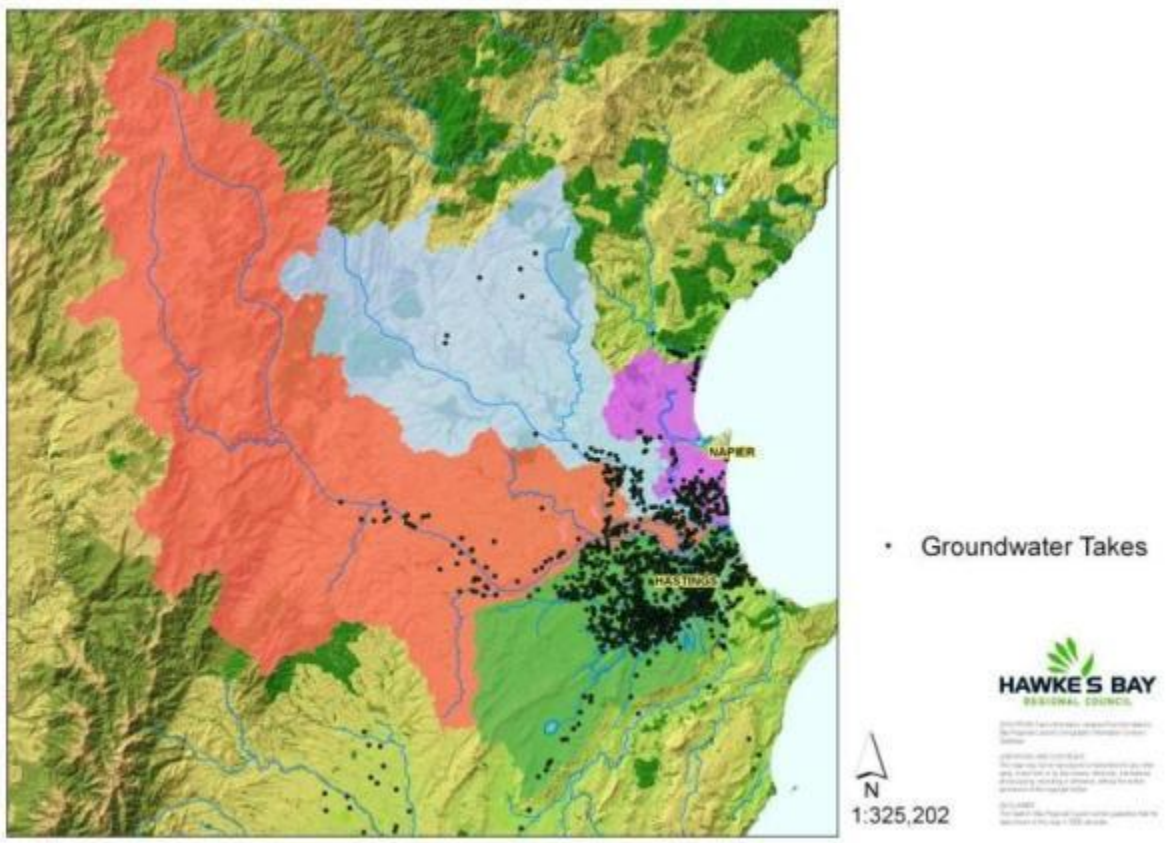


Figure 10: Groundwater takes in Greater Heretaunga and Ahuriri

Concerns raised in TANK Group discussions are that the existing groundwater model does not predict likely effects of any changes in groundwater use and is limited in its capacity to inform the setting of an allocation limit. The connectivity between surface water and groundwater and the effect of river flow on aquifer recharge has not been well understood in the past but information collected over recent years is helping with that understanding. It is anticipated that HBRC will have developed a coupled surface water / groundwater model for assessing connectivity and stream depletion effects to inform Plan Change decisions.

To improve water supply security, the TANK Group wants HBRC to explore whether it is feasible to supplement surface water flows where restrictions occur from the confined aquifer where there are no restrictions. This was trialled to good effect in the Raupare in the summer of 2012/13.

The TANK Group notes that investigations in New Zealand and Australia suggest that stygofauna may provide essential ecosystem services that contribute to ground water dynamics and nutrient attenuation. The group believes more research should be undertaken to understand the importance of these organisms as well as factors that might affect their capacity to maintain ground water quality, groundwater flow and effects on groundwater dependent surface water ecosystems. The

Group notes that Napier City Council and Hastings District Council take water that is more than a year old to ensure pathogens are not present.

There are many hundreds of groundwater takes in the Greater Heretaunga and Ahuriri region whose stream depletion effects need to be determined. The TANK Group considers that the 400m stream depletion rule in the RRMP is too coarse, arbitrary, and not effects-based. The approach taken in the Tukituki Plan Change 6 may be an improvement and the TANK Group will consider supporting that approach for the Greater Heretaunga and Ahuriri Plan Change.

Groundwater – interim agreements

9. The RRMP needs to be informed by a better understanding of the groundwater resources so that limits can be set. The TANK Group supports ongoing HBRC groundwater investigations and considers that these investigations should include:
    a. Water balance (How much water can sustainably be abstracted?)
    b. Aquifer recharge from surface water
    c. Relationship with surface water (stream connectivity, depletion effects and ecology)
    d. Areas of concern (quantity and quality)
    e. Specific detailed investigations into the effects of individual takes in the unconfined and semi-confined areas of the Heretaunga aquifer
    f. Nutrient and contaminant pathways
    g. The significance of stygofauna.
10. The TANK Group believes that supplementation of surface water flows from the confined aquifer should be explored.

8.4. Measures for improving water use efficiency

Measures for improving water use efficiency are Management Variables which will have an effect on a range of Values and Objectives including those associated with public and commercial water supplies, kaitiakitanga, habitat and the economy. Performance Measures which the TANK Group will use for assessing the benefits of water use efficiency measures will include potable water quantity, richness and abundance of native fish, certainty of water supply and number of jobs in water-dependent sectors.

8.4.1. Municipal water use efficiency

It is important that water efficiency measures are adopted by all sectors and all sections of the community, as all water use has a depletion effect on the region's water resources. While irrigation is the largest water use in the region, municipal takes are also substantial. Irrigators are exploring options for making water go further including good irrigation practices, global consents and staged reductions of water abstraction. The TANK Group believes that suppliers of municipal water for urban and industrial use should also be exploring water efficiency measures and that these suppliers should have demand management and conservation strategies. Strategies could include procedures for low flow restriction periods and educational initiatives for the community.

Municipal water use efficiency – interim agreements

11. The TANK Group considers that municipal water suppliers should have demand management and conservation strategies.
12. The TANK Group believes that some restrictions on urban and permitted domestic water supplies are appropriate in certain circumstances, such as when other abstractors from the same or connected resources are experiencing significant water restrictions and/or bans.

8.4.2. Good irrigation practices

Most crops in the Greater Heretaunga and Ahuriri region are dependent on irrigation water and the 2013 drought saw many growers on the Heretaunga Plains facing water restrictions and crop loss. Some of the issues associated with water shortages in the Greater Heretaunga and Ahuriri region could be mitigated if good irrigation practices were adopted by all irrigators. Most industries have Industry Good Practice (IGP) programmes established which include irrigation practices. The TANK Group believes that all water consent holders should be adhering to their own industry IGP programme, and that evidence of this should be provided to the Regional Council.

Good irrigation practices – interim agreements

13. The TANK Group considers that all water consent holders should be required to provide evidence to HBRC (at a frequency to be determined) that they are compliant with industry IGP irrigation practices.

Figure 11: Good irrigation practices are a necessity in gravel-dominated soils like the Gimblett Gravels.

8.4.3. Global consents and water sharing

Global consents involve the combining of a number of consents into a single consent and allocation of water (rate and volume).

Global consents are already possible within existing RRMP rules and HBRC is participating with growers to assist in setting them up, e.g. with Twyford Irrigators Group and Ngaruroro Water User Group. However, there are difficulties of getting growers who have adequate supply to join a global consent when they perceive there to be little individual benefit.

For a global consent, all takes need to be telemetered and transfer of water can only be between homogeneous systems and not from groundwater to surface water.

Global consents and water sharing – interim agreements

14. The TANK Group encourages HBRC to continue to work with water user groups to assist with setting up global consents.

15. The TANK Group would like to see a process for instantaneous transfers of water consents and will aim to identify the circumstances where this would be appropriate.

