

Managing diffuse source discharges to land and water in the Taranaki region

Review of the regional fresh water and soil plans for Taranaki

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Executive summary

This working paper entitled *Managing Diffuse Source Discharges to Land and Water in the Taranaki Region* addresses the discharge of contaminants from diffuse (widespread) sources to land and water. The paper is one of a suite of documents contributing to the Taranaki Regional Council's (the Council) review of the *Regional Fresh Water Plan for Taranaki* (the Freshwater Plan) and the *Regional Soil Plan for Taranaki* (the Soil Plan).

This paper examines issues relating to the discharge of contaminants from diffuse sources and proposes some recommendations to be considered as part of the review of the freshwater and soil plans. Key findings and recommendations outlined in this paper are as follows:

- Over the last two decades, dairy farms in Taranaki have intensified their land use resulting in increased stocking rates, increased herd sizes, and increased quantities of fertiliser and agrichemicals being applied to the land.
- The cumulative effects of agricultural sourced discharges – whether to land or water – are arguably the single greatest human induced pressure on Taranaki's freshwater quality.
- The effects of cumulative diffuse discharges are particularly noticeable in the intensively farmed parts of Taranaki such as the ring plain and coastal terraces and are contributing to the decline in the biological 'health' of our waterways in a downstream direction.
- Taranaki's overall freshwater quality is relatively good, with mainly improving trends. Our aim is to keep those water quality trends positive while supporting the dairy industry with reasonable and justified requirements and time to make the adjustments.
- International and other studies confirm that, for Taranaki, the fencing and planting of riparian margins is the most effective way of dealing with diffuse pollution.
- Through the Taranaki Riparian Management Programme, the Council and the wider community has supported farmers to voluntarily fence and plant their riparian margins to mitigate the impacts of intensive land use – this programme is unique in terms of its scale and coverage.
- The Taranaki Riparian Management Programme is the largest enhancement planting scheme on privately owned land in New Zealand. The amount of fencing and planting carried out by farmers involves thousands of kilometres of new fencing and the planting of 2.5 million trees.
- Most farmers are stepping up and taking the necessary steps to implement their riparian plans and ensure freshwater quality in Taranaki is being maintained or enhanced. Approximately 74% of the stream banks recommended in the riparian plans that need to be protected by fencing are now fenced and 60% of the stream banks that need to be protected by vegetation are now planted or have existing vegetation.
- The paper canvases a number of broad policy options including the pros and cons of rules requiring the exclusion of livestock from waterways, the compulsory versus voluntary planting of riparian margins, and establishing a cap (discharge limits) for fertiliser and agrichemical discharges to land.
- The Council's preferred approach is to:
 - support dairy and other intensive pastoral farmers voluntarily implementing the recommendations of their riparian plans through the Taranaki Riparian Management Programme
 - for dairy and other intensive pastoral farmers that fail to make reasonable progress in implementing the recommendations of their riparian plans, new rules apply from **1 July 2020** whereby they will be required to obtain a land use consent to address the diffuse adverse effects of their land use activities on freshwater quality. For that small group the obvious disadvantages are reduced operational flexibility in terms of adopting mitigation measures

such as planting and fencing, and increased costs associated with obtaining resource consents and inspection and compliance costs.

- Completing the implementation of riparian plan recommendations by 1 July 2020 is readily able to be achieved for all but a few farmers without major impost. Monitoring of riparian plans confirms that
- Allied with other proposals to improve the effectiveness of point source wastewater treatment systems, the Council is seeking to build and improve on the environmental gains made to date while supporting the dairy industry with reasonable and justified requirements and time to make the adjustments.
- This paper is a starting point for consulting with stakeholders on possible changes to the Freshwater Plan.

Preface

This working paper entitled *Managing Diffuse Source Discharges to Land and Water in the Taranaki Region* is the second in a series of papers addressing the impacts of agricultural discharges to land or water. The first paper addressed point source discharges associated with farm dairies, this paper addresses the discharge of contaminants from diffuse (widespread) sources. Together the papers contribute to the Taranaki Regional Council's (the Council) review of the *Regional Fresh Water Plan for Taranaki* (the Freshwater Plan) and the *Regional Soil Plan for Taranaki* (the Soil Plan).

Over the last two decades, dairy farms in Taranaki have intensified their land use resulting in increased stocking rates, increased herd sizes, and increased quantities of fertiliser and agrichemicals being applied to the land. A major challenge for agricultural production in the region is to increase production to meet global demands for dairy produce in a manner that protects soil quality and productivity, land use flexibility and value, and addresses offsite effects, now and for the future.

The cumulative effects of agricultural sourced discharges – whether to land or water – are arguably the single greatest pressure on Taranaki's freshwater quality that are essentially of human cause and therefore under our control, albeit within the reality of Taranaki's existing land use and economic environment. The effects of these discharges are particularly noticeable in the intensively farmed parts of Taranaki such as the ring plain and coastal terraces and are contributing to the decline in the biological 'health' of our waterways in a downstream direction.

However, it is not as if we are starting from scratch in the management of diffuse sources on Taranaki's freshwater quality issues. Early on in Taranaki, we understood the issues and, in response to those issues, have over the last two decades, implemented significant non-regulatory and regulatory programmes that involve Taranaki farmers and the wider community proactively taking steps to mitigate the impacts of their land use.

Through the Taranaki Riparian Management Programme, the Council and the wider community has supported farmers fencing and planting their riparian margins, which, in turn, traps and filters contaminants on land and prevents or minimises their entry into water. Fencing and planting of riparian margins also prevents direct stock access and enhances instream and stream bank habitats.

This voluntary programme involves a property planning service, on-going advice and liaison, and the largest enhancement planting scheme on privately owned land in New Zealand. The programme is unique to Taranaki and is truly international in scale. The amount of fencing and planting carried out by farmers involves thousands of kilometres of new fencing and the planting of 2.5 million trees. Approximately 74% of the stream banks recommended in the riparian plans that need to be protected by fencing are now fenced and 60% of the stream banks that need to be protected by vegetation are now planted or have existing vegetation. International and other studies confirm that, for Taranaki, the fencing and planting of riparian margins is the most effective way of dealing with diffuse pollution.

The paper canvases a number of policy options including the pros and cons of the broad application of rules requiring the exclusion of livestock from waterways, the compulsory versus voluntary planting of riparian margins, and establishing a cap (discharge limits) for fertiliser and agrichemical discharges to land.

Having examined the options, and given that our overall freshwater quality is relatively good, freshwater quality trends are generally encouraging, and that most farmers are stepping up and taking the necessary steps to ensure freshwater quality in Taranaki is being maintained or enhanced, the Council's preferred approach is not to introduce a universal requirement to obtain a land use consent for intensive pastoral farming, nutrient trading schemes or the like, as being proposed in other

parts of New Zealand. Instead, the Council's preferred approach is to continue to support the implementation of the Taranaki Riparian Management Programme underpinned by a deadline for the application of a regulatory and compliance regime for those farmers that have failed to make reasonable progress in retiring and planting their riparian margins.

For most farmers, I am confident that they will avail themselves of the obvious advantages of the Taranaki Riparian Management Programme and get on with the business of completing the retirement and planting of riparian margins. Within the timeframes proposed herein, this is a task that is readily able to be achieved for all but a few farmers without major impost.

However, as for any group of people, I have no doubt that there will be some who will wait to be led and controlled – to be regulated and required to do the inevitable. For that small group, it is proposed that new rules apply from **1 July 2020** whereby they will be required to obtain a land use consent to address the diffuse adverse effects of their land use activities on freshwater quality. For that small group the obvious disadvantages are reduced operational flexibility in terms of adopting mitigation measures such as planting and fencing, and increased costs associated with obtaining resource consents and inspection and compliance costs.

Allied with other proposals to improve the effectiveness of point source wastewater treatment systems, the Council is seeking to build and improve on the environmental gains made to date.

This paper is a starting point for consulting with stakeholders on possible changes to the Freshwater Plan. I am confident that through early engagement and discussion Taranaki can develop practicable solutions that reflect local environmental conditions and local community expectations, best industry practice, and sound science. In so doing, we will not only give effect to new national policy requirements, we will also 'future-proof' the dairying industry so that Taranaki continues to be at the forefront of dairy productivity and environmental management.

Taranaki's water quality is relatively good with mainly improving trends. Our aim is to keep those water quality trends positive while supporting the dairy industry with reasonable and justified requirements and time to make the adjustments.

David MacLeod
Chair
Taranaki Regional Council

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1. Introduction

1.1 Purpose

The purpose of this working paper is to set out future directions for the management of diffuse discharges to land and water in the Taranaki region.

This paper contributes to the Taranaki Regional Council's (the Council) review of the *Regional Fresh Water Plan for Taranaki* (the Freshwater Plan) and the *Regional Soil Plan for Taranaki* (the Soil Plan).

1.2 Background

Diffuse (widespread) or non-point source discharges are those discharges to land or water that do not have a particular point of origin (e.g. are not introduced into receiving waters from a specific outlet), but arise from a wide or diffuse area. Diffuse source discharges are derived from a broad range of activities but are often attributable to poor land use practices such as the excessive use of fertilisers and agrichemicals to land, grazing of river and stream margins, the direct entry of stock to water and water courses, and inappropriate land use on erosion prone land.¹

Maintaining or improving soil health and freshwater quality is essential to the region's well-being.

Taranaki is one of the most intensively farmed regions in New Zealand and this places considerable demand upon its soil and freshwater resources. Healthy soils are essential for a sustainable environment, the maintenance of farm productivity and opportunities for flexibility in land use, and for its vital role in maintaining surface and ground water quality.

¹ Note *natural* contributing factors to declining water quality lie outside the scope of this paper. Natural diffuse sources include sedimentation caused by erosion on Mount Taranaki and in the eastern hill country or the entry of natural phosphate off Mt Taranaki and natural levels of iron and manganese in shallow groundwater and surface waters.

Taranaki's overall soil health is good. However, there is the potential for inappropriate land use practices to impacts on soil health over time. Of more immediate concern are the cumulative effects of diffuse discharges on freshwater quality.

Good freshwater quality is essential to meet the consumptive demands of agriculture, industry and commerce plus drinking and community supply. Good freshwater quality is also important in its own right for maintaining healthy rivers and streams, including their natural character, ecological, amenity and recreational values, and the cultural and spiritual values of or customary uses by tangata whenua.²

Until the 1970s, the major cause of deterioration in freshwater quality in New Zealand was the discharge of contaminants to water from point sources. However, stricter controls on discharge practices have resulted in a significant decline of pollution from these sources. While point source discharges are still a significant influence on freshwater quality in some areas, at a national level, the effects of diffuse sources on waterways has been identified as the most serious freshwater management challenge in New Zealand today.³ This working paper examines the situation in Taranaki, and explores regionally-appropriate responses.

The freshwater and soil plans were both adopted in 2001. Ten years on the Council is required to carry out a full review of the freshwater and soil plans. This paper therefore undertakes a stocktake of the studies and research relating to the management of diffuse source pollution in this region and canvases the policy options to ensure soil health and freshwater quality is maintained and, where necessary, enhanced in the region.

² Water forms an important part of the cultural and spiritual values of Maori who have a kaitiaki or guardianship role in relation to water.

³ Ministry for the Environment, 2007, page 266.

The paper represents a starting point for consulting with key stakeholders to obtain their early input into the development of revised Plan provisions addressing the future management of diffuse source pollution.

1.3 Scope

As previously noted this paper is contributing to the review of the freshwater and soil plans. The scope of this paper focuses on diffuse sources from human induced activities.

For Taranaki, agricultural activities are the most significant contributor of diffuse source impacts on freshwater quality and these activities are the focus of this paper, particularly in relation to:

- the application of fertilisers and agrichemicals to land and runoff to water
- runoff from other farm sources (e.g. feeding paddocks, standoff pads, farm tracks and raceways) to water
- the avoidance and mitigation of the adverse environmental effects of diffuse source discharges to water through riparian management.

Other issues such as the impact of discharges to water that come from end-of-pipe sources (point sources) are largely addressed in a separate report by the Council on the future management of farm dairy effluent.

1.4 Structure

The working paper has seven sections.

Section 1 introduces the working paper, including its purpose, background, scope and structure.

Section 2 sets out the statutory and planning context for the Council to manage diffuse discharges to land and water in the region, including an overview of the Taranaki Riparian Management Programme.⁴

Section 3 provides a brief overview of the 'problem', including the characteristics of diffuse pollutants, the pathways for them entering water bodies, and their impacts on Taranaki's soil health and freshwater quality.

Section 4 summaries key findings of research, studies and reviews relating to the management of agricultural-sourced diffuse discharges to land and water.

Section 5 examines key management issues relating the options for managing different agricultural-sourced diffuse discharges to land and water. These issues include canvassing the regulatory options plus reviewing the efficiency and effectiveness of the current approach, including progress to date in meeting targets.

Section 6 summarises the policy options for the future management of agricultural-sourced diffuse discharges to land and water in the region, including suggested changes to Plan provisions.

Section 7 sets out the summary and conclusions for this paper.

A definition of terms and an explanation of acronyms used in this paper and appendices are presented at the back of this paper.

⁴ The Taranaki Riparian Programme, which targets the region's most intensively farmed land, is the cornerstone of the Council's approach to managing diffuse source discharges. Refer section 2.7 below for further information.

2. Statutory and planning context

This section sets out the statutory and planning context for managing agricultural-sourced diffuse discharges in the Taranaki region.

2.1 The Resource Management Act

The Resource Management Act 1991 (RMA) is the principal statute for the management of natural and physical resources. The purpose of the RMA is to promote sustainable management of natural and physical resources.

Duties and restrictions under Part 3 of the RMA that particularly apply to the management of agricultural-sourced diffuse discharges to water are as follows.

Under section 9(2) of the RMA:

“No person may use land in a manner that contravenes a regional rule unless the use:

- (a) is expressly allowed by a resource consent;*
- or*
- (b) is an activity allowed by section 20A[certain lawful activities allowed].”*

Under section 15(1) of the RMA:

“No person may discharge any –

- (a) contaminant or water into water; or*
 - (b) contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water ...*
- unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent.”*

The Council is responsible for promoting the sustainable management of freshwater and soil resources, including soil health and water quality, in the Taranaki region. This responsibility is set out in section 30 [regional council functions] of the RMA.

Under section 30 of the RMA, the Council, *inter alia*, has the following functions:

- the control of the use of land for the purpose of:
 - soil conservation
 - the maintenance and enhancement of water quality
 - the maintenance and enhancement of ecosystems in water bodies
- the control of discharges of contaminants into or onto land, air, or water and discharges of water into water
- the establishment of regional rules to allocate the capacity of water to assimilate a discharge of a contaminant.

The RMA provides for a hierarchy of policies and plans and other statutory powers to enable central and local government to carry out their functions. These include national policy statements, national environmental standards, regional policy statements, regional plans, and district plans.

2.2 The National Policy Statement on Freshwater Management

Across New Zealand, freshwater quality is coming under increasing pressure.

Subsequently, the Government promulgated the *National Policy Statement on Freshwater Management 2011* (the NPS), which came into effect on 1 July 2011.

The NPS sets out objectives and policies that direct local government to manage water in an integrated and sustainable way, while providing for economic growth within set water quantity and quality limits.

Local authorities must give effect to relevant provisions of the NPS in their planning documents and resource consent authorities must have regard to relevant provisions when considering consent applications.

The NPS, amongst other things, requires all regional councils to set water quality limits in their regional plans to achieve freshwater objectives for all bodies of fresh water in their

regions. Where these objectives are not met, time bound targets for water quality are to be specified in the plans to ensure these objectives are met in the future.

The NPS contains two objectives for managing freshwater quality that regional councils must give effect to. The objectives of the NPS relating to freshwater quality are:

- "A1. To safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of freshwater.
- A2. The overall quality of freshwater within a region is to be maintained or improved while:
- (a) protecting the quality of outstanding freshwater bodies
 - (b) protecting the significant values of wetlands
 - (c) improving the quality of freshwater in water bodies that have been degraded by...over allocation (i.e. of their assimilative capacity)."

Also of relevance to this technical paper is Policy A3 of the NPS,⁵ which addresses water quality. Policy A3 reads as follows:

"Policy A3: Water quality

By regional councils:

- (a) imposing conditions on discharge permits to ensure the limits and targets specified pursuant to Policy A1 and Policy A2 can be met, and
- (b) where permissible, making rules requiring the adoption of the best practicable option to prevent or minimise any actual or likely adverse effect on the environment of any discharge of a contaminant into fresh water, or onto or into land in circumstances that may result in that contaminant (or, as a result of any natural process from the discharge of that contaminant, any other contaminant) entering fresh water."

Also of relevance is Policy A4(1) of the NPS, which has been included as a transitional policy in the Plan.⁶ Policy A4(1) reads:

⁵ Other relevant NPS policies include policies A1 and A2, which relate to the establishment of freshwater objectives and the setting of water quality limits.

⁶ Policy A4 provided for regional councils to immediately amend their regional plans (without using the statutory review process in Schedule 1 of the RMA).

"...When considering any application for a discharge the consent authority must have regard to the following matters:

- (a) *the extent to which the discharge would avoid contamination that will have an adverse effect on the life-supporting capacity of fresh water including on any ecosystem associated with fresh water and*
- (b) *the extent to which it is feasible and dependable that any more than minor adverse effect on fresh water, and on any ecosystem associated with fresh water, resulting from the discharge would be avoided."*

2.3 The New Zealand Coastal Policy Statement

The New Zealand Coastal Policy Statement (the NZCPS) was gazetted on 4 November 2010 and took effect on 3 December 2010.

The purpose of the NZCPS is to state national "... policies in order to achieve the purpose of the Act in relation to the coastal environment of New Zealand". As a national policy statement local authorities must give effect to relevant provisions of the NZCPS in their planning documents and resource consent authorities must have regard to relevant provisions when considering consent applications.

Policy 1 of the NZCPS identifies the extent and characteristics of the coastal environment. Of note the coastal environment extends beyond the coastal marine area (that part of the environment regulated via that Coastal Plan) and may include parts of rivers and streams with significant coastal processes, influences or qualities. Such areas also fall under the scope of the Freshwater Plan.

Of particular significance to the review of the freshwater and soil plans are policies 21, 22 and 23(1) of the NZCPS:

"Policy 21: Enhancement of water quality

Where the quality of water in the coastal environment has deteriorated so that it is having a significant adverse effect on ecosystems, natural habitats, or water based recreational activities, or is restricting existing uses, such as aquaculture, shellfish gathering, and cultural activities, give priority to improving that quality by:

- (a) identifying such areas of coastal water and water bodies and including them in plans;
- (b) including provisions in plans to address improving water quality in the areas identified above;
- (c) where practicable, restoring water quality to at least a state that can support such activities and ecosystems and natural habitats;
- (d) requiring that stock are excluded from the coastal marine area, adjoining intertidal areas and other water bodies and riparian margins in the coastal environment, within a prescribed time frame; and
- (e) engaging with tangata whenua to identify areas of coastal waters where they have particular interest, for example in cultural sites, wāhi tapu, other taonga, and values such as mauri, and remedying, or, where remediation is not practicable, mitigating adverse effects on these areas and values.

Policy 22: Sedimentation

- (1) Assess and monitor sedimentation levels and impacts on the coastal environment.
- (2) Require that subdivision, use, or development will not result in a significant increase in sedimentation in the coastal marine area, or other coastal water.
- (3) Control the impacts of vegetation removal on sedimentation including the impacts of harvesting plantation forestry.
- (4) Reduce sediment loadings in runoff and in stormwater systems through controls on land use activities.

Policy 23: Discharge of contaminants

- (1) In managing discharges to water in the coastal environment, have particular regard to:
 - (a) the sensitivity of the receiving environment;
 - (b) the nature of the contaminants to be discharged, the particular concentration of contaminants needed to achieve the required water quality in the receiving environment, and the risks if that concentration of contaminants is exceeded; and
 - (c) the capacity of the receiving environment to assimilate the contaminants; and
 - (d) avoid significant adverse effects on ecosystems and habitats after reasonable mixing;

- (e) use the smallest mixing zone necessary to achieve the required water quality in the receiving environment; and
- (f) minimise adverse effects on the life-supporting capacity of water within a mixing zone."

