From:	Jim Cotman
To:	Healthy Rivers
Subject:	Further Submission TO WRC Healthy Rivers Plan Change
Date:	Saturday, 5 May 2018 10:28:14 AM
Attachments:	Further Submission to Waikato Regional Council Variation 1 Proposed Plan Change.docx CMP Leadership Group.pptx Terms of Reference for Lake Waikare Whangamarino Catchment leadership partners group - Final.docx.pdf FINAL_Koi_Carp.pdf Final Lake Waikare Whangamarino Catchment Plan Primary Stakeholders Catchment report (1).pdf

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Chief Executive

Waikato Regional Council
401 Grey Street
Hamilton East

Please find my further submission to Healthy Rivers Variation 1 Plan Change.
Please ensure this is read in cconjunction with and in addition to my earlier submission.

Regards

Jim Cotman

078267898

SUBMISSION FORM

VARIATION 1 TO PROPOSED WAIKATO REGIONAL PLAN CHANGE 1 WAIKATO AND WAIPĀ RIVER CATCHMENTS

Waikato Regional Council
Te Kaunihera ā Rohe o Waikato

IMPORTANT NOTE

Save this PDF to your computer before answering. If you edit the original form from this webpage, your changes will not save. Please check or update your software to allow for editing. We recommend Acrobat Reader.

We need to receive your submission by 5pm, 23 May, 2018

YOUR NAME, ADDRESS FOR SERVICE AND CONTACT DETAILS (MANDATORY INFORMATION)

Name of Submitter (individual/organisation)	Jim Cotman	
Contact Person (if applicable)	Jim Cotman	
Agent (if applicable)		
Email address for service	cotmanj@xtra.co.nz	
Postal address	104 Settlers Road RD 1 Te Kauwhata	
Phone number/s	Home: 078267898	Business:
	Mobile:	Fax: 078267898

PLEASE INDICATE WHETHER YOU WISH TO SPEAK AT A HEARING

- (●) Yes, I wish to speak at the hearing in support of my submission.
- ( ) No, I do not wish to speak at the hearing in support of my submission.

JOINT SUBMISSION

- [ ] If others make a similar submission, please tick this box if you would consider presenting a joint case with them at the hearing.

TRADE COMPETITION AND ADVERSE EFFECTS (SELECT APPROPRIATE)

○ I could / ◉ could not gain an advantage in trade competition through this submission. *Refer to last page for further information*

◉ I am / ○ am not directly affected by an effect of the subject matter of the submission that:

a. adversely effects the environment, and

b. does not relate to the trade competition or the effects of trade competition.

IF YOU HAVE USED EXTRA SHEETS FOR THIS SUBMISSION PLEASE ATTACH THEM TO THIS FORM AND INDICATE BELOW

◉ Yes, I have attached 8 extra sheets. ○ No , I have not attached extra sheets.

SIGNATURE - *NOTE A SIGNATURE IS NOT REQUIRED IF YOU MAKE YOUR SUBMISSION BY ELECTRONIC MEANS*

Signed J H Cotman Date 4th May 2018

Type name if submitting electronically

SUBMISSIONS CAN BE

Chief Executive, 401 Grey Street, Private Bag 3038, Waikato Mail Centre, Hamilton 3240

Waikato Regional Council, 401 Grey Street, Hamilton East, Hamilton

(07) 859 0998

healthyrivers@waikatoregion.govt.nz *Please note: Submissions received by email must contain full contact details.*

PLEASE CHECK that you have provided all of the information requested and if you are having trouble filling out this form, phone Waikato Regional Council on 0800 800 401 for help.

Personal information is used for administration and will be made public. All information collected will be held by Waikato Regional Council, with submitters having the right to access and correct personal information.

FORM 5 Clause 6 of First Schedule, Resource Management Act 1991

Further Submission to Waikato Regional Council Variation 1 Proposed Plan Change

Submitted by:

J H. Cotman

Address for Service:
104 Settlers Road
RD1
Te Kauwhata

Ph 078267898

Email: cotmanj@xtra.co.nz

Thank you for the further opportunity to submit on the Proposed Variation 1 Plan Change for the Waikato Region.

This submission is in support of and in addition to my earlier submission to PC1.

Please note: I wish to be heard.

Further Submission to Proposed Variation 1 Regional Plan

In support and in addition to my earlier submission:

I note in the Proposed Variation 1 Plan Change, the high level of interest in the health and wellbeing of the Lake Waikare /Whangamarino Catchment by Hauraki Iwi, in particular the strong support for a Catchment Management Planning approach as one of the important mechanisms to improve the environmental outcomes we all seek.

As noted in my earlier Submission I strongly urge that a coordinated approach to develop a non-regulatory Catchment Management Plan is the most effective and efficient process for achieving water quality improvement.

The Primary Stakeholders Catchment Trust (PSCT) noted in my earlier submission, has continued to 'put our money where our mouth is', in progressing a coordinated inclusive CMP for the priority Lake Waikare/Whangamarino Catchment. Yes it can be done!

We have achieved:

- The formation of a Leadership Group, (PSCT, Iwi, DOC, F & G supported by WRC) to provide the Governorship for the development of the Plan including key objectives, prioritized issues and implementation strategies.

- While progress has not been all plain sailing the success of the CMP approach is seen in the success by the key stakeholders reaching a good understanding of each of our core set of values, of being comfortable asking the hard questions and being prepared to listen to good debate to ensure we achieve the desired result of improving water quality.

Progress includes:

- The development of a set of agreed Statements & Objectives that set the direction for the prioritization of actions toward achieving water quality improvements.

