RESOURCE MANAGEMENT GROUP

HAWKE'S BAY
REGIONAL COUNCIL

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TUKITUKI CATCHMENT IMPLEMENTATION PLAN

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Asset Management

Land Management

Tukituki Catchment Implementation Plan - Draft

Non-regulatory approach to the implementation of Change 6

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EXECUTIVE SUMMARY

The Tukituki Catchment Implementation Plan (TCIP) outlines the proposed non-regulatory approach of the Hawke's Bay Regional Council to achieve the freshwater objectives and implement the policies and rules of the proposed Change 6 in the Tukituki Catchment.

A number of key drivers have influenced the development of the proposed process within this plan. The under-allocation of nitrogen (N) and the over-allocation of phosphorus (P) (as reflected in the instream nitrate-nitrogen (NO3-N) limits and the dissolved reactive phosphorus (DRP) targets) for the majority of the Tukituki catchment have lead to a preferred approach that is non-regulatory focussed (stock exclusion excepted) to manage P and a "lighter" regulatory approach to manage N. This aligns well with the approach proposed via the Land and Water Forum third report (October 2012).

The primary aim of the process is on achieving the DRP water quality targets by focussing HBRC efforts on priority sub-catchment where existing P losses result in significant exceedences of the targets. Equally important to the process is the critical nature of the synergies that exist between the implementation of Change 6 and the Ruataniwha Water Storage Scheme's Production Land Use Conditions in meeting these water quality targets, should the Scheme go ahead.

The TCIP process includes a short term and medium term aim. It has a catchment wide short term focus to enable the development of mechanisms, alliances and processes required to assist landholder's transition to the new policies and rules of Change 6, promote the wider adoption of Industry Good Practice and build HBRC understanding of the mitigation required within priority sub-catchments.

The medium term focus is on working closely with sub-catchment communities to develop sub-catchment plans and build the capacity of landholders through HBRC and wider industry support to effectively claw back the over-allocation of P.

The process contains 5 sub-programs

1. Stock exclusion transitional support
2. Nutrient budgeting, phosphorus management planning and farm environmental management planning systems and capacity development
3. Monitoring, evaluation, reporting and improvement (MERI) planning
4. Sub-catchment over-allocation mitigation
5. The adoption of catchment wide Industry Good Practice.

The TCIP will require the support of a number of key stakeholders including the HB Pan-Sector Group, Mana Whenua and the sub-catchment governance committees.

Finally an estimate of the potential costs to HBRC that could be required to implement components of the TCIP is considered.

Abbreviations used in this report

CSAs	Critical Source Areas
DRP	Dissolved Reactive Phosphorus
FEMP	Farm Environmental Management Plan
IGP	Industry Good Practice
HB	Hawke's Bay
HBRC	Hawke's Bay Regional Council
KASA	Knowledge, attitudes, skills and aspirations
LAWF	Land & Water Forum
LAWMS	HB Land & Water Management Strategy
LMT	Land Management Team
MERI	Monitoring, evaluation, reporting & improvement
N	Nitrogen
NB	Nutrient Budget
NCE	Nitrogen Conversion Efficiency
PMP	Phosphorus Management Plan
NRM	Natural Resource Management
P	Phosphorus
RLS	Regional Landcare Scheme
RWSS	Ruataniwha Water Storage Scheme
TCIP	Tukituki Catchment Implementation Plan

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1. INTRODUCTION

The Tukituki Catchment Implementation Plan (TCIP) outlines the proposed Non-regulatory approach of the Hawke's Bay Regional Council (HBRC) to achieve the freshwater objectives and implement the policies and rules of Proposed Plan Change 6. The focus of the implementation program is to assist with achieving Change 6's freshwater objectives (particularly Objectives TT1 – TT3) in an economically, socially, culturally and environmentally sustainable way.

The TCIP has been prepared as a supporting document to the Section 32 report that accompanies Plan Change 6. This TCIP has also been developed in close alignment with the draft Production Land Use Conditions for the proposed Ruataniwha Water Storage Scheme, through which most of the future intensification of land use in the Tukituki Catchment could potentially occur.

The TCIP outlines the key drivers within the Tukituki Catchment that have influenced the proposed approach and how processes to address these will be implemented. The plan will consider some implications on resourcing.

The approach articulated in this report is aligned with the guiding principles of the Hawke's Bay Land and Water Management Strategy (LAWMS) which through the development of a strategic document in collaboration with a multi-party reference group, determined a smarter way to manage the different values and expectations placed on land and freshwater in Hawke's Bay. The TCIP is consistent with recommendations 9, 10, 15, 16 and 22 of the Land & Water Forum (LAWF) third report (October 2012), which has reinforced the appropriateness of the approach as proposed within the TCIP. HBRC has worked with a wide variety of primary sector industry organisations in the development of the TCIP.

2. KEY ELEMENTS OF IMPLEMENTATION PLAN DESIGN

A number of key drivers have influenced the formation of the proposed approach articulated in the TCIP and they have set up the conditions of the framework or context with which the TCIP operates. Each is discussed in more detail below.

2.1. Non Regulatory Approach

The approach proposed in the Tukituki Catchment to manage the adverse impacts of production land on water quality contains a mix of both regulatory and non-regulatory mechanisms. The Council's preferred approach in the context of existing water quality within the catchment is to take a largely non-regulatory approach to phosphorus management (apart from stock exclusion and the requirement for phosphorus management plans in priority sub-catchments) and a "lighter" regulatory approach to nitrogen management, by working in collaboration with the region's landholders, communities and industries to find nutrient loss reduction solutions that are practical and affordable. This is consistent with the approach proposed in the third LAWF Report (October 2012) for a catchment in an under-allocated situation as shown in figure 1. More details on the considerations behind the proposed approach can be found in the Section 32 report.

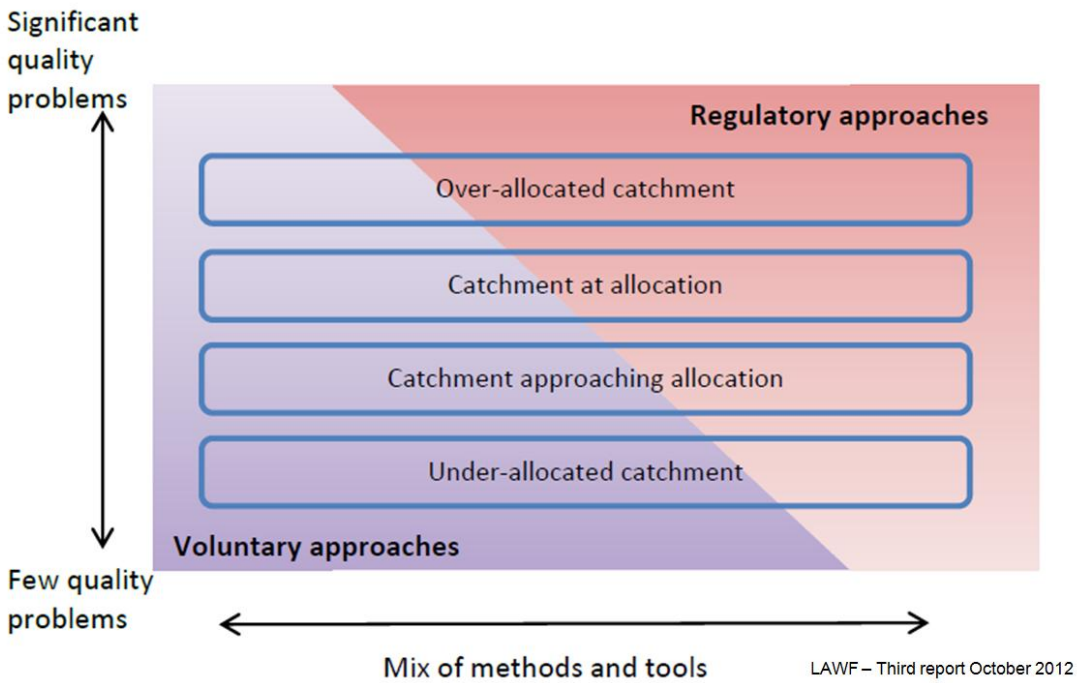


Figure 1. Preferred approach in response to resource pressure (LAWF 2012)

There are a number of critics of the potential effectiveness of a non-regulatory or voluntary approach to addressing water quality issue within the community. For example, section 5-9 of the Environment Court's One Plan decision states that "history suggests plainly enough that alone [voluntary approaches] do not suffice to effectively deal with the problem".

However literature and experience suggests that voluntary approaches can and have been successful at achieving agri-environmental outcomes. Where these approaches have worked a number of common themes exist –

1. Credible enforcement threats that regulators can fall back on if non-regulatory approaches fail (such as Policy TT5(2)(c) in Change 6).
2. A strong monitoring, evaluation, reporting and improvement process.
3. Some form of peer sanction for underperformance. Preferably carried out by industry groups.

   Dowd et al (2008), Sin (2012), and Barnes et al (2012).

Two other factors are critical to the success of a non-regulatory approach and that is participation in the processes by landholders and industry groups and institutional commitment and support of the non-regulatory process.

1. There a typically three main motivators to participation in a non-regulatory or voluntary process and they include

a) An environmental stewardship ethic – a personal commitment to sustainable environmental management.

b) Market based incentives – environmental protection will increase when the bottom line to farmers is improved through participation.

c) Government based incentives – these can be in the form of financial incentives, subsidies, penalties or fines.

Dowd et al (2008).

The approach proposed by HBRC, as articulated in the section 32 report, requires the development and implementation of Industry Good Practice (IGP). It is noted that Change 6 also incorporates two review dates when HBRC will review the need to increase the level of regulation if insufficient progress is being made.

2. Organisational commitment to a non-regulatory process is a vital element of its success. Non-regulatory approaches can become the preferred approach when no clear solution is apparent or the transactional cost of regulatory approaches are too cost prohibitive for the organisations proposing them. Potentially this can result in an unrealistic expectation on the process, setting it up to fail at the start. Alternatively, in an attempt to save costs, the resourcing of the non-regulatory approach is kept to a minimum effectively handicapping the ability of the approach to utilise the variety of tools and mechanism that now exist to support the voluntary adoption of agri-environmental programs.

2.2. Phosphorus focus

While the catchment is largely under allocated in terms of N, this is not the case for phosphorus (P) where in a number of sub-catchments (figure 2) in-stream Dissolved Reactive Phosphorus (DRP) levels exceed the targets proposed within Change 6. The management of P in the landscape requires a significantly different approach to that of nitrogen (N) making it difficult to control phosphorus losses through permitted activity conditions (or conditions on resource consents).

