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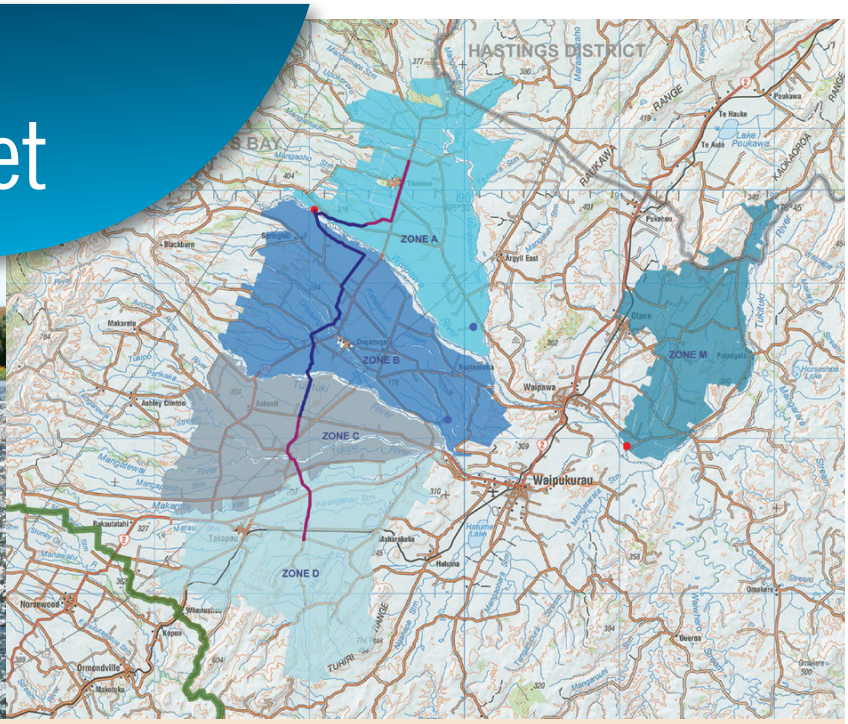

Ruataniwha Water Storage Scheme Overview

The Project

The Ruataniwha Water Storage Scheme (RWSS) is a long-term sustainable water supply solution for Central Hawke's Bay. It is part of a wider programme to better manage water resources in the Tukituki Catchment.

The scheme consists of a 90 million m³ storage reservoir located in the upper Makaroro river, storing water during periods of high flow and over winter. Water can then be released to improve river flows during summer for aquatic life and other river users, while at the same time providing secure water to irrigators. The scheme will be funded by both the public and private sector.

The Need

Hawke's Bay's agricultural advantage lies in its temperate climate, availability of productive land, and potentially abundant water supplies. However, the geography of the region is such that Hawke's Bay is prone to drought. The region experienced four consecutive years of drought from 2006 to 2009, with significant negative economic impacts. Coupled with this, current water allocation exceeds the limits. Consequently, the future is uncertain for consent holders. No new consents have been granted since 2007.

Increased Farm Productivity & Resilience

Farm productivity improves with a reliable water supply, resulting in wider economic benefits for Hawke's Bay. An on-farm feasibility study undertaken by Macfarlane Rural Business concluded that the scheme will enable land use intensification and conversions for a variety of farm types, resulting in more productive and resilient farms in the Ruataniwha Plains. In particular, sheep & beef, arable & process vegetable, dairy, and mixed arable farms with dairy support would benefit from reliable water. It is estimated that the scheme could irrigate 20-30,000ha of farmland, depending on the make-up of farm types.

Environmental Benefits

The use and protection of the Tukituki River has long been a topic of debate in Hawke's Bay.

Since 2008, Hawke's Bay Regional Council has been working on a range of plans and actions in the catchment to provide positive environmental, social, cultural and economic outcomes for the region, now and into the future.

A combination of water storage and higher minimum flows set by HBRC will release the potential for the Lower Tukituki River to be returned to more natural flows in summer, especially if current irrigators can be moved to storage.

A significant amount of work has gone into a wide range of investigations assessing the possibility of large-scale water storage in the Ruataniwha basin. The scheme, coupled with the Proposed Tukituki Plan Change provisions aims to improve water security for farmers, unlock economic potential for Hawke's Bay and improve water quality and quantity in the Tukituki River.

