



Ministry for the  
**Environment**  
*Manatū Mō Te Taiao*



# Water Programme of Action

The Effects of Rural Land Use  
on Water Quality

**Technical Working Paper**

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The interdepartmental working group involved in this project comprises of the following government departments:

- Ministry of Agriculture and Forestry
- Ministry for the Environment
- Ministry of Economic Development
- Ministry of Health
- Department of Conservation
- Te Puni Kokiri
- The Treasury
- Department of Internal Affairs
- Environment Waikato and Marlborough District Council as representative of regional councils.



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# 1 Purpose

This paper explores the current issues associated with managing the impacts of rural land use and associated diffuse (non-point) source discharges of contaminants on freshwater quality. It proposes possible ways to improve water quality management issues for the purposes of consultation. This paper examines the framework for managing rural land use impacts on water quality. It does not propose water quality standards, which are more appropriately set through other processes (eg, national policy statements, national environmental standards, regional policy statements and plans).

While deteriorating water quality is an accumulation of rural and urban pollution, this paper is solely on rural land use impacts for the following reasons:

- Urban discharges (which generally are, or become, point source discharges) are largely being managed, whereas diffuse discharges to water from rural land uses such as farming are not being addressed well.
- Urban areas affect only 3% of New Zealand’s length of rivers.
- Around 60% of New Zealand’s land area is under primary production, therefore rural land uses have the ability to impact on a large number of waterways.
- There has been a need to limit the current scope of work due to resource limits of departments and the timeframes set by Ministers for the Water Programme of Action (WPoA).

The focus on rural land use issues does not preclude addressing urban land issues, including urban stormwater, in the future, either through the WPoA or through other policy development processes.

## 1.1 Background

In January 2003, the Sustainable Development Programme of Action (SDPoA) was released by the Government to set directions and outline initial actions towards sustainable development. Included within the programme are four work streams: energy, sustainable cities, child and youth development, and freshwater quality and allocation. The WPoA addresses the freshwater work stream, with three concurrent working groups examining water quality, water allocation and identifying potential water bodies of national importance. The water quality work discussed here will be integrated with the other two work areas in the proposed public discussion document on freshwater issues.

The goal of the SDPoA for freshwater is “adequate, clean freshwater available for all” with the desired water quality outcome being that “freshwater quality is maintained to meet all appropriate needs”.

The application of the principles of the SDPoA to water quality issues indicates that solutions to problems of managing land use effects on water quality should, as far as possible, be mutually reinforcing and recognise environmental, economic, cultural and social values, and the needs of current and future generations. Taking a sustainable development approach requires looking for complementary and innovative solutions.

Local authorities manage water quality under two key pieces of legislation: the Resource Management Act (RMA) 1991 which has a **sustainable management** focus and the Local Government Act (LGA) 2002 which has a **sustainable development** focus.

The current scope of the water quality project, while striving to meet **sustainable development** objectives, has operated under **sustainable management** principles as per Part II of the RMA.

Sustainable development embodies the concept of “getting more, from less, for longer”<sup>1</sup> and has been defined as:

*“development which meets the needs of the present without compromising the ability of future generations to meet their own needs” and involves:*

- *“Looking after people.*
- *Taking a long-term view.*
- *Taking into account effects on social, cultural, economic and environmental dimensions.*
- *Participation and partnerships”*<sup>2</sup>

Sustainable management means:

*“managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while:*

- a) safeguarding the potential of foreseeable needs of future generations; and*
- b) safeguarding the life-supporting capacity of air, water, soil and ecosystems; and*
- c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.”*<sup>3</sup>

There is considerable overlap between the concepts as both embody the ideas of sustainability; consider intergenerational issues; involve participation of people and communities; and consider social, economic, environmental and cultural values. The key difference is that sustainable management requires safeguarding the life-supporting capacity of air, water, soil and ecosystems and avoiding, remedying or mitigating any adverse effects of activities on the environment, while providing for social, economic and cultural well-being and health and safety. Under sustainable management the consideration of adverse effects cannot be traded off against the social, economic and cultural values in the same way as they may be under sustainable development. The concepts of sustainable development and sustainable management are evolving. Any tensions that may remain are, however, beyond the scope of managing water quality.