Significant phosphorus loss from farms is characterised by being concentrated in localised areas, typically comprising less than 20% of a catchment area (McDowell et al 2004). These areas have commonly become known as critical source areas (CSA's). The P loss from these CSA's is largely associated with soil loss or run-off and tends to be episodic with large pulses of P typically generated by discrete storm events. Controlling the P loss requires an understanding of where and when P and soil is mobilised at a paddock scale. To control this P loss, mitigation practices need to be sufficiently targeted within the critical source area to be effective and appropriately cost effective for landholders to readily adopt (Monaghan 2009). The selection of appropriate mechanisms to meet these needs is highly site specific and cannot be readily prescribed at a regional or even catchment level.

2.3. Sub-catchment nutrient over-allocation (hotspots)

The state of phosphorus loss within the Tukituki Catchment is characterised by a number of catchments contributing a significant proportion of the whole of catchment P load, as shown in figure 2, which highlights those sub-catchments where in stream DRP concentration is greater than the Change 6 Table 5.9.1 targets. These "hotspot" sub-catchments are priority areas for the non-regulatory implementation response, details of which are discussed on page 17.

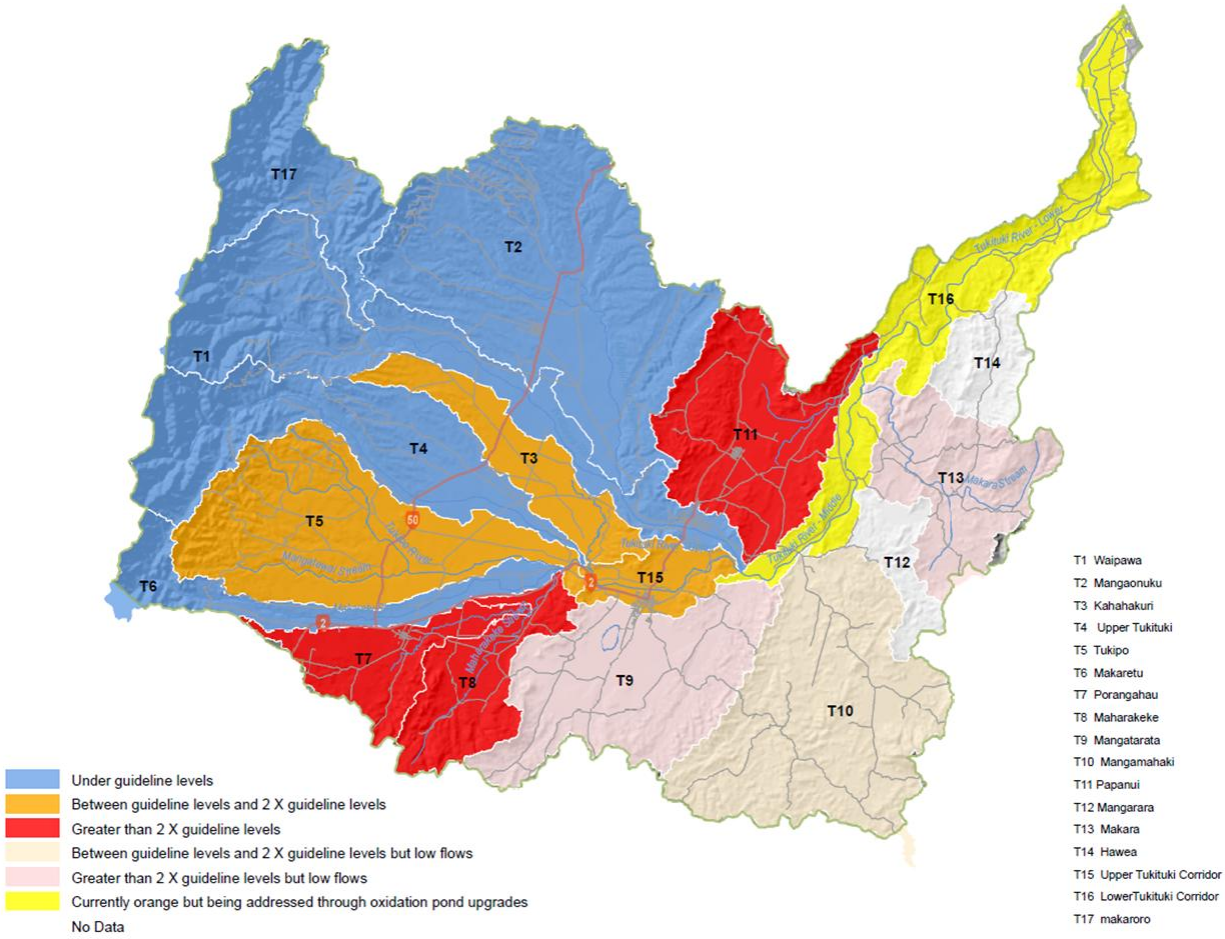


Figure 2. Dissolved Reactive Phosphorus levels relative to targets within sub-catchments of the Tukituki Catchment

Within these sub-catchments there is a need to "claw-back" or mitigate existing levels of P loss as articulated by Objective TT2 of Change 6. While these excessive P loss sub-catchments will be where the initial program emphasis will be directed, some sub-catchments could be targeted for excessive nitrogen leaching, *E. coli* or deposited sediment (% sediment cover on gravel stream beds) levels, based on their relative contribution to overall catchment loads and limits.

2.4. Proposed Ruataniwha Water Storage Project

The proposed Ruataniwha Water Storage Scheme (RWSS) will have a significant influence on the implementation approach if it progresses. Potentially most of the significant intensification to occur within the Tukituki catchment will be linked to new irrigation. This will enable HBRC to target programs and processes around where, when and by how much changes in land use intensity are likely to occur, allowing for a co-ordinated mitigation of that land use intensification. Additionally, other mechanisms to influence the adoption of Industry Good Practice through the contractual arrangements around irrigation water supply create additional levers to incentivise good practice.

The draft Production Land Use Conditions for the RWSS outlines the approach the RWSS will employ to ensure that intensification of land use generated through the provision of irrigation water is minimised and the processes that will be used to adaptively monitor, manage and mitigate any issues should they eventuate. Alignment of processes between the implementers of the Change 6 non-regulatory approach and the RWSS is vital given the significance of the potential for intensification with the RWSS and synergies between the proposed activities of both processes.

If resource consents are granted for the RWSS and its construction is committed there is a requirement under conditions proposed by HBRIC to implement an Integrated Mitigation and Offset Approach which includes provision for the spending of over $7 Million over 30 years on 4 identified projects, including $50,000 per year on spring fed stream enhancement and phosphorous mitigation in priority sub-catchments.

This would supplement other existing programmes and funding inputs under the TCIP.

2.5. Adaptive Management and flexibility of approach

The TCIP provides a template of the processes proposed to implement the rules and policies of Change 6 and support the draft Conditions of Production Land use for the RWSS process as they exist in their current state. There is the potential for these to change through consideration of submissions on the plan change or the RWSS consent application process. Additionally, significant biophysical and socio-economic diversity exists within and between catchments which is influenced by a range of internal and external drivers that vary over time, for example changing seasonal climatic conditions and commodity prices.

Increasingly contemporary natural resource management (NRM) is advocating the use of adaptive management to deal with problems that are complex and which have a degree of uncertainty around the biophysical responses to the management solutions applied. It is a process of learning by doing, which combines the need for immediate action with a plan for learning. 3 key principles drive an adaptive management approach:

a) An analysis of management options to enable considered decision making.

b) A sound and detailed monitoring, evaluation, reporting and improvement program and plan.

c) The ability to compromise with groups with differing values.

Westgate et al (2013) and Williams (2011).

What is often cited as a significant reason for the failure of adaptive management is organisational inflexibility in processes that allow adaptive management to occur Williams (2011). The monitoring, evaluation, reporting and evaluation (MERI) plan will articulate how Council and key stakeholders will be kept informed of the TCIP progress towards achieving the objectives stated. Indicators will be used to signal a need for a reassessment of direction and consideration of alternative management approaches when and where they may be required.

3. OVERARCHING APPROACH

The Tukituki Catchment is the first of what will be an on-going process of catchment based plan changes to the Hawke's Bay Regional Resource Management, Plan in response to the Central Government's National Policy Statement for Freshwater Management (Ministry for the Environment 2011). In many ways, from a non-regulatory perspective, the Tukituki Catchment Change 6 offers an opportunity to "pilot" an approach to achieving water quality objectives which, can then be rolled out in other catchments.

The scale of farming practice change required to reduce P losses will be significant in some areas, and the non-regulatory process in particular will rely heavily on strong alliances with the primary industry sector. The HBRC plays an active role in the Strategic Farming Initiatives Pan Sector Group and this group will play a critical strategic role in the development and implementation of a co-ordinated process to the wider adoption of IGP within the farming community.

The initial focus of the implementation process in the short term (1-2 years) is catchment wide, developing the necessary mechanisms, alliances and processes required to assist landholders

understand and transition to the new policies and rules within Plan Change 6. Additionally, the development and implementation of processes to promote and influence the wider adoption of IGP throughout the Tukituki Catchment will be developed. Within the priority sub-catchments, characterisation of biophysical factors influencing water quality and the socio-economic conditions of the community that could impact on their ability to make the necessary land management changes will be identified and community stakeholder groups formed. Indicators of Change 6 and TCIP driven change will need to be benchmarked to enable considered and consistent reporting via the monitoring, evaluation, reporting and improvement (MERI) framework.

In the medium term the focus will be on the sub-catchment priority areas that are contributing significantly to the water quality issues within the Tukituki Catchment. Sub-catchments will be the priority area of operation for the HBRC land management teams (LMT's) activities and Regional Landcare Scheme (RLS) investment and will require strong relationships with a wide range of stakeholders within these catchments to be effective.

Ultimately, in the long term, measured farming practice change needs to occur at a paddock scale. Where sub-catchments are exhibiting excessive nutrient losses, mitigation practices need to have been adopted, and for the rest of the catchment nutrient budgeting and phosphorus management plans adopted and good agricultural practice being employed. The HBRC MERI plan will play a key role in measuring and monitoring the success at this scale of Change 6 and the implementation process.

The approach taken in Change 6 is to develop policies and rules that support the effectiveness of a non-regulatory approach by providing incentives to landholders, communities and industry groups to be involved in the implementation processes proposed in the TCIP. Existing land use will remain a permitted activity if industry developed indices of IGP and nitrogen conversion efficiency (NCE's) are met by 2020. If individual landowners do not comply with that requirement, then land use consents will be required.

4. IMPLEMENTATION PROCESS PLAN

Five key programs are being developed to support the implementation of Change 6. These are based around the short term need to provide transitional support to landholders adapting to the new policies and rules contained within Change 6 and the medium term programs to target a co-ordinated and collaborative approach to driving the adoption of Industry Good Practice throughout the Tukituki Catchment. An additional program will focus on targeting priority sub-catchments where existing nutrient losses are beyond the proposed targets within Change 6. Each of these processes is discussed in more detail below.

The consolidated timing of activities and processes proposed within the TCIP to effectively deliver on the outcomes and objectives of the process are shown in table 5, page 30. Key policy deadlines and milestones within Change 6 have been highlighted in yellow to provide the appropriate scheduling context.