8.4.4. Staged reductions

The current regime for water restrictions in the RRMP is that when rivers drop to minimum flow levels, most abstractors are required to cease abstraction. The TANK Group believes that while this "on-off" policy may be appropriate for some catchments, in others it may be too blunt and other, more sophisticated mechanisms should be explored.

Water consent holders seek flexibility in the exercising of their consents including options to utilise staged reductions, i.e. reduce water takes at different stages to help to delay or prevent rivers from reaching minimum flow restrictions. In dry years irrigators could work out the most appropriate system of cutbacks for a river or stream taking into account the water requirements of different crops.

Avoiding bans on irrigation is only one side of the coin. There are multiple benefits of staged reductions including to in-stream values because under a staged reduction regime, river flows stay at higher flows for longer.

The benefit of staged reductions for irrigators will depend on a number of hydrological factors. These include the rate of flow recession (how quickly flow drops in a drought), the rate of take, and the lag between point of take and stream flow. With a fast rate of flow recession and small net take, staged reductions will result in only a short extension of irrigation season prior to ban. For a slow rate of recession and large net take, the stage reduction will result in a greater extension of irrigation season prior to ban.

Due to the varying benefits, staged reductions should be assessed on a catchment by catchment basis once information is gathered on how rivers or aquifers would respond. For staged reductions to work, all abstractors of water from a zone with a staged reduction policy will need to be managed under a single global consent and all takes will need to be telemetered.

Figure 12 represents a theoretical model of how a stage reduction policy might work. The nature and number of thresholds and the staged reduction values have been chosen simply to help explain the concept and could be very different in the final event, should such a policy be pursued.

The green downward sloping curve represents the river flow reducing over time due to no rainfall. The minimum flow restriction would begin on the 22nd day of no rain (@ approx 4200 L/s) and all abstraction would cease. Under a staged reduction regime, irrigators begin to reduce their water abstraction when the river drops to MALF or 6000 L/s by 30%. This change in river flow is represented by the multi-coloured staggered line in the graph. As the takes are reduced, the river level rises and then starts to fall again in the absence of rain. At the next threshold, 90% of MALF or 5400 L/s, water abstraction is reduced by a further 30% and the river level rises again. Further reductions occur at 80% of MALF. At 70% of MALF, the minimum flow is reached and no takes are permitted.

In this theoretical situation, total water restrictions without staged reductions would have started on the 22nd day without rain. With staged reductions, this has been put off to the 38th day.

How would **staged reductions** work?

A river could have a range of trigger flows.

At the first trigger flow, everybody cuts back irrigation by 20%.

At the second trigger flow, everybody cuts back irrigation by a further 20%.

And so on until the final trigger flow, which is the minimum flow, where irrigation must cease.

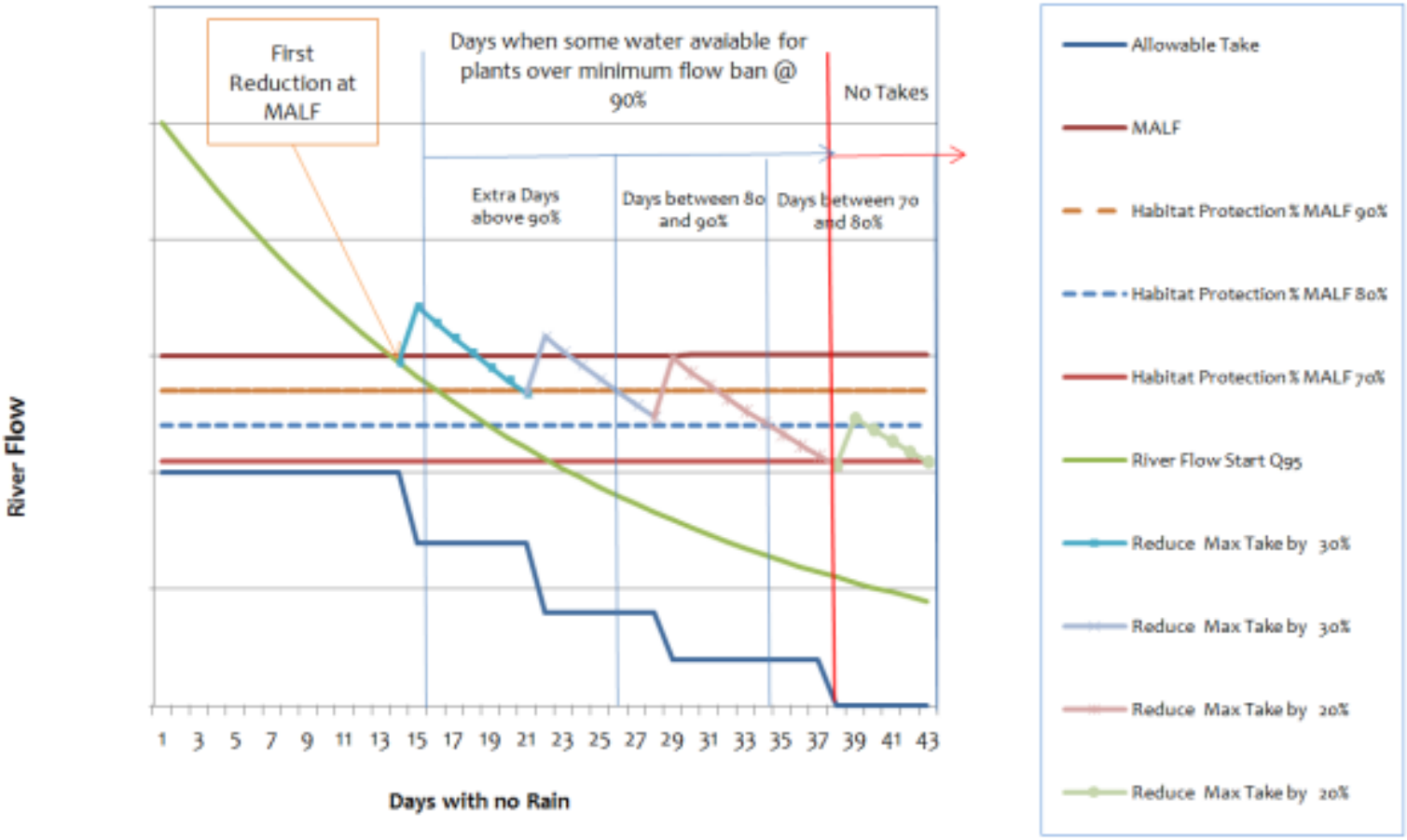


Figure 12: Theoretical staged reduction regime

Staged reductions – interim agreements

16. The TANK Group considers that HBRC should investigate the benefits of staged reductions of water abstraction in the Greater Heretaunga and Ahuriri region. For staged reductions:
    a. A global consent for a surface water zone would be preferable
    b. Incentives will be needed to participate in a staged reduction policy (e.g. lower minimum flow restrictions)
    c. Telemetry will be required for all water users participating in a staged reduction policy.

8.5. Water storage

Water storage is a Management Variable which will have an effect on a range of Values and Objectives including those associated with social, economic and recreational opportunities. Numerous Performance Measures will be used by the TANK Group for assessing the impacts of water storage including mauri, area of wetlands, certainty of water supply for water-dependent sectors, and potable water quantity.

There is general agreement that Hawke's Bay receives plenty of rainfall but there is not always water where and when people need it. Water storage increases the security of supply for abstractors so that they can continue using water when they would otherwise be on a ban, and potentially provides for the augmentation of river flows to retain or improve water quality and ecological values. Water storage is also recognised as a way in which communities can build resilience around drivers such as climate change and increase economic prosperity. Iwi would like to have their own storage for community supply as well as for habitat e.g. for tuna.

Water storage does not just mean large scale run-of river dams, although this is one approach. What is meant by water storage includes "water harvesting" and could include the following (none of which are prohibited in the current RRMP):

- Water harvested at high flows
- On farm-storage
- A number of distributed dams across a catchment that integrate storage needs
- Greater storage within soil itself such as within the humus layer
- Techniques that utilise gradient to optimise rainfall retention

The TANK Group believes that in the Greater Heretaunga and Ahuriri region, large scale storage is only likely to be needed if existing minimum flow and allocation regimes change.