Māori have strong views on the importance of freshwater quality for cultural and other reasons, as discussed at more length in sections 4.1.3 and 4.2.3 below.

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<sup>1</sup> Towards Sustainable Development: The Role of the Resource Management Act 1991, Office of the Parliamentary Commissioner for the Environment, August 1998.

<sup>2</sup> The Government’s Approach to Sustainable Development, August 2002, p6.

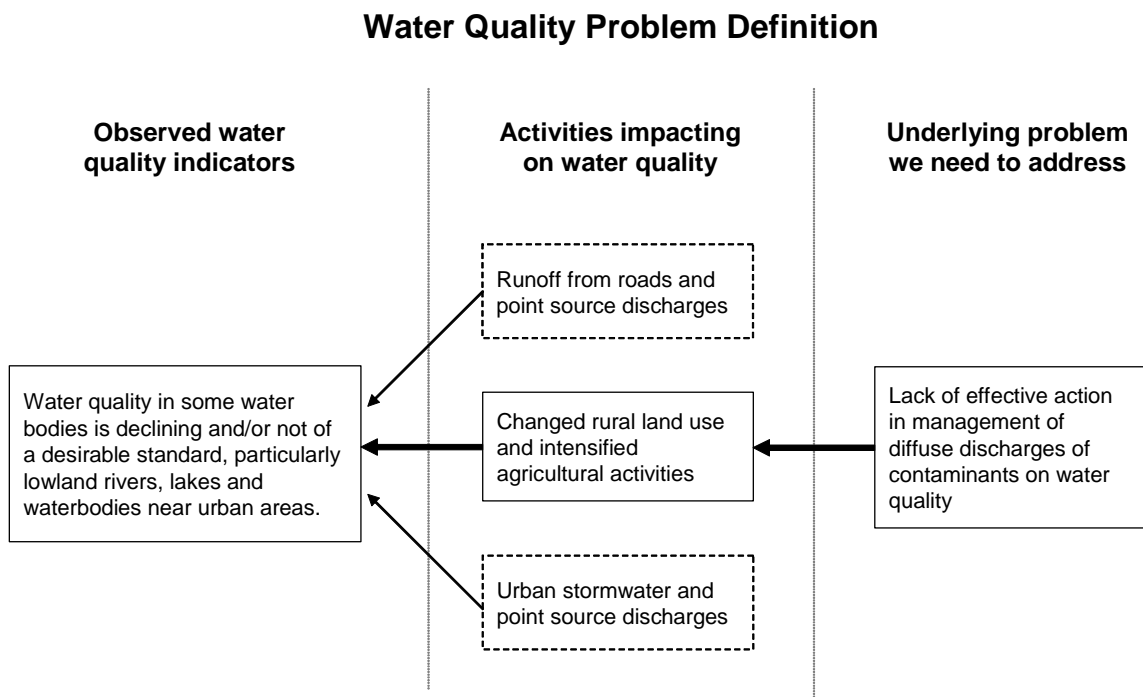
<sup>3</sup> Resource Management Act 1991, Section 5 Purpose.



## 2 Problem Definition: Effects of Rural Land Use on Water Quality

We are observing that water quality in some water bodies (particularly those passing through catchments with mainly agricultural land use) is declining and/or not meeting desirable water quality ‘standards’ (refer to Appendix 2 for details). A major contributing factor is diffuse discharges from rural land use and intensified agricultural activities. Such activities have economic benefits, but they put pressure on water bodies to cope with additional nutrients (eg, from animal excreta and fertilisers), micro-organisms and sediment. The underlying reason why these activities are impacting on water quality, and therefore the problem we need to address, is **a lack of effective action in the management<sup>4</sup> of diffuse discharges of contaminants on water quality, in some catchments.**

The causal relationship is outlined in the following diagram.



<sup>4</sup> “Management” in this context includes planning, monitoring, innovation, informing public perceptions/expectations and research.