- Consideration of large or small scale mitigation options that better meet the 'Objectives'.

- A rigorous process developed to ensure actions recommended are appropriate, are science credible and undergo a cost/benefit analysis against other options.

- The actions are in reality a suite of Best Practical Options (BPO)

(BPO definition: *Good management practices (meeting the RMA definition of best practicable option) that can be periodically redefined and adopted as measurable activity standards. to improve or maintain overall water quality at a catchment or sub-catchment level. GMPs will differ depending on the catchment profile or the nutrient management issue.)*

The Lake Waikare/Whangamarino Catchment Management Plan in Action (example of success)

One of the strengths of the CMP approach that we have instigated is demonstrated by the recent Priority Action unanimously agreed by the Leadership Group to ELIMINATE KOI CARP & CATFISH from our waterways.

This is a significant action that has only become feasible through the CMP process (Leadership Group) deliberations and agreement. Previously small scale interventions were carried out by different groups without strong leadership, unanimous agreement and the development of a long term Strategic Plan.

This project has been tested 'for fit' through the Lake Waikare/Whangamarino CMP Strategic Plan and Core set of Objectives and meets the criteria for priority action. In reality this is the **Best Practical Option** to deal with Sediments & Nutrient enrichment.

I attach a review document PSCT had prepared (With WRC support) that summarized the mountain of existing Catchment information on water quality. This document is a working example of a' Forensic Analysis' approach to Catchment planning.

This is a key component that leads the identification of catchment specific water quality issues. This approach fits our model of ensuring that 'fit for purpose' interventions are promoted and actioned catchment by catchment. Many landowners believe that this will lead to faster more robust solutions.

Note too that this Analysis clearly dismisses Nitrogen as the most important issue to deal with and leads to the recognition of sediment and by default phosphorous should be our immediate focus.

The Catchment review document provides invaluable guidance on the most significant water quality issue we face in the Lower Waikato Catchments

Yet Variation 1 Plan Change has not recognized nor promoted Eradication of Koi as the priority activity that their own water quality information suggests it should be.

I note though that the recently released WRA Restoration Strategy does refer to the need to deal with Koi Carp and as noted in my earlier submission Iwi recognize the adverse effects these predators cause.

I note too the Hauraki Iwi support in Variation 1 Plan Change for dealing with Koi Carp.

I note too the overwhelming support from landowners within our catchment (who have credible information on the adverse effects) to eradicate these noxious pests.

The 'Leadership Group' for the development of Lake Waikare /Whangamarino Catchment Management Plan are frustrated at the inaction.

Thus a proposal led by PSCT has unanimous support to take effective action.

The Plan is underway to set up a 'Centre of Excellence to Eradicate Koi Carp & Catfish'. This would be led by local Iwi who have a strong stake in eradicating these pests in order to improve the ability to harvest kai improve water quality and will be strongly supported by Landowners.

While WRC's own evidence supports Koi Carp as the prime cause of sediment load in Lake Waikare & the Whangamarino Wetland and thus surely deserving of significant action, it appears that WRC prefer to manage complex natural systems using multiple layers of disconnected regulation. This approach is a significant disincentive in terms of motivation for a property owner to invest in an effort to address environmental effects such as sediment loads when clearly landowners see the cause as unrelated to the action demanded by the regulator.

This is regardless of the inefficiency from a regional economic point of view to 'invest' in costly actions to improve water that will have a marginal improvement, when the same or less investment targeting Koi (or other primary cause) could better address degradation.

Frustratingly the WRC's regional pest management strategy does not address Koi notwithstanding DOC considering it to be a significant pest in some sub catchments. WRC are remiss in not elevating eradication of Koi cap as its prime target in any of its planning documents.

Key points to my further submissions

- ✓ **That the (New) Plan recognizes and supports Landowner leadership (those at the coal face with skin in the game) to develop and implement Catchment Management Plans.**
- ✓ **That the (New) Plan encapsulates the Catchment Planning Approach that is based on the development and use of Best Practical Options.**
- ✓ **That the (New) Plan supports the Eradication of Koi carp and catfish as a priority action.**
- ✓ **That Nitrogen should not be used as the surrogate for setting the rules & that the N reference point should not form part of any (New) Plan.**

- ✓ **That stock exclusion policies should be developed on the Best Practical Option premise based on mitigation options that best meet agreed CMP objectives and actions (Science validated)**

- ✓ **That the Commissioners recognize that the 'one stop policed shop' promoted by the CSG will not achieve real step change but instead alienate those who can and are willing to make change over time.**

I attach:

a) Membership of the Catchment Leadership Group
b) Terms of Reference
c) Catchment Map
d) Review of Catchment Issues (Dr Doug Edmeades)
e) Koi Carp – Eco-Terrorists

Thank You

Jim Cotman (Chairman PSCT)

Lake Waikare/Whangamarino Catchment Leadership Group

Working Group Partners

Primary Stakeholders Catchment Trust

IWI - Tainui & Hauraki

Department of Conservation

Fish & Game

Waikato Regional Council

Sharing values

To achieve

Lake Waikare/Whangamarino Catchment Management Plan

Catchment-wide Water Quality Enhancement

Terms Of Reference (TOR)
Leadership Partners Group
Lake Waikare and Whangamarino Wetland Catchment

22nd December 2017

This advisory group has a primary focus of supporting the development of a catchment management plan (CMP) and implementation actions that will meet the long-term aspirations of the community

The Leadership Partners Group TOR reflects the participants' agreement of the following:

REPORTING TO: Waikato Regional Council (via Lower Waikato Catchment Committee (LWCC))

PARTIES: *Leadership representatives from:*

- *Landowner (Primary Stakeholders Catchment Trust)*
- *Iwi representatives holding mana whenua (Waahi Whanui Trust , Nga Muka Development Trust, Hauraki Collective)*
- *Department of Conservation*
- *Auckland/Waikato Fish and Game (Landowners and statutory managers of sports fish and game bird resource)Council representatives: Councillors Stuart Husband, Jennie Hayman, and Tipa Mahuta, Malcolm Lumsden (*Lower Waikato Catchment Committee Chair)
- *Waikato District Council*
- *Waikato Regional Council*

The Leadership Partners Group (the Group) will be chaired by the WRC/nominee and supported by relevant regional council staff.