Fast Facts

Dam type:
Concrete-faced rock fill dam

Dam height:
83 metres

Reservoir length:
7 kilometres

Storage volume:
90 million cubic metres

Surface Area:
372 hectares

Irrigation footprint:
20,000 to 30,000 hectares

Area of influence:
Productivity increased for approx 42,000 hectares

Potential electricity generation:
6.5 megawatts

Estimated regional economic benefit:

- 4% GDP increase
- 3.5% increase in employment
- Improved resilience to drought

Estimated cost:
$265 million

RUATANIWHA Water Storage

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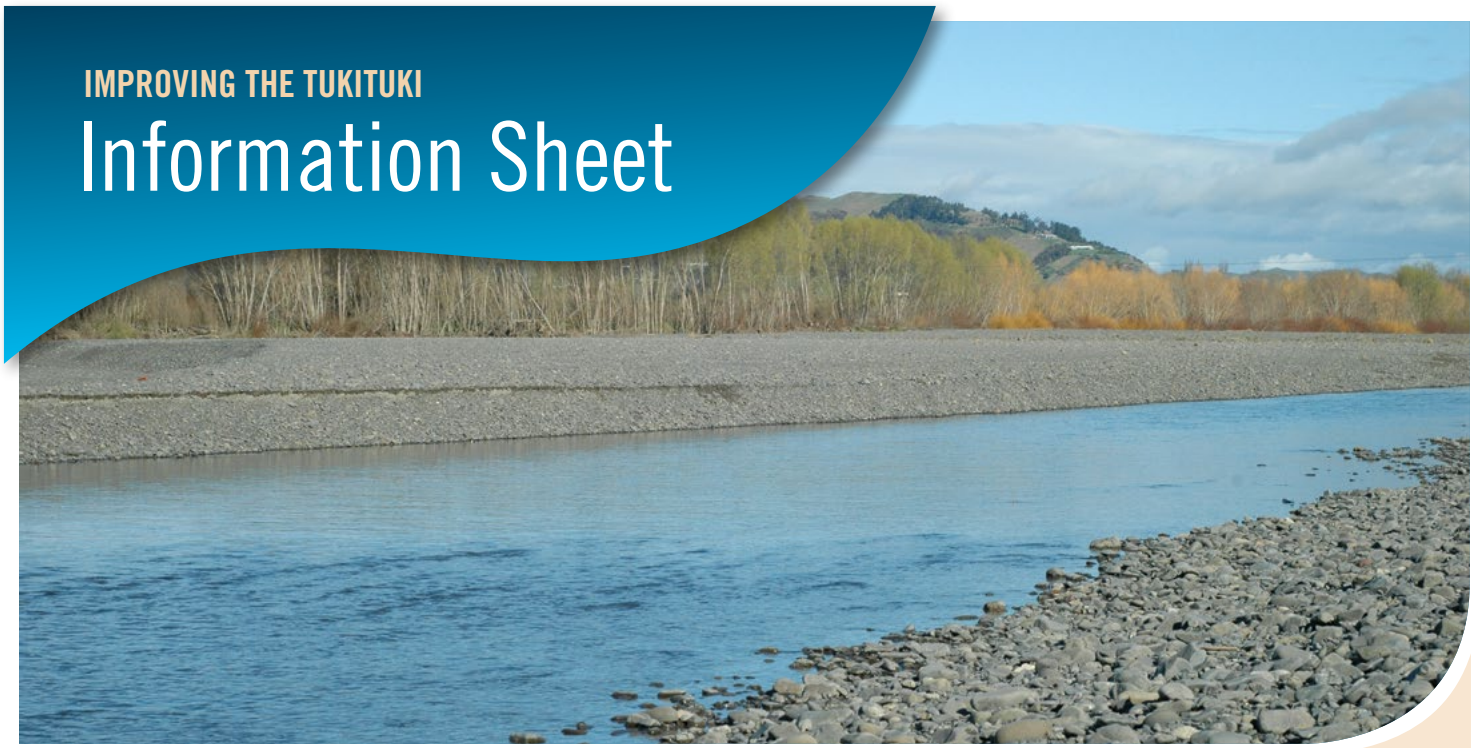

1.0 Improving Summer Flows

The use and protection of the Tukituki River has long been a topic of debate.