### 3 Essential Features of a Framework for Managing Water Quality

This section of the paper outlines what a good water quality policy framework should be capable of and the essential features of such a framework to improve water quality management on a catchment basis.

A good water quality framework is one that is capable of:

- effectively managing the diffuse discharges of contaminants into water bodies
- achieving desirable water quality
- supporting the many social, economic, environmental and cultural values New Zealanders associate with water.

A good water quality framework requires seven essential features for managing the impacts of diffuse discharges from rural land use on water quality. These features are also likely to be applicable for managing other water quality issues (eg, urban stormwater, runoff from roads and carparks, point source discharges).

The essential features of a good water quality framework are:

#### Roles and relationships

- Clear roles and accountabilities for central government and councils to enable effective management of water quality issues.
- Effective partnerships and engagement between all levels of government, Māori, industry and landowners in achieving identified water quality outcomes.

#### Strategic direction

- High quality strategic resource management planning and decision making for sustainable development outcomes in water quality management, that:
  - addresses water quality issues
  - identifies and balances the interests of national, regional and local communities across economic, environmental, cultural and social values
  - takes a long-term focus, thus considering the needs of current and future generations
  - identifies complementary strategies, values and interests and recommends actions and solutions that optimise outcomes across values and interests
  - leads to explicit, transparent and difficult decisions and, where necessary, makes trade-offs between values
  - incentivises innovation and relevant research.
- Taking an integrated management approach – one where water management (both water allocation and quality) issues and land use activities (rural and urban) are addressed collectively. Water allocation is important as the volume of water abstracted impacts on the capacity of a water body to assimilate and transport contaminants, and also its regenerative capacity.<sup>5</sup>

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<sup>5</sup> “Regenerative capacity” in this context means the scope for the ecosystem to be restored.

- Having flexibility and adaptability (adaptive management) given the incomplete understanding of the impact of discharges on environmental outcomes, time-lags before pollutants become evident, the transient nature of freshwater ecosystems, and the potential for change in community priorities.

### **Consultation**

- Effective and meaningful consultation between all levels of government, Māori, industry, landowners and the public on water quality issues.

### **Information, research and technology**

- Water quality management and planning processes supported by good information and research that fosters innovative and holistic solutions to water quality issues, including:
  - good scientific information on the impacts of discharges, including appropriate data collection and analysis
  - the relationship between land use and other factors (eg, point source discharges, urban storm water) impacting on water quality (including cumulative effects)
  - traditional Māori knowledge (matauranga);
  - the limitations of what is known now and areas where further information is required
  - information on the different values of water and the interactions between the values, and the costs/benefits of securing particular water quality outcomes.

### **Effective tools (legislation, policy tools, economic instruments)**

- Clear and enabling legislation.
- Appropriate procedures for setting agreed minimum water quality standards for different categories of water bodies having different values.
- Having access to an appropriate range of policy tools to enable water quality management, including the ability to specify rights to make discharges, and access to regulatory and market instruments to influence land user behaviour.

### **Community awareness**

- Effective education to:
  - achieve community understanding of the impacts of discharges on water quality and on all of the values associated with water
  - provide guidance on implementing and working with the RMA and other relevant legislation
  - encourage the use of best management practice and understanding of the science relating to water quality management and development of innovative technologies to minimise contaminants at the source
  - encourage mitigation and restoration of ecosystems (eg, wetlands).

### **Capacity**

- Adequate capacity, knowledge and skills within central government, local government, Māori and landowners to understand all of the values and issues related to water quality management.

## 4 Current Framework

The following section outlines the current policy framework for managing the impacts of diffuse discharges on water quality, this enables comparison with the essential features outlined in section 3, allowing gaps to be identified in section 5.

### 4.1 Roles and relationships

#### 4.1.1 Central and local government roles

The RMA devolves primary responsibility for managing water quality issues to regional councils. This is in terms of consents and rules for discharges to water and land, and rules for land use activities that may affect water quality. While land use issues are primarily the responsibility of territorial authorities through their district plans, regional councils can set policy for integrated management of resources through their regional policy statements and can control land use through regional plans to achieve water quality objectives.

