Summary of technical projects

August 2015

Healthy Rivers PLAN FOR CHANGE | Wai Ora HE RAUTAKI WHAKAPAIPAI

Maniapoto Māori Trust Board
Raukawa Charitable Trust
Te Arawa River Iwi Trust
Tūwharetoa Māori Trust Board
Waikato Raupatu River Trust
Waikato Regional Council

Listed below are some of the technical projects that will be used to provide technical information to the Healthy Rivers: Plan for Change/Wai Ora: He Rautaki Whakapaipai project's Collaborative Stakeholder Group.

Technical project	Description	Why it's needed
1. Groundwater summer fieldwork programme	• Fieldwork investigations across the Waikato and Waipa river catchments to provide new data and information on groundwater flow, pathways, travel times (age and age distribution), nitrogen levels and links between groundwater and surface water. • Requires sampling of surface waters under summer low flow conditions when dominated by groundwater sources. • The technique for measuring groundwater age has a 12 week analytical step. **Status:** Complete	• Knowledge of groundwater is varied across the region, with significant gaps in our understanding in places like the Waipa, Hamilton Basin and Lower Waikato. • Will contribute to or improve understanding of basic hydrology, hydrogeology, regional groundwater levels, water chemistry (especially nitrogen), and groundwater/surface water age and age distribution across the catchment. • The resulting data will provide the core information required for developing hydrogeological models of how the groundwater behaves across the catchment.
2. Conceptual hydrogeological models	• Utilizing existing information and that gathered in the groundwater summer fieldwork programme (project 1), develop 'models' of how the groundwater systems operate in different parts of the catchment (Upper, Middle, Lower Waikato and Waipa). • These conceptual models will provide macro-level information on recharge distribution and rates, lithological units and aquifer delineation, hydraulic characteristics, head distribution, flow paths and travel times. **Status:** Complete	• This work will essentially 'translate' existing data and the data obtained in the groundwater summer fieldwork programme into a consistent understanding across all subcatchments as to how the groundwater behaves. • This understanding informs water quality modelling, particularly in relation to attenuation and lag (nitrogen load to come). It also addresses previous Collaborative Stakeholder Group questions about wanting to understand more about the groundwater resources across the Waikato and Waipa river catchments.

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3. Estimate historic land use and nitrogen leaching across the catchment	Across the Waikato and Waipa river catchments: • analyse samples of historic aerial photos to estimate changes in land use through time (1940s to present) • estimate historic nitrogen leaching rates through the application of assumed historic farm system practice. **Status:** Near completion	• To estimate the relative importance of nitrogen 'load to come' and nitrogen attenuation on both observed and predicted surface water quality there is a need to understand the history of nitrogen leaching over a period similar to that of the groundwater age. • This requires a historic record of changes in land use (and intensity) across the catchment.
4. Estimate flow in the vadose (unsaturated) zone	• Using existing data and that obtained from the groundwater summer fieldwork programme (project no. 1), estimate the time for water and nutrients to travel through the vadose (unsaturated) zone to the water table and how this varies across the catchment. **Status:** Complete	• This further informs our understanding of land use-groundwater-surface water linkages. • The importance of the unsaturated zone as a 'store' for water and nitrogen is not well known.
5. Catchment model	• Improve the current surface water quality modelling tool so that it is better able to represent the effects of groundwater processes (flow paths, lags and attenuation) and how these vary across the catchment. • Also, integrates all four Healthy Rivers/Wai Ora contaminants (nitrogen, phosphorus, *E. coli* and sediment) along with clarity as a basic function of nutrients, chlorophyll (algae) and sediment. **Status:** Complete	• The importance (or otherwise) of 'nitrogen load to come' and nitrogen attenuation to future nitrogen concentrations in the river network is not well understood. • This tool will be a simple yet significant way of linking the improved knowledge of the groundwater system derived from the other groundwater projects to surface water concentrations. • This enhancement will not only provide a better explanation of current river nitrogen concentrations and their trends but also the timeframes over which improvements may occur due to the various mitigation methods. This will integrate with economic modelling to inform the Collaborative Stakeholder Group of implications of policy options.