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Improving summer flows

During the last five years Hawke's Bay Regional Council has invested significant time and money to better understand the quality and quantity of the water that flows down the Tukituki River.

Research shows raising the flows in the Tukituki River would have a negative impact on current irrigators, which is why HBRC began looking at water storage. The concept is simple - store winter water to use in the dry summer months, taking the pressure off the Tukituki River.

This research has shown ongoing droughts, drawing of water for irrigation and wastewater discharges have all affected the river. This also highlighted the need to look into new options for water management

What's driving the need to increase minimum flows?

The need to increase the minimum flows in the Tukituki River is driven by a number of factors.

- Current minimum flows are not adequate to protect fish habitat;
- A commitment to review the way we set minimum flows was made following appeals on the Regional Resource Management Plan in 2006;
- The Hawke's Bay community, including environmental interest groups, has expressed continuing concern since 2008 at low flows and water quality in the Tukituki River;
- The National Policy Statement on Freshwater Management requires councils to set water quality and quantity limits.

There are several advantages to having more water flow down the Tukituki River:

- A more attractive river to swim and fish in
- Maintenance and enhancement of the mauri of the river
- More water for the fish to swim in and more room to grow

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2.0 Managing Slime and Algae

The use and protection of the Tukituki River has long been a topic of debate.

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A significant amount of work has gone into a wide range of investigations assessing the possibility of large-scale water storage in the Ruataniwha basin.

The Ruataniwha Water Storage Scheme (RWS), coupled with the Proposed Tukituki Plan Change provisions aims to improve water security for farmers, unlock economic potential for Hawke's Bay and improve water quality and quantity in the Tukituki River.

Less slime and algae caused by Phosphorus

The Tukituki River is different to others around the country because phosphorus is the main cause of the slime and algae seen in the river.

Our research has shown if the amount of phosphorus in the river is reduced, it will limit the ability for slime and algae to grow. This will give us a more attractive river for swimming, fishing and other recreational activities.

We could manage nitrogen to reduce algae and slime, but it would be more costly and take a lot longer.

Other factors causing the slime and algae include the amount of light reaching the streambed, what the bed of the river is like, and the frequency of floods in the river.

Ways to reduce phosphorus in the river:

Stock exclusion rule

- Keeping stock out of the water. New stock exclusion rules will reduce the amount of sediment, bacteria and pathogens entering the water.
- Fonterra also requires stock exclusion from waterways as part of its milk supply agreements

Waipukurau and Waipawa oxidation pond discharges

- A significant reduction in in-river phosphorus will be achieved when these discharges meet the requirements of the current consent, by September 2014.

Farm management plans

- Environmental Farm Plans will be required for all farmers that are signed up to the RWS. This will help farmers to identify and minimise areas of risk for their farm and farming system.
- Any other farmers who intensify farm use will also require farm management plans.

Targetting hot spots

- Through working with farmers and the community in hotspot catchments to identify sources of phosphorus and finding ways to deal with it. HBRC will also be focusing financial incentives in these areas.

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3.0 Nitrogen Management

The use and protection of the Tukituki River has long been a topic of debate.

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Limit effects on aquatic life, by managing Nitrates

Nitrogen is a nutrient that 'leaks' out of all land and often ends up in nearby water bodies. It is usually associated with farming activities but will come from any land, including land that is covered in native forest.

In some parts of New Zealand Regional Councils are looking at using Nitrogen limits to manage the growth of periphyton (slime and algae) in rivers. Over many years the HBRC has conducted investigations and research in the Tukituki. This work tells us that we can control the growth of slime and algae through active management of Phosphorous (see information sheet 2.0).

This is for two reasons:

- Given the specific characteristics of the catchment, it would take a very long time to effectively control peripyhton by limiting Nitrogen. If this method was used, much of the current land use would have to cease and large areas of the catchment would have to be turned into forest. There would be significant adverse economic impacts for individual farmers and the region;
- Managing slime and algae can instead be achieved by limiting Phosphorous through a range of rules and incentives.