Central government can articulate its interest in water quality issues and set water quality standards through the use of national policy statements and environmental standards. A regional plan or district plan must not be inconsistent with a national or regional policy statement.

#### 4.1.2 Partnerships

Partnerships between central government, regional councils, territorial authorities, Māori, industry and landowners to manage water quality outcomes currently occur only to a limited extent. Examples where partnerships have occurred include:

- Environment Waikato is working closely with central government agencies, the Taupo District Council and the Tuwharetoa Trust Board to address declining water quality in Lake Taupo (refer Appendix 3 – Case Study on Lake Taupo).
- Regional councils work with landowners, industry and care groups to improve farming practices (eg, retiring margins of rivers and lakes from livestock and cropping; soil conservation; planting activities to restore wetlands and plant river and lake margins).
- Fonterra, regional councils and central government agencies collaboratively work on *Market Focused* and the *Dairying and Clean Streams Accord* to manage the impacts of rural land use on water quality by encouraging dairy farmers to undertake best practice activities on their farms.

### 4.1.3 Restricted opportunity for Māori engagement and participation

Māori have particular interests in fresh water in New Zealand, arising out of their status as indigenous people and the Treaty of Waitangi. Māori also have interests as owners of agricultural land and may be impacted by constraints on land use. Māori interests are recognised to some degree in the RMA and in the SDPoA. Yet Māori interests and values are not generally reflected in water quality management and decisions. However, councils can decide to involve Māori and empower them to become more active participants in water quality decision making.

The mixing of waters and waste discharges are considered to degrade the mauri (life force) of the waters, and may also offend the mana (status) of different iwi or hapu who hold traditional rights and responsibilities with respect to the different waterways. This leads to Māori being unable to practice their customs and traditions associated with those water bodies.

The management of freshwater (including ongoing Māori involvement in management) is frequently an issue in Treaty settlement negotiations. Many Māori consider that, in practice, their opportunities to engage and participate in management and decision making on water are restricted, due to both a lack of capacity and resources within local government and Māori, as well as limitations in the legislative framework.

The issue of Māori participation and engagement in resource management planning and decision making has also been raised through the current Resource Management Act review. Work undertaken in the Water Programme of Action will need aligning with the outcomes of the Resource Management Act review.

## 4.2 Strategic direction

### 4.2.1 Water quality management and planning is evolving

Over the last 15 years, New Zealand has made significant progress in reducing direct (point source) discharges of human and agricultural sewage and industrial waste into waterways. These discharges were relatively easy to identify and address, leading to significant and almost immediate improvements in water quality in some areas. To some degree, direct discharges have been managed by converting them to diffuse discharges, for example land disposal of waste from urban areas and dairy sheds.

With the reduction in direct discharges, there is evidence that diffuse sources of contaminants (eg, nitrogen and micro-organisms like *campylobacter*) from intensive agricultural land use are now the key contributors to rural water quality problems (particularly in lowland rivers). Therefore, many water managers are recognising the need to focus more on diffuse discharges, as part of the evolution of water management and planning in New Zealand.

Regional councils are beginning to take action on water quality management but in some areas it is in the early stages of development. Some examples of where progress is being made include:

- Water quality in Lake Taupo (see case study in Appendix 3).
- Environment Bay of Plenty introducing a rule into its regional plan to help address poor water quality in Lakes Rotorua and Rotoiti.

- *Market Focused* and the *Dairying and Clean Streams Accord* (as noted in section 4.1.2).
- Lake Alexandrina (see case study in Appendix 4).

#### **4.2.2 Changing land use with more intensive and diversified activities**

Agricultural land use covers over half of New Zealand, with agriculture being the main economic activity in most regions and provincial cities in the country. Economically, the total value of agricultural exports in 2003 was \$14.4 billion (equal to 51% of total mercantile exports), and the sector employs 9.6% of New Zealand's total workforce. The value of agriculture to the economy is well understood and accepted within New Zealand.