4.1. Stock exclusion

The primary regulatory mechanism for reducing phosphorus in waterways in Change 6 is through the provision of a stock exclusion rule. This rule will require all landholders –

a) On land that is less than 15 degrees in slope; require livestock to be excluded from lakes, wetlands and permanently flowing rivers and their margins by 31 December 2017 and intermittently flowing rivers[1] and their margins by 31 December 2022;

b) On land that is greater than 15 degrees in slope and where the stocking rate exceeds 18 stock units per hectare; require livestock to be excluded from lakes, wetlands and permanently flowing rivers and their margins by 31 December 2017 and intermittently flowing rivers and their margins by 31 December 2022.

c) Require stock races crossing rivers and streams to be bridged or culverted by 30 June 2017;

Estimates of the amount of stock exclusion required have been determined from work undertaken by Water Sciences Group within HBRC. The degree of stock disturbance of riparian margins was estimated through remote sensing (Fiona Cameron pers comm HBRC 2013). The assumption has been made that where there is minor to no stock disturbance recorded, mechanisms exist to exclude stock. Categories have been consolidated to represent where stock exclusion potentially exists and where it doesn't. Approximately 2,250 km of waterways within the Tukituki catchment are classed as moderately to highly disturbed, which if it is assumed that 1 ½ sides of each waterway required fencing to effectively exclude livestock, would equate to an estimated cost of $10,125,000.

Figure 3 below shows that there is significant variability between sub-catchments on the degree of stock disturbance that occurs. There is also some correlation between the degree of stock disturbance and the DRP concentrations in-stream within the priority sub-catchments with the Porangahau, Maharakeke and Papanui sub-catchments having 77%, 87% and 61% respectively of riparian margins with high stock disturbance.

Table 1 shows the dominant Land Use Capability Classes for sub-catchments where existing DRP concentrations are greater than guideline levels and the phosphorus load is a significant contributor to the overall Tukituki catchment P load. For the majority of these catchments, LUC classes 1-4 dominate, with a low proportion of class 7 hill country, suggesting that the direct effect of livestock in these areas is likely to be associated with intensive land uses. The total distance of river margin classed as highly disturbed within these sub-catchments is significant, suggesting the contribution of stream bank disturbance and direct deposition of dung via livestock to in-stream DRP concentrations in these catchments is likely to be significant.

[1] An intermittent river does not flow continuously but has a bed that is predominantly unvegetated and comprises sand, gravel, boulders or similar material.

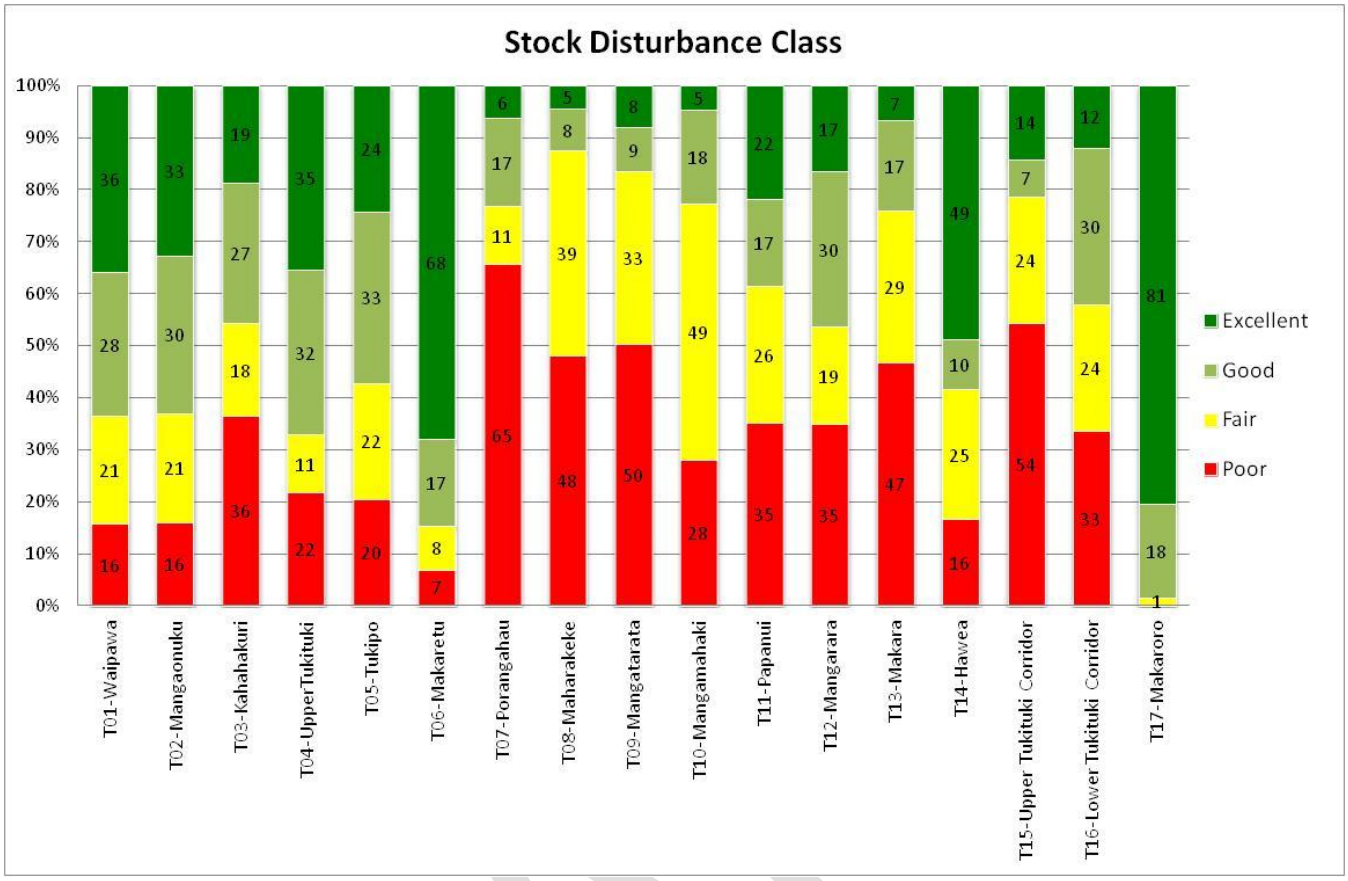


Figure 3. Condition of riparian margins as affected by stock disturbance within the Tukituki Catchment (F.Cameron & B. Lynch, HBRC pers comm 2013)

Table 1. Riparian margin condition, % of LUC classes and estimated costs of exclusion for priority sub-catchments

	Papanui	Porangahau	Maharakeke	Tukipo	Kahakuri	Upper Tuki corridor
% of Riparian zone categorised as moderately to highly disturbed	61	77	87	43	54	78
% LUC Class 1-4	57	79	49	69	81	32
% LUC Class 7>	1.2	0.4	0.8	10.6	0.2	41.5
Total length (km) of 2nd-4th order streams	282	124	131	471	148	46
Total length of streams classed as moderately to highly disturbed	173	105	114	201	81	34
Estimated sub-catchment cost – assuming $3 / m fencing on 1.5 sides.	$778,500	$472,500	$513,000	$904,500	$364,500	$153,000

Table 1 shows an estimate of the potential cost for implementing the stock exclusion rule. Within the Porangahau and Papanui sub-catchments for example it is estimated that approximately $472,500 and $778,500 respectively will be required to exclude stock. This is approximately $4,500-$6,400 in fencing related costs per landholder on average within these catchments.

In response to the rules and scale of change required and the significance of stock exclusion on decreasing in-stream DRP levels, the following objectives have been identified as requiring HBRC support –

a) Awareness raising around the rule changes and the interpretation and implementation of those rules in an on-farm context, will be a short term priority. It is anticipated that initial landholder demand for advice and support will be relatively slight but will escalate markedly as the deadlines for having stock exclusion implemented approach. A number of workshops/on-farm demonstrations are proposed over the next 12 months particularly in sub-catchments where there is a high proportion of the sub-catchment un-fenced. These workshops will become part of an overarching communication strategy to the plan change currently being developed by the HBRC's Communications group.

b) Consenting requirements where the conditions of the permitted activity rule cannot be met. This will require a collaborative effort between both HBRC Land Management and Consents sections as consideration of the practicalities and alternatives to fencing for the farm system may initially be required when processing a consent.

c) Provision of RLS support for stock exclusion will be prioritised to projects that add to the water quality outcomes additional to those obtained through stock exclusion alone. This funding will be primarily targeted within the sub-catchment hotspot areas.

d) In areas of greater than 15° slopes and less than 18 su / ha, emphasis on the need to keep stock out of waterways will be promoted through the Industry Good Practice process. In areas being cultivated, the importance and provision of cultivation setbacks to minimise the risk of sediment contamination of rivers and streams will be promoted as part of IGP.

e) A working group will be formed within HBRC over the next 3 months and will include members of the HBRC science and land management groups and external experts to identify priority areas for targeting the Land Management Team's soil conservation program at areas of high sediment loss impacting on priority streams and waterways within the Tukituki catchment. It is proposed that these areas will become the priority focus of the LMT's pole planting program over the next 2-3 years.

f) Benchmarking and on-going MERI on the state of stock exclusion over time will be important to inform plan change effectiveness. Some initial benchmarking has been carried out as shown in the tables above. Processes to monitor changes going forward will be incorporated into the overarching Tukituki MERI plan and will integrate with the existing HBRC Riparian Monitoring Project 339 202, which is looking at developing a MERI framework for monitoring and reporting on riparian margin quality.

g) Dealing with auditing and non-compliance to the stock exclusion rule is primarily the responsibility of HBRC compliance team. Given the area of the landscape influenced by this rule change, it cannot be viewed as a task for this group alone. Ultimately the requirement for this task is 5 years away and is likely to be driven by complaints and detailed auditing of sub-catchments in response to established MERI indicators to be developed in the HBRC Tukituki MERI Plan.

Operationalising this process will require a co-ordinated response from the HBRC's Land Management, Science, Consents, Compliance and Communications Teams. The potential lag of landholder demands for stock exclusion adoption support following on from the notification of Change 6, enables a more detailed consideration of the relative roles, responsibilities and resourcing issues to be articulated collectively between these groups. This will be undertaken over the next 6 months.

4.2. Nutrient Budgeting, phosphorus management planning and farm environmental management plans

Nutrient budget (NB), phosphorus management plans (PMP) and farm environmental management plans (FEMP) are the primary mechanism by which, individual landholder compliance to regulations and rules and contribution to both the in-stream load and nutrient mitigation effort are quantified. The use of nutrient models is how nutrient loss from the landscape and nitrogen conversion efficiency is calculated. The Change 6 Section 32 report considers the models currently in use in New Zealand. The model likely to dominate nutrient budgeting in the pastoral sector and for most other industry sectors for at least the short to medium term is the Fertiliser Association of New Zealand, Ministry of Primary Industries and AgResearch developed and owned OVERSEER® model.