However, the setting of limits for a Nitrogen component called "nitrate" is proposed for the Tukituki Catchment.

High levels of the nitrate component of nitrogen in the water can affect the ability of living things in the water, such as fish and insects to grow. So it is important to carefully manage the amount of nitrate leaking out of the land and going into nearby waterbodies.

In late 2011 Hawke's Bay Regional Council asked NIWA to look at what are the maximum level of nitrate in the water that need to be set to protect the important species living in the Tukituki River, like Inanga, insects and trout. This is the first time any Regional Council has looked specifically at what the right levels should be for our native New Zealand species. This information has been used to develop a specific risk management framework for the Tukituki. This framework is a very conservative approach to managing nitrate because it includes very sensitive species that do not occur in the Tukituki or New Zealand.

This research is also being used for limit setting in many other regions and is being incorporated into the revised ANZECC (Australian and New Zealand Guidelines for Fresh and Marine Water Quality) guidelines.

In the Tukituki we are fortunate that our nitrate levels in the water are far lower than NIWA say the maximum limits need to be. This means we can safely add more nitrate to the water without affecting any of the important species living in river. The rules and policies we are proposing for the Tukituki will allow more nitrates to go into the water but will control the levels to ensure we do not breach the limits. This will ensure the protection of our important species.

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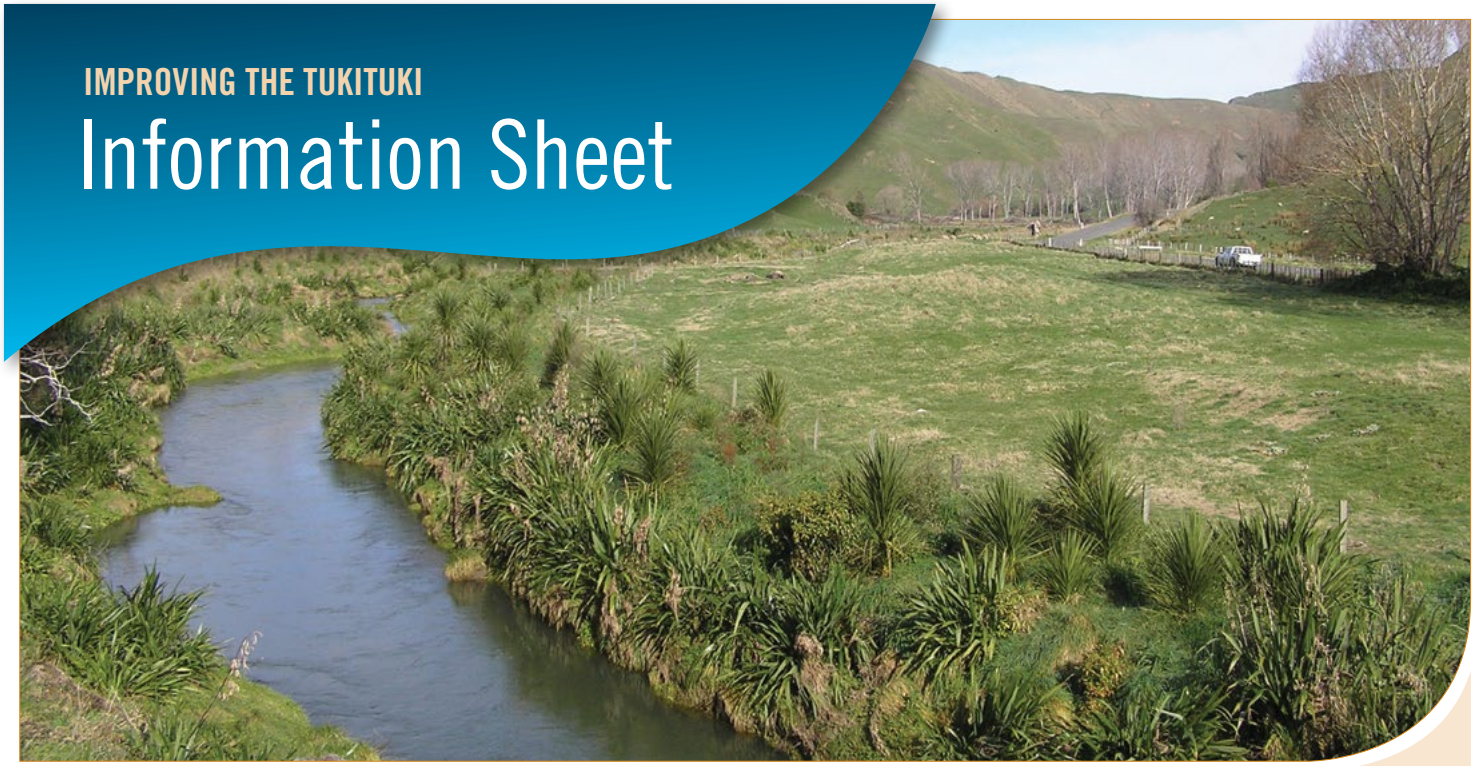