Water storage – interim agreements

17. The TANK Group believes farming practices which maximise water retention in the landscape is likely to reduce irrigation demand and hence reduce the need for large scale water storage in the Greater Heretaunga and Ahuriri region.
18. To maintain current levels of food and fibre production, the TANK Group considers that water storage will be required if allocations are reduced and/or minimum flows are increased.
19. The TANK Group encourages HBRC to make allocations of high flows more easily available for on-farm and/or community storage and distribution through the consenting process.

8.6. Nutrient Management

Nutrient management is a Management Variable associated with water quality limit setting which can involve policies, rules and incentives on nutrient loss, riparian management & stock exclusion. Values and Objectives associated with nutrient management include safeguarding the life-supporting capacity and mauri of waterways, improving social freshwater opportunities and the Hawke's Bay economy. Performance Measures which will be used by the TANK Group for assessing the impacts of nutrient management policies include mauri, macroinvertebrate community index score, mahinga kai quality and availability, angler days, potable water quality and total profit in water-dependent sectors.

There are some water bodies (or parts of) in the Greater Heretaunga and Ahuriri region where nutrients are elevated and causing increased algal growth, e.g. in the middle and lower Tūtaekuri. The majority of nutrients are coming from runoff and leaching from farms and "critical source areas" are being identified. On-farm nutrient management is necessary to maintain life-supporting capacity, help avoid proliferations of algal growths (and others such as cyanobacteria) and also to avoid toxicity to aquatic species and protect drinking water supplies.

Like water use efficiency, many nutrient issues could be mitigated if good agricultural practices were adopted by all landowners. The TANK Group believes that all farmers should be adhering to their own industry IGP programme, and that evidence of this should be provided to the Regional Council.

As well as adherence to IGP, all landowners within prioritised catchments should be required to develop and implement farm management plans which include nutrient budgeting. Evidence of compliance with farm management plans should be provided to the Regional Council and disincentives placed on landowners who fail to demonstrate adherence to their farm management plans.

Nutrient management approaches being developed for the Tukituki Plan Change 6 (e.g. stock exclusion rules and identification of critical source areas for nutrients) may be able to be adapted for the Greater Heretaunga and Ahuriri region.

(NB. Macrophyte growth in lower Karamū may be enhanced by nutrients but the issues are complex and the most appropriate way to suppress growth may be through riparian shading).

Nutrient management – interim agreements

20. The TANK Group agrees that nutrient management is necessary to maintain life-supporting capacity, avoid proliferations of undesirable algal growths, avoid toxicity to aquatic species and protect drinking water supplies.
21. The TANK Group believes that all farmers should be required to provide evidence to HBRC that they are compliant with industry IGP nutrient management practices.
22. The TANK Group considers that policy and management measures should target "hot-spot" areas where the values identified by the TANK Group are being compromised or at risk of being compromised by excessive nutrients. These areas need to be identified as well as the critical source areas for nutrients.
23. The TANK Group agrees that farm environmental management plans, which may go beyond IGP, should be mandatory for all landowners in "hot-spot" areas.
24. The TANK group recommends that monitoring of ground water nutrients take into account appropriate temporal lags between nutrient management practice and measured nutrient concentrations in ground water samples.

8.7. Stock exclusion

Stock exclusion is a Management Variable which will have impacts on ecological, recreational, cultural and economic Values and Objectives. Performance Measures for assessing the impacts of stock exclusion policies include mauri, macroinvertebrate community index score, mahinga kai

quality and availability, angler days, potable water quality, total profit in water-dependent sectors and net benefit of policy measures.

The TANK Group considers that stock exclusion rules should be consistent across catchments and that many of the Plan Change 6 policies may be appropriate for the Greater Heretaunga and Ahuriri region Plan Change. However, the Greater Heretaunga and Ahuriri area is also very different to the Tukituki – the most obvious being that there is more flat land – and there may be some variation which better suits the Greater Heretaunga and Ahuriri catchments.

The main difficulty around assessing stock exclusion options for managing nutrients in the Greater Heretaunga and Ahuriri catchments is that nutrient limitation (N or P) in waterways is still to be determined and problem areas have not been identified.

It is agreed by the TANK Group that all cattle should be excluded from waterways but the challenge is around how to manage sheep. In the Greater Heretaunga and Ahuriri region there are a lot of flatland farmers (e.g. orchards & vineyards) who use livestock at discrete times of the year such as to control weeds in winter and to help reduce leaf area in summer. It is estimated that there are 500kms of drains through orchards & vineyards in the Greater Heretaunga and Ahuriri region and that fencing them all off may be impractical, expensive and may not deliver the benefits expected.

Stock exclusion – interim agreements

25. The TANK Group supports exclusion of cattle from waterways in the Greater Heretaunga and Ahuriri region.
26. In catchments where stock (other than cattle) in streams is proven to be a problem, the stock exclusion should be considered.

8.8. Stormwater management

Stormwater management is a Management Variable which will impact on a range of Values and Objectives including life-supporting capacity, mauri, wahi taonga, human and ecological health and the Hawke's Bay economy. Performance Measures which will be used by the TANK Group for assessing the impacts of stormwater management policies include macroinvertebrate assemblage incl. community index score, mahinga kai quality and availability, and net benefit of policy measures.

The TANK Group has discussed both rural and urban stormwater issues which are quite different in the Greater Heretaunga and Ahuriri area. Rural issues are primarily sediment, pathogens and nutrient related while urban issues include these as well as heavy metals, oils and illegal discharges (e.g. paint, animal waste). Flat grades of land in urban areas result in infrequent flushing flows, meaning that contaminants can persist in these systems.

Catchments with high levels of urban development, like the Ahuriri and Karamū catchments, also have high volumes of surface runoff due to large areas of impervious surfaces. Surface runoff invariably includes high levels of pollutants to receiving environments with flat grades and infrequent flushing flows, such as the Ahuriri Estuary and the Karamū Stream network which results in a gradual decline in the health of these receiving environments.

Fish passage is restricted throughout much of the stormwater network due and the TANK group believes that there are opportunities to improve these systems for fish passage.

Many of the issues associated with the stormwater networks are complex and date back many decades. Napier City Council, Hastings District Council and HBRC all manage stormwater and it will require collective action to effectively mitigate the adverse effects of stormwater discharges in the Greater Heretaunga and Ahuriri catchments. While the issues are complex, the TANK Group believes there are potentially some “easier” wins including:

- Controls on zinc roofing e.g. require all new roofing to be painted
- Bylaws on design, operation and management of industrial sites
- Education and knowledge transfer
- New developments to be required to include sustainability attributes e.g. LIUDD Low Impact Urban Design and Development

“Harder” issues identified include:

- The volume of water getting into the stormwater system
- Rural stormwater overwhelming the urban system
- Drains which have a base flow i.e. are not stormwater
- Joining up disjointed or incomplete older networks exist
- Improving fish passage

In 2009 a collaborative stormwater working group, which included representatives from HBRC, territorial authorities, HBRC’s Māori Committee, Fish and Game and the Department of Conservation drafted a Regional Stormwater Strategy. The Strategy identifies key outcomes of less flooding,

reduced contamination, improved environments and resilient communities. The Strategy was released for public consultation where it received positive support.

The Regional Stormwater Strategy has not been adopted by any of the Councils to date as it was recognised that it needed to be integrated into catchment approaches to water management.

The TANK Group considers the Regional Stormwater Strategy to be a good starting point for improved stormwater management.

Stormwater – interim agreements

27. The TANK Group recommends the re-establishment of the Regional Stormwater Working Group (with possible inclusion of some TANK members) to review and where necessary update the Regional Stormwater Strategy.
28. The relevant agencies involved in stormwater management should investigate options including:
    a. Controls on zinc roofing e.g. require all new roofing to be painted
    b. Bylaws on design, operation and management of industrial sites
    c. Education and knowledge transfer
    d. New developments to be required to include sustainability attributes e.g. Low Impact Urban Design and Development

8.9. Wetland management

Text to be completed by John Cheyne

Figure 13: The TANK Group supports the preservation of Wetlands

Wetland management – interim agreements

29. The TANK Group recognises the importance of wetlands in the Greater Heretaunga and Ahuriri region and believes that measures should be undertaken to support the preservation of remaining wetlands, consistent with other policy documents such as the Regional Policy Statement and the NPSFM.
30. The TANK Group considers that wetlands should be identified and categorised to determine ecological significance and that wetlands deemed ecologically significant should be given protection that is consistent with the NPSFM.