MEETING FREQUENCY: *The Group will agree and set out meeting frequency.*

MEETING PROCEDURES: *The Group will work through consensus, and acknowledge divergence.*

PURPOSE:

1. *To provide governance support and guidance to the development and content of the Lake Waikare and Whangamarino Wetland CMP and Implementation actions.*
2. *To consider the relationship the CMP has with relevant non statutory and statutory planning documents, such as Waikato Regional Plan Change 1 and the Regional Pest Management Plan.*
3. *To agree a Vision Statement that is given effect through the CMP that aims to ensure ongoing measurable environmental, economic and other objective improvements over time.*
4. *Facilitate/coordinate to support stakeholder engagement, meetings and input to the CMP.*

CONTEXT:

5. *All parties agree and acknowledge that for the Group to be effective there needs to be a shared respect and understanding for each party's values* and historical layers of ties to the area.
6. *The Leadership Group provides an arrangement by which the Council will be assisted with engagement with iwi partners, landowners (as primary stakeholders) crown and local government agencies and interested parties that will result in a robust CMP and implementation actions.*

SPECIFIC RESPONSIBILITIES:

7. *Parties provide a conduit to and from their respective agencies/sectors to the WRC and CMP project team.*
8. *The CMP content and material are prepared by the WRC CMP project team taking into account advice and direction received from the Group*
9. *Parties provide timely feedback on material presented at the Group.*
10. *To enable the Group to consider the content of the CMP,*
    (a) *Regular progress reports to and from the WRC CMP project team to the Leadership Group are presented and align with the Group's vision and objectives.*
    (b) *The Group make recommendations to WRC about the final form of the CMP and the subsequent implementation actions.*
11. *Parties work closely to support a number of public meetings to enable stakeholder engagement and input to the CMP.*

PROCESS FOR APPROVING RECOMMENDATIONS TO COUNCIL

12. *The Group will support the Lake Waikare and Whangamarino Wetland CMP, noting consensus or any divergence in relation to the plan when submitted to the LWCC for Regional Council approval and will promote the plan to their respective agencies for information/approval as appropriate.*

13. *The Lower Waikato Catchment Committee, after considering any Group recommendations, will decide through its delegation from Council:*
    i. *To accept the recommendations for actioning by resolution, or*
    ii. *Refer their considerations back to the Group with a request that the Group clarify one or more aspects of their recommendations*.

14. *Each of the Group participants will recommend the CMP to their respective agencies/groups, together with any funding implications as appropriate.*

RESOURCING:

15. *Each party will bear its own costs with no expectation of individual remuneration for Leadership Group Partners participation.*

16. *The Group will require:*
    a) *A clear brief and understanding of the scope of the CMP.*
    b) *Information from the CMP project team in a timely manner and form that is easily understood.*
    c) *Good facilitation processes, experienced chairing and timely WRC staff and administrative support.*

17. *The Group will defer to the Lower Waikato Catchment Committee for appropriate (budget) support and work within the constraints set by the Committee.*

Principles of engagement

Key principles to guide effective collaboration:

- *patience and listening ability*
- *respect for the ability to present alternative views and approaches*
- *restraint from being judgmental on input of others*
- *being prepared to reach common ground and positions*
- *being brave*
- *willingness to engage and participate in discussions that may be out of their comfort zone*
- *commitment to evidence based approach to guide and inform policy development*
- *being pragmatic*
- *putting issues on the table*
- *early warning of emerging issues that could impact on the CMP*
- *doing what you say you will do and not undermining the process*
- *continual focus on the common goal*
- *ensuring all participants have base level of information and understanding of relevant matters*
- *agreeing on the circulation of meeting notes, materials and associated matters.*

The application of these principles will give rise to:

- *building trusting relationships through well run processes, positive behaviours such as providing feedback, adequate information, time and support, active listening and space to understand the issues*
- *achieving quality engagement and maintenance of open, honest and transparent communication*
- *development of evidence based approaches involving understanding of the problems, how they may be addressed and encouragement of innovative solutions*
- *sustaining the momentum through acknowledging achievements, reinforcing the positives focusing on the outcomes*

Proposed Waikato Regional Plan Change 1

Waikato and Waipa River Catchments Koi Carp Issues

The Healthy Rivers 'Plan for Change' led by the 'Vision and Strategy' required the development of a plan for the rivers to be swimmable and safe for food collection.

The change to the Operative Waikato Regional Plan (PC1) is designed to restore and protect water quality in the Waikato and Waipa Rivers by managing nitrogen, phosphorus, sediment and microbial pathogen levels in the rivers.

The 'Vision and Strategy' states that the Waikato and Waipa Rivers are degraded and require restoration and protection and that one method for this will be provided by ongoing management of diffuse and point source discharges of nitrogen, phosphorus, sediment and microbial pathogens.