2.4 The Regional Policy Statement for Taranaki

The *Regional Policy Statement for Taranaki 2010* (the RPS) sets out broad objectives and policies for the Taranaki region to promote integrated management in the region. Both regional and district plans must give effect to the RPS.

The RPS, *inter alia*, identifies the effects on water quality arising from diffuse source discharges to water bodies as a regionally significant resource management issue.

The RPS includes policies and methods of implementation to achieve that objective. Of note are WQU policies 1 and 2, which relate to diffuse source discharges to water.

“WQU POLICY 1: Sustainable land management practices

Sustainable land management practices and techniques that avoid, remedy or mitigate adverse effects on surface water quality will be encouraged, including:

- (a) the retention and restoration of effective riparian buffer zones;
- (b) the careful application of the correct types and quantity of fertiliser and agrichemicals;
- (c) the careful application of the appropriate quantities of farm dairy effluent having regard to topography, land area, weather and soil conditions;
- (d) the development, recontouring and restoration of disturbed land to reduce diffuse source discharges of contaminants to water;
- (e) farm management practices that avoid, remedy or mitigate the effects of stock entry to rivers and streams, trampling and pugging by stock, overgrazing, and accelerated erosion from inappropriate land use on erosion prone land; and
- (f) other land management practices, including the discharge of contaminants to land and the diversion of stormwater runoff to land, which avoid or reduce contamination of surface water.

WQU POLICY 2: Riparian management
The retirement and planting of riparian margins throughout the Taranaki region will be promoted, with a particular focus on ring plain catchments."

The Council's riparian management programme is listed in the RPS as one of the main methods to address this issue.

2.5 The Freshwater Plan

The Council's freshwater management responsibilities are primarily addressed through the Freshwater Plan. This Plan became operative on 8 October 2001.

The Freshwater Plan sets out policies relating to managing diffuse discharges to water, including Policy 6.3.1 which outlines management practices to maintain and enhance water quality by reducing diffuse source discharges of contaminants, and policy 6.3.2 and 6.3.3 which promote the protection and enhancement of riparian vegetation.

In terms of the regulatory framework set out in the Freshwater Plan, diffuse source discharges are primarily addressed as a permitted activity. Fertiliser and agrichemical applications onto land are generally permitted by the Freshwater Plan (rules 30 to 34) without the need for a resource consent. Similarly, pursuant to rules 25 and 26, the discharge of stormwater from earthworks (less than eight hectares) is also a permitted activity.

Only when diffuse source discharges are of a scale or a volume that they are considered a point source (e.g. large scale earthworks associated with tracking and roading), and or can not comply with the relevant standards, terms and conditions, would an activity be required to obtain a resource consent.

Stock access to waterways is addressed in rules relating to the construction, placement and use of a culvert, ford, or bridge in, on, under, or over the bed of a river (rules 52-58). Activities relating to structures on or over riverbeds are permitted or discretionary activities depending upon the scale and significance of the activity.

Appendix I of this paper sets out relevant rules in the freshwater plan relating to the management of diffuse discharges.

There are no regional rules relating to prohibiting or controlling stock grazing to or standing in water. Indeed the Council has implemented a significant non regulatory programme – the Taranaki Riparian Management Programme. This is very much a collaborative approach involving the regional community, through the Council, supporting farmers to voluntarily retire riparian margins on either side of the waterways on their properties by fencing them off and planting them with suitable vegetation (refer section 2.7 below).

This collaborative approach was adopted in preference to rules and was considered the more effective and efficient option for achieving water quality objectives at that time. However, as noted in the Plan should monitoring indicate that the voluntary approach is not achieving its objectives, then alternative measures such as regulation will be considered.

2.6 The Soil Plan

The Council's soil conservation responsibilities are primarily addressed through the Soil Plan. This Plan became operative on 8 October 2001.

The Soil Plan, amongst other things, addresses soil health matters. This includes the issue of residual soil contamination from diffuse sources.

To address the issue of residual soil contamination, Policy 2.2 states the Council will encourage management practices to avoid adverse increases in residual soil contamination. The methods to implement that policy are non regulatory and include advice and information, advocacy, research and monitoring.

The Soil Plan also addresses accelerated erosion issues. The loss of sediment on erosion prone slopes impacts upon soil productivity, capability and versatility, resulting in the increased siltation of watercourses and a reduction in freshwater quality.

To address the issue of accelerated erosion, policies 1.1 and 1.2 states the Council will encourage sustainable land management practices on erosion prone land with a particular focus on the eastern hill country.. The methods to implement that policy are non regulatory and include the Sustainable Land Management Programme (refer section 2.8 below).

2.7 The Taranaki Riparian Management Programme

The Taranaki Riparian Management Programme is the largest enhancement planting scheme on privately owned land in New Zealand.⁷ This voluntary programme, which is unique to Taranaki in terms of its sheer scale and its effectiveness, began in 1993. The programme involves farmers, with the support of Council, fencing and replanting riparian margins on Taranaki's most intensively farmed land (e.g. the ring plain). The purpose of the fencing and planting is to exclude livestock from waterways and to intercept and reduce runoff reaching water.

The Taranaki Riparian Management Programme has the following three components.

2.7.1 Riparian planning service

The Council prepares riparian plans at no cost and no obligation to the landowners. The plans contain property-specific recommendations for riparian management including what areas should be fenced and/or the recommended plant species. Estimated costs of fencing, planting and weed spraying are also provided.

The riparian plans are prepared following a property inspection and close consultation with the landowner. This ensures they are tailored to the needs of the property and therefore more likely to be implemented.

As at 30 June 2012, more than 2,390 riparian plans have been prepared for farmers covering the most intensively farmed land.

2.7.2 Riparian plant scheme

Complementing the planning service is the provision of native riparian plants at cost to plan holders.

To make riparian planting more affordable, the Council contracts plant nurseries to supply, in bulk, suitable indigenous plants, and then pass on the savings to plan holders. In 2011/2012, the Council supplied over 415,000 native plants to riparian plan holders. Since 1996, the Council's plant production schemes have supplied over 2.5 million plants to plan holders.

In addition to supplying plants, the Council, on behalf of interested riparian plan holders, tender for the provision of planting contract services. By tendering, Council is able to match the demand with services, identify potential savings between competitors, and pass on these savings to plan holders.



Farmers collecting riparian plants, the Council's plant nursery at Lepperton

2.7.3 On-going liaison and support

Following the preparation of riparian plans, the Council undertakes regular one-on-one engagement with farmers to support the implementation of riparian plans.

This involves Council land management officers visiting/contacting riparian plan holders to establish their progress with fencing and planting, as appropriate, encouraging plan holders to budget riparian works into their next annual budget, and take plant orders.

⁷ Taranaki Regional Council, November 2011.



On-going liaison with plan holders is an integral part to ensuring the implementation of riparian plans

2.8 The Sustainable Land Management Programme

The Council's Sustainable Land Management Programme targets the hill country and coastal sand country to mitigate land use effects on soil conservation (as outlined in section 3.2 below, accelerated erosion results in excessive sediment levels in waterways).

Similar to the Taranaki Riparian Management Programme, the Sustainable Land Management Programme involves the provision of advisory and extension services to land holders to promote voluntary change towards sustainable land management practices.

The Sustainable Land Management Programme involves the provision of comprehensive farm plans to interested land holders in the eastern hill country. These plans look at all aspects of a farming operation including land and stock management and specifically address management practices that protect soil and water resources while

maximising the productive capability of the property.

As at 30 June 2012, the Council has prepared a total of 361 comprehensive farm plans and agroforestry plans,⁸ which together cover 192,799 hectares or 63% of the privately owned land in the Taranaki hill country.

The Sustainable Land Management Programme also involves a plant provision scheme whereby the Council grows or obtains quality conservation planting material and makes these plants available to property plan holders at cost.

The provision of planting material at cost is a key component in the success of the Council's Sustainable Land Management Programme. In 2011/2012, the Council provided 11,992 poplar and willow units to 100 plan holders; of which 6,082 were 3metre poles.

2.9 Industry initiatives

The *Dairying and Clean Streams Accord* (the Accord) is a national voluntary agreement to improve the dairy industry's environmental performance. The parties to the Accord are the Ministry for the Environment, the Ministry of Agriculture and Forestry, Fonterra and regional councils. The Accord was signed in May 2003.

The Accord five targets for dairy farmers that have a material influence on dairy farm environmental performance. Of particular relevance to this paper are the following two targets:

- to exclude dairy cattle from 90% of streams, rivers and lakes by 2012 (by the fencing of waterways and the provision of stock crossings)
- to promote nutrient budgeting.

At a local level, the Council, Federated Farmers and Fonterra have prepared the *Regional Action Plan for Taranaki* (the Regional Action Plan). The Regional Action Plan sets out regionally-specific targets to implement

⁸ Depending upon individual circumstances and land owner interest, other types of plans – agroforestry plans and conservation plans – are available under the Sustainable Land Management Programme.

the Accord. Plan targets for dairy farms relating to diffuse pollution and to be achieved over the life of the Plan are:

- 90% of farms to have a riparian plan
- 90% of farms to be fenced and planted
- 90% of regular stock crossings to be bridged or culverted
- 100% of farms to have a nutrient budget.

Progress against those targets is monitored and reported upon annually.

Nationally, the Accord parties are in discussions regarding a successor to the Dairying and Clean Streams Accord. At this time, the value, scope, targets and signatories to any successor Accord have yet to be determined.

Another significant industry initiative is OVERSEER[®], which is an agricultural management tool that assists in examining nutrient use and movements within a farm to optimise production and environmental outcomes.

OVERSEER[®] calculates and estimates the nutrient flows in a productive farming system and identifies potential for risk of environmental impacts through calculation of nutrient loss as run-off and leaching and greenhouse gas emissions.

Its current uses are in the development of on-farm nutrient budgets⁹, whole-of-farm nutrient management plans and, through the use of additional proprietary software, the development of farm specific fertiliser recommendations. OVERSEER[®] calculates maintenance nutrient applications for pastoral farms, i.e. the levels of nutrients required to maintain the current soil test values.

OVERSEER[®] is a valuable tool for farmers and their advisors in planning nutrient use and assessing the potential environmental losses. It is increasingly being used nationally to support environmental policy – most notably around Lake Taupo and as a part of the Horizons Regional Council's *Proposed One Plan* (refer section 4.1 below).

Appendix II of this paper presents an overview of OVERSEER[®].

⁹ *Nutrient budgets are an important tool in assessing the environmental impact and sustainability of agricultural management on a farm.*

3. Agricultural-sourced diffuse discharges to land or water

This section provides an overview of agricultural activities contributing to diffuse source discharges, the characteristics of diffuse pollutants, the pathways for them entering water bodies, and their impacts on Taranaki's freshwater and soil resources.

3.1 Farm activities contributing to diffuse pollution

As the dominant land use in Taranaki, agriculture has the most widespread impact on soil health and freshwater quality. In relation to diffuse source discharges, the problem stems from the cumulative impacts¹⁰ from a large number of agricultural activities that collectively may pose significant environmental risks to soil health and or freshwater quality.

Farm management practices play a crucial role in the amount and impact of these pollutants. While it is possible to minimise environmental risks, environmental risks are exacerbated should farm practices occur in a manner that allows contaminants to escape or seep into soil and ground or surface water, e.g. through:

- Increasing stocking rates resulting in increased quantities of excreta and urine being discharged and runoff to surface water or leaching into groundwater
- the excessive use of fertilisers, pesticides and herbicides (resulting in excessive nutrient levels in the soil and or nitrogen and phosphorus runoff to water)
- contaminants escaping from feeding paddocks, standoff pads, raceways, and tracks (resulting in the direct discharge or runoff of leachate, excreta, urine and pathogens)
- the direct entry of livestock to water and or grazing near waterways (resulting in

the direct discharge or runoff of streambank sediment, excreta, urine and pathogens into water)

- inappropriate land use on erosion prone land (resulting in sediment runoff to water).

The most recent OECD environmental review of New Zealand highlights that freshwater quality has declined in those areas dominated by pastoral farming.

In terms of change in agricultural production, New Zealand was ranked 1st out of 29 OECD countries, with the highest percentage increase in agricultural production. New Zealand also recorded the highest percentage increase in total nitrogenous fertiliser use and the 2nd highest percentage increase in total phosphate fertiliser use out of the 29 OECD countries. The OECD review highlighted the need for a 'tool box' of response measures and tailored responses to address issues.¹¹

In Taranaki, as elsewhere in New Zealand, dairy herds are increasing in size through stocking rate intensification and farm amalgamations. The number of dairy cows has increased from 350,000 in the late 1970s to about 480,000 by 2009. Dairy farms are typified by higher stocking rates and higher quantities of fertilisers and agrichemicals being applied to the land in comparison with other land uses.¹²

The net effect of the expansion and intensification of dairying in the region is to increase the amount of nutrients, sediment, and animal effluent being applied to the land and dispersed into water bodies traversing the intensively farmed parts of Taranaki.¹³

¹⁰ The term 'cumulative effects' been described in case law (*Gargiulo v Christchurch City Council, C137/00*) as "...any one incremental change is insignificant in itself, but at some point in time or space the accumulation of insignificant effects becomes significant."

¹¹ Howard-Williams, C, et al, 2010.

¹² Of the pastoral land use category, dairy farming has the highest diffuse pollution footprint with almost 37% of the total nitrogen load entering the sea originating from the 7% of the land area that makes up dairying. Howard-Williams, C, et al, 2010.

¹³ Intensive farming, particularly dairying, has historically focused on the fertile flat areas of the ring

Table 1 below summaries some key statistics and trends highlighting the expansion and intensification of dairying in the region.

Table 1: Dairying trends in Taranaki

	2002/2003	2010/2011
Average herd size (cows milked) ¹	210	270
Farm size (effective hectares) ¹	85	96
Stocking rate (cows/ha)	2.5	2.8
Fertiliser and lime inputs (per cow) ¹	\$122	\$181
Pastoral production (kg milk solids) ¹	59,500	92,600
Number of farm dairies ²	2,189	1,803

¹ Refer Ministry of Agriculture and Forestry farm monitoring reports for 2003 and 2011

² Derived from Council's consents database (R2D2).

Along with increased herd sizes and stocking rates there has been clearance of much of the original riparian cover over the last 160 years. The clearance has significantly reduced the role of riparian vegetation to intercept diffuse source pollutants by trapping and filtering runoff before it reaches water (Figure 1). Of note traversing the ring plain are more than 300 rivers and streams – with a total length of 14,660 kilometres of stream bank – collecting and transporting diffuse source contaminants arising from the adjacent land use activities.

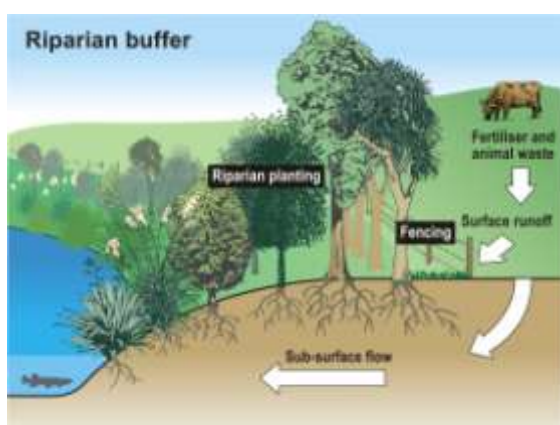


Figure 1: Diffuse source activities and riparian management

plain. However, over the last decade dairying has also expanded into the coastal terraces and the frontal hill country.

3.2 Characteristics of diffuse source discharges

There are three main types of pollutants that are of concern in relation to diffuse source impacts on freshwater quality and soil health. They are:

- nutrients were identified by the Parliamentary Commissioner for the Environment as the pollutant of most concern.¹⁴ On land they cause less of a problem. However, excessive nitrogen levels in soils can lead to nitrate leaching into either surface water or groundwater. The rapid growth of unwanted algae and aquatic weeds is tangible evidence of a problem. There are two nutrients that collectively cause water quality issues – nitrogen and phosphorus. The largest source of nitrogen is urine from livestock while the largest source of phosphorus is from sediment (e.g. soil erosion from the mountain and eastern hill country) and topdressing. Lost nutrients = lost economic investment by farmer
- sediment is a problem by virtue of where it is – in water rather than on land. The loss of forests and other vegetation that retained the soil on land has led to an acceleration of natural erosion processes. Excessive sediment levels in water damages aquatic life in the rivers by smothering and through the destruction of instream habitat. The sediment also carries phosphorus into the water. Lost soil = lost productivity for farmer
- pathogens – invisible microbes (bacteria, viruses) that affect the health of people and animals – are obviously pollutants in terms of usage of water. However, they cause relatively little damage to the natural environment.

The two nutrients – nitrogen and phosphorus – enter water by largely different routes. Nitrogen occurs in forms that are highly soluble in water and so can travel via overland flow as well as groundwater.

Overland flow is probably the largest source of diffuse pollution in Taranaki. However, the direct access of livestock is also a widespread

¹⁴ Parliamentary Commissioner for the Environment: *Water Quality in New Zealand*, March 2012.

pollution source. Direct livestock access to water adversely affects freshwater quality by:

- the physical damage to the banks of waterways caused by livestock treading and browsing, which increases the susceptibility of riparian margins to erosion, sediment loss and pollutant runoff
- direct excreta and urine deposits in water, which adds nitrogen, phosphorus and faecal microbes.

Most phosphorus, on the other hand, enters water with soil and if the soil can be stopped from getting into water, so will the phosphorus. Once in water, however, much of the phosphorus is locked up in sediment and can be there for a very long time.

3.3 Effects of diffuse source discharges to land

The high density of grazing stock on dairy farms delivers more nutrients to the land than other forms of farming.¹⁵

Nutrients, including the elements nitrogen and phosphorus, are essential for plant growth and soil biological activity. However, when supply exceeds demand (when saturation is reached) elevated phosphate levels and any excess soluble nitrogen can be leached from the soil and adversely affect water quality.

Excess soluble nitrogen is of particular concern on the ring plain and coastal terraces given the concentration and intensification of dairying in these areas and because any declines in soil health are difficult to reverse.

So what is the condition of Taranaki's soil health to date? The Council's state of the environment monitoring shows good to excellent overall soil health in the region.^{16 17}

A 2008 soil study¹⁸ found that while phosphate levels have increased significantly over a 20-30

¹⁵ Dairy cows excrete almost seven times the amount of nitrogen and phosphorus in their faeces and urine compared to breeding ewes, and around three and a half times that of breeding hinds. Ministry for the Environment, 2008.

¹⁶ Taranaki Regional Council, February 2003.

¹⁷ Taranaki Regional Council, February 2009.

¹⁸ This study repeated and updated, for the region, a national soil monitoring project (the 500 soils project).

year timeframe in Taranaki, over the past ten years the increase has in fact been negligible.

The 2008 soil study found that total nitrogen levels were above recommended levels on almost all dairy farms and that the average total nitrogen level on dairy farms had slightly increased over the past ten years. However, a 2007 long-term soil study¹⁹ found that total soil nitrogen in the dairy farm sites probably has not changed when assessed against levels of 30 or 20 years ago.

The majority of nitrate leaching comes from fertiliser and animal excreta, not the decomposition of organic nitrogen.

The Council also undertook trials on the possible effects of livestock intensification upon soil and pasture quality. The stocking rate intensification trials found there was no significant difference in loss of nutrients and trace elements (total nitrogen, calcium, and magnesium) via leaching, even though stocking rates and the amount of feed imported increased. For the duration of these trials it was apparent that higher stocking rates did not necessarily lead to an increase in leaching to groundwater, but rather the issue was more one of balancing nutrient application and uptake by pasture.

The trials showed that appropriate farm management could improve soil quality (structure and chemistry) even at higher stocking rates, and that more highly stocked soils can be as good as those stocked at a lower rate.