8.10. Estuarine management

The estuaries in the Greater Heretaunga and Ahuriri region are areas which support significant ecological, cultural and recreational values. Swimming and food gathering opportunities are compromised in the estuaries by elevated faecal indicator bacteria concentrations which may stem from a number of sources including stormwater, overland flow or accidental sewage discharges. The importance of estuarine sites in Greater Heretaunga and Ahuriri region for human activities is such that the TANK Group believes measures should be undertaken to ensure that these activities can occur during normal conditions (i.e. outside periods of high rainfall when bacteria concentrations are naturally high).

Estuarine management – interim agreements

31. The TANK Group believes that the estuaries in the Greater Heretaunga and Ahuriri region should be managed so that popular activities including swimming and food gathering are able to be safely undertaken during normal climatic conditions (i.e. outside periods of high rainfall when bacteria concentrations are naturally high). Some areas may require improvements over an extended timeframe to meet community aspirations.

9. Catchment specific topics

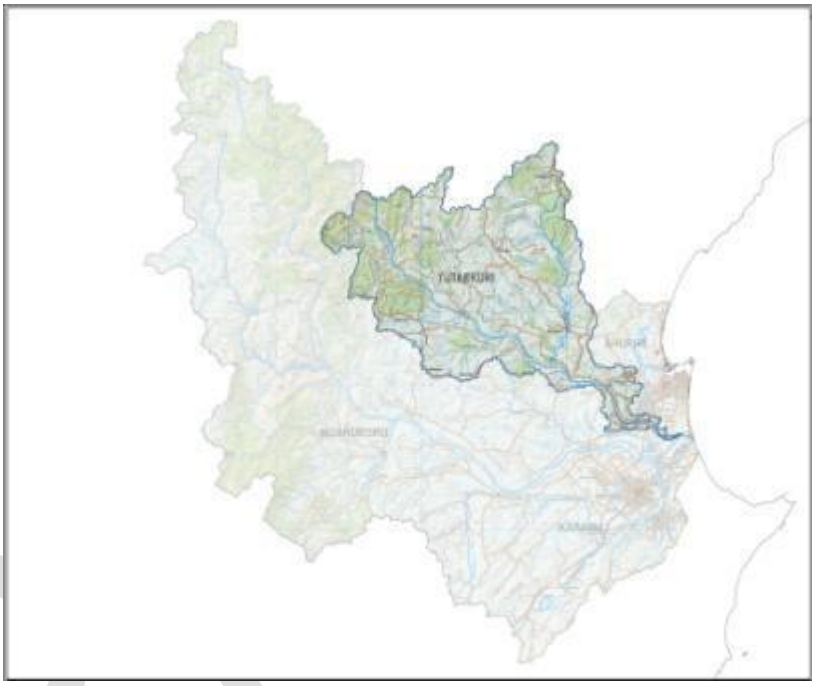
The four individual catchments have very different characteristics, which result in different pressures and responses. The TANK Group has identified important values that exist in these catchments and the issues that arise from activities that put pressure on these values. As noted above, where values are competing is where pressure on freshwater is greatest and the management response is most difficult. Values associated with consumptive water use are often in direct competition with in-stream values. The management response is further complicated by the fact that, although the values are in competition for freshwater, they also complement each other. Human health and wellbeing, for example, is supported by the economic benefits derived from industrial and commercial activities, and, without life-supporting capacity, water is not suitable for production and processing.

HBRC monitors water quality and river flow at a wide range of sites in the Greater Heretaunga and Ahuriri area and has produced comprehensive reports on the state and trends of water quality across the region. The most recent reporting phase was in 2009 as part of the 5-yearly State of Environment (SOE) monitoring. The next phase is due to be completed in June 2014. While it is likely that there will be little change in state or trends (because there has been little land use change in the last five years in the Greater Heretaunga and Ahuriri region) the TANK Group may not be able to progress discussions on water quality limits until the 2014 SOE is published. However, some high level agreements have been reached which are noted in this section.

Access to water is a critical component in unleashing the productive capacity of the versatile Heretaunga Plains soils for food and fibre production. The prosperity of the region's rural and urban populations is dependent upon the land based primary industries and some significant processing industries rely on a secure supply from primary produce and access to reliable and clean process water. In combination, the wealth created by these productive and processing industries flows on

into most other sectors of the economy. In short, the ability of the community to enjoy and appreciate the natural and physical attributes of the region, including water bodies, is dependent upon the ability to work in the region and freshwater is central to that. It is important therefore that the right balance between protection and use is found and agreed upon.

Tūtaekuri



The Tūtaekuri catchment is 83,105 hectares and includes Puketapu as well as a number of other small settlements. Waiohiki Marae is located in the lower catchment.

The Tūtaekuri River begins in native vegetation high in the Kaweka Range and then passes through commercial pine forest as a clear, fast flowing rocky river. The river has good quality habitat for most of its length with a regular occurrence of riffles, pools and bends and a predominantly cobble streambed.

Dry stock farming dominates the middle catchment although approximately 7000ha of dairy farming has been established over the 10-15 years, mostly around Patoka. Downstream of the Mangaone River confluence, the Tūtaekuri valley widens and flattens, and the river takes a more semi-braided morphology. Landuse here is predominantly vineyards and orchards, with dry stock farming in the surrounding hills as well as peri-urban/commercial development.

Māori wai relationships – to be completed

The catchment holds significant ecological value associated with the aquatic and riparian ecosystems and indigenous fauna and flora. Seven native fish species with populations which are classified as declining at a national level are found in the Tūtaekuri and it is an important catchment for lamprey and koaro.

There are a number of freshwater wetlands in the catchment which support a wide range of bird and fish species, the largest being the ecologically significant Lake Te Rotokare. The lower braided reach of the Tūtaekuri supports a high population of banded dotterels.

The catchment supports a significant brown and rainbow trout fishery with good angling opportunities in the Mangatutu and the Tūtaekuri mainstem. Trout populations are self sustaining with spawning occurring in a number of tributaries.

Other recreational activities in the catchment include tramping, swimming and kayaking. In the upper reaches, the Donald River is highly valued for whitewater kayaking while flatwater kayaking occurs in the lower catchment near Puketapu. Popular swimming locations are found near Puketapu and at Guppy Rd near Taradale where the recreational grade is recorded as fair due to occasional bacterial contamination. The lower section of the Tūtaekuri is fenced to keep cattle out and to support the high recreational value of the river.

Water quality

HBRC monitors ecological health and water quality at seven sites in the Tūtaekuri catchment, of which three are long-term data records covering 20 years of quarterly samples, and four additional sites since 2012. The four sites on the Tūtaekuri mainstem are Lawrence Hut, upstream of the Mangaone River confluence at Rissington, Puketapu and Brookfields Bridge. The three remaining sites are in the two biggest tributaries, the Mangatutu (one) and the Mangaone (two).

From 2009 SOE reporting, most parameters indicate good water quality in the Tūtaekuri catchment. The microbiological water quality is generally excellent. Water clarity outside periods of high river flow is generally excellent at the top of the catchment although declines in the lower catchment. The generally low ammonia concentrations are unlikely to cause any acute or chronic toxic effects on the aquatic biota.

The key issue for the catchment is the common occurrence of nuisance levels of periphyton (algae) in the lower Tūtaekuri River during extended periods of low river flows which occur despite the nutrient concentrations being below recommended guidelines (RRMP guideline for DRP and ANZECC guidelines for SIN). The Mangaone and Mangatutu Rivers show an increased concentration of nutrients, particularly DRP, and are likely to be contributing to the excessive periphyton growths in the Tūtaekuri mainstem. The lower Tutaekuri also exhibits reduced MCI scores and HBRC is investigating the likely cause of this decline and the sources of nutrients.

The 2009 SOE report showed no clear indication towards a single nutrient limiting periphyton growth in the Tūtaekuri catchment, indicating that the limitation status can potentially switch often and at different flow conditions during the course of a year. There is only a weak link between river flows and a trend towards P- or N-limitation. Therefore a single nutrient management option was not recommended for managing periphyton growth in the Tūtaekuri catchment.

It is anticipated that 2014 SOE reporting will identify the sources of nutrients, and clarify the nutrient limitation status of the river during periods of active algal growth.

Water quantity

HBRC monitors water flow in the Tūtaekuri catchment at three sites: Lawrence Hut, Brookfields Bridge and the Mangaone River at Rissington. Most surface water takes are linked to the 2800 l/s minimum flow Ngaroto Rd. This minimum flow provides greater than 90% habitat retention for longfin eel, rainbow trout and torrentfish.