Yet arguably the largest contributor to sediment loading in the rivers, KOI CARP, do not receive the attention they warrant.

Koi carp contribute to poor water quality and are a serious problem in both Australia and New Zealand. They are a serious problem for our Lake & Waterways.

Impact of pest fish

Many people are unaware of the damage done to our waterways by pest fish. Unfortunately, some types of introduced fish have spread into the wild, become pests and are threatening New Zealand's freshwater species and environments by:

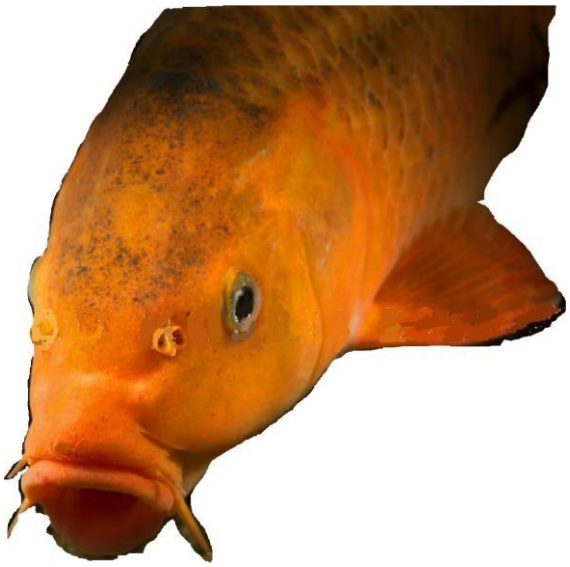
- Stirring up sediment and making the water murky
- Increasing nutrient levels and algal concentrations
- Contributing to erosion
- Feeding on and removing aquatic plants
- Preying on invertebrates, native fish and their eggs
- Competing with native species

What damage do they do?

When they feed they stir up the bottom of ponds, lakes and rivers, muddying the water and destroying native plant and fish habitat. Koi carp are opportunistic omnivores, which means they eat a wide range of food, including insects, fish eggs, juvenile fish of other species and a diverse range of plants and other organic matter.

They feed like a vacuum cleaner, sucking up everything and blowing out what isn't wanted. Aquatic plants are dislodged in the process and are unlikely to re-establish. Koi carp cause habitat loss for plants, native fish, invertebrates and waterfowl.

Koi Carp produce many times their own body weight of sediment each day through this feeding method.



Where are they found?

Koi carp prefer still waters in lakes, or backwaters in rivers. They are highly tolerant of poor water quality and contribute to water quality decline.

Koi carp are widespread in Waikato River, Lake Waikare, Whangamarino Wetlands & tributaries feeding these.

Voice your support to eradicate these predators.

agKnowledge

"The Independent Fertiliser Experts"

Lake Waikare & Whangamarino

Catchment Plan

A report prepared for

Primary Stakeholders Catchment Trust

By

Dr D C Edmeades & Mr F Philips

BRIEF

A trust (Primary Stakeholders Catchment Trust (PSCT) has been established by landowners in the Lake Waikare-Whangamarino catchment to facilitate their involvement in the development of a Catchment Management Plan (CMP).

The Trust has asked agKnowledge Ltd to:

1. Liaise with the Waikato Regional Council and obtain, digest and distil the information they have already collected in relation to the preparation of the Lake Waikare Whangamarino Catchment Management Plan.

2. Liaise with the Waikato River Authority (WRA) to obtain and digest information related to the Waikato Waipa River Restoration Strategy.

3. Translate the information into a digestible format and filtered for relevance to farmers.

4. Identify problems, gaps and limitations in the available information.

DESCRIPTION OF CATCHMENT

The Lake Waikare-Whangamarino Catchment comprises 7 sub-catchments and within the catchment there are five Waikato Regional Council (WRC) water quality monitoring sites (Table 1 and Figure 1).

Table 1: Sub-catchments within the Lake Waikare-Whangamarino catchment

Sub-catchment	Area (ha)	Area monitored (ha) [1]
Mangatangi	19,454	19,452
Maramarua/Kopuera	13,106	0
Matahuru	10,806	10,653
Waikare	10,688	0
Waerenga	2,032	1,951
Whangamarino Jefferies	9,705	9,602
Whangararino Island block	14,723	14,723
Total	*80,652*	*56,382 (70%)*

Note 1) area upstream of the monitoring site

All the sub-catchments, except for Maramarua/Kopuera and Mangatangi, drain through the monitoring site at Whangamarino (Island Block) and the whole catchment drains into the Waikato River prior to the Mercer Bridge.

CATCHMENT MANAGEMENT PLAN

The Waikato Regional Council (WRC) has commenced the process to develop a Catchment Management Plan (CMP) for the Lake Waikare-Whangamarino catchment.

To-date three documents have been prepared:

5. The "Lake Waikare & Whangamarino Wetland Catchment Management Plan: Part One – Catchment Over View – Draft for Consultation, March 2017." This report documents the resources in the catchment.

6. A data-base (Excel spreadsheet) listing all known Projects (64 on-ground activities such a riparian planting), Studies (72 Research Reports), and Monitoring programs, completed or in progress in the catchment, as at the end of 2016.

7. Based on this data-base, a further report "Lake Waikare & Whangamarino Wetland Catchment Management Plan: State of Understanding report – draft for consultation, March 2017", assesses this body of work in the catchment and identifies important gaps in the current knowledge.

THE WRC 'STATE OF UNDERSTANDING' REPORT

It is made clear that this report is a 'work in progress' and importantly, it is noted that the Landowners are key stakeholders and that their input "needs to be incorporated" in the ongoing development of the CMP.