4.0 Improving Habitat

The use and protection of the Tukituki River has long been a topic of debate.

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Improve river health and habitat - with planting and riverside fencing

Stream side (riparian) planting has a wide range of benefits for the species that live in the rivers and on land. In-stream benefits come from the reduction of contaminants and sediment to rivers.

As well as reducing phosphorus and bacteria coming into the river, planting along riverbanks has a range of benefits for river habitat and the aquatic life that lives there.

Some of our native fish (eels and kokopu) like to hang out under the vegetation which overhangs the stream banks where it is shady and cool. Planting by streams and rivers provides shade, thus keeping the water from getting too hot in summer. Shade and lower temperatures also reduce algal growth and maintain oxygen levels to sustain life in the stream. This is not only good for fish but all life in the water.

Other native fish (bullies and some galaxiids) like to live under the gravels and cobbles in the stream. Riparian planting holds back sediment which otherwise smothers this critical stream habitat and makes the water murky. Roots, branches and leaves in the water provide more habitat and food for the stream invertebrates and are a big factor for ecosystem health and aquatic life.

Stream side planting also has benefits for the species on land. Spiders are able to spin webs in the vegetation to catch flies hatching from the rivers. This has implications as it provides food for birds and other animals further up the food chain, aiding land based biodiversity.

It is likely riparian planting will be encouraged as part of farm management planning.

A $7million mitigation package will be included with the Ruataniwha Water Storage resource consent application, with a key focus on riparian planting and other biodiversity benefits.

Fencing in tandem with planting along river and stream banks not only excludes stock but improves stream habitat.

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5.0 Socio-economic Impact

The use and protection of the Tukituki River has long been a topic of debate.

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Improve the region's employment, wealth and economic wellbeing

The Ruataniwha Water Storage Scheme (RWS) has potential to deliver significant environmental, economic and social benefits for Hawke's Bay. It would provide reliable irrigation water to approximately 25,000 hectares of land, create new job opportunities and give a real boost to the region's economy, especially in Central Hawke's Bay. It is estimated:

- The scheme's construction period is expected to require four thousand job years of work.
- The scheme has the potential to create 2,250 jobs through increased farming activity and its flow-on impacts
- Boost GDP by approximately $235 million a year by full water uptake
- Provide farmers, orchardists and viticulturalists with the water security they need for their operations
- Provide food processors the certainty of supply they require to maintain and grow their businesses
- Such a large project would also fulfil the business community's desire for more inwards investment.

We believe the RWS Scheme has real potential to provide a range of positive results for Hawke's Bay in the next 10 to 15 years; in particular it would drive renewed growth in Central Hawke's Bay.

Over time it is expected the community profile and farm ownership will change. New families will come into the area leading to a subsequent rise in school rolls. There's likely to be great demand on social services and increased participation in sport and recreation.

Hastings District Council and Central Hawke's Bay District Council are considering a social management plan to ensure that community needs, both existing and new, are catered for. This may include migrant assistance programmes for families moving to the region due to extra jobs being created and improved roading infrastructure to cater for the expected increase in rural productivity.

Business Hawke's Bay is coordinating business attraction and growth opportunities. Along with iwi and other groups they are coordinating labour market development initiatives to fill the expected demand for certain skills

The future without water storage

Without the Ruantaniwha Water Storage Scheme to meet the improved environmental parameters in the proposed Tukituki Plan Change there would have to be a reduction in farming in Central Hawke's Bay.