The Council has also reviewed data from national and specific Taranaki studies^{20 21} on whether cadmium (a contaminant found in phosphate rock) and zinc (an animal remedy) are accumulating in pasture soils to an extent that poses an environmental risk (such as toxicity) in produce. In these studies, the average cadmium concentration in dairying soils in Taranaki was in the range 0.52-0.66 mg/kg, and for all soils the averages were 0.47-0.66 mg/kg. Very few results lay above 1.0 mg/kg, with the highest reported in any study 1.7 mg/kg. Generally cadmium levels

¹⁹ Parfitt, R.L and Ross, C, 2007.

²⁰ Taranaki Regional Council, 2005.

²¹ Sparling, G, 2001.

were highest on grazed pastures (but there was little distinction between pastoral soils and plantation soils), and lowest within indigenous forestry soils.

Internationally, guideline values for cadmium in agricultural soils (including beef, mutton, and horticultural soils) are in the range 1-12 mg/kg, with the lower values being used for triggering the need for further investigation (1.0-1.4 mg/kg). The majority of Taranaki sites were about half the lower guideline values. At the average rate of increase found in some of these studies, it would be approximately 100 years before the average for dairy sites exceeds the guideline values triggering the need for further investigation.

Modelling of cadmium accumulation predicts that cadmium concentration levels in Taranaki soil will reach a limiting value around 1.3 mg/kg or a little higher, depending upon phosphate fertiliser application rates²². However, it is noted that the rate of superphosphate application has declined over time (Figure 2)²³, and the current cadmium concentration in super-phosphate is less than half of what it was over the preceding four decades. These factors would considerably extend the period before levels were reached that would necessitate further investigations.²⁴

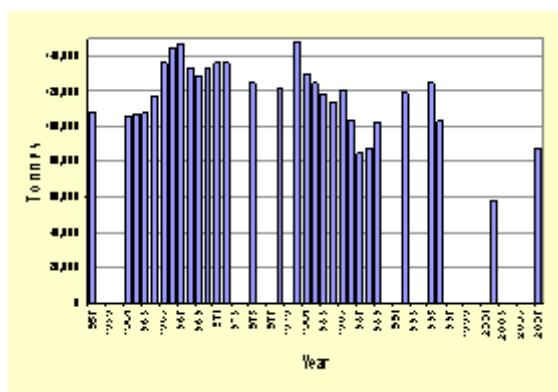


Figure 2: Tonnes of superphosphate based fertiliser used in Taranaki

²² Taylor M et al, 2007.

²³ Note: Data on tonnes of superphosphate not available for all years.

²⁴ A New Zealand Food Safety Authority survey further noted that "...residues of agricultural compounds and cadmium are well within acceptable dietary levels, with almost all agricultural compounds being present at levels constituting less than 0.1% of an acceptable dietary intake". Refer Ministry of Agriculture, 2009.

Zinc concentrations at all sites were also far below guideline limits. While the highest soil concentration was found in one dairy pasture site, generally levels were similar in all land uses surveyed: indigenous bush, plantation forest and beef pasture sites.

As part of the 2008 soil survey, samples were also collected for analysis for evidence of residual contamination by agrichemicals. All sites were tested for a suite of 18 different acidic herbicides (including acetochlor, chlorpyalid, dicamba, 2,4-D, haloxyfop, MCPA, MCPB, pentachlorophenol, picloram, 2,4,5-T, 2,4,5-TP, and triclopyr). Sites were also tested for a suite of 72 different chemicals that are used to control insects or fungus. These included acephate, atrazine and its derivatives, captan, chlorpyrifos, cyfluthrin, diazinon, dichlorvos, malathion, parathion, permethrin, simazine, trifluralin, and vinclozolin.

The limits of detection for the herbicides were in the range 0.008-0.02 mg/kg. The limits of detection for the pesticides were in the range 0.009-0.04 mg/kg.

Of the 72 pesticides tested for on 20 sites (1,440 results), 12 results were positive (in each case, just on the limit of detection). That is, 99.2% of all results were negative for the presence of any pesticide. One site had five positive detections, while a second had two (these two sites were the two cropping sites tested). Five other sites (two drystock farms and three forestry plots) had a single pesticide (out of 72) confirmed as present. No agrichemicals were detected in the soil at any dairy farm site, the predominant land use on the ring plain of Taranaki.

The herbicide *acetochlor* was detected at five sites (some drystock, market gardening, and indigenous forest sites), otherwise no agrichemical was detected at more than one site. Acetochlor is used for pre-emergent weed control in cropping. It is strongly absorbed by soil, with little leaching, and a half life of 8-18 days i.e. it degrades rapidly and is not persistent or cumulative.

On the basis of these results, there is no evidence of any issue of residual or cumulative agrichemicals in the soils of the region.

3.4 Effects of diffuse source discharges to water

On land or of themselves, nutrients are not a problem. The problem with excessive nutrient enrichment is how it may affect the physicochemical and biological condition of water once it escapes or seeps into our waterways or groundwater.

When other environmental conditions are right, excess nutrients can have significant effects on water bodies. Nitrogen and phosphorus stimulate plant growth, leading to algal blooms (sometimes toxic), oxygen depletion, and ecological damage. Ammonia can kill fish, and elevated nitrate levels can make groundwater unsafe for drinking.

As a general rule, high levels of nitrogen and phosphorus, in particular, contribute to the excessive ('nuisance') growth of plants, including algae, which, in turn, can smother the instream habitat, affect the attractiveness of water for swimming, impact on fish habitat, impede water flows and block water intakes.

Nuisance impacts on water quality vary across the country according to topography. The growth of nuisance aquatic weeds and algae in water can lead to eutrophication and increased diurnal fluctuations in dissolved oxygen and pH resulting in oxygen depletion. There may also be reductions in water clarity. This is especially an issue for lakes and streams with retention structures.

Fortunately, nutrients are not such a problem in Taranaki, as in other parts of the country or internationally, because of our fast flowing and relatively short rivers and streams. Frequent flushing events in our rivers and streams – thanks to plentiful rainfall – provide natural scouring. Even in summer Taranaki rivers do not have large bodies of shallow sluggish warm flows along their length, which are conducive to the growth of nuisance aquatic weeds and algae.

However, cumulative impacts from diffuse and point source runoff have marked impacts increasing periphyton substrate cover particularly in the lower reaches of Taranaki waterways under warmer, low flow conditions, e.g. Kaupokonui Stream,

Waingongoro River, Kapoiaia Stream, and the Manganui River.²⁵

3.4.1 What is the condition of Taranaki's surface water quality?

The Council's state of the environment monitoring shows relatively good to excellent overall surface water quality in the region.^{26 27}

On most physical, chemical and biological measures, freshwater quality is being maintained in Taranaki – i.e. organic matter, suspended solids, clarity, conductivity (dissolved matter), and bacterial contamination.²⁸ This is during a time when there has been increasing demands on fresh water, e.g. the number of consents involving water abstractions and discharges has increased considerably, urban centres are spreading, and livestock farming has intensified.

State of the environment monitoring also shows that, at some sites, freshwater quality has improved.

The Council's Macroinvertebrate Community Index (MCI) describes the state of and trends in the biological health of Taranaki rivers. MCI monitoring is carried out at 57 representative sites on 25 rivers or streams twice a year, and ranges from sites in near pristine water to sites in intensively farmed catchments.

The latest MCI results are overall very encouraging. In 2010/2011, 55 of the 57 representative sites had MCI scores similar to or better than historical medians for each of those sites.

The physicochemical monitoring results are also, overall very encouraging. Although the monitoring does identify some matters still needing further attention.

The physicochemical monitoring undertaken by the Council shows that BOD levels has been stable over the long-term record. An increase of BOD concentration over time was identified at two sites. However, closer analysis of these

²⁵ Taranaki Regional Council, 2012.

²⁶ Taranaki Regional Council, February 2003.

²⁷ Taranaki Regional Council, February 2009.

²⁸ Taranaki Regional Council, 2012.

two sites indicates that this trend is much more a matter of a small change in a very low baseline concentration.

The vast majority of results for bacteriological parameters also showed regional stability over both the longer term and also more recently. Markers of aesthetic water quality are now either stable or improving (earlier results showed a decline in clarity at a few sites). While over the long-term record there were increases in either or both of dissolved reactive phosphate and total phosphate at most sites, the previous trend of deterioration in phosphate has been halted-the more recent data shows 91% of all phosphate results are now either stable or in fact improving.

In the light of the current conversation at national level propounding that nitrogen concentrations are deteriorating (getting higher) in surface waterways, it is interesting to note that across the three nitrogen species (nitrate, ammonia, and total nitrogen) during the full period of monitoring, results in fact overwhelmingly show stability (80%), and improvements (reduction in nitrogen) match deterioration (increase) almost exactly (5 improvements, 6 deteriorations). Even more significantly, the concentrations of total nitrogen in our waterways have either been stable over the last 16 years (60%), or have improved (40%)-there is not a single site where the concentration of total nitrogen has increased. For the more recent data, one site-an upper catchment site- shows deteriorating total nitrogen, but three mid and lower catchment sites show improvement.

Appendix III of this paper sets out a snapshot of the state and trends in freshwater quality in Taranaki.

While previous increases in nutrient loading of Taranaki waterways has been halted, Taranaki rivers and streams have yet to experience a recovery down to their earlier concentrations.

State of the environment monitoring also highlights that there is some room for improvement. Catchments such as the Kurapete Stream, and the Mangati, Mangawhero, Tawhiti, and Waiokura streams are identified as being most at risk from agricultural sourced diffuse discharges. These catchments are typically small spring fed

streams, which originate in intensively farmed land.

MCI data confirms a 40-50 unit decline in the index downstream along the length of ring plain catchments. Poorer biological health is generally found in low elevation pasture areas (Figure 3). In lower catchments, stream biological health is 'fair' and may fall to 'poor' in some catchments.

The cumulative impacts of diffuse source discharges from adjacent land uses is but one factor contributing to the progressive decline in MCI values. Other contributing factors include changes in stream morphology, variability in riparian shading and the cumulative impacts of farm dairy effluent systems discharging to water.

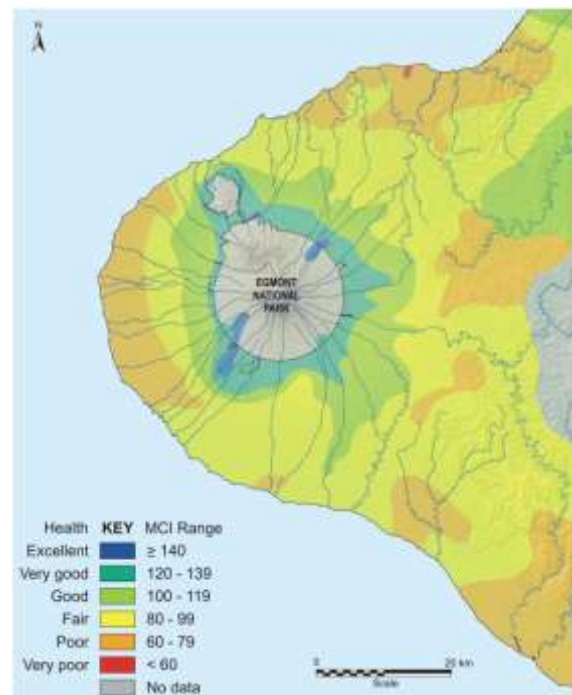


Figure 3: Ecological stream health for Taranaki rivers and streams as measured by MCI values

3.4.2 What is the condition of Taranaki's ground water quality

Groundwater is an important water resource in Taranaki and is a major component of stream flow during dry weather for most streams.

Contamination of groundwater occurs when pollutants percolate through the soil and into the underlying aquifers. Diffuse source discharges such as farm runoff or effluent irrigation²⁹ are particularly significant potential sources of contamination.

The geological properties of an aquifer play a large part in determining whether contaminants discharged onto or into land will reach groundwater. Historically, the principal groundwater issues in Taranaki have been the presence of high concentrations of dissolved iron in the Taranaki volcanic aquifers (a natural phenomenon) and the concentration of nitrates from intensive pastoral farming.

Nitrate levels in Taranaki groundwater that exceeded the New Zealand drinking water standard of 11.3 mg/l mainly occurred in south Taranaki. However, state of the environment monitoring shows that, for the most part, incidents of nitrate levels in Taranaki groundwater exceeding New Zealand's drinking water standard were intermittent in nature and limited in distribution.

From the most recent report on nitrates in shallow groundwater in Taranaki it was observed that nitrate concentrations in shallow groundwater have continued to decrease in the region with 90.5% of 550 samples lying below the 11.3 mg/l guideline for drinking water. Trend analysis performed on all the data from 2002-2007 indicates that two-thirds of the sampled sites showed an improvement in groundwater quality in terms of nitrate levels.

3.4.3 Summary of diffuse source impacts on freshwater quality

Set out in Table 2 overleaf is a summary of the pollutants impacting upon freshwater quality, including a summary of why they are a problem, the farm sources contributing to the pollutants entering water, and how they get there.

²⁹ *The effects of farm dairy land treatment have been addressed in a separate paper. Refer Taranaki Regional Council, 2012.*

Table 2: Pollutants impacting upon freshwater quality

Pollutants	What is the problem	Source of pollutants	How it gets to water
Nitrogen	<ul style="list-style-type: none"> • Feeds nuisance plant and algae growth in waterways • Algae and nuisance plants affect in stream life and make water unpleasant for swimming and drinking • Ammonia can be toxic to fish • Nitrate contamination of groundwater. 	<ul style="list-style-type: none"> • Urine from stock • Nitrogen from fertiliser • Ammonia in farm dairy wastewater. 	<ul style="list-style-type: none"> • Moves down through the soil (leaching) into groundwater and subsurface drains, which feed into streams • Surface runoff • Stock in streams • Discharges from dairy and municipal treatment pond systems.*
Phosphorus	<ul style="list-style-type: none"> • Feeds nuisance plant and algae growth in waterways • Algae and nuisance plants affect in stream life and make water unpleasant for swimming and drinking. 	<ul style="list-style-type: none"> • Dung from stock • Phosphate from fertiliser • Farm dairy waste water • Soil sediment. 	<ul style="list-style-type: none"> • Soil and bank erosion (P binds to soil particles) • Surface runoff • Dairy and municipal treatment pond systems* • Stock in streams • Subsurface drains.
Sediment	<ul style="list-style-type: none"> • Makes water murky and affects stream life • Poor water clarity makes water less suitable for swimming. 	<ul style="list-style-type: none"> • Stream bank erosion, slips, and trampling • Tracks and races • Surface of paddocks. 	<ul style="list-style-type: none"> • Surface runoff • Stream bank collapse • Slips.
Pathogens	<ul style="list-style-type: none"> • Human health risk from swimming and drinking • Can affect stock health if present in stock water. 	<ul style="list-style-type: none"> • Dung from stock • Farm dairy effluent. 	<ul style="list-style-type: none"> • Stock in streams • Surface runoff • Dairy and municipal treatment pond systems * • Discharges from poorly managed land treatment systems.*

* Note that issues associated with farm dairy effluent management systems have been addressed in a separate report entitled *Future Directions for the Management of Farm Dairy Effluent*, which has also been prepared as part of the review of the Freshwater Plan.

4. Review of the science

This section outlines key research and studies, relating to the management of agricultural-sourced diffuse discharges to water in the Taranaki region.

4.1 International study on diffuse source management in the Brighouse catchment

There is mounting international scientific evidence proving the success of the concept of fencing off the banks of rivers and streams as an effective and cost-efficient means to protect them from contamination by surface runoff.

An example of strong relevance to Taranaki is a study, managed by the Scottish Environment Protection Agency, of the stream catchment flowing into Brighouse Bay in Southern Scotland. It has relevance because – like many parts of Taranaki – the catchment is a rural region dominated by live stock farming, and with a low human population.

The study noted that the principal source of faecal contamination in the Brighouse Bay catchment is from the animal population. As stated in the study “...the practice of spreading faecal wastes on catchments is a central component of sustainable nutrient cycling in all temperate livestock farming systems. This presents an obvious threat to the compliance of receiving environments even where the farmers are following current good-practice codes.”

To address the issue, the study examined a number of remedial measures, including fencing off the riparian zones along the stream banks to provide a buffer zone between livestock and the stream channels.³⁰

Water quality sampling undertaken under both low-flow and high-flow conditions highlighted significant improvements in water quality. The results also suggest that the remedial measures implemented in the study –

³⁰ The Brighouse Bay catchment was seen as an ideal location for this study, because it involved seven farms contained wholly within the catchment’s hydrological drainage basin.

principally fencing streams to produce a vegetated riparian zone and prevent stock access – were effective in reducing faecal concentrations by between 66% and 81%.

4.2 International study on diffuse source management in the Humber River

In a study conducted by the University of East Anglia in the United Kingdom, researchers created a model of the various factors that lead to diffuse pollution, and then used the model to test the effectiveness of different methods of cutting the pollution, using the catchment of the Humber River as a case study.

Methods trialled ranged from reducing the number of dairy cows in the area by 20%, to cutting fertiliser use by 20%, to fencing off stream banks and planting riparian vegetation.

The study results were dramatically in favour of the fencing option. The model suggested that faecal bacteria pollution could be as much as 59% lower with fenced streams and riparian vegetation than without. By contrast, reducing the number of cows would lead to a 12% reduction, and cutting fertiliser use would cut the bacterial concentrations by less than 10% (refer Figure 4).

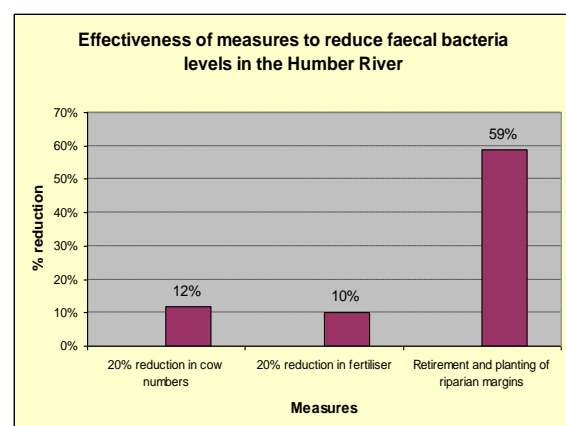


Figure 4: Effectiveness of measures to reduce faecal bacteria levels in the Humber River

4.3 Study on point and diffuse contributions, Manawatu River

Nitrogen and phosphorus concentrations in the Manawatu River, New Zealand, are among the highest nationally. To target its policies to better address nutrient levels, the Horizons Regional Council undertook a study³¹ on the relative contributions of soluble nutrients from point and diffuse sources to freshwater. The study also examined nutrient levels from point and diffuse sources at various river flows and in relation to concentration-based regulatory targets set out in the One Plan using load calculations.

The study reviewed long term nutrient and flow data maintained by Horizons Regional Council on the upper Manawatu and Mangatainoka sub-catchments of the Manawatu River.

The study measured nutrient loads in the upper Manawatu and Mangatainoka sub-catchments of the Manawatu River that were 55–154% greater than target nutrient loads.

The measured loads were predominately from diffuse sources, which contributed 98% or more of the soluble inorganic nitrogen and 84–88% of the dissolved reactive phosphorus at all flows.³²

The study highlighted the importance of policy to manage nutrient enrichment in these areas and the need to target inputs from diffuse sources at all flows, along with management of point sources at low flows.

4.4 Study on best practice farming in the Waiokura catchment

In 2001 NIWA and others commenced a study in the Waiokura catchment aimed at measuring the benefits of 'best practice' farming operations.

The Waiokura Stream is a small lowland stream that flows through some of the most intensively farmed pasture in New Zealand. Intensive dairying along its length, involving 44 farms, has elevated the levels of nitrogen, phosphorus, suspended solids and faecal bacteria in its water. It was for these reasons the Council selected the catchment to be part of a national study.

Between 2001 and 2007, farmers have increased the length of stream bank fenced and protected by riparian works from 40% to more than 52%. There has also been a 25% reduction in farm dairy effluent discharges to the stream (with a corresponding increase in land treatment) and farmers have reduced application rates of phosphorus-based fertilisers.

Studies (Wilcock, Betteridge *et al* 2009, Shearman and Wilcox, 2009) in the Waiokura catchment have subsequently confirmed significant improvements to the health of the stream.

Regular monitoring has shown that levels of dissolved contaminants from fertiliser runoff, treatment pond effluent and sediment loss have been reduced by as much as 40%.