Technical project	Description	Why it's needed
6. Developing a relevant water quality attribute table: expert workshop	• Based upon current knowledge, an experts' workshop to develop a Waikato Objectives Framework (WOF) containing appropriate attributes and attribute bands for the four contaminants as they relate to the values described by the *Vision and Strategy for the Waikato River* and the Collaborative Stakeholder Group's focus statement, and that are not inconsistent with the National Policy Statement for Freshwater Management. **Status:** In progress	• Developing a set of attributes and attribute bands is a key step in developing the plan change to manage the four contaminants (nitrogen, phosphorus, sediment and *E.coli*). • These attribute bands will be used to describe current state, assist with definition of change scenarios to aid Collaborative Stakeholder Group deliberations, and provide a framework for the Collaborative Stakeholder Group's eventual recommendations to the Healthy Rivers Wai Ora Committee on limits and targets relating to the four contaminants for each of the Freshwater Management Units it decides upon.
7. Efficacy of different mitigations on land and their costs	• Determine the effectiveness and cost of a wider suite of mitigation practices, especially for phosphorus, *E.coli*, and sediment losses so they can be added to the Farm costs economic model (project 9). This will involve both a technical experts' panel and review/input by sector experts. The technical experts have held a workshop and the next steps are to engage with sector experts, write up the mitigations and obtain review. **Status**: Complete	• Comprehensive analysis of the various scenarios for meeting attribute limits will require that all possible mitigations for all four contaminants be represented. Currently the Farm Costs model has a focus on in-paddock nitrogen mitigations and therefore needs to be extended.

Technical project	Description	Why it's needed
8. Review and update point source information	Revisit the previous Opus report on point source discharges and the costs of treatment upgrades to reduce contaminant loadings. This will involve: • providing the Opus report to all point source dischargers, seeking their comments in relation to the accuracy of data for their current operation and the accuracy of the estimates for treatment plant enhancement • identify and where possible resolve any issues regarding availability of information • draft a report on updated estimates • peer review of the report by an engineer independent of the dischargers. **Status:** Complete	Mitigation options to help meet water quality limits include the possibility of reducing point source inputs through enhanced treatment. As with land mitigations, it is important to have robust information on the efficacy and the cost of point source mitigations (treatment plant upgrades) to provide into the economic modelling. While point sources are estimated to be a small contributor to the total contaminant load, point sources may be important contributors in localised situations.
9. Farm costs economic model	• Using the Economic Impact Joint Venture model as a foundation, this initiative aims to project the optimal pathway to achieve desired future states for each of the four key contaminants (nitrogen, phosphorus, *E. coli*, sediment) along with clarity. **Status**: Complete	• The key tool for the Collaborative Stakeholder Group to conceptualise how the various policy options will result in improvements across all five Freshwater Management Units, along with better describing the associated real world costs. This model will integrate directly with the *Regional costs economic model* (see project 10).
10. Regional costs economic model	• Update a comprehensive input-output model of the Waikato regional economy and link it to the *Farm costs economic model* (see project 9). • Building from (and integrated within) the *Farm costs economic model* (see project 9), this model aims to estimate cumulative net economic impact of achieving future desired water quality states at the catchment, regional and national levels. • The regional impacts of policy options will be defined through various key economic indicators across all sectors. **Status:** Complete	• Full analysis of future scenarios requires (amongst other things) an estimate of the regional-level economic effects of meeting contaminant limits.

Technical project	Description	Why it's needed
11. Faecal source tracking	• This work will use forensic DNA and chemical fingerprinting techniques to trace the origins of faecal contamination in river water (faecal source tracking). • Water samples will be collected from five sites in each of the four subcatchments during low and high flow conditions to identify the dominant sources of faecal contamination (i.e. bovine, other ruminants, humans, waterfowl, dogs). • Depending on findings, this work may need to be extended. **Status:** Complete	• The *Vision and Strategy for the Waikato River* and the Collaborative Stakeholder Group's focus statement highlight swimming water quality as an important value for the Waikato River. • However, many tributary streams and significant stretches of the Waipa and the lower Waikato currently exceed *E.coli* levels deemed suitable for swimming. • Inputs from farming, urban stormwater, wastewater discharges, and waterfowl are all plausible sources of faecal contamination, but knowing the actual sources and their relative contributions is important so that mitigation actions can be better targeted.
12. Determinants of visual clarity in the Waikato and Waipa Rivers	• Provide an expert analysis of the drivers of water clarity in different parts of the Waikato and Waipa river catchments, in particular, the relative influence of planktonic algae and inorganic sediments derived from erosion. • Key findings were summarised as part of the introduction to the clarity attribute session at Collaborative Stakeholder Group workshop 9. **Status:** Report complete, available at www.waikatoregion.govt.nz/tr201513/	• Water clarity is a key attribute that influences swimmability, fishability, ecosystem health, and people's perception of, and connection with, the water. • Management of water clarity to meet states that support these values requires understanding of the drivers of clarity so that the relevant actions can be prioritized (e.g. focusing on nutrient controls where algae are strongly dominant vs sediment controls where inorganic particulates are most important).