After reviewing all the work in the catchment up to the end of 2016, the report notes that, "a significant amount of research and on-the ground projects have occurred to date within the catchment, however many of these have tended to focus on the Lake Waikare and the Whangamarino wetland and not the wider catchment subject to the CMP. " In other words the focus has not been directed to issues related to agricultural activities in the catchment.

Despite the large body of research and activities in the catchment the report identifies 19 issues/gaps in the state of current knowledge. Leaving aside those relating directly to the internal management of the Whangamarino Wetland and Lake Waikare, there are a number that relate to land use and farming activities in the broader catchment. These can be condensed down as follows:

8. Farming effects on the wetlands where farms abut the wetlands and feeder streams.

9. Management and rehabilitation of land in the headwaters of the catchment.

10. Management and mitigation of the stream-channel erosion in the lower reaches of the catchment.

11. Quantification of the sediment and nutrient input and outputs within the catchment.

12. Defining measurable water quality targets for the sub-catchments within the catchment.

There are some issues relating to the internal management of the Lake Waikare, and Whangamarino Wetland, which may indirectly influence land management and farming, in the wider catchment. Of particular importance are:

13. The effect of pests (koi carp and catfish) on the re-suspension of sediments in the lower reaches of the lowland streams and in the Whangamarino Wetland and Lake Waikare.

14. The ongoing management of the control gate on Lake Waikare and the Whangamarino Wetland weir.

The report concludes by listing 23 "potential investigations" identified to fill the gaps in the preparation of a CMP. Three of these are relevant to the issues/gaps identified above and in fact should be condensed into one overarching investigation.

15. Summarise all the water quality (nitrogen, phosphorus, pathogens and sediments) monitoring data collected by the WRC and the Department of Conservation (DOC) with a view to developing a Catchment Nutrient Plan (CNP) as a subset within the CMP.

THE WAIKATO RIVER AUTHORITY

The Waikato River Authority (WRA) was established in 2010 as a result of the Treaty Settlement between Waikato-Tainui and the Crown. The WRA is the sole trustee of the Waikato River Clean-up Trust and is responsible for administering a $220m fund over a 30 year period. The Trust generally has up to $7m available each year to support river restoration activities throughout the Waikato and Waipa River Catchments. The Trust will not fund activities explicitly required by the Healthy Rivers Plan Change (see next section) unless they go beyond the minimum standard e.g. through fencing wider set back of streams.

In the recent 2017 funding round the WRA priorities relevant to farmers and farming in the Lake Waikare – Whangamarino Catchment include:

16. Projects that improve water quality in streams, wetland and lakes and drains that flow into the Waikato River and its catchment.

17. Restoration of catchment headwaters of the Lower Waikato, in particular the Matahuru and Mangawara sub-catchments.

18. Projects that improve the health of the Whangamarino wetland.

19. Habitat and water quality enhancement of high priority lakes including Lake Waikare.

20. Retirement and restoration of wetlands associated with lakes including the Matahuru and Awaroa wetlands.

21. Projects that protect and restore currently existing wetland and the creation of new wetlands throughout the catchment.

The WRA has already funded a number of activities in the catchment over recent years. These are captured in the WRC data-base, noted earlier.

THE WAIKATO AND WAIPA RIVERS RESTORATION STRATEGY

The Waikato Regional Council, Waikato River Authority and DairyNZ will be jointly releasing a forward-looking strategy in 2018 entitled "Waikato River & Waipa River Restoration Strategy." This will set out funding and restoration priorities for "a wide-range of non-regulatory activities related to the restoration and protection of the Waikato and Waipa Rivers. Huka Falls to Port Waikato and the Waipa River." The focus is broad and covers the whole catchment and includes consideration of iwi cultural priorities, erosion and sedimentation, water quality, biodiversity, fish, and access and recreation

HEALTHY RIVERS: PLAN CHANGE ONE

Plan Change One (PC1) is a Regional Plan change now in a statutory process, details of which, including timeline, can be found on the WRC website. It is not clear at this stage when hearings before the Commissioners will be heard, or importantly, when the finalized plan will be ready for implementation.

In the context of this report it is emphasized that, relative to the CMP and the WRA, the PC1 has a narrow focus – it is solely concerned with water quality as expressed by the four contaminants: nitrogen, phosphorous, pathogens and sediments.

WATER QUALITY

Trends

Based on the data from the five water-quality monitoring sites in the catchment, the trends in the water quality are summarized in Table 2 (page 8).

22. There has been deterioration in the physical quality of the water (turbidity and clarity) in 3 of the 5 sub-catchments reflecting an increase in sediments in the water.

23. There have been some improvements in total nitrogen in some sub-catchments (3 of 5) and deterioration in others (2 of 5). All five catchments, have improved with respect to ammonia.

24. There have been no practically important or statistically significant trends in phosphorus.

Current Situation

The water quality (median values, 2010 to 2014 incl. WRC Technical Report 2015/15) at each of the monitoring sites is summarized below (Table 3). To give some perspective to the data, the water quality in the Waikato River at Huntly, Mercer and Tuakau is also provided (*in italics*).

Table 3 Water quality attributes in the five sub-catchments (2010-2014). The water quality attributes at three of the monitoring sites in the lower Waikato River are provided to given some perspective to the data.