Average concentrations of bacteriological indicators such as *E.coli* have been falling by about 8% per year (refer Figure 5). Significantly, improvements in freshwater quality have been achieved despite the fact that dairy farm productivity in the catchment has increased by almost 25%.³³

Monitoring has also highlighted a 20% reduction in in-stream concentrations and 29% reduction in yields of dissolved reactive phosphorus. The studies found that the primary drivers for this decrease were a reduction in farm dairy pond discharges to

³¹ Roygard JKF, *et al*, 2011.

³² *Of note, at low flows, point source inputs contributed up to 64% of the dissolved reactive phosphorus in the upper Manawatu sub-catchment. The issue of point source discharges in Taranaki during low flow periods has been separately addressed in the report 'Future Directions for the Management of Farm Dairy Effluent'.*

³³ Wilcock, R., *et al*, 2009.

water (diverted to land), and a reduction in the use of phosphate fertiliser in the catchment.

Total phosphate concentrations and yields in the Waiokura catchment fell by 30%. This decrease was attributed to less farm dairy pond discharges to water, a reduction in the use of phosphate fertiliser, and improved riparian management.

The Waiokura study highlights the importance of controlling diffuse sources as well as point source discharges to land and water to avoid, remedy or mitigate impacts on freshwater quality.

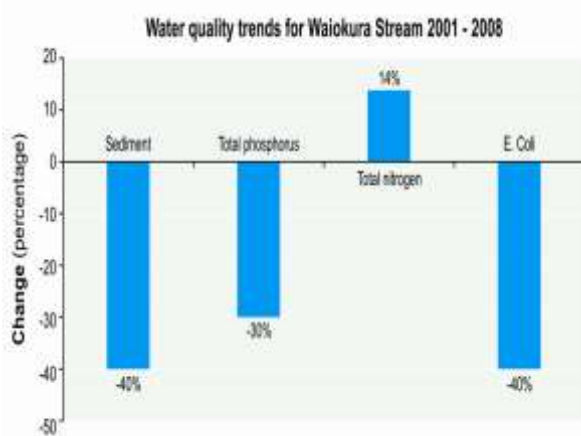


Figure 5: Water quality trends in the Waiokura Stream 2001 to 2008

4.5 State of the environment monitoring

As highlighted in section 3.4 above, the Council undertakes comprehensive state of the environment monitoring to obtain robust information for parameters measuring the state and trends relating to the region's soil and freshwater resources.

In summary, key findings from the state of the environment monitoring are:

- the impacts of diffuse source discharges on soil health and freshwater quality are a particularly significant issue on intensively farmed parts of Taranaki, i.e. the ring plain and coastal terraces
- Taranaki has good soil health with no evidence of residual soil contamination
- Taranaki has good to excellent overall water quality in the region. However, in some areas, some water quality trigger values are not being met particularly in lower catchments
- biological and physicochemical temporal trends for freshwater quality are generally encouraging
- biological health falls in a downward direction from 'excellent'/'very good' to 'fair'/'poor'
- previous increase in nutrient concentrations in the region's streams have largely been halted, but are still to be reversed and reduced to previous levels.

5. Review of other policy considerations

This section provides an overview of other policy considerations to be taken into account by the Council when determining future management of diffuse source discharges. These considerations include reviewing the different management options for managing diffuse source discharges, the efficiency and effectiveness of the current approach, including progress to date in meeting targets.

5.1 Regulating land use activities

Regulatory tools (e.g. the resource consenting process) are generally regarded as fairly blunt instruments to deal with the issue of diffuse source contamination. This is because the RMA largely precludes regional councils from imposing many conditions on resource use activities that are the primary source of agricultural diffuse source water quality externalities. In fact, the RMA includes an entitlement for agriculture and other existing land uses to continue that land use at its current intensity and type (sections 10 and 20A of the RMA).³⁴

With the first generation of regional plans, most regional councils determined to address diffuse source impacts on soil health and water quality through non-regulatory means and/or via permitted activity rules

Activities that contribute to diffuse discharges are generally allowed as permitted activities due to their small scale impacts on an individual basis. The permitted activities are subject to conditions, such as rates of nutrient/effluent application. However, monitoring of these conditions does not occur except when significant problems become apparent.

More recently (as plans are reviewed and second generation plans prepared), an increasing number of regional councils have adopted much stricter regulatory controls for

³⁴ The RMA entitlements to continue existing lawfully established activities means that regional rules alone cannot require the land use type or intensity to change, even if the adverse effects of the land use itself are severe.

the control of land uses to manage the effects of diffuse contaminants on freshwater quality. Given the inherent difficulty of tracing the source of these contaminants, any rules tend to be applied by proxy through prescribed land use and intensity and/or farming and management practices (e.g. requiring riparian fencing, particular nutrient management arrangements).

Southland Regional Council, Otago Regional Council, Environment Waikato (through Variation 5), Environment Bay of Plenty (through Objective 11), Environment Canterbury and Horizons Regional Council have all proposed regulation of land use that sets limits and/or requires consents for certain types of farming activities, e.g. particularly dairying, irrigated sheep and beef farming, cropping and commercial vegetable growing.

Appendix III of this paper provides an overview of the regulatory approach adopted to manage diffuse source contamination across the regions.

Horizons One Plan

Horizons Regional Council's *Proposed One Plan* is an example of a regional plan that includes rules for the control of intensive land uses to manage effects of diffuse contaminants.

Pursuant to the *Proposed One Plan* existing dairy, intensive sheep and beef, cropping and horticulture operations within "priority catchments" plus conversions elsewhere in the region will require a resource consent in terms of nutrient management.

Rule 13.1 of the *Proposed One Plan* requires intensive farming operations to complete a Farmer Applied Resource Management (FARM) strategy.

The FARM strategy includes performance criteria addressing:

1. limits for POP nitrogen leaching as determined by land use capability
2. minimising freshwater contamination from nitrogen, phosphorus and faecal microbes

3. meeting in stream core allocation and minimum flow requirements
4. meeting the requirements of the Clean Stream Accord including the exclusion of stock from streams, and the establishment of culverts or bridges at stock crossing points.

The *Proposed One Plan* has been the subject of a long, expensive, and largely adversarial process, with appeals to the Environment Court.

On 31 August 2012, the Environment Court released its interim decision on the *Proposed One Plan*. The Court's decision largely upheld provisions in the *Proposed One Plan* relating to freshwater quality and nutrient budgets. At the time of writing this paper, appeals to the Environment Court's ruling had been subsequently lodged with the High Court.

5.2 Nutrient trading schemes

Over the last decade there has been considerable interest in trading schemes to improve sustainable management. For example the individual transferrable quota system has been used in New Zealand to help manage marine fisheries, while the carbon trading scheme helps New Zealand to meet its obligations under the Kyoto Protocol. More recently the concept has been applied to reduce nutrient inputs to help minimise the impact of pastoral farming on water quality.

How does a 'cap-and-trade' scheme work? Essentially 'cap and trade' system incentivise those who can reduce their contaminant output most easily to do so. The theory behind such systems is that early adapters or existing efficient participants can gain benefit by selling or trading credits, while less efficient participants have incentives to improve their efficiency to reduce the costs they face.

All cap-and-trade schemes follow these basic steps:

- define the 'cap', e.g. the nutrient load that maintains lake water quality
- define the 'players' in the market, e.g. dairy farmers
- allocate the 'cap' amongst players – these allocations become the 'allowances'

- trade 'allowances' – this involves having a market place and setting a price
- monitor compliance.

In recent times, the Government, in conjunction with Environment Waikato and Environment Bay of Plenty, has established two nutrient trading projects to maintain/reduce nutrient inputs into Lake Taupo and Lake Rotorua. Through the 'cap and trade' scheme nutrient loads are managed thereby maintaining or improving water quality. The nutrient trading schemes rely on the Overseer® model as a means of generating a notional discharge as a calculation for regulatory purposes.

Nutrient trading schemes are relatively complex to design and, so far, are largely unproven instruments. They can be difficult for participants to understand, and may require a high level of auditing. Market behaviours may also lead to unexpected outcomes. These factors, combined with legislative restrictions on the transferability of discharge permits, impede other regional councils using 'cap and trade' arrangements to manage discharges.

Subject to confirmation through the public process for reviewing the freshwater and soil plans, nutrient trading schemes are not considered appropriate to Taranaki.

Trading nutrient inputs to Lake Taupo

A cap-and-trade scheme to reduce nutrient inputs has been implemented at Lake Taupo. The target has been set to reduce the nitrogen load by 20%. Farms occupy only 18% of the land but contribute more than 90% of the manageable nitrogen input to the lake.

The 'players' in the Taupo market are farmers and the Lake Taupo Protection Trust. The Trust administers an \$81.5 m fund to protect lake water quality, and will stand in the market to purchase nitrogen discharge allowances (NDA) and/or farmland.

The initial allowances are being allocated based on documented stocking rates, meat and wool production, fertiliser use, and other parameters, during a five-year window and using Overseer® to predict nitrogen exports. When this process is completed, each farmer

will have a consent which details their NDA – a fixed amount expressed as tonnes of nitrogen per year (tN/yr) as calculated by Overseer.

From year to year, farmers can alter how they farm, provided their nitrogen export (as predicted by Overseer®) does not exceed their NDA.

If a farmer wants to increase production, they must purchase NDA from another farmer who wants to decrease production. Once a trade has been agreed between two farmers, each of their consents is adjusted to increase or decrease their NDA.

5.3 Benefits and costs of riparian management

At a regional level, Taranaki's ratepayers are contributing around \$1 million of rates each year to support the Taranaki Riparian Management Programme.³⁵ The regional investment recognises the wider public benefits derived from farmer efforts to maintain or improve the region's water quality. It also recognises the on-going contributions farmers make to maintaining riparian zones.

At the property level, for many individual farmers, the cost of establishing and maintaining their riparian zones is a normal part of farm budgeting, alongside such other essentials as fertiliser application and repairs and maintenance.

The costs associated with riparian management include retirement costs (loss of productivity and fencing requirements), the cost of planting, and the cost of alternative water supplies and stock crossings where necessary. These costs are largely incurred during the establishment phase.

Other costs incurred by farmers relate to the cost of on-going maintenance, including the maintenance and repair of fencing and the control of weeds and pests

The benefits of planting and retiring riparian margins are many fold and include both public and private benefits, for example:

- improved water quality : owing to direct input and overland flow of nutrients and faecal microbes from animal wastes, and sediment being filtered and trapped
- improved erosion control: the retirement (and planting) of riparian margins reduces trampling stabilises stream banks and channels – reducing stream bank erosion and streambed siltation and water turbidity
- flood mitigation: riparian vegetation reduces the severity of flooding by intercepting rainfall and regulating the entry of surface and subsurface flows to waterways
- stream shading: riparian vegetation minimises temperature fluctuations by reducing solar energy input to the waterway. The lowered water temperature minimises the growth of nuisance algae and macrophytes and promotes in-stream biological diversity
- habitat enhancement: riparian vegetation provides cover for spawning fish, and food and habitat for nesting and juvenile birds. Small water plants and invertebrates become numerous, providing a better food supply for fish and waterfowl
- aesthetic enhancement: riparian management enhances the aesthetic and amenity values of the waterways, which helps to maintain their recreational potential
- improved animal health and product quality: improved milk grades are documented where farm dairies no longer draw water from contaminated streams
- farm management: fenced waterways aid farm management by facilitating stock movement and decreasing stock losses.

³⁵ *The Taranaki Riparian Management Programme represents a significant investment by the region and individual farmers with community support for the Programme effectively being re-affirmed every year through the long term council planning process under the Local Government Act 2002.*

As previously noted, the Taranaki Riparian Management Programme addresses both the fencing and planting of riparian margins. This is an important point of difference from the approach adopted nationally through the *Dairying and Clean Streams Accord*, which focuses on the fencing of rivers and streams. However, as noted in Table 3 below, while fencing to keep stock out of the rivers and streams will reduce faecal discharges to water, much more significant benefits are derived if the stream banks are also planted.

As demonstrated in section 4 above, overseas research confirms that the fencing and planting of riparian margins is, for Taranaki conditions, the most effective means of addressing diffuse pollution. The question to be resolved through the public process for reviewing the freshwater and soil plans is whether fencing and planting of riparian margins continues to be voluntary or whether it is required by regulation. The answer to that question depends very much on the progress and the likelihood of fencing and planting targets being achieved in a reasonable timeframe (refer section 5.4 below).

Table 3: Benefits of riparian management

Benefits of riparian fencing only	Benefits of riparian fencing and planting
<ul style="list-style-type: none"> Reduces faecal bacteria in water 	<ul style="list-style-type: none"> Reduces faecal bacteria in water Helps keep bank stable Filters P and sediment from runoff Reduces water temperatures shading of waterways Improves in stream habitat for fish and aquatic life Improves habitat for native birds, insects and plants

5.4 Progress to date and targets to be achieved

5.4.1 Regional Action Plan targets

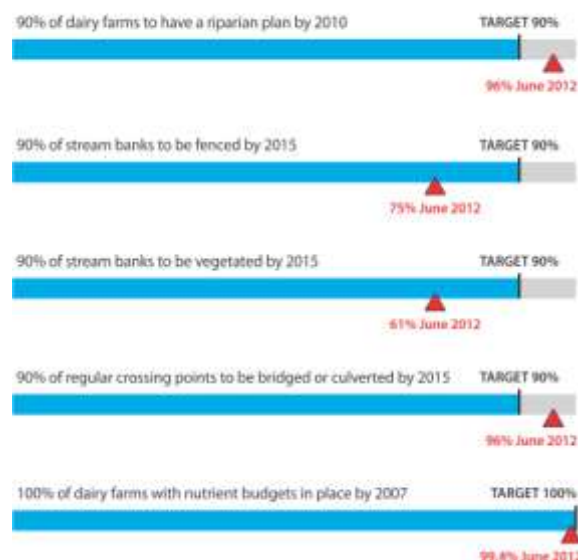
Considerable progress has been made by dairy farmers against Regional Action Plan targets relating to diffuse pollution.

As at 2012, the targets relating to the preparation of riparian plans, the bridging and culverting of regular stock crossings and nutrient budgeting have been met or exceeded.

Considerable progress has been made against targets relating to the percentage of stream banks to be fenced and planted. However, based upon current trends, it is unlikely that the target of 90% of all stream banks (covered by riparian plans) to be fenced and vegetated will be achieved by the target date of June 2015. This is addressed in further detail in sections 5.4.2 and 5.4.3 below).

Farmer progress against the targets set out in the Regional Action Plan is set out below.

Taranaki Targets



5.4.2 Progress in implementing the Riparian Management Programme

As at 30 June 2012, the Council has prepared 2,390 riparian plans with planting and fencing recommendations covering 95% of dairy farms and most of the ring plain and coastal terraces (Figure 6).

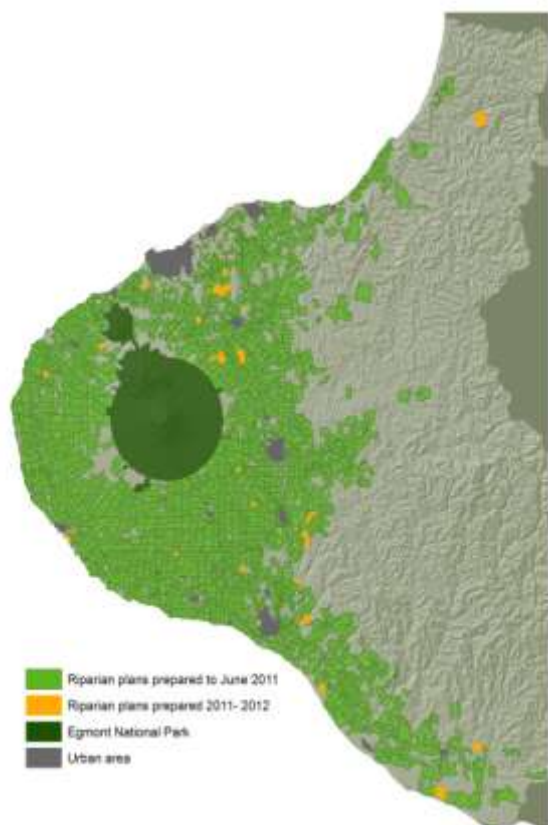


Figure 6: Riparian farm plans, as at 30 June 2012

The Council’s riparian planning phase is now largely completed. The focus of the Taranaki Riparian Management Programme is now on the implementation of recommendations in the plans.

The implementation of fencing and planting recommendations in riparian plans has gathered momentum in recent times. Since 1996, the Council’s plant production schemes have supplied over 2.5 million plants to plan holders. This represents the largest enhancement planting scheme in New Zealand and is projected to increase further (Figure 7).

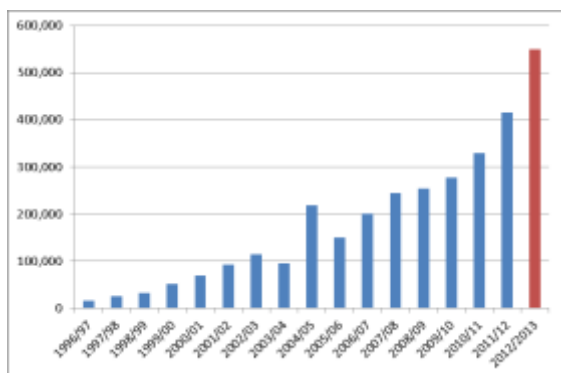


Figure 7: Number of riparian plants supplied per annum

Since 2002, riparian plan holders have fenced 2,306 kilometres of stream bank and planted 1,155 kilometres of stream bank.³⁶

If the fencing and planting in place at the time of plan preparation is taken into account, it means that so far almost 9,444 kilometres of stream banks are fenced (74% of the total covered by a riparian plan) and almost 5,940 kilometres of stream banks are now protected by either existing or newly planted vegetation. This is 60% of the total length identified as relevant for planting.

Notwithstanding, the significant work being undertaken a considerable amount of work still needs to be taken and the question is now whether to rely on a voluntary or regulatory approach to give effect to riparian plan recommendations.

Together, the 2,390 riparian plans have identified over 5,638 kilometres of stream bank requiring fencing and 5,037 kilometres of stream bank requiring planting. Under the current collaborative approach, farmers have voluntarily completed 41% of their riparian plan recommendations relating to new fencing and 23% of the recommendations relating to new plantings as at 30 June 2012 (Table 4).

Table 4: Riparian plan implementation – at a glance (as at 30 June 2012)

	Recommended fencing		Recommended planting	
	Km	%	Km	%
Works completed	2,306	41%	1,155	23%
Works left to be done	3,332	59%	3,882	77%
Target*	5,638	100%	5,037	100%

* Total amount of works recommended in the 2,390 riparian plans as being required to fence or plant riparian margins

³⁶ Since 2002 the Council has adopted and applied GIS mapping to monitor and record information on the implementation of riparian plans based upon annual property visits.

5.4.3 When will Council targets for riparian management be achieved?

In recent times, the Council has signalled the need for farmers to ramp up their fencing and planting to meet regional targets.

Assuming the *status quo* (i.e. continued non regulatory approach), the Council anticipates continued significant progress by riparian plan holders in the fencing and planting of their riparian margins.

Projections for implementing riparian plan recommendations (refer Figure 8 overleaf) show that:

- by **30 June 2017** approximately 93% of recommended new fencing will be completed (i.e. only 384 of the 5,502 kilometres of stream banks recommended to be fenced will be left) and
- by **30 June 2017** approximately 69% of the recommended riparian plantings will be completed (i.e. 1,529 of the 4,919 kilometres of stream banks recommended to be planted will be left)
- by **30 June 2019** all the recommended fencing is expected to be completed and 96% of the recommended plantings.

Progress by riparian plan holders with implementing the planting recommendations has been and is expected to continue to be slower than progress on the fencing recommendations.³⁷ However, it is noted that as of 30 June 2012, 87% of riparian plan holders had less than 4 kilometres of stream bank planting to be completed.

The projections above assume a 10% per annum increase in new fencing and a 15% increase in planting. These assumptions are consistent with the accelerated progress by farmers to implement riparian planting and fencing recommendations. The projections further acknowledge the impetus that Fonterra's requirement to retire riparian margins, as part of their terms and conditions of supply, has added to the implementation of riparian plans.