Data input consistency is vital in nutrient budgeting. This applies not only to the management and farm input data as used by landholders, but also to biophysical information like soil type, slope and climate information. Information incorrectly entered at the initiation of an on-going monitoring process can significantly impact on the accuracy of output data produced. In this light, a significant consideration in the short term will be in developing consistent protocols for data entry across the Tukituki catchment in collaboration with the fertiliser industry and other nutrient budget providers. It is anticipated that given the rapidly increasing demand for nutrient budget information throughout New Zealand, this will be occurring at a national scale. Establishing protocols and systems that enable much of the preparation of farm biophysical (and potentially management information) to be automated will significantly reduce the time taken to prepare nutrient budgets, which is vital given the number of budgets required. Individual landholders are required within Change 6, Rule TT1(b) to retain farm records that will enable them to accurately prepare nutrient budgets retrospectively from 2013 onwards. An awareness raising program will be developed in collaboration with the HBRC Communications group to ensure all landholders are aware of this rule.

Change 6 and the draft RWSS "General Conditions – use of water for production land use" have identified the need for five main forms of nutrient budget, phosphorus management plan and farm environmental management plan and these are described and defined in Change 6 and discussed in more detail below.

a) Nutrient budgets for benchmarking purposes – In Change 6, Land Use and Water Quality rules TT1 (a) and (c) outline that land users who are potentially leaching greater than 15 kg nitrate-N ha / yr or whose land use practices based on more than minor variances on average leaching rates for the whole farm as modelled by Overseer will need to prepare a nutrient budget benchmark. The allowable variance on either of these benchmarks to maintain permitted activity status is the lesser of an increase of 10% or 5 kg N on benchmarked or 15 kg N / ha yr leaching losses.

   The nutrient budget accuracy to provide this information is significant and will require detailed and accurate data entry and consideration. Estimates for the time taken to prepare nutrient budgets for benchmarking purposes have been obtained from Bay of Plenty Regional Council (Alistair McCormack pers comm. 2013) and Waikato Regional Council (Natasha Hayward pers comm. 2013). Nutrient budget benchmarks typically take between

15-30 hours to complete per budget, but in some circumstances, landholders with complicated crop rotations or numerous and diverse property blocks could exceed 40 hours per budget. Industry estimates of the time taken to do these nutrient budgets are significantly less. Provided farmer information is at hand and consistent base data protocols are in place, time taken per budget could be between 6-8 hours for a sheep and beef property and 4-6 hours for a dairy unit (Ants Roberts & Mike Manning, Ravensdown Fertiliser per com 2013). The level of operator competency in carrying out these detailed budget benchmarks is a significant consideration in building market driven nutrient budgeting capacity in the region. The time frame for these nutrient budgets are by 2018 for properties leaching more than 15 kg N/ha/year and at the time of the proposed increase in nitrogen leaching rates.

b) Nutrient budget for auditing purposes – for land users losing greater than 15 kg N ha / yr, rule TT1(c) requires that these budgets will be updated at 3 yearly intervals post 2018. Provided these nutrient budgets have been undertaken correctly in the first instance, it will require approximately 1.5-3 hours to update each nutrient budget.

c) Phosphorus management plans – are the primary means for the identification, assessment and management of risk to water quality of P loss from farms within the priority sub-catchments. It is within the PMP that the management of the spatially discrete and episodic nature of P loss is articulated. The mechanisms by which this occurs and the management responses required to address this P loss differs by land use. There are already existing industry templates and protocols that address these issues well (Coubrough et al 2012) and the preferred approach by HBRC is that industry groups deliver and manage the development and implementation of the PMP's by sector within the priority sub-catchments.

   Phosphorus management plans can be carried out as a group process, with an industry facilitator and support from HBRC and typically would take between 4-8 hours to carry out (using the Beef & Lamb LEP 1 & 2 as an example). The scheduling for completion of PMP's by sub-catchments is described in the Land Use and Water Quality rule TT1(e) of Change 6. Failure to complete a PMP by this date would result in a change to the permitted activity status of that land use and would then require a consent.

   Phosphorus management plans are an essential component of the development of a sub-catchment nutrient management plan. It is through the individual PMP's that on-farm critical source areas are identified and articulated as requiring potential incentivised support to mitigate. No RLS investment will be provided to landholders who do not have an active PMP. The process of PMP development by individual landholders will be supported by the priority sub-catchment program through the provision of farmer workshops and field days by HBRC, that will incorporate the use of external experts and existing methodologies (McKergow & Tanner 2011), to assist landholders develop their property based phosphorus management plans.

d) Industry nutrient loss benchmarks – it is estimated that between 750 – 850 land users within the Tukituki catchment leach less than the 15 kg N ha / yr. In the Tukituki scenario where the majority of the catchment is under-allocated in nitrogen but over allocated in phosphorus, resourcing to influence practice change needs to reflect the realities of the task at hand. For these land users, the expectation is that they will be benchmarked against industry standards and protocols that articulate the annual average N losses by sector. Random auditing will be used to check compliance to these standards.

e) Farm environmental management plans – are currently being developed as part of the draft RWSS "General Conditions – Use of Water for Production Land Use". The FEMP's will provide a comprehensive risk assessment and articulation of management responses to address this risk, of land users who utilise water from the RWSS. The FEMP's include nutrient budget benchmarks pre and post scheme irrigation water supply, and nutrient budget audits every two years after that. Auditing of the FEMP's is extensive and will be annually for the first three years, by which point, if conditions within the FEMP's have been met, audits will occur every three years.

   Any increase in nitrogen leaching that trigger a need for a resource consent on land not within an Irrigation Scheme area will also require the preparation of a Farm Environmental Management Plan.

Table 2 below outlines an estimate of the number and costs of nutrient budgets and phosphorus management plans as described within Change 6. Figures for the cost of FEMP preparation and the co-ordination and collection of industry nutrient loss benchmarks have not been considered.

Table 2. Estimate of the number and cost of nutrient budgets and phosphorus management planning as required by Change 6.

	Time taken (per NB / PMP)	**Estimated number required in the Tukituki catchment**	**Estimated cost[1] ($/budget)**
Nutrient budget benchmarks (by 2018)	@ 15-30 hours *@ 4-8 hours*	500-600 by 2018	**$1,050 – $3,000** ***$280 - $800***
Nutrient budget – audits (3 yearly – post 2018)	1.5-3 hours	500-600 every 3 years post 2018	**$150 - $300**
Phosphorus management plan (priority sub-catchments)	~ 4-8 hours	XX Papanui XX Porangahau XX Maharakeke XX Tukipo XX Kahahakuri XX middle Tukituki Corridor	Assuming 20 people per workshop x 2 workshops (8 hours) **~ $200 / PMP**

[1] Costs of nutrient budget preparation has been estimated based on an assumed rate of between $70-100 / hr

Currently the main providers of nutrient budgets are fertiliser industry representatives and a small number of private consultants. Approximately 3-3.5 fertiliser industry staff operate within the Tukituki Catchment and one private consultant who have undertaken the "Sustainable Nutrient Management" course provided by Massey University. Within HBRC, 6 staff have completed the course to an intermediate level and one to an advanced level. There is currently a shortfall between the numbers of accredited nutrient budgeting providers and the number of nutrient budgets required within the Tukituki catchment given that no staff are dedicated solely to the delivery of nutrient budgets. Using the assumptions in table 2, it is estimated that between 5-12 additional full time provider equivalents would be needed to undertake 500-600 nutrient budgets benchmarks if they were required in one year and between 1-2 full time providers to complete a nutrient budget for auditing purposes.

Within Change 6, Land Use and Water Quality rule TT1(c) states that a nutrient budget must be provided by those necessary prior to 1 July 2018 and updated at three yearly intervals after that. These are not all required at once, and over the next 5 years, there is a significant opportunity in the marketplace to build the nutrient budgeting capacity to meet this need, while at the same time significantly reducing the time required to carry out nutrient budgets through the development of improved nutrient budgeting protocols and processes.

Nutrient budgeting will not be a task undertaken by HBRC staff although there may be a need to provide some short term transitional support in the marketplace if nutrient budgeting demand exceeds the existing industry capacity to supply nutrient budgets. There is an opportunity to consider incentivising the development of the nutrient budgeting capacity within the Tukituki catchment by potentially providing some financial support to additional people doing a "Sustainable Nutrient Budgeting" course at Massey University. The intermediate course costs $1,300 + GST and requires 3 day on-campus attendance and up to 40 hours of work in preparation for the course. The advanced course costs $1,850 + GST, also includes a compulsory 3 day on-campus component and up to 160 hours of additional work.

Protocols for the on-going auditing of compliance to nutrient budgets and phosphorus management plans will need to be developed over the short term. There is the need to establish protocols for data management that enable both compliance and MERI targets outcomes to be easily obtained from the consolidated nutrient budget and phosphorous management planning information.

4.3. Monitoring, evaluation, reporting and improvement (MERI) Plan

A strong non-regulatory approach requires a considered MERI plan and process. The diversity of biophysical and socio-economic issues and drivers between and within the sub-catchments of the Tukituki Catchment requires an approach that can actively and adaptively respond to challenges and barriers as they emerge. Indicators to signal the need for adaptation are an inherent component of MERI plan and process.

A potential lag exists between the response times of measured water quality improvement and the adoption of improved land management practices. This can create significant tension between those implementing practices to achieve the outcomes and those who have an expectation of rapid and wide scale water quality improvement. Lag can occur in a number of forms –

a) Variable travel times through the flow paths by which nutrients travel to waterways i.e. from groundwater, and via the vadose zone.

b) Response times of the decline in the concentration of nutrients within the nutrient source areas.

c) Landholder ability and willingness to respond to policy and rule changes.

d) The time taken for mitigation practices e.g. riparian strips, and wetlands to become fully effective after establishment.

e) The time taken for in-stream responses to occur to a changed nutrient input and the potential for lag that exists within the hydrological systems, for example existing P enriched sediment contributing to stream load.

Meals et al (2010).

The factors above can all contribute to a significantly different response time in water quality improvement between sub-catchments of the Tukituki. Potentially, where improvements are slight or slow, disillusionment and even abandonment of effort may occur by those who are adopting practices to mitigate those water quality issues. At a sub-catchment level, a MERI plan needs to consider, measure, monitor and communicate to the wider stakeholders –

a) Community engagement effectiveness i.e. number of events, numbers of participants, and the potential impacts on landholder behavioural change in response to event participation.

b) Attitudinal change of landholders making the land management changes – for example their knowledge, skills, aspiration and attitudes to water quality and adoption of Industry Good Practice. Rockwell and Bennett (2004).

c) Changes in land use practices adopted on-farm.

d) Changes in other biophysical indicators that influence nutrient loss – for example erosion incidence and sedimentation, soil compaction, and Olsen P levels.

e) The location and number of water quality monitoring points in relation to the where significant land use change is occurring.