Site	Median Clarity (m)[1]	Median total nitrogen (mg/m^3)	Median total phosphorous (mg/m^3)	Median ecoli (n/100ml)
Mangatangi	0.50	490	72	380
Matahuru	0.27	1310	98	600
Waerenga	0.75	1120	46	500
Whangamarino (Jefferies)	0.39	1090	89	600
Whangamarino (Island Road)	0.20	1830	152	180
Huntly Tainui[2]	*0.9*	*562*	*45*	*Not known*
Mercer Bridge[2]	*Not measured*	*631*	*52*	*80*[3]
Tuakau[2]	*0.6*	*571*	*53*	*Not known*

Notes 1) the higher the number the clearer the water.
2) figures are the 10 year goals from Plan Change One
3) 95 percentile not median.

25. All the sub-catchments have poorer clarity than the three sampling sites in the lower reaches of the Waikato River.

26. The median total nitrogen concentrations of the water in four of the five sub-catchments are higher than in the lower reaches of the Waikato River.

27. The total phosphorus concentrations are higher within the catchment than in the lower reaches of the Waikato River

28. The clarity of the water entering the Whangamarino wetland from the Matahuru and Jefferies catchments is better than in the water leaving the wetland at Island Road.

29. The total phosphorus and nitrogen concentrations in the water entering the Whangamarino wetland from the Matahuru and Jefferies catchments are lower than in the water leaving the wetland at Island Road. The reverse is true for e coli.

30. The total phosphorus concentrations are higher within the catchment than in the lower reaches of the Waikato River

31. The clarity of the water entering the Whangamarino wetland from the Matahuru and Jefferies catchments is better than in the water leaving the wetland at Island Road.

32. The total phosphorus and nitrogen concentrations in the water entering the Whangamarino wetland from the Matahuru and Jefferies catchments are lower than in the water leaving the wetland at Island Road. The reverse is true for e coli.

Table 2 Trends in water quality (1993 to 2012, WRC Technical Report 2013/20) in the six tributary streams in the Waikare-Whangamarino Catchment.

Tributary	Attribute							
	Temperature	**Dissolved oxygen**	**Turbidity**	**Visual clarity**	**Total nitrogen**	**Ammonia**	**Total phosphorus**	**E coli**
Mangatangi	ns[1]	ns	deterioration	deterioration	improvement	improvement	ns	-
Mangatawhiri	ns	ns	ns	ns	improvement	improvement	ns	-
Matahuru	ns	ns	deterioration	deterioration	ns	improvement	ns	-
Waereanga	ns	ns	deterioration	deterioration	deterioration	ns	ns	ns
Whangamarino (Jefferies Road)	ns	ns	ns	ns	improvement	improvement	ns	-
Whangamarino (Island Block)	ns	ns	improvement	ns	deterioration	ns	ns	-

Note 1) ns = not statistically significant or not of any practical importance

Plan Change One Targets

It is not possible to discuss the development of a CMP for this catchment without being cognizant of Plan Change One (PC1) – the now notified plan to 'clean-up' the Waikato and Waipa Rivers. PC1 is focused on enhancing water quality (i.e. reducing the concentrations of nitrogen (N), phosphorus (P) pathogens and sediments).

It is noted that PC1 specifically identifies the Whangamarino Wetland for its international significance and accordingly it is has been given a high priority in terms of restoration.

PC1 has set water quality targets or each of the 5 sub-catchments to be achieved in 10 years and 80 years. These are set out in Table 4 together with the current situation. Note that there are **no targets in respect to phosphorus**.

33. For nitrate N the current concentrations in all the sub-catchments, except Whangamarino, are the same as the targets set for years 10 and 80. A modest reduction is required in 10 years in the Whangamarino.

34. There are **no targets set for total** N (as distinct from nitrate N) in these sub-catchments although there are targets for total N in the Waikato River. (This is so for all the sub-catchments in the Waikato-Waipa catchment).

35. The goals set for e coli in year 10 require modest reductions in the Waerenga and the two Whangamarino sub-catchments. However over 80 years large reductions are required in all sub-catchments.

36. The changes in clarity required to meet the 10-year targets appear to be modest, but larger improvements are required over 80 years.

37. It follows that of the 4 contaminants (nitrogen, phosphorus, pathogens and sediments) the main focus in this catchment as far as PC 1 is concerned should be on reducing sediments and e coli, noting that reducing sediment loads (and hence improving clarity) will have a concomitant effect on reducing P concentrations (see also para 40 and 41).

Table 4 Current water quality measurements and the targets required in Plan Change One (PC1) in 10 and 80 years for five sub-catchments.

Sub-catchment	Attribute	Current	PC 1 (10yr)	PC1 (80 yr)
Mangatangi	Nitrogen (median nitrate, mg/m^3)	110	110	110
	Ecoli (95th percentile, n/100 ml)	6125	5567	540
	Clarity (m)	0.5[1]	0.5	1.0
Matahuru	Nitrogen (median nitrate, mg/m^3)	720	720	720
	Ecoli (95th percentile, n/100 ml)	6770	6147	540
	Clarity (m)	0.3[1]	0.4	1.0
Waerenga	Nitrogen (median nitrate, mg/m^3)	820	820	820
	Ecoli (95th percentile, n/100 ml)	5605	5098	540
	Clarity (m)	0.8[1]	0.9	1.0
Whangamarino (Jefferies)	Nitrogen (median nitrate, mg/m^3)	650	620	620
	Ecoli (95th percentile, n/100 ml)	5175	4712	540
	Clarity (m)	0.4[1]	0.6	1.0
Whangamarino (Island Road)	Nitrogen (median nitrate, mg/m^3)	750	750	750
	Ecoli (95th percentile, n/100 ml)	668	655	540
	Clarity (m)	0.2[1]	0.3	1.0

Note 1) from Table 3 and rounded up to be consistent with the PC 1 targets.