³⁷ The slower rate of implementing planting recommendations, compared to fencing, is attributed to the task often being much more significant and time consuming (e.g. may involve 2 or 3 rows of plants from the water edge).

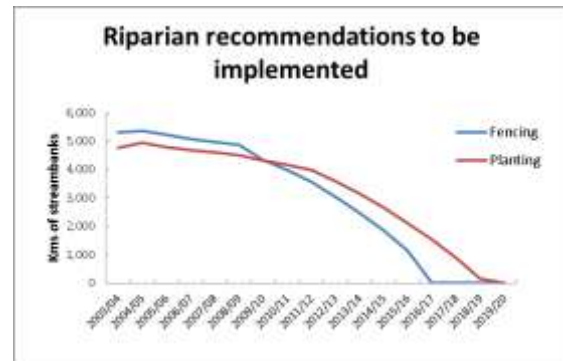


Figure 8: Projection of progress in implementing riparian planting and fencing recommendations over time

5.5 Aligning Council and industry stock exclusion requirements

In January 2012 Fonterra announced that it was including a new clause in its terms and conditions of supply to require the exclusion of all stock from waterways.

From the start of the 2012/2013 season, Fonterra suppliers are required to fence all their waterways (including regionally significant wetlands). Suppliers who cannot comply with this target will need to have an environmental improvement plan in place to resolve the non-compliance.

Fonterra's stock exclusion requirements have significant implications for the Council's own plans, policies and programmes. On one hand it demonstrates strong industry leadership to improved freshwater quality and is likely to significantly accelerate the fencing of stream banks in the region to exclude stock from the waterways. However, there is potential to derogate from the Taranaki Riparian Management Programme.

The main points of difference between the Taranaki Riparian Management Programme and Fonterra's stock exclusion requirements are:

- the focus on both fencing and planting: The Council wants farmers to both fence and plant riparian margins and do not want a situation whereby, in the rush to comply with Fonterra requirements, farmers erect fence that preclude or restrict planting recommended in the riparian plans

- the waterways being targeted: the Riparian Management Programme includes waterways not covered in the Accord's definition of 'waterways'.

Fonterra have signalled their strong support for the Taranaki Riparian Management Programme and a joint documentation of understanding has been developed to promote synergies between their respective programmes (refer **Appendix IV**). This includes agreement that the Council's riparian plans will satisfy Fonterra requirement for non-compliant suppliers to obtain an environmental improvement plan.

Fonterra's requirement to exclude livestock from waterways represents a significant shift in the policy landscape. The review of the Freshwater Plan is an opportunity for the wider community to consider whether the Council should introduce a compliance regime that aligns with or exceeds industry compliance requirements.

5.6 Opportunities and constraints for extending the Riparian Programme into the eastern hill country?

The Council's current policy focus for addressing diffuse source discharges targets dairying – which is largely confined to the ring plain and the coastal terraces – and nutrients. However, in the eastern hill country, sheep and beef farming on erosion prone slopes is contributing to soil loss, which, in turn, results in the entry of sediments in water bodies.

Eastern hill country rivers typically have short tributaries contained by narrow steep valleys and carry heavy sediment loads. Through the review of the freshwater and soil plans there is an opportunity to consider expanding the Taranaki Riparian Management Programme to the eastern hill country. The advantages of doing so are largely twofold:

- improved freshwater quality outcomes through the exclusion of livestock and the planting of riparian vegetation to intercept sediment runoff (and, to a lesser extent, nutrient runoff and pathogens)

- a seemingly more equitable management approach whereby all land uses across Taranaki are targeted.

Conversely, the disadvantages or limitations to expanding the Taranaki Riparian Management Programme to the eastern hill country are:

- there are much less intensive land uses in the hill country and therefore less issues associated with nutrients
- there are significantly higher costs for individual farmers to fence and plant riparian margins in the hill country
- in many places, because of the terrain, it is impracticable, to fence and plant riparian margins in the hill country
- there are significantly higher costs for riparian management in the hill country that will, in many places, be disproportionate to the benefits anticipated
- it potentially duplicates the Sustainable Land Management Programme, which, amongst other thing, is effectively promoting land practices that avoid, remedy or mitigate accelerated erosion and the sedimentation of hill country rivers³⁸
- while the Riparian Management Programme targets intensively farmed land it is not confined to the ring plain nor dairying – the programme covers a variety of land use types, including drystock and lifestyle blocks, and riparian plans will be prepared for hill country properties on request.

In summary, the effects of nutrients and pathogens on freshwater values in the intensively farmed parts of Taranaki are an order of magnitude much more significant than those associated with sedimentation in the hill country. Consequently, the public/private costs of expanding the Taranaki Riparian Management Programme to target the eastern hill country are likely to be disproportionate to the environmental benefits anticipated (riparian planning services and support is still available on request).

³⁸ Council monitoring shows that land used sustainably in the eastern hill country has increased from 85% in 2000 to 87.4% by 2007 – refer Taranaki Regional Council, 2009.

Issues associated with diffuse source discharges from agricultural activities are very much an issue of land intensification. For Taranaki, intensification largely involves dairying and other intensive pastoral farming on the ring plain and coastal terrace.³⁹

5.7 Have the plans been effective?

Over the life of the freshwater and soil plans the Council has carried out interim reviews of their efficiency and effectiveness. There has also been an independent performance audit of the Council's management of freshwater quality.

Set out below is a summary of the key findings from the interim review and audit.

5.7.1 Interim review of the freshwater and soil plans

In June 2008, the Council completed an interim review on the effectiveness and efficiency of the Freshwater Plan. The review examined trends, issues and experiences (including state of the environment monitoring and other relevant studies) associated with the implementation of the Freshwater Plan.

In relation to the management of diffuse source pollution, the interim review confirmed that the adverse effects of contaminants discharged to land and water from diffuse sources are generally avoided, remedied or mitigated and that surface water quality has either been maintained or enhanced through better riparian management.

Notwithstanding that, the interim review also identified a number of areas where further improvement and research was required.

As part of the interim review, the Council prepared a report entitled *Effectiveness and Efficiency of the Regional Fresh Water Plan for Taranaki* and sought the views of key stakeholders on the conclusions reached.

Feedback on the report was received from Federated Farmers, the Taranaki / Whanganui

³⁹ Horticulture and cropping represent 0.04% of Taranaki's land cover – refer Landcover Database.

Conservation Board, the Department of Conservation, and Taranaki Fish and Game. Most stakeholders were generally satisfied with the implementation of the Freshwater Plan and the conclusions and recommendations presented in the report. However the slow rate of implementing riparian plans was noted as an issue of concern by the Department of Conservation and Fish and Game.

As noted at the time, the Council undertook to address these points/concerns as part of its full review of the Freshwater Plan.

In July 2009, the Council completed an interim review on the effectiveness and efficiency of the Soil Plan.⁴⁰ The review examined trends, issues and experiences (including state of the environment monitoring and other relevant studies) associated with the implementation of the Soil Plan and concluded that there was no evidence of an adverse increase in residual soil contamination and that the non regulatory methods had been efficient in meeting the Plan's objectives.

5.7.2 Performance audit on regional council management of freshwater quality

The Council is considered to be well positioned to develop and adapt its existing regulatory and non regulatory methods to address on-going risks for freshwater quality.

In April 2011, the Controller and Auditor-General's office released its interim findings for the Council's management of freshwater quality.⁴¹ The aim of the audit was to provide Parliament with assurance on whether regional councils are effectively maintaining and enhancing freshwater quality.

The Auditor-General's findings in relation to diffuse pollution in Taranaki were as follows:

- diffuse pollution from dairying is a contributor to lower (and deteriorating)

⁴⁰ Taranaki Regional Council, 2009A.

⁴¹ Taranaki was one of four councils examined to identify examples of best practice and effective strategies for enhancing freshwater management – the other councils involved were Southland, Manawatu and Waikato. Refer Auditor-General, 2011.

water quality being found in the low elevation pasture areas

- the Council through the Riparian Management Programme has demonstrated a proactive adaptive management approach
- the Programme's design and administration is effective
- the Council is well positioned via the Freshwater Plan to develop and adapt its existing methods to address on-going risks for freshwater quality in the region.

The Auditor-General's report had no recommendations but did suggest that given the Council is so well-positioned in its policies, it could be more ambitious with respect to taking action to enhance freshwater quality in those areas where it does not meet relevant trigger values (refer section 3.4.1 above). The Auditor-General suggested that the Council could pursue more ambitious objectives by:

- requiring implementation of the riparian management programme
- targeting sensitive catchments for, amongst other things, riparian management.

5.7.3 Council experiences with enforcement

While there are no rules in the freshwater and soil plans relating to soil health or specifically excluding stock from waterways, agricultural activities can clearly have significant adverse environmental effects.

In circumstances where land use practices are having significant adverse effects on soil health or freshwater quality the Council uses the enforcement provisions of the RMA to enforce section 17 [Duty to avoid, remedy or mitigate adverse effects] of the Act.

In 2011, the Council issued three infringement notices relating to stock grazing to or standing in the water. Diffuse pollution caused by stock grazing to or standing in water has not been a significant problem to date and is less likely to be in the future as waterways are fenced through the Taranaki Riparian Management Programme and the Clean Streams Accord.

5.8 Key findings

In summary, key findings from sections 3 and 4 of this working paper are:

- regulatory tools (e.g. the resource consenting process) are generally regarded as fairly blunt and potentially very expensive instruments to deal with the issue of diffuse source contamination
- subject to confirmation through the public process for reviewing the freshwater and soil plans, nutrient trading schemes are not considered appropriate to Taranaki
- there is clear scientific evidence confirming that, for Taranaki catchments, riparian management is a particularly effective approach to managing diffuse source pollution to water
- through the Taranaki Riparian Management Programme, significant progress has been voluntarily made by farmers to fence and re-vegetate riparian margins however accelerated progress is required if the Council's current targets are to be met
- most farmers are stepping up and taking the necessary steps to ensure freshwater quality in Taranaki is being maintained or enhanced
- through the existing collaborative approach, Regional Action Plan targets for 90% of dairy farms to:
 - fence stream banks will be achieved by 30 June 2017
 - plant stream banks will be achieved by 30 June 2019
- the Auditor-General considered the Council to be well positioned to develop and adapt its existing methods to address on-going risks for freshwater quality
- in all likelihood there will always be a few individuals who will not participate voluntarily in riparian management programmes.

6. Future directions for diffuse source management

This section summarises the policy options for the future management of agricultural-sourced diffuse discharges to land and water in the region, including the preferred option, before setting out recommended changes to the revised plan to give effect to the proposed approach.

6.1 Policy options

To maintain and enhance soil health and freshwater quality in the Taranaki region in relation to agricultural sourced diffuse discharges to land or water there are essentially three broad policy responses:

- *Option 1: Regulate land use:* This option involves the broad application of regional rules targeting intensive pastoral farming and a compliance regime to impose nutrient caps and or require the adoption of mitigation measures such as riparian fencing and planting
- *Option 2: Nutrient trading scheme:* This option involves the development of a compliance regime and the application of economic instruments targeting intensive pastoral farming (e.g. tradable permits and offsets) to incentivise land use practices that reduce sediment and nitrate load to water bodies
- *Option 3: Taranaki Riparian Management Programme.* This option involves Council adopting a collaborative approach and continuing to proactively support and assist farmers to voluntarily fence and retire riparian margins.

Appendix V of this paper summarises the benefits and costs of the respective options.

6.2 The preferred approach

Having examined the options relating to managing the effects of diffuse source discharges to land or water, the preferred principal approach is a continued focus on the implementation of the Taranaki Riparian Management Programme (i.e. Option 3).

It is proposed that the Council continue with a collaborative approach to promote the voluntary fencing and planting of riparian margins on intensively farmed parts of Taranaki through the Taranaki Riparian Management Programme. The implementation of the Riparian Management Programme can be expected to achieve the same environmental outcomes (i.e. maintain and increase Taranaki's freshwater quality) as that possible through a regulatory approach. However, it has the added advantages of increased operational flexibility and reduced costs to farmers. Continuing with a collaborative approach also acknowledges the suite of other on-farm environmental improvements likely to be required by the Freshwater Plan review (e.g. converting or upgrading farm dairy effluent management systems).

Notwithstanding the above, for those farmers on intensively farmed land that do not make reasonable progress in the fencing and planting of their riparian margins, it is proposed that rules apply (i.e. Option 1) requiring a resource consent to ensure the riparian plan is implemented and that riparian margins are retired and planted.

Other options considered

The following policy/regulatory options were considered in the development of this paper but were not considered appropriate for Taranaki:

- Targeted rules requiring mitigation measures (planting and fencing) for 'sensitive' (over allocated) catchments to enhance freshwater quality. This was one of the recommendations arising from the Auditor General's report. However, it is the Council's view that all intensively farmed catchments should be addressed as a priority.
- Requiring all intensive pastoral farms to obtain a land use consent to ensure nutrient management plans and mitigation measures (planting and fencing) are in place. This option was considered unnecessarily onerous, expensive and unjustifiable given most farmers are taking effective action.
- Requiring all intensive pastoral farms to 'cap' nutrient inputs on to the land. This option was considered unnecessarily blunt and onerous (given environmental indicators are good for most rivers and streams) so long as farmers are adopting appropriate mitigation measures such as the planting of riparian margins.
- Establishing a nutrient trading scheme. This option was considered overly complex for the 'issue' with the public/private costs very difficult to calculate but likely to be disproportionate to the environmental benefits anticipated.

6.3 Proposed changes to the Freshwater and Soil Plan

To give effect to the preferred approach outlined in section 6.2 above, the following amendments are proposed for the revised Freshwater and Soil Plan:

- the setting of quantifiable freshwater quality objectives, limits and targets
- the setting of implementation targets whereby intensive pastoral farmers must have retired and planted riparian margins by 1 July 2020
- rules requiring a resource consent for intensive pastoral farming only where the land owner has not made reasonable progress on the retirement and planting of riparian margins by the target date
- provisions relating to the issuing of certificates of completion and the granting of any exemptions for the fencing and planting of riparian margins
- revised rules addressing runoff from raceways, silage pits and feedlot pads
- provisions relating to compliance monitoring.

6.3.1 Review of freshwater quality objectives, limits and targets

The current Freshwater Plan includes largely descriptive freshwater quality objectives and limits. However the NPS for Freshwater Management requires the revised Plan to include numeric limits and targets to ensure freshwater quality objectives are met.

Through the revised Freshwater and Soil Plan, the Council will be seeking to maintain and enhance overall freshwater quality across the region. This will allow for and may involve some 'overs and unders' where freshwater quality outcomes agreed with the community provide for lower water quality in some catchments but with net outcomes overall being maintenance or improvement.

The setting of freshwater objectives for water bodies will require consultation with the broader community as part of the Plan review. In determining community objectives for the revised Freshwater Plan, it is proposed that the Council investigate listing regional values of

freshwater.⁴² The freshwater objective will describe the environmental state and outcome sought for the water body (or part of a water body) to enable community values and wishes to be achieved. The development of freshwater objectives therefore encompasses two steps:

1. determining the desired community outcomes, e.g. retention of a healthy trout fishery, retention of mauri, ability to swim in the river in summer, ability to use the water for stock watering without treatment, or ability to use the water for municipal water supply with only disinfection
2. determining what environmental state is needed for those outcomes to be achieved.

The Council will undertake technical investigations to establish numeric limits and targets necessary to meet different freshwater quality objectives for different water bodies and ensure they are relevant to Taranaki, including parameters and indicators.

In determining freshwater limits and targets to be included in a revised Freshwater and Soil Plan, the investigation will identify the framework, indicators and parameters that will allow the Council to set the specific quantifiable amount necessary to allow a freshwater objective to be met. In brief, the limits and targets proposed in the revised Plan will be seeking to establish the acceptable level of suspended solids, nutrients and faecal coliforms in waterways and groundwater in the Taranaki region are at a level that will maintain or enhance the ecological health of aquatic ecosystems, and other values as applicable.

In relation to 'over-allocated' water bodies where water quality limits or objectives can not currently be met, the Council will set targets.⁴³ The target forms part of a staged work programme set out in the revised Freshwater and Soil Plan for the Council to work towards achieving the limits necessary to achieve the objective.

⁴² *Appendix VI of this paper lists the national values of freshwater set out in the preamble of the NPS for Freshwater Management.*

⁴³ *Target is a limit that must be met at a defined time in the future. This meaning only applies in the context of over-allocation as defined in the NPS for freshwater Management.*

As part of the investigations into limits and target setting, the Council will also develop and include MCI-based categories of in-stream health in the Plan that reflects the freshwater quality that can be expected from good land use management practices.

Indicators of diffuse management

Likely indicators to be included in the Plan relating to diffuse source management are:

- nutrients (ammonia, nitrate, total nitrogen, and dissolved reactive and total phosphorus)
- appearance (turbidity, clarity, absorbance, suspended solids)
- organic contamination (biochemical oxygen demand)
- bacterial levels (faecal coliforms and enterococci bacteria)
- temperature
- algal cover.

6.3.2 Setting of implementation targets for riparian management

As previously noted there is clear scientific evidence confirming that, for Taranaki catchments, riparian management is a particularly effective approach to managing diffuse source pollution to water. Through the Taranaki Riparian Management Programme, farmers have voluntarily made significant progress to fence and re-vegetate riparian margins.

By 1 July 2020, all intensively farmed parts of Taranaki are expected to be fenced and planted with appropriate riparian vegetation to mitigate the effects of adjacent land uses on freshwater quality. It is therefore proposed that a target to that effect be included as a policy in the revised Freshwater and Soil Plan.

The policy will require dairy farms and other intensive farmed land to be 'certified' (refer 6.3.4. below) that they have implemented their riparian plans and that:

- all water bodies on the property have been fenced and vegetated appropriately
- all regular stock crossings are bridged or culverted

- any regionally significant wetlands are fenced to exclude stock.

For uncertified farmers (i.e. those that have not made reasonable progress in implementing their riparian plans), the deadline will trigger the application of a regulatory and compliance regime.

Most farmers are taking the necessary steps to fence and plant riparian margins and ensure freshwater quality in Taranaki is being maintained or enhanced. However, as for any group of people, there will be some who will wait to be regulated and required to do the inevitable. For that small group, it is proposed that new rules in the revised Freshwater and Soil Plan will apply whereby they will be required to obtain a land use consent to mitigate the diffuse adverse effects of their land use activities on freshwater quality. For that small group the obvious disadvantages are reduced operational flexibility and increased costs associated with obtaining resource consents and inspection and compliance costs.

Section 6.3.3 below sets out the likely scope of rules to target stock exclusion and the planting of riparian margins for farmers who have not met their requirements to fence and plant riparian margins. Section 6.3.4 below sets out how the Council might go about certifying dairying and other intensively farmed land and ensuring farmers have met requirements to fence and plant riparian margins (and therefore will not be required to obtain a resource consent).

Completing the implementation of riparian plan recommendations by 1 July 2020 is readily able to be achieved for all but a few farmers without major impost. Council monitoring of riparian plans shows that approximately 92% of riparian plans should be 100% completed by 1 July 2020 if plan holders were to fence and plant one kilometre or less of works, per annum, over the next few years. Figure 9 identifies the amount of riparian plan recommendations- fencing and planting - still to be completed at the farm level as at 30 June 2012.