The MERI plan needs to show clear and logical cohesion between both the Plan Change and policy effectiveness and the effectiveness of the programs and mechanisms employed to achieve those policies. It is proposed that a cross-organisational and collaborative industry MERI plan will be developed as a priority within the next 6 months. This will be linked to a developed program logic across HBRC groups. MERI planning is often a balance between what could be measured and what can be measured both logistically and cost effectively. HBRC will consider strategies and synergies both within HBRC and with our external stakeholders in the development of the MERI plan. Consideration to the resourcing required to affect this process will be part of the MERI plan development as it will require additional staff time and resourcing to plan, implement and report on an on-going basis.

4.4. Sub-catchment over-allocation mitigation

The proposed process for mitigation of excessive nutrient loss in priority sub-catchments is discussed below. A pilot program is being considered in the Porangahau sub-catchment to both establish and trial the tools, methods and practices to be used in other areas to successfully engage the active participation of community stakeholders into managing water quality issue within their sub-catchment.

The specific processes and practices to be employed in this approach will be articulated in more detail through the collaborative development with the community stakeholders concerned, of a sub-catchment management plan. Potentially, where nutrient loss is significant, the successful mitigation of these issues may require solutions that cross multiple property boundaries, occur on public land or cost more than the ability of individual landholders to address. In this situation the sub-catchment plan may help to co-ordinate a collective approach to managing these areas and suggest external investment is targeted at these priorities first.

Regardless of the specifics of the ultimate approach adopted within these sub-catchments, five key elements will need to be addressed for an effective process to occur and these include –

a) Catchment characterisation and benchmarking.

b) Community engagement, participation and governance groups

c) Capacity building and on-farm implementation of IGP

d) Practice change mechanisms and financial support.

e) Monitoring, evaluation, reporting and improvement.

4.4.1. Catchment characterisation and benchmarking

The first issue to be addressed within these sub-catchment hotspots is to understand the relative ambient and anthropogenic contribution to the in-stream P concentration and this directly determines the proportion of stream load that is effectively "manageable". Manageability is also a socio-economic consideration as well. Sub-catchments where the amount of mitigation required to bring in-stream P levels back within limits is large are likely to be beyond the capacity of private landholders to individually meet the targets required. The catchment characterisation process will enable HBRC to predict the potential level of on-farm and external investment that may be required to affect change within these sub-catchments. This will include –

a) A detailed investigation and characterisation of the water quality issues and from where in the catchment nutrient loads are coming from.

b) The identification of potential critical source areas within the landscape of each sub-catchments through the assessment of remotely sensed imagery, LiDAR and the use of models that are currently in development for identifying CSA's at a farm scale. The use of local knowledge will play a key role in identifying where these potential source areas exist on farm.

c) Modelling, potentially through the use of TRIM2, to identify the amount of reduction that is required to achieve in-stream targets.

d) An assessment and benchmark of the land use practices currently employed by the sub-catchments landholders.

e) A survey and benchmark of the sub-catchment communities knowledge, aspirations, skills, and attitudes (KASA) to water quality, which will be a essential component of the on-going monitoring process and indicator for program success.

f) An assessment of the key drivers and barriers to the adoption of Industry Good Practice within each sub-catchment and the potential response to different practice change mechanisms

HBRC Water Quality and Land Scientists will play an important and significant role in helping quantify the biophysical properties of each sub-catchment. It is proposed that HBRC will seek external support for the development of protocols around land use, KASA and market needs survey approaches.

4.4.2. Community engagement, participation and governance groups.

The process proposed is to spend time prior to the initiation of a formal pilot program talking to a number of key stakeholders within each catchment with the aim of building up relationships and understanding of the community drivers, networks, key stakeholders and expectations for engagement. Through this process, a group of stakeholders representing a range of perspectives within the sub-catchment will be asked to participate as a governance group to guide the development and implementation of the sub-catchment process.

Engaging and raising the awareness of the wider sub-catchment community will need to consider the relative expectations on landholders and of the wider community. It is possible that some landholder/primary sector specific awareness raising may be required as a lead in to the wider community engagement process.

The aim of the wider community engagement is to both raise awareness and commitment to addressing water quality issues and to assist the sub-catchment stakeholder group develop a sub-catchment plan for each priority area that incorporates the community's expectations, goals, roles and responsibilities. Lees et al (2012) & Woodcock & Brown (2005).

The facilitation of these community engagement processes and stakeholder groups will be the responsibility of the recently employed Catchment Facilitator within the HBRC LMT, whose role it will be to co-ordinate the processes required to create sub-catchment plans and respond to the needs of the communities within these sub-catchments. It is anticipated the external expertise and independent facilitation will be required from time to time to assist in these processes.

4.4.3. Capacity building and on-farm implementation of IGP

Ultimately the priority focus of the sub-catchment process is to provide tools and resources for landholders within these catchments to make the desired changes to land management and create their own phosphorus management plans that will lead to the achievement of in-stream targets and objectives.

HBRC proposes to take a participatory active research approach to this process, with the organisation and running of workshops and events tailored to the needs of landholders within each sub-catchment. HBRC will collaborate significantly with industry groups in providing these activities. External and local expertise will be sourced to assist disseminate and context information, and assistance will be provided to enable landholders to create their own phosphorus management plans that articulate a cost effective implementation process. Where possible, HBRC will use industry sector specific templates and protocols for phosphorus management planning to achieve this outcome.

4.4.4. Practice change mechanisms and financial support

The relative mix and focus of appropriate farming practice change mechanisms to support landholders within these sub-catchments will be a key component of the planning process for each sub-catchment. A significant emphasis of this mix is likely to be around direct incentives. The LMT's Regional Landcare Scheme has already been prioritised towards providing significant financial support to this process. If the RWSS proceeds, additional offset funding will be made available to affect change within these sub-catchments. The total amount of resourcing required to affect this change within sub-catchments is currently unknown and limited given the need to invest in other priority sub-catchments as the planning processes progresses through other areas of Hawke's Bay.

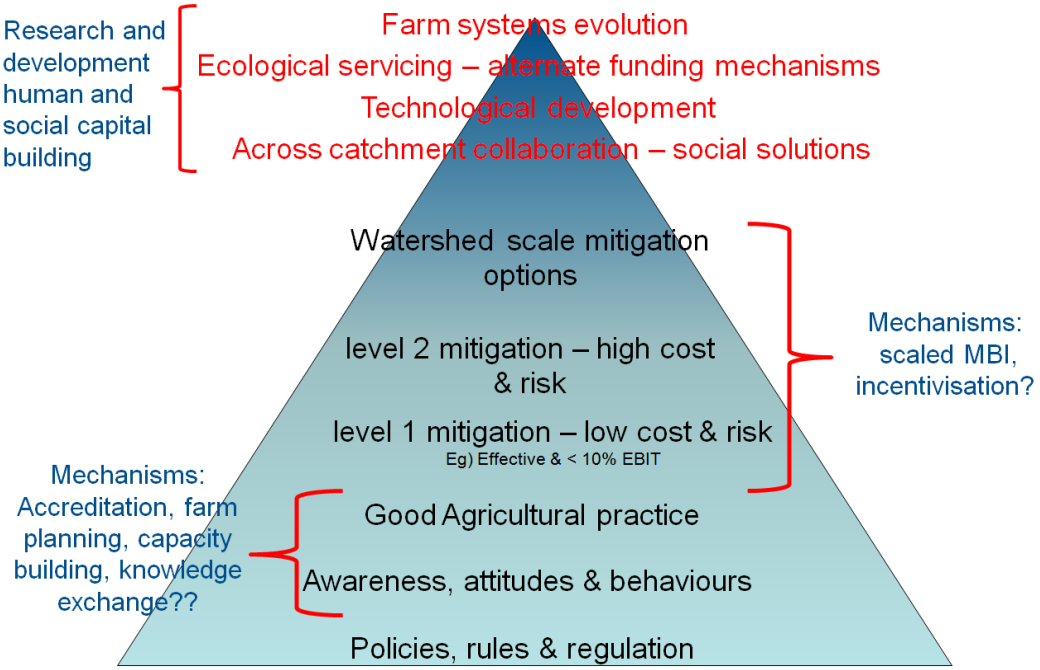


Figure 4. Increasing costs of mitigation and their relationship to practice change mechanism support.

Figure 4 proposes that within these sub-catchments, practices which are relatively inexpensive and cost effective to adopt, are readily adopted. To continue to reduce nutrient losses above this level will require some on-farm investment in specific mitigation practices and these will increasingly become more expensive depending on the amount of nutrient to be reduced, the land use type and the biophysical characteristics of the landscape where the mitigation is being adopted (Roberts et al 2012). There is an expectation on landholders within the priority sub-catchments to provide additional support and stewardship to higher value assets over and above of what is expected of other landholders in the Tukituki Catchment. These costs come in addition to any investment in stock exclusion, nutrient budgeting and phosphorus management planning, and adopting IGP's, potentially with little private benefit but significant private cost to the landholders concerned.

Table 3 shows the significant variability that exists in the cost effectiveness of different P mitigation practices. The cost effectiveness is strongly influenced by the amount of P being lost from each site and the specific factors that contribute to its loss e.g.) soil type, topography, land use etc (McDowell and Nash 2012).

Table 3 Summary of efficacy and cost of phosphate mitigation strategies (McDowell & Nash 2012).

Strategy	Main targeted P form(s)	Effectiveness (% total P decrease)	Cost, range ($ per kg P conserved)†	Cost, Waikakahi ($ per kg P conserved)†
Management				
Optimum soil test P	dissolved and particulate	5–20	highly cost-effective‡	(15)
Low solubility P fertilizer	dissolved and particulate	0–20	0–20	0
Stream fencing	dissolved and particulate	10–30	2–45	14
Restricted grazing of cropland	particulate	30–50	30–200	na
Greater effluent pond storage/application area	dissolved and particulate	10–30	2–30	13
Flood irrigation management§	dissolved and particulate	40–60	2–200	4
Low rate effluent application to land	dissolved and particulate	10–30	5–35	27
Amendment				
Tile drain amendments	dissolved and particulate	50	20–75	na
Red mud (bauxite residue)	dissolved	20–98	75–150	na
Alum to pasture	dissolved	5–30	110 to >400	na
Alum to grazed cropland	dissolved	30	120–220	na
Edge of field				
Grass buffer strips	dissolved	0–20	20 to >200	30
Sorbents in and near streams	dissolved and particulate	20	275	na
Sediment traps	particulate	10–20	>400	>400
Dams and water recycling	dissolved and particulate	50–95	(200) to 400¶	200
Constructed wetlands	particulate	–426 to 77	100 to >400#	300
Natural seepage wetlands	particulate	<10	100 to >400#	na

HBRC is currently reviewing how the RLS will be used to support this change within priority sub-catchments. In particular, the possibility of changing how RLS projects are evaluated, prioritised, funded and marketed. The possibility of sub-catchment communities having a far greater role in the allocation of funds within their sub-catchments is also being considered. A well branded, transparent and effective investment process may have the potential to attract more internal and external financial support.