Security of water supply is excellent with the approximately 100 consent holders in the catchment never having been subject to low flow restrictions. There may be scope for granting additional water permits but this will need to take into account other potential changes to the flow regime (e.g. groundwater / surface water connectivity).

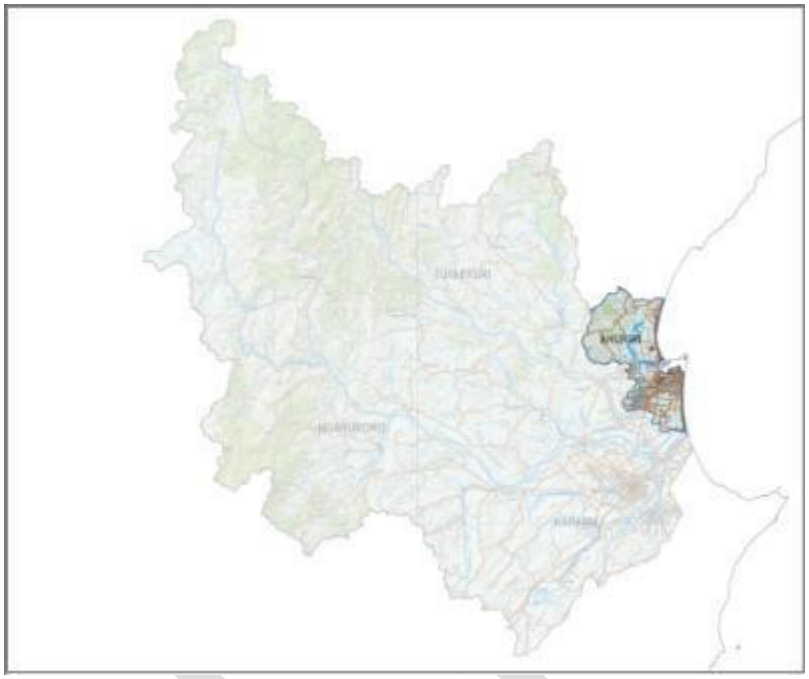
Tūtaekuri – interim agreements

32. The TANK Group is concerned about the excessive periphyton growth in the lower Tūtaekuri and requests that HBRC investigate and report back to the Group on causes of these growths and possible measures to reduce them.
33. The TANK group will consider whether to recommend confirming or amending the existing minimum flow and allocation.

Ahuriri

The Ahuriri catchment is 14,564 hectares and includes Napier and surrounding suburbs north to Bay View and south to Awatoto. Wharerangi and Te Maara Marae are in the catchment. The catchment includes a number of urban and peri-urban streams as well as the Ahuriri Estuary.

Māori wai relationships – to be completed



Because of the nature of the Ahuriri catchment, the most significant freshwater management issues are urban-based. The Napier City stormwater network which protects the urban and industrial areas from flooding generally flows into the Ahuriri Estuary, a site of ecological, cultural and recreational significance. Despite extensive modification, reclamation, drainage, and discharges from the stormwater network, the estuary is recognised as a regionally and nationally significant area with high wildlife and fisheries values. In the Regional Coastal Environment Plan, the Ahuriri Estuary is classified a Significant Conservation Area which affords the estuary particular protection mechanisms.

As one of the few sheltered, tidal lagoon estuaries within Hawke's Bay, Pandora Pond provides for a number of recreational opportunities including swimming, kayaking, sailing, and waka ama. On an exposed coastline such as Hawke's Bay, this is an important area for contact recreation and is one of the highest profile uses of the estuary, along with bird watching.

Water quality

HBRC monitors at two long-term sites in the Ahuriri catchment for the SOE programme: the Taipo Stream at Church Rd and the Awatoto Drain.

A comprehensive water quality and ecology study was carried out in 2008/09 which looked at 13 sites in 7 streams. This study found that most parameters indicate poor water quality in the Ahuriri catchment. The urban streams in this catchment are significantly more polluted and macroinvertebrate communities in significantly poorer health than the rural streams. Some of the industrial streams show regular exceedances of environmental guidelines for zinc. During summer, water temperatures in the urban streams regularly exceed 25 C which can potentially lead to fish kills in the streams if occurring for extended periods.

Most Ahuriri streams have elevated nutrient and suspended solid concentrations, with dissolved phosphorus concentrations being particularly high – always well above ANZECC and RRMP

guidelines. Some of the urban streams such as Saltwater Creek, Purimu Stream and Cross Country Drain have particularly high phosphorus concentrations while Georges Drive Drain and Saltwater Creek have elevated ammoniacal nitrogen and suspended solid concentrations. E. coli concentrations in the Napier catchment streams are highly variable with very high concentrations reached in some streams.

Extensive monitoring is undertaken by HBRC in the Ahuriri Estuary as part of its SOE monitoring. The estuary is currently classified as being in 'fair' condition for contact recreation. However, elevated bacterial concentrations occur at times, especially after heavy rain, which can increase the risk of illness for recreational users.

Clarity is good in Pandora Pond and nuisance algal growths are rare. Concentrations of contaminants in estuary sediments are mostly at levels below guidelines, however sites adjacent to stormwater discharges have shown levels that can exceed environmental guidelines, and where adverse biological effects can be expected to occur occasionally.

Current information suggests that shellfish gathered from the estuary may be unsuitable for human consumption because of elevated faecal indicator bacteria concentrations which may stem from stormwater, overland flow or accidental sewage discharges. The inflow of stormwater derived from urban drains and the proximity of shellfish beds to these inflows indicate that the estuary should not be regarded as a safe shellfish resource. Faecal source tracking will help identify the sources of faecal contamination and assist with targeting appropriate management strategies.

Toxic metal contamination of shellfish and fish species is currently not at levels expected to pose immediate health risks although the indirect effects of contaminants on the abundance and distribution of edible resources is an area identified for further investigation.

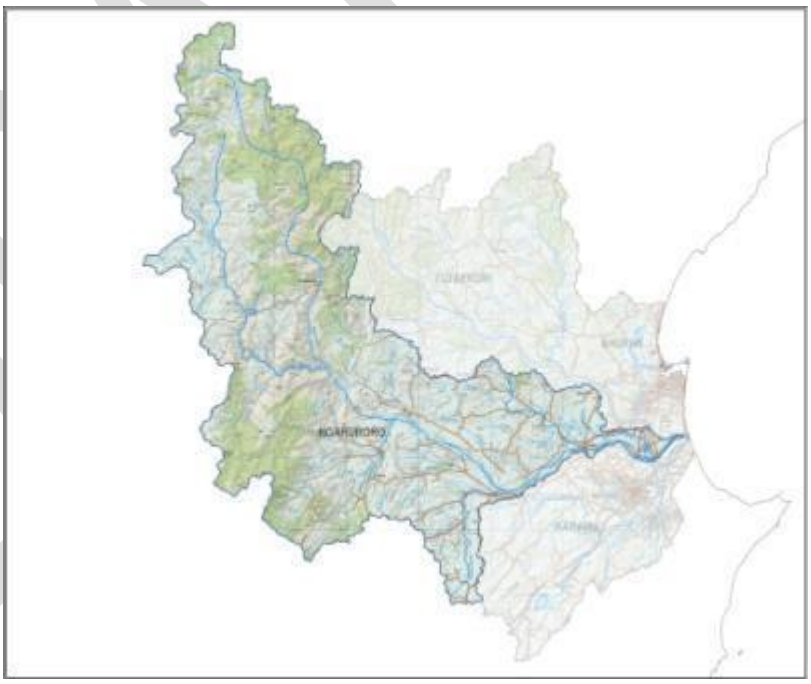
Water quantity

The major issue from a water quantity perspective in the Ahuriri catchment is the large volumes of stormwater as noted in section 7.8. There is only a very moderate amount of freshwater abstraction for irrigation and there are no minimum flow limits for review. The groundwater allocation limit which will be set for the Heretaunga aquifer may impact on the few groundwater abstractors in the catchment. From a freshwater management regime perspective there a no major issues which require addressing in the Plan Change.

Ahuriri – interim agreements

34. The TANK Group considers the Ahuriri Estuary to be a site of ecological, cultural and recreational significance and recommends that all reasonable measures are undertaken to support these uses and values including restoring suitability for food gathering.
35. The TANK Group is concerned about sediment, nutrient, bacteria and contaminant inputs to the Ahuriri Estuary and requests that HBRC investigate and report back to the Group on sources of these and possible measures to reduce them.
36. The TANK Group is concerned about poor water quality in the urban streams and requests that HBRC investigate and report back to the Group on causes of the poor water quality and possible measures to improve it.