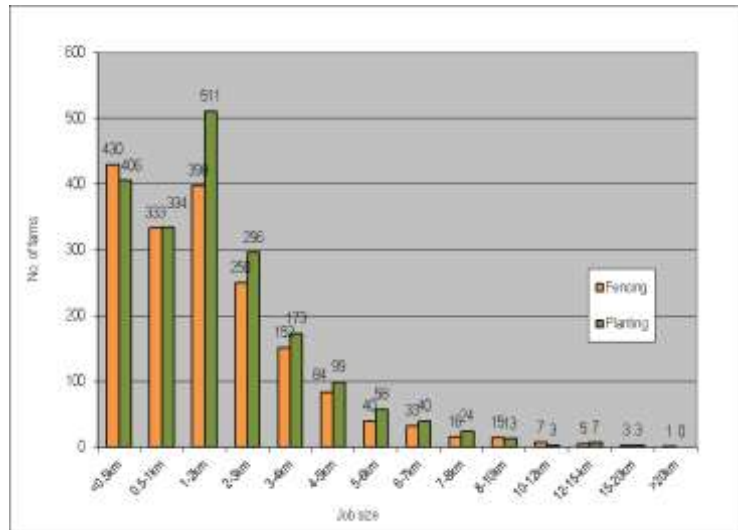


Figure 9: Recommended riparian planting and fencing left to be done

6.3.3 Land use consents for farmers making inadequate progress

As previously noted, it is proposed that new rules be included in the Freshwater and Soil Plan whereby dairy and other intensive pastoral farmers may be required to obtain a land use consent to manage the diffuse adverse effects of their land use activities on freshwater quality. It is proposed that these rules take effect from **1 July 2020**.

The possible need for a resource consent would target those dairy and other intensive pastoral farmers that have failed to complete or make reasonable progress in implementing the recommendations of their riparian plans.

The final scope and wording of any rules to require a land use consent from intensive pastoral farmers that have made inadequate progress in implementing their riparian plans needs further investigation and would be subject to the public process associated with the review of a revised Freshwater and Soil Plan. However, one possibility of what the rules might look like is presented in Table 5 below.

Table 5: Draft rules for intensive pastoral farming and the implementation of riparian plans

Rule	Activity	Classification	Conditions/standards/terms	Control/discretion/notification	Policy reference
1	Use of land for intensive pastoral farming from 1 July 2020	Permitted	(a) The owner or occupier of the property on which the activity is undertaken has a Riparian Management Certificate of Completion for that property**; OR (b) The owner or occupier of the property has obtained from the Council a written exemption to the requirement referred to in (a) above.		XYZ
2	Use of land ⁴⁴ for intensive pastoral farming from 1 July 2020	Controlled	(a) The owner or occupier of the property on which the activity is undertaken shall submit a riparian management plan ^{***} to the Council as part of the resource consent application. (b) The owner or occupier of the property on which the activity is undertaken shall implement the riparian management plan referred to in (a) above to ensure: (i) livestock are excluded from wetlands and lakes that are identified on the plan (ii) livestock are excluded from beds of rivers and streams identified in the plan other than at any specific location where access is required for livestock to cross the river in which case (iii) applies (iii) livestock crossings identified on the plan are bridged or culverted and run-off originating from the carriageway of the bridge or culvert must not be discharged to any surface waterbody (iv) the margins of rivers and streams identified in the plan are appropriately vegetated or planted to provide an effective riparian margin.	Control is reserved over: (a) Provision of information including the riparian plan, and its content. (b) Timing and setting of conditions relating to the implementation of a riparian plan. (c) Monitoring and reporting. (d) Duration of consent. (e) Review of conditions of consent and the timing and purpose of the review. (f) Payment of administrative charges and financial contributions. Resource consent applications under this rule will not be notified.	XYZ

* Intensive pastoral farming means using any area of land greater than 20 hectares and that is used for the grazing, keeping, rearing or breeding of livestock where the stocking rate equals or exceeds two dairy cows, or the equivalent stock units, per hectare.

** Explanation of certificates of completion is provided in section 6.3.4 below.

*** Riparian management plan is defined as a riparian management plan prepared by the Taranaki Regional Council, or a Council approved equivalent.

⁴⁴ The proposed rules would control a use of land under section 9(2) of the RMA, whereby no person may use any land in a manner that contravenes a regional rule unless the use is expressly allowed by a resource consent. The rule falls within the functions of a regional council under section 30(1)(c) of the RMA to control the use of land for the purpose of the maintenance and enhancement of water quality in water bodies and coastal water.

6.3.4 Riparian management certificates of completion and exemption provisions

In November 2011, Council officially introduced the concept of a Riparian Management Certificate of Completion and it is proposed that the concept be integrated into the new Freshwater and Soil Plan.

The Certificate of Completion validates that the Council is satisfied that the land occupier has implemented all the work in their riparian plan.

The processing and issuing of a Certificate of Completion is subject to meeting the following assessment criteria:

- all water bodies on the property have been included and addressed in the riparian plan
- all riparian margins are fenced and vegetated appropriately
- all regular stock crossings are bridged or culverted
- any regionally significant wetlands are fenced to exclude stock.

As previously noted, it is proposed that the aforementioned assessment criteria be considered for inclusion as a policy in the new Freshwater and Soil Plan.

It is further proposed that, in circumstances where an intensive pastoral farmer has made reasonable but incomplete progress in implementing riparian plan recommendations, or in the case of a new dairy conversion whereby new works are required, consideration be given to the granting of a waiver from any regulatory requirements.

Any exemption or waiver will be at the Chief Executive of the Council's discretion and will address individual circumstance where the Council is satisfied that:

- (a) the riparian plan holder has substantially complied with and made reasonable progress in implementing the fencing and planting and other recommendations set out in the riparian plan; or
- (b) the prescribed requirements are clearly unreasonable or inappropriate in the particular case (e.g. size of the job needing

to be done and timeline for completing the tasks); and

- that the granting of the exemption will not significantly prejudice the attainment of the freshwater objectives, limits or targets set out in the revised Freshwater and Soil Plan.

Any exemption may be subject to conditions ensuring that:

- (a) fencing and planting works are undertaken and or completed within a specified timeframe; and or
- (b) works are undertaken in the interim to mitigate any adverse effects of land use on freshwater quality.

Examples of what might constitute 'reasonable progress'

Examples of what might constitute reasonable but incomplete progress to implement and complete riparian plan recommendations by 1 July 2010, and for which the Council might consider granting a waiver, could include one or a combination of the following circumstances:

- over 5 kilometres of work was required from the time the revised Freshwater and Soil Plan is publicly notified⁴⁵
- for such properties, the land occupier has demonstrably completed at least 1 kilometre of work per annum from the time the revised Plan was publicly notified
- a property that was not in the Taranaki Riparian Management Programme and did not have a riparian plan prior to the notification of the revised Freshwater and Soil Plan
- other extenuating circumstances.

6.3.5 Other rules

Additional rules and or other minor changes are proposed to the current 'permitted activity' rules in the Freshwater Plan to address other diffuse source discharges to freshwater. The proposed changes include:

- ensure stock crossings of rivers and streams that permanently contain water

⁴⁵ Note, as at November 2012 78% of riparian plan holders had less than 3 kilometres of work left to be done to meet all their riparian plan recommendations.

are bridged or culverted and run-off originating from the carriageway of the bridge or culvert discharged onto or into land

- include a new 'control/discretion' in Rules 35 and 36 relating to the adoption of avoidance, mitigation and remediation measure for farm dairy discharges that ensure a higher level of freshwater protection (such measures might be higher effluent treatment standards, reduced application rates, increased set back distances, riparian management etc)
- ensure feedpads are sealed and avoid seepage and leakage to waterways or groundwater
- ensure effluent runoff from bridges, culverts, underpasses, raceways and any other stock concentration areas is managed, so that effluent does not discharge directly to waterways or water bodies
- ensure the discharge of urine and excreta from dairy cows in the vicinity of the farm dairy is diverted and managed as part of the farm dairy effluent management system⁴⁶
- include a new 'control/discretion' in permitted activity rules that ensure adequate separation distance from waterways
- a new controlled activity rule that requires land uses not able to comply with the rule above to obtain a resource consent with standards, terms and conditions to address on-farm waste minimisation issues, including avoiding or mitigating the impacts of diffuse source discharges to land or water.

Supporting policies will promote the planting of vegetation that is suited to the particular conditions at a site, is the correct vegetation for the intended purpose, and is indigenous vegetation that is of regional genetic stock.

6.3.6 Establishing a riparian compliance monitoring programme

In the scenario that some farmers must obtain a resource consent to manage the diffuse adverse effects of their land use activities on freshwater quality (refer section 6.3.6 above) a monitoring programme will need to be established to confirm compliance against the conditions of their consent.

The cost of any compliance monitoring is recovered from the consent holder. Further work is required on confirming the scope, design and frequency of any monitoring. However, as an example, monitoring involving visual inspections would be in the order of \$1,000. In the event that additional monitoring is required, additional charges may apply.

If monitoring reveals non-compliance, additional work may be carried out and the additional costs are recovered from the consent holder. The consent holder may also be subject to enforcement action.

It is proposed that the Council amend the monitoring section in the Plan to encapsulate an added compliance monitoring programme targeting those land occupiers required to get a land use consent under section 6.3.3 above.

⁴⁶ *Badly designed or maintained race ways and stock crossing points can create large amounts of soil and effluent run-off, increasing phosphate and faecal bacteria in waterways. This decreases the water's visual clarity and is a risk to human and stock health.*

7. Summary and conclusion

The *Regional Fresh Water Plan for Taranaki* was made operative in 2001. Since its adoption, the Plan has stood the test of time well with overall freshwater quality being maintained and, in some places, enhanced within Taranaki.

The cumulative effects of diffuse sources of pollution on rivers and streams are undeniably the most challenging freshwater management issue in New Zealand today. From a national perspective, freshwater monitoring and research clearly indicate that any environmental gains from reduced point source pollution are in danger of being overshadowed by increased diffuse pollution.

Focusing more particularly on the situation in Taranaki, overall freshwater quality is relatively good, freshwater quality trends are generally encouraging. Notwithstanding that, with continued intensification of dairy farming in Taranaki, it is timely, as part of the review of the Freshwater Plan, to reassess future directions for the management of diffuse source discharges in the Taranaki region.

In the preparation of this paper, the Council has undertaken a stocktake of the evidence, studies and research relating to the management of diffuse source discharges. Key findings are:

- diffuse source discharges, alongside the cumulative impacts of point source discharges, are a key driver behind deteriorating freshwater quality
- diffuse pollution is much more of a challenge than point (end-of-pipe) pollution – both in terms of the problem and the application of regulation to often very small and routine farming practices
- the farming community's 'ownership' of the problem to date whereby farmers have voluntarily planted and fenced thousands of kilometres of their waterways
- the accelerated progress by dairy farmers to fence and plant their riparian margins and the expectation that this will voluntarily be achieved by 2020.

The Riparian Management Programme is now transforming the Taranaki landscape, reversing decades of streamside clearance. While it is early days yet, in the longer term the big effort is expected to safeguard and, in many places, improve the quality of Taranaki's fresh water, while at the same time allowing the region's dairy industry to grow and prosper.

There is a demand in some quarters for more regulation. However, the Council's start position (acknowledging its legal requirement to maintain an open mind during the Plan review) is not to introduce a universal requirement for a land use consent requirements for dairy farming, nutrient trading schemes or the like, as being proposed in other parts of New Zealand.

As highlighted in this paper, most farmers are stepping up and taking the necessary steps to ensure freshwater quality in Taranaki is being maintained or enhanced.

Having examined the options relating to managing the effects of diffuse source discharges to land or water, the preferred approach is to continue to support the implementation of the Taranaki Riparian Management Programme underpinned by a deadline for the application of a regulatory and compliance regime from **1 July 2020** for those farmers that have failed to make reasonable progress in retiring and planting their riparian margins.

Most farmers will avail themselves of the obvious advantages of the Taranaki Riparian Management Programme and get on with the business of completing the retirement and planting of riparian margins. However, as for any group of people, there will be some who will wait to be led and controlled – to be regulated and required to do the inevitable. For that small group new rules are proposed that will require them to obtain a land use consent to manage the adverse diffuse effects of their land use activities on freshwater quality. For that small group the obvious disadvantages are reduced operational

flexibility and increased costs associated with obtaining resource consents and inspection and compliance costs.

Taranaki's water quality is relatively good with mainly improving trends. Our aim is to keep those water quality trends positive while supporting the dairy industry with reasonable and justified requirements and time to make the adjustments.

This paper is a starting point for consulting with stakeholders on possible changes to the Freshwater Plan. The Council looks forward to canvassing these matters with stakeholders and obtaining their views and input prior to publicly notifying a revised Plan for public submissions.

Definitions and acronyms

Agrichemicals means substances intended by the manufacturer, distributor, vendor, or discharger to cause or promote or contribute to or facilitate any of the following effects:

- (a) the control of plant growth (other than primarily as a fertiliser or soil conditioner) by the use of substances such as but not restricted to the categories of herbicides, algaecides, defoliants, or fruit-setting hormones;
- (b) the control of bacteria, protozoa, fungi and viruses, by the use of substances such as but not restricted to the categories bactericides, fungicides, or viricides; or
- (c) the control of vertebrates and invertebrates, by the use of substances such as but not restricted to the categories nematocides, miticides, acaricides, arachnicides, molluscides, insecticides, or other pesticides.

Application rate means the rate at which a given depth of effluent is applied per unit of time (mm/hr).

Best practicable option, in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to –

- (a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and
- (b) the financial implications, and the effects on the environment, of that option when compared with other options; and
- (c) the current state of technical knowledge and the likelihood that the option can be successfully applied.

Biochemical Oxygen Demand or **BOD** is a measure of the amount of oxygen consumed during the decomposition of organic matter in water.

Catchment refers to the entire area from which a stream or river receives its water. When it rains, the water flows naturally over and through the soil to the lowest point on the land, forming into springs, wetlands, and small streams that feed into larger streams and rivers as they run downhill. Eventually, all the streams and rivers in a catchment join and have the same outlet to the sea. Natural features such as ridges and hills form the boundaries of a catchment.

Contaminant includes any substance (including gases, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat:

- (a) when discharged into water, changes or is likely to change the physical, chemical or biological condition of water; or
- (b) when discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged.

Controlled activity means an activity which:

- (a) is provided for, as a controlled activity, by a rule in a plan or proposed plan; and
- (b) complies with standards and terms specified in a plan or proposed plan for such activities; and
- (c) is assessed according to matters the consent authority has reserved control over in the plan or proposed plan; and
- (d) is allowed only if a resource consent is obtained in respect of that activity.

Council refers to the Taranaki Regional Council.

Diffuse discharge means a discharge that does not have a particular point of origin or is not introduced into receiving waters from a specific outlet, but arises from a wide or diffuse area.

Discharge includes emit, deposit and allow to escape.

Discretionary activity means an activity:

- (a) which is provided for, as a discretionary activity by a rule in a plan or proposed plan; and
- (b) which is allowed only if a resource consent is obtained in respect of that activity; and
- (c) which may have standards and terms specified in a plan or proposed plan; and
- (d) in respect of which the consent authority may restrict the exercise of its discretion to those matters specified in a plan or proposed plan for that activity.

Dissolved oxygen refers to the concentration of free oxygen dissolved in water, and usually expressed as g/m³ or mg/l.

Drainage refers to the movement of excess water (including effluent water) through the soil body.

E. coli refers to *Escherichia coli*, which is the main coliform found in the gut of warm blooded animals.

Effluent means liquid waste including slurries.

Environmental values refer to the values that reflect the community's aspirations for the water in its region, and the level of water quality desired. They can include ecological function and biodiversity, natural character, natural features and landscape, cultural and spiritual values, scenic and amenity values, contact recreation, and mauri (life force) and mahinga kai (customary places where food is collected or produced).

Excreta means the defecation products from cattle i.e. urine and dung.

Farm dairy includes every area of the dairy cow (or goat) milking process and includes covered and uncovered areas where cows reside for longer than five minutes for the purpose of milking (including a stand-off pad or yard) but does not include raceways.

Farm dairy effluent means contaminated waste which is predominantly composed of organic matter (dung and urine) and water, applied, deposited or used in the farm dairy.

Fertiliser means a substance used, or suitable for, sustaining or increasing the growth, productivity, or quality of plants by its application to those plants or the soil in which they grow or will grow; and includes a substance imported, manufactured, or being manufactured, with the intention that it be so.

Fresh water means all water except coastal water and geothermal water.

Ground water refers to the freshwater that occupies or moves through openings, cavities, or spaces in geological formations in the ground.

K refers to Potassium.

Land treatment refers to the use of the soil matrix as a medium for removing contaminants either dissolved or suspended, in effluent water or slurries.

Leaching means the drainage of nutrients through the soil beyond the active root zone.

Limit is the maximum amount of resource use available, which allows a freshwater objective to be met.

MCI refers to macroinvertebrate community index.

N refers to Nitrogen.

NDA refers to nitrogen discharge allowances

Non-point source discharge refers to a discharge of water or contaminant that enters a water body from a diffuse source.

NPS refers to the *National Policy Statement - Freshwater Management 2011*.

Nutrient budget refers to the identification of the nutrient inputs on a farm, such as fertiliser, clover nitrogen fixation, urine, dung, effluent/manure, compost and supplements. It also identifies a farmer's nutrient outputs, such as milk, fibre, meat and supplements sold, as well as environmental losses.

Nutrient management plan means a plan prepared annually in accordance with the Code of Practice for Nutrient Management (NZ Fertiliser Manufacturers' Research Association 2007) which records (including copies of the OVERSEER® input and output files used to prepare the plan) and takes into account all sources of nutrients for dairy farming* and identifies all relevant nutrient management practices and mitigations, and which is prepared by a person who has both a Certificate of Completion in Sustainable Nutrient Management in New Zealand Agriculture and a Certificate of Completion in Advanced Sustainable Nutrient Management from Massey University.

Outstanding, in relation to “outstanding freshwater bodies” means out of the ordinary on a regional basis.

Outstanding freshwater bodies are those waterbodies with outstanding values, including ecological, landscape, recreational and spiritual values.

P refers to Phosphorus.

Periphyton refers to algae that grow on the beds of rivers, streams and lakes that turn dissolved nutrients into nutritious food (periphyton biomass) for invertebrates, which are themselves food for fish and birds.

Permitted activity means an activity allowed by a regional plan without a resource consent if it complies in all respects with any conditions specified in the plan.

Point source discharge means a discharge that occurs at an identifiable location.

Prohibited activity means an activity which a plan expressly prohibits and describes an activity for which no resource consent shall be granted.

Resource consent means a permit to carry out an activity that would otherwise contravene the Resource Management Act 1991. Requirements included as part of the resource consent are known as resource consent conditions.

Riparian management means the collection of activities and practices that can be applied to the riparian margin in order to improve the natural characteristics and functioning of the whole riparian zone (which includes the waterway itself as well as the riparian margins).

Riparian margin means a strip of land of varying width adjacent to a waterway and which contributes or may contribute to the maintenance and enhancement of the natural functioning, quality and character of the waterway and its margins.

River or stream refers to a continually or intermittently flowing body of fresh water. This includes a stream and modified watercourse. It does not include any artificial watercourse (such as an irrigation canal, a water supply race, a hydroelectric canal, or a farm drain).

RMA refers to the Resource Management Act 1991.

RPS refers to the *Regional Policy Statement for Taranaki 2010*.

Soil health refers to the biological, chemical and physical state of the soil and the maintenance of soil ecosystems.

State of the environment –refers to a type of environmental monitoring and reporting that provides a snapshot of information about the environment and how it is changing over time.

Surface water refers to water in all its physical forms that is on the ground, flowing or not, but excludes coastal water and geothermal water.

Target is a limit that must be met at a defined time in the future. This meaning only applies in the context of over-allocation.

Water –

- (a) means water in all its physical forms whether flowing or not and whether over or under the ground:
- (b) includes fresh water, coastal water, and geothermal water:
- (c) does not include water in any form while in any pipe, tank, or cistern.

Water body means fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.

Water quality refers to the physical, chemical and biological characteristics of water that affect its ability to sustain environmental values and uses.

Waterways or **waterbodies** includes any watercourse or internal drain that flows intermittently or continuously.

Wetland includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.