The Government has economic growth objectives and policies for the New Zealand economy (eg, the Growth and Innovation Framework). As agriculture contributes around half of New Zealand's export earnings, it will inevitably be a major sector in achieving any growth objectives.

As a consequence, ongoing pressure for the intensification of, and changing, rural land use is likely.

Agricultural land use in New Zealand continually changes and adapts to changing economic circumstances, demands for products, and environmental and social circumstances. Currently some farmers are trying to increase production from their land to achieve better economic returns, higher incomes for their families, or in order to service debt due to high land prices. One way to increase returns is to intensify or diversify their activities on the land. In the case of pastoral farming this could mean increasing pasture growth (by adding more fertiliser) and bringing more feed onto the property (eg, silage) to enable higher stocking rates. In some cases this could enable a change in the type of farming from a more extensive activity (eg, sheep and cattle farming) to a more intensive activity (eg, dairying). More intensive land use can lead to more pollutants entering water bodies (eg, nitrogen or phosphorus from fertilisers; nitrogen/ammonia from animal urine or silage; micro-organisms from animal faeces; sediment from stock pugging).

#### **4.2.3 Planning and decision making for sustainable development outcomes**

Section 3.0 of this paper outlined the need for a sustainable development policy framework to manage water quality in a manner that identifies and optimises outcomes across economic, environmental, cultural and social values, while considering the needs of national, regional and local communities, and of current and future generations. To date, however, community sustainable development outcomes for water quality have only been identified to a limited extent at both the national and regional levels.

To date central government has not specified the outcomes it seeks for the management of freshwater or stated what the national interest is in water.<sup>6</sup> It has not, for example, made use of the national policy statement or environmental standard mechanisms provided under the RMA to define desired water quality outcomes or processes.

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<sup>6</sup> The possible exception to this being water bodies protected by water conservation orders, although they are limited in terms of specifying central government outcomes, as they are not initiated by central government.

Most regional councils have undertaken some strategic planning for water quality outcomes through their planning processes under the RMA, but this is mainly in the area of non-regulatory actions (eg, education, establishing care groups). Only a few councils are proposing to put in place regulatory controls and rules on the effects of diffuse discharges on water quality in their regional plans.

The current Resource Management Act review is examining improving the national policy statement process and whether to allow the Government to require regional councils to develop plans addressing specific issues. The water programme of action work will need aligning with the outcomes of the Resource Management Act review.

Taking a sustainable development approach to address water quality problems means considering a wide range of factors in decision making. Decision makers are faced with the difficulty of integrating consideration of:

- the assimilative capacity of the water body to cope with ongoing impacts of agriculture (and other factors) on water quality
- water quality impacts on the different values of water, including
  - the economic benefits generated (eg, from irrigation for agriculture; energy generation, industrial and aquaculture production; and tourism activity)
  - the social benefits (eg, employment generation; water-based recreation opportunities; human and stock drinking water; providing food)
  - the value of natural ecosystems and providing habitat for New Zealand’s native plants and animals
  - Māori cultural values, including Māori beliefs that:
    - water symbolises the spiritual link between the past and the present and is a taonga (treasure) left by the ancestors for the life sustaining use of their descendants, who must guard these taonga for future generations
    - water is an essential ingredient of life, vital to the physical and spiritual survival of all things dependent on the maintenance of the mauri, wairua (spirit), mana and tapu (sacred nature) of every water body
    - a water body with an intact mauri can sustain healthy ecosystems, support a range of cultural uses, and reinforce the cultural identity of the people<sup>7</sup>
    - the mauri can be polluted and damaged by actions that are not part of the natural realm, such as removal of native riparian vegetation, contamination or drainage.<sup>8</sup> This threatens the ability of the water body to nurture life
    - these cultural values, such as the maintenance of the life-giving capacity of water, interact and intersect with other values in water – for example, the value of water to Māori and others as a factor in economic development and employment.
- how degraded water quality impacts on all four values (eg, making water unsuitable for human and animal consumption, contact recreation, and aquatic habitat; detracting from New Zealand’s “Clean Green” image which could have implications for international trade and tourism; and impacts on Māori cultural values)

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<sup>7</sup> Ministry for the Environment (2001): Managing Waterways on Farms, Ministry for the Environment, Wellington.