4.4.5. Monitoring, evaluation, reporting and investment

The MERI plan within each sub-catchment will consider two main themes

a) Benchmarking and the establishment of monitoring sites and protocols to measure change over time.

b) The measurement and monitoring of program effectiveness, including the articulation of community participation and a qualitative assessment of the impact of community participation in the program.

Given the limited resourcing for a wide scale monitoring program within each sub-catchment, it is proposed that the MERI plan targets several identified critical source areas within each sub-catchment and measures and monitors the impact of KASA change, land use practice adoption, soil and land quality indicators and water quality indicators within and on these critical source areas. The MERI plan for sub-catchments will be identified as a component of the overarching Tukituki MERI plan

4.5. The adoption of Industry Good Practice

Industry Good Practice (IGP), is an evolving suite of process based, practical measures and tools put into place by land users, sectors and industries to assist in achieving both community agreed (environmental, social and cultural) outcomes and productivity outcomes (LAWF 2012).

The significance of IGP adoption in managing water quality issues within the Tukituki Catchment is threefold.

a) The Tukituki catchment is generally under allocated with regards to in-stream nitrate-nitrogen toxicity limits. There are some localised hotspots where the toxicity limits are exceeded. To prevent this overall status from changing, which would result in a greater regulatory response, all landholders need to play a pro-active role at minimising the impact their farming practices have on water quality. Many of these on-farm management practices are common sense and widely accepted by the industries themselves. The emphasis is on seeing a greater adoption of these practices by all landholders.

b) The approach proposed enables the industry groups themselves to largely determine the appropriate IGP for different types of farming in the Tukituki catchment. Change 6 sets a deadline of 2017 for this to occur for nitrogen losses. Timeframes for the adoption of phosphorus IGP's will need to consider the review date of 2020 for a re-assessment of the approach to P management in the Tukituki catchment.

c) The wider community's expectations on water quality are likely to increase in the future. All land users need to be cognisant of this and continually improve the way production land is used, to proactively prevent potential conflicts in the future.

Recommendation 15 of the third LAWF report states – IGP should be defined and adopted in all catchments. In order to maximise the contribution from IGP's and their effectiveness as essential methods in achieving limits & freshwater objectives:

- Regional plans need to incorporate and incentivise IGP
- IGP should utilise sector guidelines and practices
- Management plans should be used as a tool
- IGP should incentivise continual improvement
- IGP should recognise and integrate good business practice with the treatment of all contaminants
- Management plans should be reviewed and changed in response to site & catchment responses
- Sector organisations should enhance their capacity to develop IGP, and provide extension, training & support
- IGP should have wide stakeholder involvement in its design and review

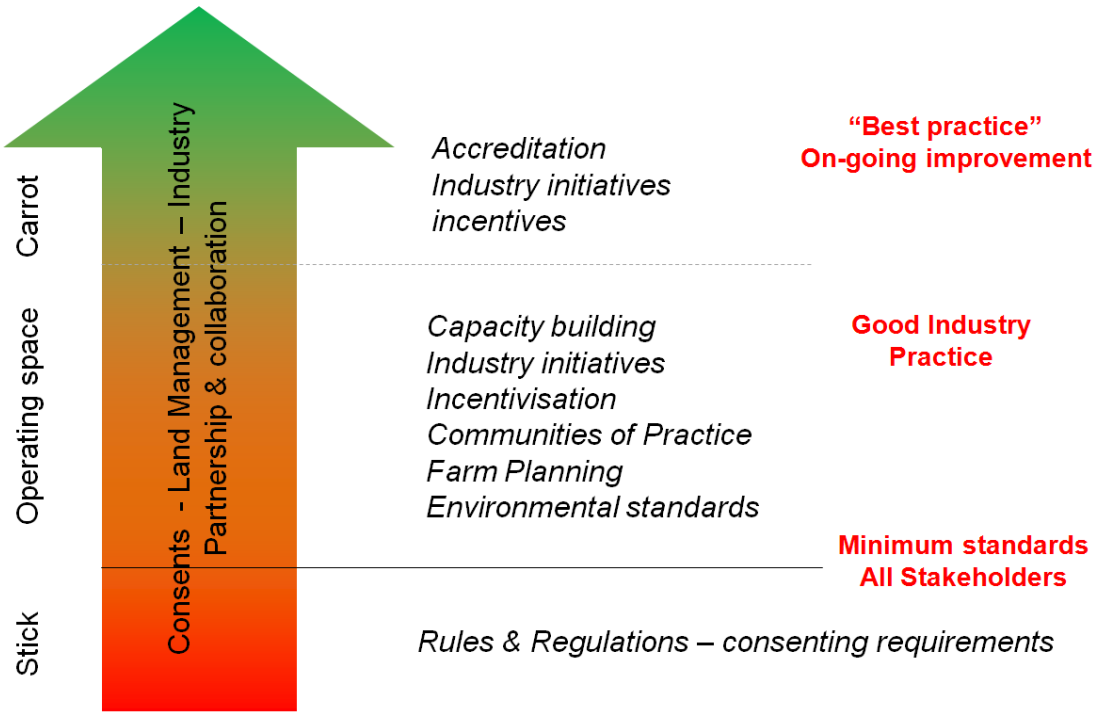
HBRC supports Recommendation 15 in principle, and will be working closely with industry groups to implement an effective and co-ordinated process to promote the wide-scale of IGP throughout the Hawke's Bay region.

Figure 5 below, summarises the conceptual approach proposed. To influence the on-going minimisation of nutrient losses from farms, a suite of policy mechanisms is required to ensure all

land users achieve a minimum environmental standard of land use practice and continue to strive for higher levels of profitable, efficient and environmentally sustainable land uses practices into the future.

Regulatory approaches are limited in their ability to drive this level of on-going improvement within primary sectors. By working proactively with industry groups to design a whole of implementation approach that considers the need for a collaborative approach to both regulation (the stick) and reward (the carrot), a greater standard of environmental improvement could be possible. This requires the clever use of practice change mechanisms and processes to promote improvement at various degrees of Industry Good Practice and a preparedness to collaborate by all involved at both ends of the practice change spectrum i.e. the stick and the carrot.

Figure 6. The need for continual improvement, collaboration and considered practice change in driving improved land management practices



How HBRC proposes to influence the wider adoption of IGP throughout the Tukituki and wider Hawke's Bay region are outlined below –

1. Providing time and space in the policy approach within Change 6 for this approach to work, while reinforcing the necessity for industry to take an active role in driving this process.

Water Quality Policy TT4 Implementing Nitrate-Nitrogen limits states that HBRC will -

a) Require industry good practices to be implemented on farms in order to minimise nitrogen losses;

b) Recognise that the Tukituki River catchment is generally in a state of under-allocation with respect to in-stream nitrate-nitrogen limits therefore:

(i) Allow a reasonable time (by 1 July 2017) for the primary industry sector to develop industry good practice nitrogen leaching rates and nitrogen conversion

efficiencies for different land use, soil type and climate, and to provide industry support to farmers to prepare on-farm nutrient budgets;

(ii) Include industry good practice nitrogen leaching rates and nitrogen conversion efficiencies in the Regional Resource Management Plan via a plan change prior to 1 July 2018;

(iii) Provide until 1 July 2018 for the managers of existing farming operations to model nitrogen leaching rates and until 1 July 2020 for them to implement any necessary changes to their farming systems to achieve industry good practice nitrogen leaching rates and nitrogen conversion efficiencies; and

Water Quality Policy TT5 Implementing the Phosphorus targets and limits

c) Requires industry good practices to be implemented on farms in order to reduce phosphorus losses;

It is proposed that a collaborative process with HBRC and primary sector groups will collectively develop over time an acceptable range of Nitrate-N losses and nitrogen conversion efficiencies using existing science and industry monitoring data and actual measured regional benchmarks of Nitrate-N losses and NCE's.

These will then be promoted as the standards by which individual landholders can benchmark their own Nitrate-N losses and NCE's obtained through nutrient budgeting and implement the necessary IGP's to ensure that their own losses fall within these industry acceptable ranges. An acceptable range enables the variability that exists within the different methods of managing production systems and the biophysical features of each property to be recognised.

2. To promote the wider adoption of IGP, and in particular practices which affect policy TT5 around phosphorus management.

To influence the wide scale adoption of P oriented IGP, HBRC will seek the support of the Strategic Farming Initiative Pan Sector Group in developing 2 keys processes.

a) A MERI framework to measure, monitor and compare IGP adoption across the Tukituki catchment - templates for this exist already that can be considered in the development of the framework. IGP is site and sector specific and critically needs to be developed and prescribed by those most familiar with the effectiveness and efficiency of the IGP process. It is proposed that an IGP framework will be developed through workshops in collaboration with primary sector Industries and regional landholders.

   A commitment to collaboratively reporting on primary sector programs, and activities and landholder participation within those programs is an important component of this framework. Significant good work is already going on within the primary sectors to promote IGP adoption, but this information does need to be captured and used to inform wider community stakeholders of both the effort and effectiveness of these processes.

   A component of the RLS budget will be directed at initiating the development of MERI framework for IGP with the primary sector.

b) A co-ordinated implementation plan and practice change approach - A wide variety of innovative approaches to promoting industry IGP already exist (Coubrough et al 2012).

Developing a collaborative process both between HBRC and industry and between the primary sector groups themselves will be an important part of promoting the wide scale adoption of IGP throughout the region. The primary sector groups have considerable expertise in the design and implementation of practice change mechanisms to support and influence landholder adoption of IGP which can be incorporated into the IGP and potentially within the sub-catchment hotspot mitigation process. It is proposed that a co-ordinated implementation plan for IGP adoption is created within the Pan-sector group that will avoid the duplication of resources, minimise the over-saturation of landholders and create synergies and efficiencies to improve the rate and extent of IGP adoption.

5. KEY STAKEHOLDERS

Strong working relationships and a collaborative approach to working with a variety of stakeholders in the development and implementation of a non-regulatory response at different scales is vital. Key stakeholders are discussed in the following section with an analysis of all stakeholders presented in table 4.

5.1. HB Pan-Sector Group and Primary Sector Industries.

This group came together in January 2012 under the auspicies of the HB Strategic Farming Initiative; a process initiated by the HBRC Economic Development Manager and Massey University. The group is well represented by 25 of the leading primary sector industry groups, agri-businesses and research agencies within Hawke's bay and nationally. The group has put together an action plan that identifies their role as having multiple economic and environmental objectives for primary production in the Hawke's Bay Region, including "*Driving uptake of best practise farming systems*"

The group has been strongly involved in the Plan Change process, coming together in various guises three times to provide input and guidance into the development of policies and rules within the Change 6. The groups impact on the development of Change 6 has been significant.