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Appendix I: Relevant regional rules relating to agricultural diffuse source discharges to land or water

Activity	Rule	Standards/Terms/Conditions	Classification	Notification	Control/Discretion	Policy Reference
Discharges of stormwater and sediment deriving from soil disturbance activities of 1ha or less: <ul style="list-style-type: none"> • Into surface water (excluding those wetlands listed in Appendix II) and/or • Onto or into land in circumstances where sediment from soil disturbance may enter water 	25	<ul style="list-style-type: none"> • The discharge shall not derive from an area of soil disturbance greater than 1ha⁴⁷; • The discharge shall not derive from a volume of soil disturbance greater than 3000m³²⁰; • Soil stabilisation shall be undertaken as soon as practicable after the completion of the works; • Discharge to surface water shall contain less than 100gm³ suspended solids; • Discharge to surface water shall not give rise to any or all of the following effects in the receiving water after reasonable mixing: <ul style="list-style-type: none"> (a) the production of any conspicuous oil or grease films, scums, or foams, or floatable or suspended materials; (b) any conspicuous change in the colour or visual clarity; (c) any emission of objectionable odour; (d) the rendering of fresh water unsuitable for consumption by farm animals; (e) any significant adverse effects on aquatic life. 	Permitted			

⁴⁷ For the purpose of this rule the area/volume of soil disturbance is defined as the total area of uncompacted and/or unvegetated exposed soil on any particular property or contiguous properties within the control of any particular person or persons.

Activity	Rule	Standards/Terms/Conditions	Classification	Notification	Control/Discretion	Policy Reference
<p>Discharges of stormwater and sediment deriving from soil disturbance activities of between 1 and 8ha;</p> <ul style="list-style-type: none"> • Into surface water (excluding those wetlands listed in Appendix II) and/or • Onto or into land in circumstances where sediment from the soil disturbance may enter water 	26	<ul style="list-style-type: none"> • The discharge shall not derive from an area of soil disturbance greater than 8ha⁴⁸; • The discharge shall not derive from a volume of soil disturbance greater than 24,000m³²¹; • The discharge shall not derive from soil disturbance which takes place between 1 May and 31 October; • The discharge shall not derive from soil disturbance which takes place within a defined urban catchment;⁴⁹ • Soil stabilisation shall be undertaken as soon as practicable after the completion of the works; • Discharge to surface water shall contain less than 100gm³ suspended solids; • Discharge to surface water shall not give rise to any or all of the following effects in the receiving water after reasonable mixing: <ul style="list-style-type: none"> (a) the production of any conspicuous oil or grease films, scums, or foams, or floatable or suspended materials; (b) any conspicuous change in the colour or visual clarity; (c) any emission of objectionable odour; (d) the rendering of fresh water unsuitable for consumption by farm animals; (e) any significant adverse effects on aquatic life. 	Permitted			

⁴⁸ For the purpose of this rule the area/volume of soil disturbance is defined as the total area of uncompacted and/or unvegetated exposed soil on any particular property or contiguous properties within the control of any particular person or persons.

⁴⁹ Defined urban catchments are shown in Appendix IX of the Plan.

Activity	Rule	Standards/Terms/Conditions	Classification	Notification	Control/Discretion	Policy Reference
Discharge of offal, farm rubbish, leachate from silage pits and feedlots and other on-farm waste material into or onto land excluding those materials covered by Rules 22 and 35-39	30	<ul style="list-style-type: none"> • Discharge occurs onto or into production land; • Only waste generated on the subject property shall be discharged; • Discharge shall not occur within 50m of any bore, well or spring used for water supply purposes; • Discharge shall not occur within 25m of any surface water body; • Discharge shall not lead or be liable to lead to any contaminants entering surface water; • Disposal of surplus agrichemical solution and containers shall be undertaken in accordance with the recommendations of the manufacturer or supplier, as stated in the directions on the product container label; • Offal pits shall be securely covered; • Offal pits shall be at least 15m from any other offal pit that has been used within the previous five years. 	Permitted			
Discharge of fertiliser onto or into land	31	<ul style="list-style-type: none"> • Fertiliser is approved for use under section 5 of the Fertilisers Act 1960 or under the Agricultural Compounds and Veterinary Medicines Act 1997; • Discharger shall at all times adopt the best practicable option to prevent or minimise any adverse effects of fertiliser drift beyond the boundary of the target property or on other non-target areas within the boundary of the property; • If discharge is by any other method than aerial application, discharge shall not occur directly on or above a river, lake, wetland or other surface water body, including any drain which is discharging to a surface water body; OR • If discharge is by aerial application, fertiliser shall be applied in a manner which does not cause or is not likely to cause an adverse effect from deposition into a river, lake, wetland or other surface water body, including any drain which discharges to a surface water body. 	Permitted			

Activity	Rule	Standards/Terms/Conditions	Classification	Notification	Control/Discretion	Policy Reference
Discharge of aquatic herbicides onto or into surface water ⁵⁰ (excluding the wetlands listed in Appendix IIA)	32	<ul style="list-style-type: none"> • Aquatic herbicide is approved for use under section 21 of the Pesticides Act 1979 or the Hazardous Substances and New Organisms Act 1996; • Discharger must at all times adopt the best practicable option to prevent or minimise any adverse effects beyond the boundary of the target property or other non-target areas within the boundary of the property; • Discharge shall be undertaken in accordance with manufacturer's instructions and any relevant regulations; • Discharge shall be for the purpose of eradicating, modifying or controlling unwanted aquatic plants, and shall not exceed the quantity, concentration or rate necessary; • The discharge shall not give rise to any or all of the following effects in the receiving water after reasonable mixing: <ul style="list-style-type: none"> (a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; (b) any conspicuous change in the colour or visual clarity; (c) any emission of objectionable odour; (d) the rendering of fresh water unsuitable for consumption by farm animals; (e) any significant adverse effects on aquatic life; • There shall be no adverse effect on any take for potable or water supply, or any take under a resource consent or permitted by Rule 15 of this Plan; • Discharger shall notify the Taranaki Regional Council as soon as practicable in the event of accidental or unintended discharge of herbicides; • Discharger shall keep records of the name of applicator, agrichemical equipment used and methods of use, including equipment calibration details, type of each agrichemical applied, the volume and concentration of the agrichemical used, the locality, area and date of application, the location and nature of any sensitive area, weather conditions including wind speed and direction, and any abnormal situation or incident. 	Permitted			

⁵⁰ Appendix VI contains information on good agrichemical spray management practices that provides general guidance on the best practicable option for preventing or minimising adverse effects on the environment from spraying of agrichemicals.

Activity	Rule	Standards/Terms/Conditions	Classification	Notification	Control/Discretion	Policy Reference
Discharge of agrichemicals onto or into land by land-based application methods ⁵¹ (excluding discharge of agrichemicals by spray application) ⁵²	33	<ul style="list-style-type: none"> • Agrichemical is approved for use under section 21 of the Pesticides Act 1979 or the Hazardous Substances and New Organisms Act 1996; • Discharger shall avoid any contaminant entering surface water; • Discharger shall at all times adopt the best practicable option to prevent or minimise any adverse effects beyond the boundary of the target property or other non-target areas within the boundary of the property; • Discharge shall be undertaken in accordance with manufacturer's instructions and any relevant regulations; • Discharger shall notify the Taranaki Regional Council as soon as practicable in the event of accidental or unintended discharge of agrichemicals to surface water 	Permitted			
Discharge of agrichemicals by aerial application methods to land ⁵³ , (excluding discharge of agrichemicals by spray application) ⁵⁴	34	<ul style="list-style-type: none"> • Agrichemical is approved for use under section 21 of the Pesticides Act 1979 or the Hazardous Substances and New Organisms Act 1996; • Discharger shall at all times adopt the best practicable option to prevent or minimise any adverse effects beyond the boundary of the target property or other non-target areas within the boundary of the property; • Discharge shall be undertaken in accordance with manufacturer's instructions and any relevant regulations; • A method for positional navigation shall be used; • Discharger shall notify the Taranaki Regional Council as soon as practicable in the event of accidental or unintended discharge of agrichemicals to surface water. 	Permitted			

⁵¹ Under the Pesticides (Vertebrate Pest Control) Regulations 1983, approval may be required from the Medical Officer of Health and the relevant district council for the discharge of controlled pesticides.

⁵² Aerial spray application of agrichemicals is addressed in the Regional Air Quality Plan for Taranaki (1997). Appendix IV of the Regional Air Quality Plan for Taranaki contains information on good agrichemical spray management practices that provides general guidance on the best practicable option for preventing or minimising adverse effects on the environment from spraying of agrichemicals.

⁵³ Under the Pesticides (Vertebrate Pest Control) Regulations 1983, approval may be required from the Medical Officer of Health and the relevant district council for the discharge of controlled pesticides.

⁵⁴ Aerial spray application of agrichemicals is addressed in the Regional Air Quality Plan for Taranaki (1997). Appendix IV of the Regional Air Quality Plan for Taranaki contains information on good agrichemical spray management practices that provides general guidance on the best practicable option for preventing or minimising adverse effects on the environment from spraying of agrichemicals.

Appendix II: Farm nutrient management planning

Overview

OVERSEER® is a Decision Support System farm model for farmers, advisors and policy and is widely used throughout New Zealand. It allows nutrient budgets to be constructed for many enterprises including: dairy, sheep, beef, deer; fruit; vegetables and arable crops.

OVERSEER® calculates budgets for a wide range of nutrients including: N, P, K, S, and Ca, Mg, Na and H⁺ (acidity).

OVERSEER® has the ability to do "what if" scenarios, and its use can enable flexibility in achieving a nutrient 'target' or 'cap'.

The aim of the model has been to use input data that are reasonably easily obtainable by farmers or consultants. Default values are built into the model.

It is based on summaries of New Zealand (and overseas) research: OVERSEER® relies on sound science generated from research programmes funded by e.g. ForST, SFF and Industry. It has strong development support (MAF, AgResearch, FertResearch) for regular updates. Model development started in the 1990s and has continued since, with regular additions/improvements to the model since then.

Outputs

Calculates maintenance fertiliser nutrient and lime requirements

Estimates losses to the environment from:

- N leaching and run-off
- P run-off and risk index
- Greenhouse gas emissions such as CH₄, N₂O, CO₂.

Covers a wide range of management options and mitigation practices.

Farm nutrient management planning

Whilst an OVERSEER® nutrient budget is useful in itself, the real value is when it is used in a Nutrient Management Plan (NMP) to develop a farm strategy that takes into account productivity, environmental losses against consent conditions (if any) and other factors important to the business.

Nutrient Management Plans are central to 'Whole Farm Plans' and come in many formats, but they usually have the following in common:

- A farm map and description of the business
- An OVERSEER® nutrient budget as the central component
- An assessment of environmental risks
- A summary of consent requirements
- Recommended actions for addressing identified issues, including:
 - Scenario analyses
 - Details of fertiliser requirements

It is essential that NMPs should be prepared by trained advisors, competent in the use of OVERSEER® and with a detailed understanding of farm systems, nutrient cycling and environmental issues.

NMPs are increasingly being used by regional councils as a part of the consents process. However, they should never be considered simply as something to do to meet regulatory requirements. NMPs are invaluable business tools, with potential to save the farm money by increasing efficiency of nutrient use as well as decreasing discharges to the environment.

Further information


FertResearch's website has more detailed information on NMPs
Visit Environment Waikato provides website to see one regional council's view of NMPs.



Appendix III: Taranaki waterways – a report card


November 2012

How healthy are our rivers and streams?



There's a lot of public discussion about the quality of the region's rivers and streams - and rightly so, given how important they are to the lives and livelihoods of everyone in Taranaki.

As the manager of the region's freshwater resource, the Taranaki Regional Council believes it's vital for such discussion to be based on fact and science.




This report card sets out the findings of the Taranaki Regional Council's extensive monitoring and is based on recently published, detailed scientific reports that can be found on the Council website; www.trc.govt.nz.

David MacLeod
Chairman, Taranaki Regional Council

Taranaki waterways – a report card

- Scientific monitoring by the Taranaki Regional Council shows that in overview, the region's rivers and streams are doing relatively well, with water quality either stable or improving.
- Taranaki waterways are as good as or better than comparable waterways nationally, with a few isolated exceptions. Their quality also has a good ranking by international standards.
- The Taranaki community is spending millions of dollars on measures to protect and enhance the region's waterways.
- There is still room for improvement, though, and the Taranaki Regional Council has programmes aimed at achieving this. The effectiveness of these programmes is now being assessed as part of a review of the region's freshwater management rulebook.
- The Taranaki Regional Council's environmental monitoring programmes are long-standing, thorough, robust and peer-reviewed. They produce data that is reliable.



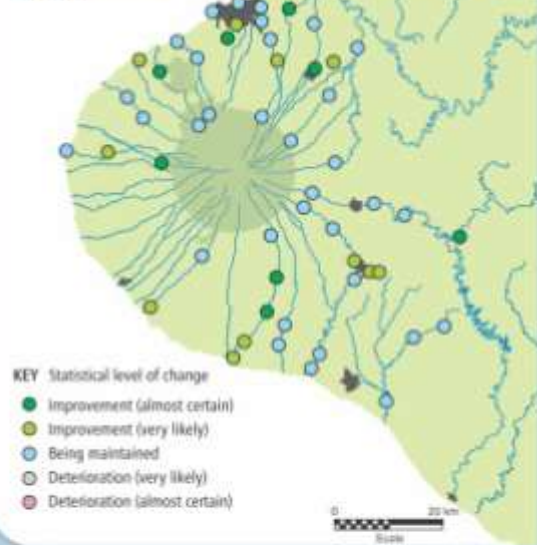
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River ecology

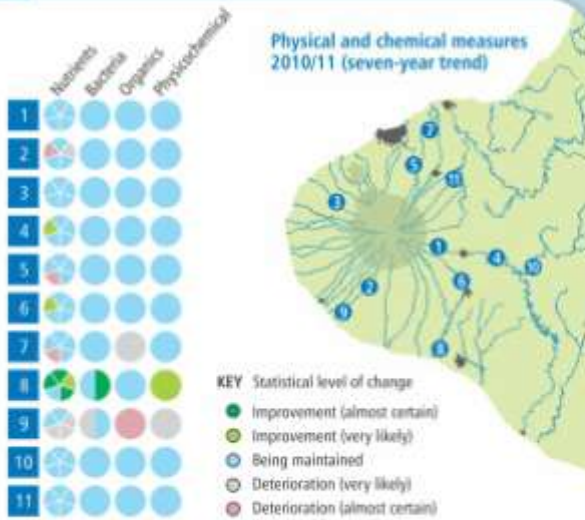
- Ecological health is regarded as the primary measure of freshwater quality. The Taranaki Regional Council was a pioneer in developing an index based on macroinvertebrate communities (tiny animals including insects, crustaceans, molluscs, worms and leeches) found in waterways. This index is now widely used in New Zealand, and similar systems are used internationally.
- The Council has analysed thousands of samples from hundreds of sites dating back to 1995, so it has a clear picture of trends across the whole region.
- Latest figures are from the 2010-2011 year, when surveys of 57 sites on 25 rivers and streams found improvements at 40 sites - an increase from 38 two years earlier. There were declines at 12 sites - two fewer than two years ago.
- A 16-year statistical analysis reveals an almost certain positive trend at nine sites, very likely positive trend at 14 sites, and a negative trend is very unlikely at any site.
- See the full 2010-2011 report here: bit.ly/NVgKnB

The evidence is clear that in general, the ecological health of the region's waterways is stable or improving.

Ecological health 2010/11



- KEY Statistical level of change
- Improvement (almost certain)
 - Improvement (very likely)
 - Being maintained
 - Deterioration (very likely)
 - Deterioration (almost certain)



Physical and chemical state

- Physical and chemical measurements are used to assess pressures on the health of rivers. These parameters include the amount of nutrients, bacteria, organic contamination, appearance, conductivity and acidity.
- Latest figures are from the 2010-2011 year, when 11 sites were sampled monthly for up to 22 parameters. Trends have been analysed over 16 years and over seven years (the shorter period to assess the impact of the Regional Fresh Water Plan for Taranaki, the freshwater "rulebook" that was adopted in 2001).
- For bacterial levels, organic contamination, appearance, conductivity and acidity, between 90% and 95% of measures show no trend of deterioration over 16 years, and between 82% and 98% show no trend of deterioration over the most recent seven years.
- For nutrient levels, 64% of measures show a trend of stability or improvement over 16 years but this increases to 89% over the most recent seven years.
- Read the full 2010-2011 report here: bit.ly/TOqNhh

The evidence shows that in general, pressures on water quality are stable, though improvement is still needed.

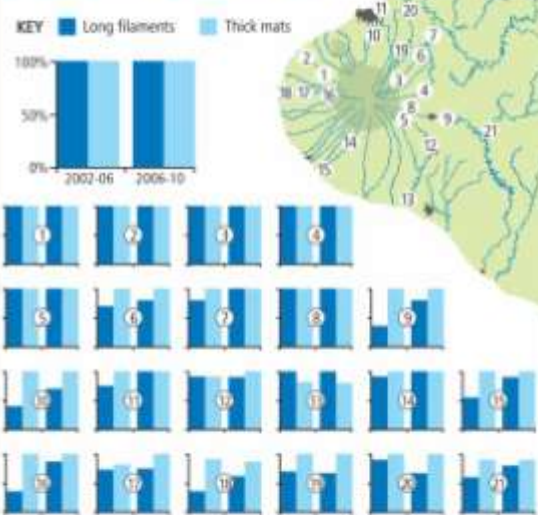


Algae

- Algae (scientists call it periphyton) gives an indication of what direct impact, if any, nutrients are having on waterways.
- Rivers need algae to live. But too much of it degrades the stream habitat and forms ugly long filaments or thick mats on river beds. Ministry for the Environment guidelines say long algae filaments should not exceed 30% of the river bed, and thick algae mats should not exceed 60%.
- The Taranaki Regional Council's latest monitoring report is for the period from 2006 to 2010, when 21 sites in 10 catchments were surveyed three times a year, at times when algae levels are expected to be at their highest.
- Ten sites met the long filament guideline in all surveys throughout the entire period; 18 sites met the thick mat guideline in all surveys. At sites where extensive algae was found, the guidelines were met between 62% and 91% of the time.
- Read the full 2006-2010 report here: bit.ly/XWY51

Eight out of 10 catchments met the guidelines more frequently than in the previous monitoring period (2002-2006).

Percentage of time MFE guidelines for algae were met 2002-2006 and 2006-2010



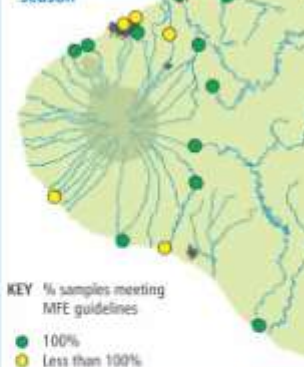
Why you can trust the data

- The Taranaki Regional Council's environmental monitoring programmes are carried out and overseen by well-qualified, experienced scientific and technical staff.
- The Taranaki Regional Council has its own laboratory with International Accreditation New Zealand (IANZ) accreditation. It is subject to internal and external Quality Assurance measures that involve, for example, duplication of some samples for separate analysis and comparison.
- Identification and analysis of stream life to gauge the ecological health of rivers is also subject to both internal and external Quality Assurance checks.
- The Taranaki Regional Council assesses water quality by analyzing ongoing monitoring results. It also contributes data to a Ministry for the Environment national grading system for recreational quality. But the Ministry's gradings are based mostly on the hypothetical risk from surrounding land use, rather than reflecting the actual monitoring results.

Popular swimming spots

- The Council monitors freshwater quality at popular recreational spots every summer, with slight variations in locations over a three-year cycle. Bacteria levels are measured at most sites, and cyanobacteria (blue-green algae) levels at a small number of sites. Results in the past two summers were the best in a decade.
- In summer 2011-2012, only 22 of the 207 samples taken from 16 sites exceeded the Ministry for the Environment "action" guideline for bathing water - the lowest level of non-compliance for 11 years.
- Of the 22 samples that exceeded this guideline, 19 were from just three sites - Lake Rotomanu, Waiwhakaho River near Lake Rotomanu, and Te Henui Stream mouth - where wildfowl and gulls are the major source of contamination.
- Eleven of the 16 sites remained within all guidelines for all samples.
- For the past two summers, two-thirds or more of Taranaki sites (65% in 2010-2011 and 69% in 2011-2012) were in the Ministry for the Environment's top category for compliance. The national average was 44% in 2010-2011 (latest figure available).
- Read the full 2011-2012 Taranaki freshwater bathing report here: bit.ly/RaMK7Z
- Read the 2011-2012 coastal bathing report here: bit.ly/PzD6IO

Freshwater bathing sites 2011/12 summer bathing season



The monitoring data shows that water quality at popular river bathing spots is better than a decade ago. Undeniably, it is far better than in the 1960s and 1970s, when waterways were routinely contaminated with partially treated municipal sewage and/or raw, untreated dairy effluent.