Ngaruroro



The Ngaruroro catchment is 201,246 hectares and includes Maraekakaho, Fernhill, Omahu and Pakowhai as well other small settlements. There are three marae in the catchment: Omahu, Runanga and Te Awhina.

Beginning high in the Ruahine Range, the Ngaruroro River is a fast flowing rocky river through predominantly native vegetation with some pasture down to Whanawhana. Below Whanawhana down to Maraekakaho, the river is semi-braided, flowing in a relatively wide and flat channel bordered by steep hill country and high river terraces. The land use in this part of the catchment is predominantly dry stock farming with land use changes occurring in the last 15 years. There are two large intensive dairy operations, one on either side of the Ngaruroro River downstream of

Whanawhana. Specific monitoring of the River upstream and downstream of one of these farms (Hawke's Bay Dairies) has been undertaken since 2000.

Downstream of Maraekakaho, the river runs through plains and low rolling hill country and land use becomes more varied including viticulture and cropping. The river channel is wide and flat, with a low gradient leading to a semi-braided morphology, constrained on each side by stopbanks. The area is a zone of groundwater recharge losing approximately 5m3/s, or 20% of its median flow, to groundwater between Ohiti and Fernhill. The Ngaruroro River then flows eastwards to an estuary shared with the Tūtaekuri River. It flows into the Pacific Ocean on the East Coast of Hawke's Bay, South of Napier.

Like the awa, tangata whenua descend from the Ruahine, Kaweka, Kaimanawa ranges. The connection for tangata whenua with the awa is longstanding, as evidenced by the marae located beside the awa – Runanga, Te Awhina, Omahu, Kohupatiki. There are two recognised names for the awa. One is Ngaruroro moko tuararo ki rangatira, given by Ruawharo, one of the tohunga or priests aboard the Takitimu waka when it arrived in Hawke's Bay hundreds of years ago. The other is Ngā ngaru ō ngā upukuroro meaning "the shoaling waves of the grayling", given by the tohunga, Tamatea. Tangata whenua are acutely aware that this name refers to a fish which is now extinct and, as tangata kaitiaki, they seek to ensure no further loss of taonga species.

The Ngaruroro catchment supports a significant brown and rainbow trout fishery. The angling activity is spread throughout the catchment, with the Ngaruroro mainstem above the Taruarau confluence and the Taruarau itself the most sought after fishery. The trout populations in the catchment are self sustaining, with trout spawning occurring in the mainstem and a number of tributaries.

Recreational activities occur in many parts the catchment. The Ngaruroro down to Whanawhana is highly prized for whitewater kayaking particularly around Kuripapango and flat-water kayaking occurs throughout the river down to the coast. Jet-boating is popular from Maraekakaho to Whanawhana. Popular swimming locations are found at Kuripapango, and at Chesterhope and Fernhill Bridges where the recreational grade is recorded as fair.

The catchment also holds significant ecological value associated with the aquatic and riparian ecosystems and indigenous fauna and flora. Significant wetlands include Lakes Runanga, Oingo, Hurimoana, Kautuku and Potaka along with Pig Sty Swamp and Waitangi wetland. These support a large range of fish and bird species some of which are threatened. Nineteen native fish species (eight with populations which are classified as declining at a national level) can be found in the catchment

and it is a stronghold for longfin eel, banded kokupu, lamprey, koaro, dwarf galaxiid and inanga in the Waitangi Estuary. The upper reaches are a stronghold for whio (blue duck) and the lower braided reaches support a very high population of banded dotterels.

Figure 14: Marei Apatu describes mana whenua connections with the Ngaruroro River.

Water quality

HBRC monitors ecological health, water quality and flow at eleven sites across the Ngaruroro catchment. Seven of these sites are on the Ngaruroro River main stem, and two on the Waitio and Tūtaekuri-Waimate tributaries. NIWA also monitors water quality and flow at two sites.

From 2009 SOE reporting, most parameters indicate very good water quality in the Ngaruroro catchment – better than national guidelines. Nutrient concentrations are very low in the Ngaruroro at Whanawhana and in the Taruarau at Taihape Road, increase travelling downstream, but always remain below guideline levels in the mainstem. Ammonia concentrations are unlikely to cause any acute or chronic toxic effects on the aquatic biota. Some periphyton growth occurs at low flows, especially in the middle and lower reaches during summer.

There are “hot spots” of excess nutrients in tributaries of the Ngaruroro: the Tūtaekuri-Waimate and Waitio tributaries have elevated DIN concentrations and DRP is usually above guideline limits. Data for other tributaries is being collected for reporting in June 2014, but there is already an indication

that nutrient concentrations in Maraekakaho are in the range of the Waitio and Tūtaekuri-Waimate, and the Poporangi has the highest nutrient concentrations of the assessed tributaries, with DRP being generally well above guideline limits.

There is no clear indication of one nutrient limiting periphyton growth in the Ngaruroro River meaning that controlling the inputs of both nutrients is important. Improved riparian management on these tributaries may assist.

Water clarity is excellent in the upper reaches but begins to decline fairly high up in the catchment suggesting that erosion from pastoral and commercial forestry land above Whanawhana is a contributing factor. Below Whanawhana the decline in water clarity is gradual, and the cause cannot be narrowed down to a single factor.

Monitoring around Hawke's Bay Dairies suggest the farm is contributing to the cumulative effects on water clarity and nutrient enrichment. However the direct effects on the river's aquatic life remain uncertain and further monitoring and analysis is required.

Because of the variation between reaches of the catchment, including natural features and resource pressures, the TANK group consider that water quality in the Ngaruroro should be addressed by looking at the upper, middle and lower reaches and Waitangi estuary separately.

Water quantity

HBRC monitors water flow in the Ngaruroro catchment at three sites on the Ngaruroro mainstem: Kuripapango, Fernhill and Whanawhana. Most surface water takes are linked to the 2400 l/s minimum flow at Fernhill. This minimum flow provides approximately 85% habitat retention for longfin eel, 60% for rainbow trout and 50% for torrentfish.

There are approximately 250 water take consents in the Ngaruroro catchment, over two thirds being from groundwater. Most of these consents expire in 2026. Security of water supply in the Ngaruroro catchment varies depending on crop, location, type of water take (surface water, groundwater) and consent details (allocation, minimum flow restriction).

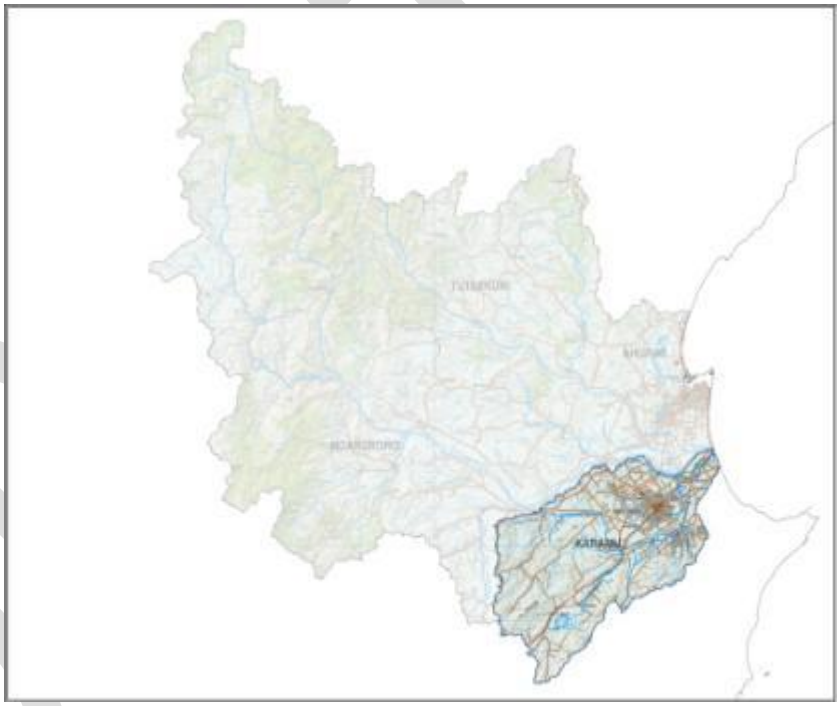
Ngaruroro – interim agreements

37. The TANK Group considers that management of the Ngaruroro catchment may be able to be based around four zones: upstream of Whanawhana; Whanawhana to Fernhill; Fernhill to the coast; and the Waitangi estuary.
38. Further monitoring and investigations are recommended to better identify the sources of water clarity degradation and nutrients in the Ngaruroro catchment.