For example to improve the river flows water consent holders would be facing less secure water for irrigation, in turn offering less certainty of supply for processors, therefore potentially affecting future employment opportunities in the region.

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6.0 Existing Irrigators

Irrigation in Ruataniwha Plains

The Ruataniwha Plains benefits from accessible surface and aquifer water resources. There are around 150 consents to irrigate within the boundaries of the command zone of the Ruataniwha Water Storage Scheme, irrigating approximately 6,000ha of farmland. Water allocation currently exceeds limits in the Regional Resource Management Plan and the security of supply is low. No new consents have been granted since 2007, and future long term renewals for water consents remain uncertain.

Tukituki Plan Change:

HBRC is currently updating the Regional Resource Management Plan to implement the Government's National Policy Statement for Freshwater Management. The proposed Tukituki Plan Change is HBRC's first amendment and amongst other changes includes:

- Raising the current minimum flow levels in the Waipawa and Tukituki Rivers to enable a healthier ecosystem. This will affect the reliability of stream depleters with greater probability of water reductions and for potentially longer periods
- Setting revised water allocation limits and new measuring and reporting requirements. This will affect both stream depleters and groundwater abstraction.

The following table summarises the current and proposed changes in reliability and allocation for each consent. For example, in the Upper Tukituki, farmers currently have restrictions 1 in every 3 years.

Plan	Allocation conditions
Current Plan	Rate of take and maximum weekly allocation
Tukituki Plan Change	Rate of take, monthly, and seasonal allocation

Water Consents

Water consents fall into three different categories:

- Surface water takes - these are takes directly from rivers and streams, directly affecting river flows
- Shallow groundwater abstraction - shallow groundwater wells that also directly impact upon surface water resources. Abstraction from these wells have a similar influence on river flows as surface water takes
- Deep groundwater abstraction - deep groundwater wells that also impact upon surface water resources, but do not have an immediate impact on river flows. Rather, there is a lag between when groundwater abstraction occurs, and the influence this has on river flows.

From a water resource management perspective, surface water takes and groundwater abstraction are treated the same and are referred to as stream depleters.

Consent Area		Stream Depleters	Deep Groundwater
Upper Tukituki	Current Reliability	1 in 3 years	Not subject to minimum flows
	Tukituki Plan Change	1 in 2 years	
Waipawa	Current Reliability	1 in 3 years	
	Tukituki Plan Change	1 in 2 years	
Lower Tukituki	Current Reliability	1 in 13 years	
	Tukituki Plan Change (for irrigators below the Red Bridge flow management site)	1 in 7.8 years	
	Tukituki Plan Change (for irrigators above the Red Bridge flow management site)	1 in 3 years	

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7.0 Draft Tukituki Plan Change

Through the draft Tukituki Plan Change the Hawke's Bay Regional Council has some key approaches for improving water quality and quantity in the Tukituki River.

HBRC staff are working on the provisions and aim to present the final Tukituki Plan Change for adoption at Council's meeting on 30 January 2013. The plan change will then be ready for notification and the formal submission process.

What does the Tukituki Plan Change do?

The draft Tukituki Plan Change sets out the environmental bottom lines for all activities in the catchment – taking water, discharging to water and land, and now the use of the land. Diffuse discharges from farmed land must also be measured against the in-stream water quality limits.

Excessive growth of algae and slime is the biggest freshwater quality issue in the Tukituki catchment. Science investigations confirm that reducing the phosphorus load in the catchment will deliver the biggest and quickest gains for environmental improvement (see Information Sheet 2.0).

- A significant reduction in in-river phosphorus will be achieved when the discharges from Waipawa and Waipukurau oxidation ponds meet requirements of the current consent, by September 2014.
- The draft plan change includes rules for keeping stock out of the water. This will help reduce algae growth by reducing the amount of phosphorus attached to the soil entering the water. Keeping stock out of the water will also improve stream banks and habitats for native fish and trout.
- The draft plan change proposes increases in minimum flow limits to protect fish habitats. This means some consent holders will need to stop taking water earlier than they currently do.