The Taranaki Regional Council also monitors the quality of seawater at popular coastal beaches every summer. Results are consistently better than the national average. In 2011-2012, more than 94% of samples were within Ministry for the Environment guidelines.



- The design of the Taranaki Regional Council's environmental monitoring programmes conforms with accepted protocols and is subject to external peer review, to check that the right things are being measured in the right places and in the right ways.
- The freshwater chapter in the Taranaki Regional Council's five-yearly State of the Environment report is peer-reviewed by the National Institute of Water and Atmospheric Research (NIWA).

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Appendix IV: Regional comparison

Table 6 below summaries a review of other regional council plans in terms of how they address diffuse source discharges to land or water.

Table 6: Regulation – a regional comparison

Regional council	Reference	Description
Environment Southland	Plan Change 33 – New Dairy Farming requires new dairy conversions to obtain resource consent.	<p>New policies and rules only apply to new conversions, defined as the initial conversion of a farm from its previous use to dairying.</p> <p>Increasing the stocking rate on an existing farm is not defined as 'New Dairy Farming'; provided there is no need to construct a new dairy shed to cope with the increased stock numbers</p> <p>Environment Southland's new policies and rules were publicly notified on 14 April 2002 and took effect immediately.</p>
Otago	Plan change 6A, enshrined as Regional Plan: Water for Otago, section 12.C.1.3	<p>New policies and rules effectively dictate how much fertiliser a farmer can apply, how many animals can be run per hectare and how much cow muck can be sprayed on to pasture. The intention is to limit the amount of nitrogen and phosphorus leaching into underground aquifers so the water there remains clean enough to drink.</p> <p>The limits set are:</p> <ul style="list-style-type: none"> - thirty kilograms of nitrogen per hectare of land per year, on average, going into groundwater - except in "more sensitive areas", where the limit is 10kg per hectare per year.
ECan	Proposed Natural Resources Regional Plan	<p>New rules apply to new activities commencing after date of Plan notification. The regional rules have more stringent conditions covering discharge of animal effluent to land, domestic wastewater systems, construction of bores</p> <p>More activities are also covered by rules, e.g. feed pads, effluent storage ponds, reticulated sewerage networks.</p> <p>The proposed Plan contains numerical water quality outcomes</p> <ul style="list-style-type: none"> - Maintain high quality groundwater - < 2mg/L N above max. conc. measured between 1996 & 2001 & not exceed 11.3 N mg/L - Community water sources: < 5.6 N mg/L
West Coast	Permitted activity rules	
Marlborough District Council	Permitted activity rules	
Tasman District Council	Permitted activity rules	
Nelson City Council	Permitted activity rules	
Greater Wellington	Permitted activity rules	
Horizons	<i>One Plan</i>	Under the Proposed One Plan existing dairy, intensive sheep and beef, cropping and horticulture operations within "priority catchments" plus conversions elsewhere in the region will require a resource consent in terms of nutrient management.
Hawkes Bay	Permitted activity rules	
Taranaki	Permitted activity rules only	Freshwater Plan currently under review
Gisborne District Council	Permitted activity rules	
Waikato	Variation 5	New rules cap the amount of nitrogen leaching into Lake Taupo with the aim of reducing nitrogen reaching the lake by 20% by 2020.

		<p>Landowners in the Taupo catchment now need to apply for resource consent for their land use activities if they will leach nitrogen above the permitted or authorised discharge levels. They can then sell or buy, lease out or lease extra nitrogen as available or required under a Nutrient Trading Scheme.</p> <p>The market is underway, with some properties refining their farming practices to reduce nitrogen discharges and thereby selling their surplus allowance (currently selling at around \$300–400/kg). Government and councils are also funding activities to reduce nitrogen inputs to the lake, such as buying nitrogen allowances as one way of reducing nitrogen inputs.</p>
Environment Bay of Plenty	Permitted activity rules	Government and council are establishing a nutrient trading scheme (similar in concept for that in Waikato) that will maintain and reduce nutrient inputs into lake Rotorua.
Auckland City	Permitted activity rules	
Northland	Permitted activity rules	

Appendix V: Documentation of understanding on the alignment of Fonterra terms and conditions of supply with the Taranaki Riparian Management Programme

Purpose

The purpose of this memorandum is to document the understanding between Fonterra and Taranaki Regional Council with regards to the new Fonterra Terms and Conditions of supply for stock exclusion with the Taranaki Riparian Management Programme. It is also a working document, recognising that processes will be developed for those actions that are known but also notes that there may be further processes to develop that are not currently known.

Background

The Taranaki Riparian Management Programme is a regional programme whereby farmers fence off land on both sides of the streams that flow through their properties, and plant them with vegetation. Science confirms that the retirement and planting of riparian margins is the most effective and appropriate solution to mitigating the impacts of diffuse source pollution in Taranaki. Since the beginning of the programme in 1993, over 2360 riparian plans have been prepared, covering 96% of Fonterra dairy farms in the region. 1631km of fencing has been completed, meaning 72% of stream banks on dairy farms now have stock excluded. 790km of new planting has been completed, with 58% of stream banks having riparian vegetation.

The Dairying and Clean Streams Accord (the Accord) was introduced in 2003 as a national initiative aimed at promoting sustainable dairying. The Accord contains national priorities for action and performance targets but also outlines principles to develop actions around 7 additional issues. One of those key actions for development is to recognise that improved water quality at the farm level will generally focus on headwaters, small streams and drains. In Taranaki, the Taranaki Regional Council, Fonterra, and Taranaki Federated Farmers adapted targets set by the Accord into a Regional Action Plan for Taranaki. The Taranaki Regional Action Plan sets a higher threshold than nationally sought via the Accord whereby farmers are required to fence and plant all of their waterways by 2015 to improve water quality.

The dairy industry itself is working hard to ensure that riparian fencing and planting continues to increase. Fonterra announced that it is including a new clause in its terms and conditions of supply that addresses stock exclusion from all waterways and all regular stock crossing points are to have bridges and culverts installed. By December 2013, all "Accord waterways" and Regionally Significant Wetlands must be fenced. The Fonterra initiative significantly accelerates the need for farmers to fence their riparian margins, and since the Taranaki focus is on the fencing and planting of waterways, care must be taken to ensure the new supply conditions do not undermine the region's higher objectives for riparian management and the maintenance and enhancement of freshwater quality.

Regular stock crossings must also be culverted or bridged by December 2013 in line with Fonterra's new clause in its terms and conditions of supply. Regular crossing points have been recorded or recommended on Riparian Management Plans during their preparation. Therefore, Council will have a role in monitoring the implementation of any recommended crossings.

Fonterra has acknowledged the unique approach to freshwater management being adopted in Taranaki. Recognizing the commitments in the Taranaki Regional Action Plan when implementing the new Fonterra Terms and Conditions of Supply in the region was a priority for the co-operative. Suppliers that are implementing their TRC riparian management plan will be given until 1st October 2015 to complete all work.

Essentially there are two pathways able to be taken by Fonterra suppliers in Taranaki. The first pathway is to participate in the Taranaki Riparian Management Programme, whereby the farmer:

- (a) has a riparian management plan in place;
- (b) receives free guidance and on site advice from a Land Management Officer;
- (c) actively implements the riparian plan every year over the next 4 years by fencing and planting waterways identified on the plan;
- (d) completes fencing and planting recommendations by the end of the planting season of 2015 (1st October);
- (e) all regular stock crossings must have a bridge or culvert in place by December 2013;
- (f) completes all fencing of Regionally Significant Wetlands by December 2013;
- (g) receives a certificate of completion once all works are completed.

Completion of these actions will meet Fonterra requirements in the Taranaki region.

The second pathway requires a farmer to meet Fonterra's national Terms and Conditions of Supply:

- (a) stock must be excluded from all waterways that permanently contain water and that are, at any time of the year, wider than 1 metre and deeper than 30cm at any point within or immediately adjacent to the boundary of the farm by December 2013. Fonterra recommends you consider your responsibilities for excluding stock from waterways when stock are being grazed off the dairy platform (your runoff).
- (b) under the second pathway, you are not required to plant; but it is recommended that the fence be put in a suitable place with room for planting recognising that planting may become regulatory in the future.
- (c) all regular stock crossings must have a bridge or culvert in place by December 2013.
- (d) completes all fencing of Regionally Significant Wetlands by December 2013.

It is paramount that farmers understand their options so they can act accordingly.

Points of agreement

Significant progress has already been reached on agreement on opportunities to align the Fonterra initiative with the Taranaki Riparian Management Programme through a number of discussions, meetings and emails. This memorandum documents agreement reached on alignment of the Taranaki Riparian Programme and the Fonterra supply conditions and ensuring both parties have a common understanding of the following matters:

The Taranaki approach

- The Taranaki solution to maintaining and enhancing water quality is the fencing and planting of waterways through the Taranaki Riparian Management Programme and Regional Action Plan for Taranaki.
- The Taranaki region will continue to fence and plant riparian margins, with stock exclusion and fencing targets to be met by 2015.

Riparian Management Plan

- The Taranaki Regional Council's riparian management plan will satisfy the Fonterra requirements to be compliant with the Terms and Conditions of Milk Supply.
- Riparian Management Plans are prepared by the Taranaki Regional Council at no cost to the supplier, and recommend fencing and planting for all water ways; and the provision of bridges or culverts and regular stock crossings.
- Riparian plan holders actively implementing their riparian management plans (and despite not yet meeting Fonterra's stock exclusion condition) will be considered compliant with Fonterra's

Terms and Conditions of Milk Supply and have until 2015 to comply.

- Actively implementing means demonstrating a meaningful commitment to addressing non compliance issues. This would normally mean demonstrating to Taranaki Regional Council an orderly and measured commitment to fencing and planting each year to complete by 2015, placing plant orders and planting riparian plants up until the winter of 2015. Suppliers need to have placed their order for subsequent planting seasons (2014, 2015) by 30 May 2013.

Stream definition

Fonterra's supply condition applies to Fonterra defined waterways only. Fonterra waterways refer to those "that permanently contain water and that are, at any time of the year, wider than 1 metre and deeper than 30cm at any point within or immediately adjacent to the boundary of the farm'.

- In accordance with the Regional Action Plan for Taranaki, streams identified on a 1:50,000 topographic map are included on a riparian plan, and any other streams or drains identified on the riparian plan are included based on the professional opinion of a Land Management Officer.

Regular crossing definition

In Taranaki, a regular crossing is where a waterway is crossed more than twice per week. Over and back is 2 crossings.

Extensions

- An extension may be granted in 2015 by the Chief Executive of Taranaki Regional Council on a case by case basis to cater for those in extraordinary circumstances (eg having in excess of approx 8km to fence and plant).
- Extension of time and works required to meet compliance issues will be outlined in a documentation of understanding between the Taranaki Regional Council, Fonterra and the supplier.

Monitoring and compliance

- Implementation of riparian plans will be monitored annually by Taranaki Regional Council until completed.
- Monitoring includes:
 - marking off areas that have been fenced and planted; and
 - checking off regular stock crossings are adequately bridged or culverted.
- New works are updated on the plan in GIS, to show what works have been completed, and what works are left to be completed
- Progress towards targets will be reported annually through the *Report on the Regional Action Plan* to the Regional Action Group (meeting with Fonterra, Dairy NZ, Open Country, Taranaki Regional Council).
- Suppliers deemed to be not actively implementing their riparian management plan will be reported to Fonterra by the Regional Council.

Completion of riparian plans

- The Council will issue a 'Certificate of Completion' to riparian plan holders that have given effect to all the recommendations set out in their riparian plan.
- A *Certificate of Completion* is recognized by Fonterra that a farmer is compliant with their stock exclusion requirements, including the fencing and planting of riparian margins, and the provision of bridges or culverts at regular stock crossings.
- Taranaki Regional Council will notify Fonterra of those who have received a *Certificate of Completion*.

- There is an ongoing requirement for plan holders to maintain fencing and planting that has been completed.

Communication

- The Council, Fonterra, and Dairy NZ staff will meet regularly to ensure consistent messages are being disseminated to landholders.
- At a higher level, executives will meet as required to discuss this documentation of understanding.

Future actions

- A process will be developed for how Council notifies Fonterra as to which planholders are taking the second pathway to meet the terms and condition of supply only.
- A process will be developed by Council and Fonterra on a dispensation/extension policy and protocol
- A process will be developed by Council for reporting the status of recommended stock crossings to Fonterra which are due for completion by December 2013
- A process will be developed by Council for reporting the status of fencing on Regionally Significant Wetlands to Fonterra which are due for completion by December 2013

Definition of terms

Compliance: actively implementing a TRC Riparian Plan completing by 2015 ; OR meeting Fonterra's stock exclusion requirements.

Distance of fence from stream: to ensure alignment between Fonterra and Council programmes, it is essential that farmers fence leaving room for planting. Proposed locations of fence lines are indicated on a riparian plan. At least a three metre wide strip is required to allow room for recommended planting, however this will vary according to the situation.

Fonterra Defined Waterways: those that permanently contain water and that are, at any time of the year, wider than 1 metre and deeper than 30cm at any point within or immediately adjacent to the boundary of the farm.'

Non compliance: not meeting Fonterra's Terms and Condition of Supply or stock exclusion requirements.

Planting: vegetation may be planted native (or suitable exotic species) or naturally regenerated.

Regional Action Plan Stream: Waterways identified on a TRC prepared/approved riparian plan, including those identified on the 1:50,000 topographic series map and any others in the professional opinion of a Land Management Officer, that require fencing and/or planting to improve water quality.

Regular stock crossing in Taranaki: a water way that is crossed by stock more than twice a week; over and back is two crossings.

Riparian Management Plan: property specific plan prepared by a Taranaki Regional Council Land Management Officer free of charge outlining fencing and planting recommendations for waterways on an aerial map of the property.

Supplier: Dairy farmer who supplies milk to Fonterra.

Stock proof fencing: The fence must be permanent, effectively excluding all cattle from accessing the waterway and preventing damage to waterway banks. At a minimum, this will be a two wire electric fence, except in areas prone to flooding or difficult terrain where a one wire fence may be appropriate.

Appendix VI: Benefits and costs of the policy options

Table 7: Advantages and disadvantages of policy options for addressing diffuse source discharges from fertilisers and agrichemicals to land

Options		Soil health will be maintained or enhanced	Water quality will be maintained or enhanced	Costs proportionate to benefits anticipated	Equitable - balances public and private investments	Certainty - will meet Plan targets and timeframes	Operational flexibility for resource users	Conclusion
1	Advice and education (supported by permitted activity rules)	√	√	√	√	X	√	Advice and information is the preferred approach based upon assumptions that environmental effects associated with the discharge of fertilisers and agrichemicals are having less than minor effects on soil health.
2	Extension services	√	√	X	X	X	√	Other options such as extension services, economic instruments and or requiring resource consents were not preferred as the public/private costs would be disproportionate to the environmental benefits anticipated.
3	Economic instruments (Nutrient Trading Scheme)	√	√	X	X	X	√	In terms of the regulatory regime, permitted activity rules are considered appropriate for managing the effects of fertilisers and agrichemicals. The rules will include standards, terms and conditions underpinning best practice in relation to the application of fertilisers and agrichemicals, and or the location of on-farm diffuse source discharges.
4	Increased regulation (resource consents)	√	√	X	√	√	X	
Assumptions		<ul style="list-style-type: none"> • Dairy intensification will continue with increasing pressures on soil health and freshwater quality • Good soil health in Taranaki • Nutrient budgets are compulsory (by industry) for dairy farms • SEM monitoring demonstrates no statistically significant increase in P levels in Taranaki soils • Taranaki's overall freshwater quality is generally good to excellent • Rules would be difficult to monitor and enforce and the costs would be disproportionate to the benefits • The nature of diffuse discharges makes it difficult to measure and collect data. Measurement is expensive and there are often large margins of error with measurement techniques. There are also significant time lags that make it difficult to quantify the impacts of diffuse source contamination and the effectiveness of policy responses. 						

Table 8: Advantages and disadvantages of policy options for addressing the fencing and planting of riparian margins

Options		Soil health will be maintained or enhanced	Water quality will be maintained or enhanced	Costs in proportion to benefits anticipated	Equitable - balances public and private benefits	Certainty - will meet Plan targets and timeframes	Operational flexibility for resource users	Conclusion
Outcomes sought:: <ol style="list-style-type: none"> 1. Increased protection of freshwater quality so that Taranaki can continue to maintain and enhance freshwater quality during periods of increased dairy intensification 2. Better management of the impacts of diffuse discharge on water quality 3. Resource users will be encouraged to take responsibility for their actions and will be given the flexibility to develop appropriate solutions in a reasonable timeframe. 								
1	Advice and education only	√	√	√	√	X	√	<p>The preferred option is a combination of 2 and 4.</p> <p>The Taranaki Riparian Management Programme involves significant voluntary public and private investment in promoting the fencing and planting of riparian managements to mitigate the impacts of adjacent land uses.</p> <p>The outcomes sought, in terms of farmer participation and environmental protection, are comparable to that that can be achieved under a more regulatory approach. Progress has been made however it may just take five or more years to achieve all targets. However, this is considered warranted given the cost of implementing the works.</p> <p>Notwithstanding the above, for those farmers on intensively farmed land that do not make reasonable progress in the fencing and planting of their riparian margins, it is proposed that rules apply requiring a resource consent to ensure the riparian plan is implemented and that <u>all</u> riparian margins on intensive pastoral land are retired and planted.</p>
2	Extension services (Riparian Management Programme)	√	√	√	√	√	√	
3	Economic instruments	√	√	X	X	X	√	
4	Increased regulation (permitted activity rules requiring fencing and planting of riparian margins)	√	√	√	X	√	X	
Assumptions		<ul style="list-style-type: none"> • Dairy intensification will continue with increasing pressures on freshwater quality • Taranaki's overall freshwater quality is generally good to excellent • Progress is being made on the fencing and planting of riparian margins on intensively farmed land in Taranaki • Measures such as riparian management have an immediate and direct benefit for improving water quality by reducing pasture runoff and protecting stream banks from erosion or collapse • Since signing up to the Dairying and Clean Streams Accord there has been a significant effort made by Fonterra suppliers to exclude livestock from waterways • Five –seven years is required after notifying the Freshwater Plan to complete the retirement and planting of riparian margins on intensive pastoral land. • Notwithstanding the advantages of voluntarily completing the riparian work a small proportion of land occupiers will refuse to make reasonable progress on completing the required fencing and planting. It is reasonable that these 'free riders' be addressed through a regulatory and compliance regime. 						

Appendix VII: National values of fresh water

Set out below are the national values of fresh water as identified in Annex B of the *National Policy Statement for Freshwater Management 2011: Implementation Guide*.

“...Water is valued for the following uses:

- *domestic drinking and washing water*
- *animal drinking water*
- *community water supply*
- *fire fighting*
- *electricity generation*
- *commercial and industrial processes*
- *irrigation*
- *recreational activities (including waka ama)*
- *food production and harvesting eg, fish farms and mahinga kai*
- *transport and access (including tauranga waka)*
- *cleaning, dilution and disposal of waste.*

There are also values that relate to recognising and respecting fresh water’s intrinsic values for: safeguarding the life-supporting capacity of water and associated ecosystems; and sustaining its potential to meet the reasonably foreseeable needs of future generations. Examples of these values include:

- *the interdependency of the elements of the freshwater cycle*
- *the natural form, character, functioning and natural processes of waterbodies and margins, including natural flows, velocities, levels, variability and connections*
- *the natural conditions of fresh water, free from biological or chemical alterations resulting from human activity, so that it is fit for all aspects of its intrinsic values*
- *healthy ecosystem processes functioning naturally*
- *healthy ecosystems supporting the diversity of indigenous species in sustainable populations*
- *cultural and traditional relationships of Māori with fresh water*
- *historic heritage associations with fresh water*
- *providing a sense of place for people and communities.*

All the values in both lists are important national values of fresh water.”