Phosphorus load

From a land management perspective it is valuable to consider not only the concentrations of the contaminants but also their loads at various locations within the catchment. We have attempted to do that for P, focusing on the sources of the P load passing the Whangamario Island Road monitoring site.

The total P load (tonnes/year) is estimated to be about 49 t/yr. This includes the inflows from the Waikato River into Lake Waikare, which occurs as part of the flood control scheme and from rainfall.

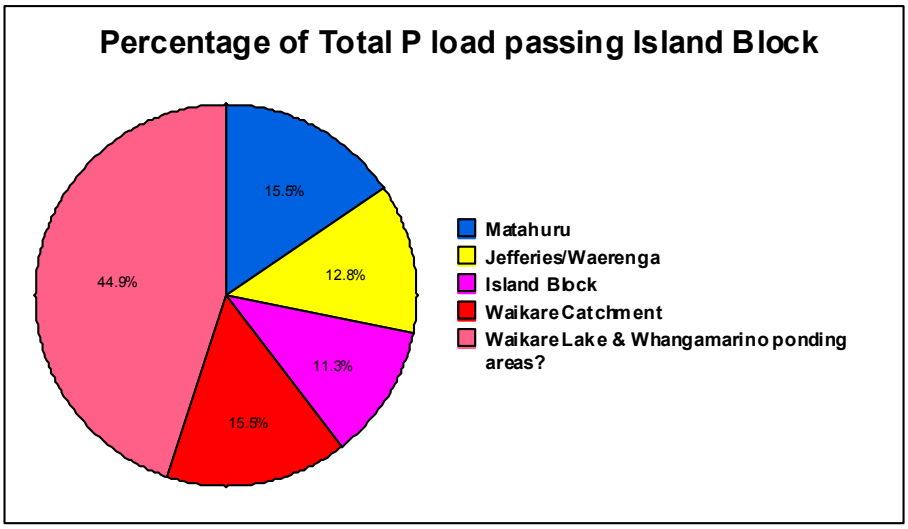
Table 5 and Figure 2 show the estimated P loads from the various sources contributing to the total load, in both absolute and relative terms.

Table 5 Estimates of the phosphate loads from various sources to the Whangamarino Island Road monitoring site.

Inflows of P from land and rainfall to Whangamarino Island Road	Tonnes P/year[1]	Proportion (%)
Matahuru	7.6	15.5
Whangamario Jefferies including Waeranga	6.3	12.8
Lake Waikare excluding Matahuru	7.6	15.5
Whangamarino Island Road	5.5	5.53
Total P accounted for	26.9	55.1
Balance from non-land activities	21.9	44.9

Note 1) These are 'best estimates' given the currently available data. The absolute numbers depend on what assumptions are made but this should not greatly affect the proportions.

Figure 2 Sources of the Total P at Whangamarino Island Road monitoring site.



38. The total P load discharged at Island Road into the Waikato River is about 49 tonnes/year representing about 5% of the total P loading in the Waikato River at Mercer (964 tonnes/year).

39. About half of the P leaving the catchment at Whangamarino Island Road is from agricultural land use and the balance from within the Waikare Lake and Whangamarino Wetland.

Conclusions: Water Quality

Notwithstanding the limitations in the data, several conclusions can be drawn from this analysis:

40. Sediments, ecoli and P (indirectly - see 41 below) appear to be the major contaminants limiting water quality in this catchment.

41. There are no goals set for managing P in this catchment. However P concentrations and sediment loadings in waterways are linked because most of the P is particulate P (i.e. attached to soil particles). For this reason reducing sediments will also reduce P concentrations.

42. Reducing N losses in this catchment is not a high priority.

43. The current evidence suggest that about half of the P leaving the catchment at Whangamarino Island Road is from agricultural land use and the balance from within the Waikare Lake and Whangamarino Wetland.

Limitations of the Information

There are some limitations in the available data that need to be acknowledged:

44. The water quality data is gathered monthly from five sites, which represent about 70% of the overall catchment. Two catchments are not sampled at all (Lake Waikare and Maramarua/Kopuara).

45. The frequency of sampling, and the fact that flow rates are only recorded at 2 sites, means that the accuracy in the mass flow calculation of the contaminants is unlikely to be better than +/- 15%.

IMPLICATIONS FOR THE CMP

The Regional Council's CMP should logically be informed by the requirements of PC1 and the priorities in the Waikato and Waipa River Restoration Strategy. Conceptually the situation can be envisaged as Figure 3 showing how the three components overlap and interact. From the farmers perspective the endpoint should provide sufficient information to prepare a well-informed, farm-specific Farm Plan.

The WRC "State of Understanding Report" identified 19 issues/gaps in the current state of knowledge, which were condensed down earlier in this report (see Para 8-12) to 5 topics of relevance to farmers. It is useful to restate these:

1. Farming effects on the wetlands where farms abut the wetlands and feeder streams.

2. Management and rehabilitation of land in the headwaters of the catchment.

3. Management and mitigation of the stream-channel erosion in the lower reaches of the catchment.

4. Quantification of the sediment and nutrient input and outputs within the catchment.

5. Defining measurable water quality targets for the sub-catchments within the catchment.

Points 1, 2, and 3 above overlap with a subset of the activities identified as funding priorities in the (yet to be released) 2017, Waikato and Waipa River Restoration Strategy (see Points 16, 17, 18, 19, 20 and 21). It is sensible therefore to encourage support for these activities as a component of the CMP.