39. Improved understanding of groundwater and surface water linkages and stream depletion effects is needed before adjustments to the existing flow regime can be agreed.
40. The main minimum flow on the Ngaruroro River (2400 l/s at Fernhill) should be reviewed and assessed for how well it is providing for in-stream values including ecological, recreational and cultural values.
41. Any changes to minimum flow and groundwater / surface water linkage rules need to consider impacts, especially security of supply and economic impacts, on water abstractors including irrigators and processors.

Karamū

The Karamū catchment is 51,462 hectares extending south from Awatoto to Havelock North and west to the Raukawa Range. The Karamū Stream and its tributaries drain the Poukawa Basin, the Kohinurakau, Kaokaoroa and Raukawa Ranges and a large part of the Heretaunga Plains.



The catchment covers the majority of the Heretaunga Plains which has been developed extensively for agriculture and comprises some of the most productive cropping areas in New Zealand. The Karamū catchment is the predominant region in Hawke's Bay for orcharding, cropping, and viticulture while the southwestern half of the catchment primarily supports dryland sheep and beef with the exception of the Poukawa Basin, which is a significant cropping area.

Figure 15: Aki Paipper discussing improvement measures being undertaken at Kohupatiki

Waterways in the Karamū catchment have been extensively modified for flood protection purposes. The current Karamu Stream was once a former course of the Ngaruroro River, until 1867 when a large flood changed the course of the river. Flooding of the productive, southern area of the Heretaunga Plains has been an issue since the time of settlement, and in 1969, as part of the Heretaunga Plains Flood Protection scheme, the Ngaruroro River was diverted to the north, leaving the Karamu and Raupare streams to feed the lower Karamu Stream or, as it also known, the Clive River.

Prior to the 1969 diversion, the Ngaruroro was very much part of daily life for mana whenua and was a major mahinga kai for fish, waterfowl and plants. Kohupatiki Marae, one of the Ngāti Hori marae, is situated on the true left bank of the lower Karamu Stream / former Ngaruroro and Ngāti Hori ki Kohupatiki's knowledge of the awa and the species it supports comes from an unbroken and ongoing relationship lasting hundreds of years. Today, the area is highly modified and indigenous biodiversity is scarce. Taonga species such as patiki and matamata, which once thrived in the area, have been mostly lost. Ngāti Hori is concerned about the continued deterioration of the Karamu River and decline in their customary fisheries, especially the patiki which are fundamental to the identity of Kohupatiki as a marae. There are, however, areas of riparian vegetation in the upper reaches of this sub catchment which provide increased habitat quality for aquatic communities. Longfin and

shortfin eels, as well as the non migratory Crans bully and upland bully have been collected in fish surveys.

There are a number of freshwater wetlands in the catchment which are ecologically significant, the largest being Lake Poukawa and Pekapeka Swamp. They support a significant number of bird species, some of which are threatened.

Water quality

HBRC monitors water quality at eight long-term SOE sites across the Karamū catchment in the Poukawa, Karewarea, Mangarau (2 sites), Herehere, Ruahapia, Awanui Streams and the Clive River. An additional short-term concurrent gauging programme with water quality samples was carried out at 14 sites in 2010.

Lowland streams with close connection to the sea are an important habitat for many native fish species, yet poor water quality and loss of habitat can greatly reduce this value. Water quality and ecology in the Karamū Stream system is relatively degraded compared to other catchments in the region. Water quality in the Karamū catchment is generally poor with a high level of total nitrogen (TN), nitrate-nitrogen (NO3) and particularly high levels of total phosphorus (TP), and soluble reactive phosphorus (SRP).

Dissolved oxygen measurements show large variations, with many concentrations being below recommended guidelines for lowland rivers. Between February and April 2013 extremely low dissolved oxygen levels were recorded – even to complete oxygen depletion in some streams. Over this period, temperatures stayed fairly low in some streams, but in others temperatures rose to 26°C. Extreme variability in temperature and oxygen as well as extremely low oxygen values are a significant threat to aquatic life. The cause of these extreme conditions has to be analysed, as several factors like macrophyte proliferation, groundwater influx, organic load/metabolism, flow conditions or direct sunlight are influencing temperature and oxygen conditions.

The Karamū system has a very poor macroinvertebrate community, indicating a low life supporting capacity but the main drivers for this have yet to be determined. Stream Ecological Valuation studies carried out in 2010 and 2011 suggested that enhancement of riparian vegetation was a management option that biotic values would most benefit from.

Some streams in the Karamū catchment show high levels of E.coli concentrations which is likely to be contributing to very poor recreational water quality recorded in the Clive River at the Boat Ramp.

Clarity is low but the Karamū streams show acceptable compliance with guidelines and the sites generally comply with guidelines for suspended solid concentration except in a few reaches.

It has to be determined what the main drivers are for these conditions, in order to be able to suggest management options. As the Karamū catchment mainly consists of lowland type streams, with many of them being groundwater fed, characteristics are naturally different from most of the Tūtaekuri and Ngaruroro catchments. For example, macrophyte proliferation, which can cause oxygen deficiency at night, occurs typically in slow flowing, lowland streams with infrequent flushing flows like the Karamū and requires different management than periphyton cover. The control of dissolved nutrient concentration is not considered to be appropriate for the management of macrophytes in streams with low levels of physical disturbance whereas macrophytes are highly dependent on light availability, stream bed substrate and flow velocity. This could lead to other management options like riparian management to shade out the plants, which would also help to enhance life supporting capacity by improving stream habitat.

Water quantity

HBRC monitors water flow in the Karamū catchment at a range of sites. Like other catchments, security of water supply varies depending on a range of factors including location, type of water take (surface water, groundwater) and consent details (allocation, minimum flow restriction). By far the majority of the 1200 water takes in the catchment are from groundwater and not subject to minimum flow restrictions (Figure 16). The green line in the chart is consented groundwater permits and the red line is surface water.