HBRC recognises that this reduces the reliability of the water supply and so, in parallel, has been investigating harvesting and storage of higher river flows to provide an alternative supply. This plan change and the Ruataniwha Water Storage project are part of the strategic approach to managing the Tukituki catchment.

HBRC also acknowledges that time is essential for these changes to come into force, so the minimum flow restrictions will not take effect until 2018, and stock exclusion until 2017.

Farm Management Plans

The primary production sector is working with HBRC to develop industry good practice guidelines for nutrient, sediment and effluent management. The rules are designed to incentivise farmer to stay in or move into the 'permitted activity' status.

Other areas of the country are also experiencing the impact of plans that set water quality limits as required by the National Policy Statement for Freshwater Management.

The process going forward

HBRC's investment company, Hawke's Bay Regional Investment Company Ltd (HBRIC Ltd) will be lodging the applications for the Ruataniwha water storage project, with a request to 'call in' the proposed plan change to the Environment Protection Authority (EPA) to enable an independent and integrated decision making process to occur through a single Board of Inquiry.

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8.0 Managing the Growth of Blue-Green Algae

The use and protection of the Tukituki River has long been a topic of debate

Hawke's Bay Regional Council has been working on a range of plans for the catchment to provide positive environmental, social, cultural and economic outcomes for the region. A significant amount of work has been done to assess the possibility of large-scale water storage in the Ruataniwha basin.

Water storage, combined with higher minimum flows (set by HBRC) will allow the river to be returned to more natural flows during summer - especially if current irrigators can be moved to storage.

The Ruataniwha Water Scheme (RWSS), coupled with provisions in the proposed Tukituki Plan Change, aims to improve water security for farmers, unlock economic potential for Hawke's Bay and improve water quality and quantity.

Reducing algae and slime

A key water quality issue - particularly in the lower reaches of the Tukituki River - is excessive slime and algae growth, also known as peryphiton. Evidence is clear that reducing phosphorus in the river system will reduce peryphiton. However, there is debate around the relative effects of decreasing phosphorus concentrations at the same time as maintaining or increasing the concentration of nitrogen, and how this might create conditions that favour undesirable algal species, such as Phormidium.

Phormidium mats observed in the Tukituki River are generally very thin and total cover is generally low. Despite this, detached mats are occasionally visible along the river margins.

National Cyanobacterial Recreational Guidelines state that alert levels should be triggered when mats break free and accumulate on the riverside. There may be risks to water users who ingest water containing detached mats or come into direct contact with them. These risks would increase if more mats were present.

The frequency and intensity of flushing flows, caused by significant rainfall events, are key factors influencing Phormidium occurrence. The proposed nutrient management for Tukituki River is unlikely to increase the risk of mats, where proposed flushing flows will remove them before they pose a significant risk.

The incidence of Phormidium does not generally appear to be a major problem in the Tukituki catchment, as it sits well below the draft guideline lower trigger (surveillance) of 20% cover.

There is no relationship between the proportion of bed covered by Phormidium mats and the incidence or concentration of toxins. Cawthron research indicates that it is probably normal to have some Phormidium in all rivers in New Zealand.

The key known drivers of Phormidium growth are:

- flow stability - long accrual period, absence of flushing flow
- substrate size - stability
- velocity (point velocity)

Flushing flows as a management tool

The RWSS offers the potential to release artificial flushing flows to manage Phormidium in the Tukituki River. Up to 40 m^3/s could be released with water storage at full supply level, and up to about 20 m^3/s at lower levels. The release of these flows could be timed to coincide with natural small rainfall events for maximum effect.

Even moderate-size flushing flows could substantially enhance public health risk by removing deposited material, detaching mats, and reducing the potential for subsequent deposits.

The effect of these artificial flushing flows is currently speculative. It is difficult to predict the proportion of Phormidium mats that might be removed. The relationship between flow and mat detachment will be site-specific and has not been established in the Tukituki River. Flushing flows will probably remove a proportion of the biomass, but complete removal of firmly attached mats may not occur.