At a meeting held on 23 January 2013, the implementation processes outlined within this document was presented to the group. A formal project plan is currently being prepared for the group to consider which will focus on the collaborative development and support of a MERI framework for IGP and a co-ordinated implementation approach for wider IGP adoption.

5.2. Mana Whenua

Mana Whenua will be critically important in the stakeholder governance of water quality management throughout the Tukituki. They represent a group with a high stake in the water quality outcomes desired and an approach to water and its management that provides a degree of attachment and vision that can unite communities around a common theme

There is a significant opportunity for synergies and alignment of processes and resources with Mana Whenua to achieve the water quality objective within Change 6. Below is a brief summary of one project currently being undertaken by mana whenua within the Ruataniwha Plains. The TCIP will align with these initiatives (and others developed in consultation with Mana Whenua) to the mutual benefit of all parties concerned.

The Ruataniwha Water Project Phase One (2011-2012) - Te Taiwhenua o Tamatea successfully received Mātauranga Kura Taiao Funds from the Ngā Whenua Rāhui Komiti. The over-arching goal was to strengthen the role of kaitiakitanga amongst whānau/marae and hapū. The Ruataniwha region has numerous rivers, streams, lakes and tributaries with a rich bio-diversity, eco systems and indigenous species. The various marae/hapū associated with Te Taiwhenua o Tamatea are seeking to

restore the mauri of all their fresh waterways through the use of traditional knowledge and practices that will ensure future generations can access and enjoy the bounty of natural resources available.
Over the last eighteen months there has been a concentrated effort on gathering oral histories from Kaumatua. This has involved: identifying taonga species and recording the history of settlement on the Ruataniwha plains; describing cultural values of importance and their special relationship with the various rivers and tributaries within the takiwa of each marae and hapū; gathering other important information such as wāhi tapu sites and determining the contemporary issues impacting on the mauri, biodiversity, ecosystems and taonga species.
Marae and whānau are keen to build on the positive gains from the project which has led to the development of "Phase Two (2013-2014)" to which we have been approved further funding. This will be a continuation of the first phase to gather traditional knowledge and to undertake assessments on the mauri of the waterways within Takapau area and on the Papanui Stream. Sites will be picked for water testing utilising traditional tools (i.e. CHI, Maori monitoring tools for measuring the mauri health state) and the SHMAK kit plus developing restoration plans to improve the mauri of the waterways.

(Pers comm. Marge Hape 2012)

5.3. Sub-catchment stakeholder committees

The sub-catchment stakeholder committees will play a major role in helping co-ordinate the direction, implementation and ultimately mitigation investment within the P priority sub-catchments. For effective governance to work, a wide range of stakeholder representation will be sought to ensure the majority of views and values within each sub-catchment are represented in the planning and decision making process.

The empowerment of sub-catchment committees in decision making and community advocacy will be a key outcome of the sub-catchment process. HBRC will evaluate the opportunity for some formal governance training to sub-catchment committee members to assist in this process.

The governance groups have the potential to assist the sub-catchment planning and management process in a variety of ways including

a) Providing critical insight into networks, key stakeholders, value, community barriers to change and catchment context i.e. historical engagement with HBRC, what has worked and what hasn't.

b) Guidance in the development of sub-catchment social capital.

c) The development and co-ordination of practice change mechanisms and capacity building activities specific to sub-catchment needs.

d) Prioritisation and allocation of resources to sub-catchment projects to mitigate nutrient issues.

e) Provide advocacy and governance for sub-catchment needs in catchment wide processes.

f) Provide guidance and advocacy for motivating community participation.

g) Potentially empowered to seek further funding and investment.

The stakeholder analysis in table 4 considers the impact by key stakeholders on the effective and efficient implementation of the TCIP. For each of the major stakeholders, their position status and

degree of influence and the reasons behind that have been considered. Whether that impact is large or small and the level of participation expected between HBRC and each stakeholder group is also considered.

Table 4. Stakeholder analysis

Stakeholder group	Position (+,0,-)	Reason for position	Degree of influence on project	Expectations – HBRC will	Participation level[1]
Pan-Sector group	+	• Existing collaborative working relationship within the group • Represents the main primary sector groups within Hawke's Bay • The potential for efficient and effective collaborative processes and projects	High	• Seek collaborative support for the development of a IGP MERI framework and co-ordinated approach to implementing and marketing IGP throughout the region • Continue to support the Pan-sector process through the organisation and hosting of regular meetings • Assist with facilitating IGP industry defined N leaching rates and NCE's • Provide regular updates through MERI reporting process and media communications	Collaborate/Empower
Mana Whenua	+	• Significant stakeholders with strong intrinsic motivations for positive outcomes for waterways • Existing project work and advocacy undertaken by Mana Whenua within catchment • Land ownership and treaty considerations	High	• Work closely and collaboratively with Mana Whenua within the sub-catchment hotspots to incorporate mana whenua values within the sub-catchment plans. • Provide support to the wider adoption of mana whenua values in other catchments in HB. • Provide regular updates through MERI reporting process and media communications	Collaborate
Sub-catchment governance committees	+	• Dominant stakeholders with greatest stake in outcomes of sub-catchment plans • Local knowledge and understanding of potential socio-economic drivers and barriers within their sub-catchment • Ability to motivate and co-ordinate wider community support	High	• Provide support and resource to the formation of the sub-catchment governance committees • Work collaboratively with sub-catchment committees in designing sub-catchment management & implementation plans to effectively address nutrient problems within the context of community needs and abilities • Empower the defining of investment priorities and allocations to sub-catchment governance groups	Collaborate/Empower
Local Government	+	• Potential impact on local government area outcomes and communities	Low	• Seek local government participation within priority sub-catchment governance groups • Provide regular updates through MERI reporting	Involve/collaborate

				process and media communications	
Fertiliser industry Representatives	+	• Nutrient management understanding and nutrient budgeting capacity	Moderate	• Seek participation in the sub-catchment planning process & IGP development. • Seek collaborative support in nutrient budgeting and phosphorus management planning delivery and reporting	Involve
Agricultural Intermediaries	0	• Degree of influence and extent of networks with land holders throughout the region	Moderate	• Seek participation in the sub-catchment planning process & IGP development. • Inform & involve through workshops and communication media • Provide regular updates through MERI reporting process and media communications	Involve
Other regional councils	+	• Synergies with existing projects • Opportunities for collaborative funding and utilising existing protocols	Low	• Provide regular updates through MERI reporting process and media communications	Inform
Wider community	-/+	• All have a stake in water quality outcomes	Low	• Provide regular updates through MERI reporting process and media communications	Inform
Farming sector	-/+	• Large numbers of stakeholders significantly impacted on by TCIP process and Change 6 policies and rules	High	• Seek participation in the sub-catchment planning process & IGP development. • Provide targeted workshops, field days, tools and resources to assist landholder adopt IGP and mitigation practices • Provide regular updates through MERI reporting process and media communications	Involve

[1] Inform—the stakeholder will be provided with balanced and objective information to assist them in understanding the problem, alternatives and solutions.
Consult—the stakeholder will be able to provide feedback on analysis, alternatives and/or decisions, and be advised how their input subsequently influenced the final decision.
Involve—the stakeholder will be able participate throughout the project to ensure their requirements and concerns are consistently understood and considered and are directly reflected in the final decision.
Collaborate—the stakeholder will provide advice and innovation in each aspect of the project, including development of alternatives and identification of the preferred option. Their advice and recommendations will be incorporated into the decisions to the maximum extent possible.
Empower—the stakeholder will make the final decision on what will or will not be implemented.

Table 5. Schedule of activities

	2013 1st ½	2013 2nd ½	2014 1st ½	2014 2nd ½	2015 1st ½	2015 2nd ½	2016 1st ½	2016 2nd ½	2017 1st ½	2017 2nd ½	2018 1st ½	2018 2nd 1/2	2019 1st ½	2019 2nd ½	2020 1st ½	2020 2nd ½
MERI	Plan developed	Benchmarks established		Annual report		Annual report		Annual report		Annual report		Annual report		Annual report	Plan review that the indicators set out in the Monitoring, Evaluation, Reporting and Improvement Plan are being met	Annual report
Stock exclusion	HBRC stock exclusion operational plan Working party – RLS soil conservation program prioritisation MERI plan developed	Awareness raising workshops and demonstrations and promotion of riparian strip outcomes. On-farm transitional support to landholders			Awareness raising workshops and demonstrations and promotion of riparian strip outcomes. On-farm transitional support to landholders				Stock races crossing rivers & streamed to be bridged	Stock excluded for all permanently flowing waterways on land <15° & stocked @ > 18 su / ha	Auditing & compliance Transitional support to landholders for exclusion of intermittent flowing waterways					
Nutrient budgeting	Awareness raising on the need to retain farm records for nutrient budgeting	Development of data entry, data management, industry nutrient loss benchmarking and auditing and compliance protocols for nutrient budgeting Nutrient budget benchmarking and priority sub-catchment phosphorus management planning.				Nutrient budget benchmarking and priority sub-catchment phosphorus management planning.				Nutrient budgets required by landholders		Land Use consents required if N leaching targets exceeded	Nutrient budget audits and priority sub-catchment phosphorus management planning Auditing and compliance checks		Nutrient budget audits and priority sub-catchment phosphorus management planning Auditing and compliance checks	
Sub-catchments	Catchment characterisation Porangahau & Papanui Formation of stakeholder governance groups	RLS investment in priority areas Initiation of Porangahau Sub-catchment pilot (community engagement, farmer workshops etc)		RLS investment in priority areas Porangahau sub-catchment plan produced Papanui sub-catchment process initiated Maharakeke catchment characterisation process initiated		RLS investment in priority areas Papanui sub-catchment plan produced Maharakeke sub-catchment planning process initiated		RLS investment in priority areas Maharakeke sub-catchment plan produced Tukipo, Kahahakuri and middle Tukituki catchment Characterisation process initiated	RLS investment in priority areas Phosphorus management plans required by Papanui & Porangahau landholders. 4ha	Initiation of the Tukipo, Kahahakuri and middle Tukituki catchment sub-catchment planning process	RLS investment in priority areas Phosphorus management plans required by Maharakeke landholders	Tukipo, Kahahakuri & middle Tukituki catchment plan produced	RLS investment in priority areas	Lower Tukituki catchment characterisation process initiated	Phosphorus management plans required by Tukipo, Kahahakuri and middle Tukituki catchment landholders Review the need for increased regulation to reduce P losses	Initiation of the Lower Tukituki catchment sub-catchment planning process
GAP adoption	Landholder requirement to keep records	Collaborative development of IGP nitrate-N leaching loss and NCE ranges Development of a IGP MERI framework Development of a collaborative IGP implementation plan with Pan-sector		IGP Implementation – workshops, field days, demonstrations etc		IGP Implementation – workshops, field days, demonstrations etc			Industry N leaching rates and NCE rates defined IGP Implementation – workshops, field days, demonstrations etc		Change Plan to include industry good practice N leaching rates and NCE ranges.				Review the need for increased regulation to reduce P losses All farms to comply with industry good practice leaching rates and NCE	Landholders to comply with industry specified N leaching & NCE rates

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APPENDIX 1. BUDGET AND FUNDING CONSIDERATIONS

A detailed analysis of the budgetary implications of implementing the TCIP is not considered in the following section. What is contained here is an indicative estimate of the potential costs to HBRC that could be required to implement components of the TCIP.