Technical project	Description	Why it's needed
13. Controls on algae in the Waikato River	• Two studies conducted by NIWA shed new light on the factors controlling algal growth in the river. • The study reports, and the interpretations made from them, have been released to the Technical Leaders Group by the clients for each study (DairyNZ and Waikato Regional Council). • The Technical Leaders Group is now seeking peer review of the studies and their interpretation, prior to presenting a summary to the Collaborative Stakeholder Group as part of its deliberations on the chlorophyll, nitrogen and phosphorus attributes. **Status**: Complete	• Algae (as measured by the green pigment, chlorophyll) is an attribute in the proposed Waikato Objectives Framework (WOF). • When the Collaborative Stakeholder Group are determining an appropriate attribute band for chlorophyll and developing mitigations to achieve/maintain that band, there needs to be a clear understanding of the factors controlling algal growth in the river. This, of course, has a flow on effect to clarity (see project 12).
14. Mātauranga Māori Knowledge Networks	• Develop knowledge networks from a Mātauranga Māori perspective drawing on literature available, values articulated at Collaborative Stakeholder Group workshop 5, and workshops with iwi representatives, pūkenga and relevant practitioners. • The knowledge networks will likely include both physical and non-physical values (e.g. mahinga kai species, swimmability, sense of place, identity and relationships, and wai tapu) and the positive and negative influencers of these values. • While the knowledge network will be holistic in its approach, the relevance of the four contaminants and their relative influence on these values will be described in an accompanying narrative. **Status:** In progress	• The National Objectives Framework in the National Policy Statement for Freshwater Management provides a framework for defining values, attributes and states. • Māori values and attributes are in their formative stage at the national level and do not provide a way forward that can be immediately picked up and incorporated into the Healthy Rivers/Wai Ora process. • To give effect to the *Vision and Strategy for the Waikato River* and the draft values they have developed, the Collaborative Stakeholder Group will need information on the connections (and the strength of connection) between the four contaminants and the values held by River iwi.

Technical project	Description	Why it's needed
15. Social and cultural impact assessment methodologies: expert workshop and Collaborative Stakeholder Group input	An experts workshop to: • identify social and cultural indicators related to prosperous communities • identify relevant methods and data sets available to undertake an impact assessment of future scenarios • develop a framework to undertake social and cultural impact assessment related to the future scenarios chosen by the Collaborative Stakeholder Group and modelled by the economic workstream • obtain input to the draft framework at Collaborative Stakeholder Group workshop 9. **Status:** In progress	• The Collaborative Stakeholder Group has developed a working list of values for water that are cognisant of both the *Vision and Strategy for the Waikato River* and the National Objectives Framework (NOF) in the amended *National Policy Statement for Freshwater Management*. • Water quality limits that reflect these values are being developed for the four contaminants. • A process will be required to identify other social, cultural, environmental, and economic values the community holds, against which they may wish to test the impacts of implementing mitigation actions and policy options that are required to achieve the water objectives. These considerations will provide the framework for integrated impact assessments.
16. Developing a baseline of social, cultural, economic and environmental indicators	Engage the expertise of Dr Beat Huser of Waikato Regional Council to: • examine the values currently proposed by the Collaborative Stakeholder Group and the draft framework developed by the group of experts (see above), to identify baseline indicator information that is available • prepare the information in a format that can be presented to the Collaborative Stakeholder Group and be used in a workshop setting for them to decide on their relevance and use. **Status:** In progress	• The Collaborative Stakeholder Group will be considering all four wellbeings (social, cultural, economic and environmental) when it deliberates on its recommendations to the Healthy Rivers Wai Ora Committee. • The Technical Leaders Group needs to be able to provide advice on the impacts of various future scenarios on social, cultural, economic and environmental indicators. • To do that requires establishing the current baseline against which future scenarios can be compared.
17. Integrated assessment	Using the assessment framework (see project 15) and the baseline indicators developed in the two projects above, conduct integrated assessments of the wider impacts on communities associated with meeting water quality limits and targets. The type of analysis will be dependent on the indicators chosen as many will be qualitative and different means of gathering the data will be required e.g. interviews, surveys, modelling etc. **Status:** In progress	• The Collaborative Stakeholder Group will require integrated assessments to inform its recommendations to the Healthy Rivers Wai Ora Committee. • Consideration of the flow on impacts of choices of targets and policy instruments will inform choice and also allow for iterations until an acceptable solution is found. • The integrated assessment is strongly dependent on information from workstreams related to Mātauranga Māori, farm costs modelling and regional input/output modelling.

Healthy Rivers Workbriefs

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