Quite independent from the CMP process, a set of water quality targets has been developed for the 5 sub-catchments via PC1. These may be modified as PC1 goes through the hearing stages but it is assumed that these targets will take precedence over any goals that the WRC may wish to include in their CMP, unless they desire a higher standard. In other words point 5 above is completed.

The limited analysis in this report on the sources and flows of P in this catchment highlights the importance of this type of forensic investigation. Thus point 4 above is an important initial step in the development, prioritization and implementation of a robust CMP.

RECOMMENDATIONS FOR PSCT

The analysis above identifies two gaps in the existing knowledge and proposed activities within the catchment.

Recommendation 1: It is suggested that the PSCT should seek funding to implement a catchment-wide, robust, water-quality monitoring system.

From this information the movements and loadings of the contaminants in and through the 7 sub-catchment catchments can be determined. This will not only inform the CMP about the priority activities for the catchment but, once in place, an ongoing monitoring system will also enable the effectiveness of any mitigation options implemented by the CMP to be measured.

It is acknowledged that the CMP is a 'work in progress' and that there is a need to seek input from farmers.

Recommendation 2: It is suggested that the PSCT seek funding to hold meetings with the farmers in this catchment to seek their input into the ongoing development of the CMP. This report could be used as the background document for this purpose.

ACKNOWLEGMENTS

The technical input from Drs Bill Vant and Eloise Ryan of Waikato Regional Council and the assistance from Dr Keri Neilsen of the Waikato River Authority are gratefully acknowledged.

Figure 1: The Whangamarino Catchment

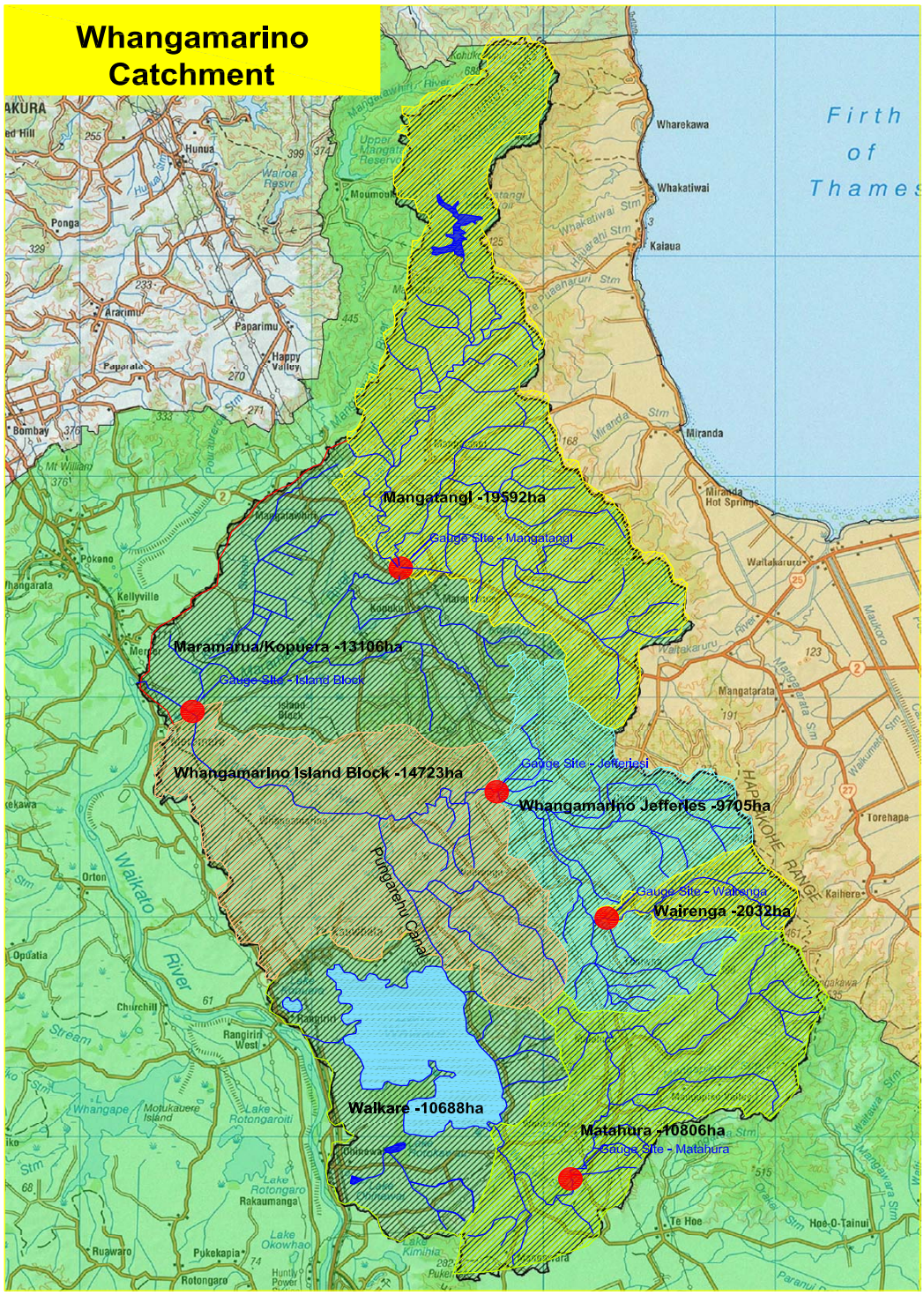


Figure 3: The Catchment Management Plan will be informed in part by Waikato and Waipa Restoration Strategy and the requirements of the Healthy River Plan.