The final form of rules and policies within Change 6 may be influenced through the submissions process and the significant and unknown variability around the amount of P mitigation that might be required within the priority sub-catchments prevents a more detailed analysis at this stage.

PRIORITY SUB-CATCHMENT NUTRIENT MITIGATION

The budget shown in table 6 includes an estimated cost per sub-catchment of characterising; water quality issues, potential mitigation practices required and initiating and completing the sub-catchment plan. A detailed estimate of the on-ground investment potentially required via RLS incentives or alternative practice change mechanisms within each sub-catchment will be developed as part of the sub-catchment characterisation process. However it is likely to be significant.

The following average costs have been taken from the RLS database to provide an indicative guide to the cost of projects that might be required to effectively claw back P in over-allocated sub-catchments. Elaboration on the assumptions behind the mitigation costs below are provided in table 5.

- Riparian strips @ ~ $18 / m
- Wetland construction - ~ $3,720-$7,220 / project
- Sediment traps & flow diversions - ~ $5,320 / project

Approximately 105 km of the Porangahau is assumed to be currently poorly fenced or unfenced and 120 km has an existing riparian vegetation quality class of fair-poor. Constructed wetlands have been used to effectively reduce Nitrate-N levels by between 11-60% (and in some cases have a significant impact on P mitigation) but to achieve this level of reduction it is estimated that between 2-5% of the catchment area needs to be in wetlands (McKergow et al 2007, and Mercer et al 2011) currently 0.13% of the Porangahau sub-catchment is in wetlands.

These figures are not intended to reflect the level of costs HBRC would incur to successfully mitigate an over-allocated catchment. There is an expectation that landholders will be required to mitigate their own P loss on-farm. However they do illustrate that where the P claw back is large or once the low cost mitigation options have been exhausted continued investment to address the issues could be significant and would require more years of incentivisation to address.

For each sub-catchment the investment forecast is anticipated to be as follows -

- Year 1 – Catchment characterisation, stakeholder committee formation, ½ on-ground allocation of RLS investment

- Year 2 – Full allocation of RLS investment into catchment 1.
- Year 3 – Catchment characterisation and community engagement of second priority catchment, ½ allocation investment in catchment 1 and ½ allocation RLS investment in catchment 2.
- Year 4 – Full allocation of RLS investment into catchment 2.
- Year 5 - Catchment characterisation and community engagement of third priority catchment, ½ allocation investment in catchment 2 and ½ allocation RLS investment in catchment 3.

Table 6. Estimated costs of implementation for the priority sub-catchment nutrient mitigation program

Resources	
Capital costs	Survey protocol development & surveying costs = ~$20,000-35,000
On-going Financial	Water quality characterisation = $15,000 / sub-catchment CSA identification and landscape characterisation = $10,000 Sub-catchment Modelling = ~$5,000 Community engagement workshops = $2,000 / workshop Farmer phosphorus management planning workshops = $3,500 / workshop Resources – aerial maps etc = ~ $5,000 MERI monitoring sites = $10,000-20,000
On-ground investment	Unknown – estimated $250,000-?? depending on state & manageability of nutrient allocation within each sub-catchment
Human	120 hours / Sub-catchment – Water quality Scientists HBRC 80 hours / sub-catchment – Land Scientist HBRC 1 FTE – Senior Land Management Advisor/catchment facilitator
Budget assumptions	• The development of a protocol for land use, KASA and market needs surveying will be required in year 1. This will provide the template for the rest of the sub-catchments HBRC will work in. • Water quality characterisation includes: water sampling – 80 samples @ $74 / sample, water science time and resources @ 120 hours. Figures obtained from Adam Uytendaal, Principal Water Quality Scientist, HBRC. • Landscape characterisation would include GIS, land use and air photo interpretation. Estimates made in collaboration with Dr Barry Lynch, principal land scientist HBRC. • Social surveying costs based on figures derived from a DOC Survey "The Good Neighbour Project". • 3-4 Community engagement and 4-5 farmer specific phosphorus

	management planning workshops are anticipated for each sub-catchment. • Riparian strip costs - Fencing @ $8 / m - Vegetation and planting costs @ $10/m • Riparian fencing costs will be more for permanent 8 wire fencing and for fencing on steeper terrain. • Riparian vegetation costs have been derived from the Taranaki Regional Councils riparian protection program @ $10 / lineal metre ($15,000-20,000 / ha). • The figure for earthworks is based on the average investment funded by HBRC into this activity for the last 2 years. • The wetland/sediment trap estimate is for a 500m^2 constructed wetland with a 5m buffer, an assumed perimeter of 110m and a vegetated area of 420m^2. • The costs for a constructed wetland include – - Earthworks @ $2,000-5,500 - Fencing @ 110m x $8/m - Planting @ $20,000 / ha x 4.2%

STOCK EXCLUSION TRANSITIONAL SUPPORT

HBRC's role in supporting the implementation of the stock exclusion rule is limited to raising awareness and providing transitional support to landholders who might have issues with implementing stock exclusion measures due to issues such as flood risk, terrain or management restrictions. This could occupy a significant proportion of time over the next 5 years.

Table 7. Estimated costs of Stock Exclusion program for HBRC

Resources	
Capital Costs	Clean Streams guide, web resources and factsheets @ $20,000
Financial	Farmer workshops @ $12,500 / yr – 2013-15 Riparian monitoring @ $10,000 / yr – 2013-15
Human	0.6 FTE / yr Land Management - on-farm transitional support 0.1 FTE / yr Consents - non-complying consent requirements over 5 years ~ 0.2 FTE / yr auditing & compliance checks
Budget	• 0.6 FTE annually for land management for on-farm support

assumptions	specifically to rule interpretation and implementation. • 8 hours per consent potentially reduced to 4 hours per consent for non-compliance to permitted activity rule if the consenting process is made more efficient through on-site authorisation and administration efficiencies • Approximately 45% of the Tukituki Catchment is on classes 1-5. Assuming an average farm size of 250 ha and approximately 15% of landholders seeking consent for non-compliance = 50-65 consents required @ 4-8 hours per consent = 0.1 FTE / year over 5 years. • A farmer awareness raising workshops @ $2,500 / workshop • Development of knowledge tools and resources to support landholder stock exclusion adoption. (Update and printing Clean Streams Guidebook) @ $20,000 • Riparian health monitoring costs have been taken from Project 339 202

IMPLEMENTING THE INDUSTRY GOOD PRACTICE PROGRAM

At the cornerstone of the IGP program is the MERI framework. While it is anticipated that in-kind support by the industry groups involved will ultimately be significant, there is a need to establish and benchmark the IGP MERI framework before their commitment to that process can be fully established. The IGP MERI framework is the key mechanism by which HBRC has of comparing IGP adoption of landholders by and within primary industry sectors. HBRC does need to retain some ownership of the frameworks design and implementation.

While the initial investment in the IGP process is significant, it is assumed that the level of in-kind contributions from the industry groups will increase in subsequent years reducing the need for direct HBRC financial support.

Table 8. Estimated costs of Implementation of the Industry Good Practice program

Resources	
Capital Costs	MERI Industry Good Practice Framework = ~ $50,000-100,000 Implementation Plan development = $30,000
On-going Financial	Co-ordination – Pan Sector administration & support - $50,000 MERI Reporting - $5,000
Human	1 FTE – Land Management Year 1 0.3 FTE – Land Management – On-going 0.05 FTE – Land Science
Budget assumptions	• The MERI framework costs would include a research & data interpretation component, a stakeholder workshop program and

	surveying to provide benchmarks. • Synergies exist between Land Science project 340 203 and the establishment of the IGP MERI framework • The land management role would include co-ordinating the implementation plan and development of the MERI framework (~ 1 FTE in year 1), on-going support would include reporting, the organisation of meetings, collaborative funding of projects etc, equating to an estimated 0.3 FTE.

NUTRIENT BUDGETING, PHOSPHORUS MANAGEMENT AND FARM ENVIRONMENTAL MANAGEMENT PLANNING

The undertaking of nutrient budgets and phosphorus management plans is not the responsibility of the HBRC, however there is a need to acknowledge that a shortfall exists between the current industry capacity to meet the potential nutrient budgeting demand over the short term and some transitional support required to fill this gap.

While direct investment in the nutrient budgeting process could be considered discretionary expenditure for HBRC, experience from other regional councils (Alistair McCormack EBOP & Natasha Hayward WRC pers com 2013) has indicated that some proactive support in building this nutrient budgeting capacity could reduce the need for significant investment in the future if the industry and market capacity to deliver on nutrient budgets is not developed in time.

Systems and protocols need to be developed to achieve the outcomes and objectives of nutrient budgeting and phosphorus management planning which include -

- improving on the consistency and timeliness of data entry into nutrient budgets,
- the management of data coming from completed nutrient budgets and phosphorus management plans
- ensuring efficient and effective auditing and compliance protocols are met

Table 9. Estimated costs to support the nutrient budgeting and phosphorus management planning process

Resources	
Capital Costs	Transitional nutrient budgeting support ~ $30,000-75,000 Investing in additional nutrient budgeting capacity ~ $1,300-2,500 / person
Human	0.2 FTE (2013-14) – nutrient budgeting protocol development 0.3 – 0.5 FTE for nutrient budgets and phosphorus management plan auditing and compliance checks and reporting.
Budget assumptions	• Providing transitional nutrient budgeting support has been estimated on the assumption that this could be achieved by directly employing a recent graduate or by paying a retainer to consultants with the expectation that the costs of budgeting would be recouped from the landholders. • Figures in the auditing & compliances checks have assumed 1-2 hours per

	nutrient budget and 3-4 hours per phosphorus management plan. It has been assumed that 10% of nutrient budgets and phosphorus management plans should be audited annually. • Sustainable nutrient management course cost estimates include $150 / night accommodation cost.

The TCIP process also needs to consider from where and how the financial resources available could be potentially increased to effectively and efficiently implement and support the necessary practice change occurring within the farming community of the Tukituki catchment. This is important when considering that other plan changes will be occurring in the future that could be as demanding on existing resource allocation. Over time this resource will need to be increased and a range of options will be considered for doing so, these could include -

- Grant money
- Targeted rates
- RWSS Offsets
- Government and Industry support
- Industry sponsorship, particularly within priority sub-catchments eg) Meridian sponsorship of Blue Duck protection.
- Community Stewardship payments – financial support to landholders protecting high value assets