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9.0 Our Goals for the Tukituki River catchment

What we're striving to achieve in the Tukituki River Catchment

As Hawke's Bay Regional Council develops a plan to set environmental bottom lines for the Tukituki Catchment, other regions around the country are doing the same. Our closest southern neighbour, Horizons Regional Council has developed the One Plan. Some farms in Central Hawke's Bay will be covered by the One Plan, while others just up the road will be managed by Tukituki Plan Change 6.

Both have the same core goals of improving water quality and reducing slime growth, but have taken a different approach to achieving that. The table below gives a good overview of the differences in the two plans.

	What do we want to do?							
Plan	**Control slime in the river**	**Set general water quality limits**	**Set phosphorus limits instream**	**Set dissolved inorganic nitrogen limits instream**	**Set nitrate limits instream**	**Require nutrient budgets**	**Have rules for stock exclusion**	**Set leaching imits for N from the land**
TTPC6	Yes	Yes	Yes, for slime control	No, only for upper catchment	Yes	Yes from 2018	Yes	No
OnePlan	Yes	Yes	Yes, along with DIN for slime control	Yes, along with DRP for slime control	No	Yes for intensive land uses	Yes	Yes - based on LUC units

So what are the key differences between the two plans?

While HBRC and HRC both look to set limits for phosphorus, the management of nitrogen is where they differ.

The One Plan sets limits on the amount of nitrogen that can be leached by intensive land uses, while Tukituki Plan Change 6 does not. The One Plan nitrogen leaching limits are based on the land use capability (or LUC) of each individual farm.

Tukituki Plan Change 6 recognises that in-river nitrate-nitrogen levels are generally within proposed limits and:

- Requires the preparation of nutrient budgets
- Provides time for primary industry to develop and implement good practices, including good practice leaching rates
- Seeks to manage more than minor increases nitrogen losses through a resource consent process
- If exceedances of the in-stream and groundwater nitrogen limits occur, a consent is required for all production land contributing to the exceedance.

Our Goals for the Tukituki catchment

Reduced Phosphorus Levels
Phosphorus is a key contributor to slime and algae growth. Reduced Phosphorus levels will slow down this growth.

Stock Crossings
Stock pollute the stream when they walk through it. Farmers will need to bridge or culvert stream crossings on regularly-used stock races.

Keep Stock from River Edge
Managing stock through temporary or permanent fencing or other means to prevent stock from damaging river banks and polluting the river.

Improved Wastewater Treatment
After September 2014, CHB wastewater discharge will have to be a far higher quality.

Nitrogen Management
Nitrogen levels will be managed to protect fish and other aquatic life.

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10.0 Targeting Phosphorus Priority Catchments

What is a phosphorus priority catchment?

A priority catchment is an area where the in-stream concentration of dissolved reactive phosphorus (DRP) is greater than the target level. These catchments are significant contributors of phosphorus in the Tukituki River, outside of existing point sources such as the Waipawa and Waipukurau sewage schemes. The map above shows the priority sub-catchments in red.

What causes them?

There are a number of contributing sources and, to some degree, each sub-catchment is different. However, farming is a significant contributor through stock contamination of waterways, soil erosion and inappropriate fertiliser use.

Why is phosphorus a problem?

High levels of phosphorus is one of the main causes of excessive slime and algae within the main stem of the Tukituki River *(see Information Sheet 2.0 - Managing Slime and Algae)*.

What can we do about it?

The first step is to identify phosphorus sources in each sub-catchment. This will ensure that any action taken to reduce phosphorus levels is targeted and cost-effective.

As these investigations continue, HBRC will be working with the community (including local landowners, iwi, and primary sector industries) to find the best way of addressing the specific water quality issues of each sub-catchment. Work will begin in Papanui.

Under the proposed Tukituki Plan Change 6, every landowner with holdings greater than four hectares within a priority sub-catchment will be required to implement a phosphorus management plan.

The HBRC land management team will provide assistance to farmers in these areas though a series of field days and workshops. They will also be working with primary industry groups to help land owners develop their individual plans.

For further information call **Warwick Hesketh** or **Kate McKinnon** at HBRC's Waipawa office on **(06) 857 8060** or email **warwick@hbrc.govt.nz** or **kate@hbrc.govt.nz**

RUATANIWHA Water Storage

HAWKE'S BAY REGIONAL INVESTMENT COMPANY LTD

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