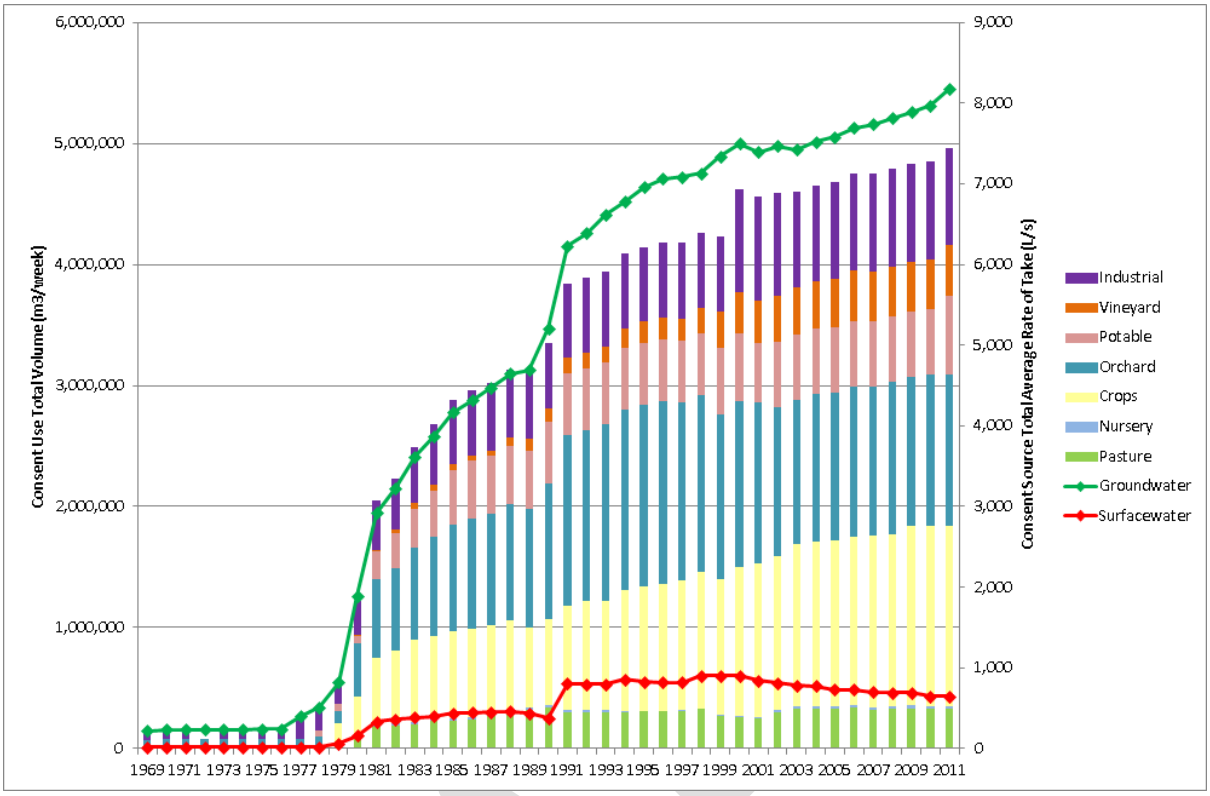


Figure 16: Consented water takes in the Karamu catchment

Improved understanding of the connection of groundwater with surface flows has seen some groundwater takes linked to Ngaruroro River minimum flow restrictions where formerly they were not. This has reduced security of supply for some consent holders particularly those in the unconfined and semi-confined aquifer zones in the Twyford region. Other groundwater takes are due to be assessed for surface water connection over the next two years.

Water takes linked to minimum flows on some of the smaller tributaries like the Karewarewa Stream regularly experience water restrictions while larger tributaries like the Raupare provide a more secure supply.

As with the other catchments, minimum flow sites and limits in the Karamū catchment are under review and the connectivity of groundwater with surface waterways is being investigated. Approximately 200 consents to abstract groundwater in the unconfined aquifer zone are due to expire in 2019 (the remainder by 2025) and it is anticipated that the groundwater model being developed in conjunction with industry and technical experts will help to inform Plan Change decisions.

Karamū – interim agreements

42. The TANK Group is concerned about poor water quality, sediment, excessive macrophytes and lack of riparian vegetation in the Karamū system and its effects on cultural, ecological and recreational values including food gathering. The Group requests that HBRC investigate and report back to the Group on causes of the poor water quality and possible measures to improved it
43. Improved understanding of groundwater and surface water linkages and stream depletion effects is needed before adjustments to the existing flow regime can be agreed.
44. Any changes to minimum flow and groundwater / surface water linkage rules need to consider impacts, especially security of supply and economic impacts, on water abstractors including irrigators and processors.

APPENDICES

1. Management Variables

The full list of Management Variables identified by the TANK Group is in the following table. These have been grouped into three sets: those that will likely need to be included to meet both HBRC's and stakeholders objectives from the TANK process (green); those that could be done by HBRC if needed to meet the objectives (orange); and those that other parties could offer as part of a package to achieve those objectives (blue).

Measures likely to be needed in the TANK process	Flow regime
	Water allocation (including for municipal and domestic supply)
	Security of water supply setting
	Policies, rules on groundwater /surface water connectivity
	Surface water and groundwater quality limits
	Tangata whenua involvement in freshwater decision making
	Use of Matauranga Maori in monitoring and reporting
	Wahi tapu register
	Policies, rules and incentives on riparian management & stock exclusion
	Policies, rules and incentives on water storage
	Policies, rules and incentives on water efficiency
	Policies, rules and incentives for water sharing/transfer
	Policies, rules and incentives on nutrient loss/allocation
	Policies, rules and incentives on good irrigation practices
	Policies, rules and incentives on stormwater management
	Policies, rules and incentives on other agricultural practices
Measures that could be included in the TANK process	Rules to protect wetlands
	Terrestrial predator control policy
	Incentives/funding by HBRC
	Education/technical assistance by HBRC
	Fish barrier removal
	Rules on good forestry practices
	Gravel extraction/raking for flood protection
	Stopbank management
	HBRC river access policy (with DoC)
	Weed management practices
	Hazard identification and risk management in built environment
	Rules on discharge of organic/animal waste
	Rules on toxic discharges
	Rules on cumulative effects of septic tanks
	HBRC policies on audited self-management
	Auditing of farms for compliance/mgmt practice
	Appropriate land use for type of land
	HBRC decrease compliance costs

	Help tangata whenua involved in freshwater governance
	Communicate opportunities to participate in freshwater governance
	Increase HBRC knowledge of Mauri of freshwater and coastal resources
	Help tangata whenua increase capacity to fulfil kaitiaki roles
	HBRC liaise with mana whenua, e.g. On consent applications
Things that other parties could do	Industry initiatives
	Maintain stormwater retention ponds
	Create freshwater reserves
	Community initiatives for education
	Stormwater rubbish control
	Finance and promote reticulated community water schemes
	Promote rainwater collection systems on individual properties
	Territorial authority initiatives for education
	Install household water meters
	Territorial authority policies on water efficiency
	Industry audited self-management
	Reuse of grey water

2. Glossary

Aquifer: An underground deposit of water-bearing sand, gravel or rock capable of yielding supplies of water.

Catchment: The total area draining into a river, reservoir or other body of water.

Community water storage: storage and distribution networks designed to supply water for more than one person ranging from small on-farm storage to large scale community-wide storage.

Ecosystem: A system formed by all plants, animals, and micro-organisms in a particular area interacting with the non-living physical environment as a functional unit.

Farm: In this report includes any land based activity for the production of food and fibre such as forestry, orchards, vineyards, cropping etc.

Farm management plan: A plan to integrate the farm business within the physical capability of the farms land and water resources. May include separate policies on the management of irrigation, effluent, fertiliser, riparian and soils.

Industry Good Practice (IGP): a quality assurance programme that provides a traceable, accountable system from crop to customer.

Kaitiakitanga: guardianship or caretaker role (in particular, of natural resources).

Mahinga kai: food gathering places, cultivated gardens.

Mana: prestige, authority, status, spiritual power (e.g. of water)

Mana whenua: those who descend through a hapū or ancestor who hold the tikanga or customary rights over a specific area.

Mātauranga Māori: Māori knowledge originating from Māori practices, observations, science, ancestors, including the Māori worldview.

Mauri: dynamic inner power and energy from the realm of the creator that emanates outwards from within provided it is accompanied by rightful action. Mauri comes from a natural balance, from the spiritual realm before it enters the natural world and thus only people can harm mauri (e.g. through unsustainable practices).

MCI – Macro Invertebrate Community Index: An index of the proportion of sensitive to tolerant species (in relation to the quality of a water body), among the community of benthic invertebrates that can be seen with the naked eye.

Minimum flow: Limits the amount of abstraction during low river flows. A minimum flow determines when consent holders have to reduce, and ultimately stop, abstracting.

Nutrient Limitation: The capacity of nitrogen and/or phosphorus to limit plant or algae growth.

Periphyton: A group of organisms in aquatic environments adapted to living on inert stable surfaces such as rocks, cobbles and logs. Organisms include fungi, bacteria, protozoa and algae.

Primary contact recreation: activities in which the user comes into frequent direct contact with water, such as swimming and waterskiing.

Secondary contact recreation: activities that generally have less-frequent body contact with the water, such as boating and fishing

Stock Exclusion: Any method or activity that prevents farmed animals from having direct access to a stream or its margins.

Stygofauna: fauna that live in groundwater systems or aquifers.

Tangata kaitiaki: those who undertake a guardianship or caretaker role (in particular, of natural resources).

Tangata whenua: in relation to a particular area, means the iwi or hapū that holds manu whenua over that area.

Taonga: treasure, anything highly prized.

Tikanga: customary right, rule, plan, method.

Wāhi tapu: Sacred site, as defined locally by the hapū who are the tangata kaitiaki for the wāhi tapu.

Water allocation limits: The amount of water available to be extracted from a water source for use (e.g. for public supply, irrigation etc). The total allocation is limited to protect in-stream values and provide security of supply to water users.

Water Quality: The chemical and physical attributes of water such as turbidity, phosphorus and nitrogen concentration, temperature, dissolved oxygen and major ion concentrations.

Water Quality Limit: A limit identified for a particular water quality variable or attribute to meet a specific management objective.

Wetland: Permanently or intermittently wet land, shallow water and land-water margins. Wetlands may be fresh, brackish or saline and are characterised in their natural state by plants and or animals that are adapted to living in wet conditions. Wetland functions include nutrient filtering, sediment trapping, preventing flooding, carbon sequestration, habitats, recreation, education, cultural value.

Whakapapa: genealogy.

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