<sup>8</sup> Ibid.

- the value to the community of land use activities which are impacting on water quality
- where there may be opportunity for further development and intensification of agricultural activity versus where development has already led to impacts greater than the assimilative capacity of a water body can cope with and its regenerative capacity.

### **4.3 Consultation**

The Resource Management Act provides processes for community consultation when setting community outcomes at the national, regional or local level. The Local Government Act 2002 also provides processes for community consultation to set community outcomes in long term council community plans and requirements for consultation with Māori. Robust consultation, however, can be quite time-consuming for all parties involved, especially for groups where the same individuals are involved in multiple consultative processes.

### **4.4 Information, research and technology**

#### **4.4.1 Problems with identifying and measuring diffuse discharges**

There can often be time lags of up to 50 or 60 years before the effects of past land use intensification show up on the ground. This time delay makes addressing degraded water quality difficult, as it has implications for intergenerational equity, acceptance of immediate costs for long term gain, and research.<sup>9</sup> The time delay may be a factor in the limited public appreciation and awareness of the adverse impacts of rural land use.

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.

Without accurate data water managers cannot easily identify contaminant sources or make successful prosecutions for breaches of legislation or planning rules.

#### **4.4.2 Science and information requirements**

In cases such as Lake Taupo, regional council action to address diffuse discharges requires the support of scientific information. Important issues are the variable quality of scientific information across catchments, the accessibility of information to decision makers, the lack of uptake of the outcomes of research, the acceptance of traditional Māori knowledge in decision making and the need to target research resources to develop innovative solutions to get better water quality management.

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<sup>9</sup> Reversing degradation of water quality and changing land use involves cost, as the Lake Taupo project illustrates. In order for agencies, land users, ratepayers and taxpayers to accept increased costs to protect water quality, they need to understand how and why it is happening.



Participants at the focus group sessions<sup>10</sup> on landowners' perceptions stated they believed any constraint on their land use had to be scientifically proven by decision makers. Anecdotally, this view reflects the opinion generally held by landowners. Related issues are the degree of certainty that can be expected to be provided by scientific analysis.

Dissemination and uptake of research has not been matched by the level of funding and effort invested.

## **4.5 Effective tools (legislation, policy tools, economic instruments)**

### **4.5.1 Legislation**

#### **Regulation of diffuse discharges under the RMA**

Under section 15 of the RMA, all discharges of contaminants into water, or discharges of contaminants onto land that may enter water, must be expressly authorised in a regional plan, resource consent or regulations.

Councils are not able to authorise any discharges if they are likely to have certain effects, including producing floatable or suspended materials, causing conspicuous changes in colour or visual clarity, objectionable odours or significant adverse effects on aquatic life (sections 70 and 107).

#### **Application of RMA to diffuse agricultural discharges**

Many councils are still developing approaches to manage diffuse discharges to land. For example diffuse discharges may be managed under discharge permits or land use consents. Landowners are not able to rely on the existing use rights provisions of the RMA in respect of such discharges.

Regional councils that have examined diffuse discharges have mainly focused on non-regulatory means, with emphasis on encouraging better practice by enhancing landowner awareness of impacts of land use on water quality. Gains in on-farm practice through this approach can be lost when changes in the economic climate encourage intensification to increase profit; or a reduction in effort and investment in environmental outcomes.

There are also issues with regulation of land use and water quality relating to perceived impingement on landowners' property rights. Addressing these issues can be politically contentious leading to a reluctance to tackle them.

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<sup>10</sup> Property Rights in Water Quality: A Review of Stakeholders' Understanding and Behaviour, Harris Consulting, March 2004.

#### 4.5.2 Policy and regulatory tools

As well as using education and information programmes to address diffuse discharges from rural land use, councils have also collaborated with central government and industry groups in negotiating voluntary agreements, such as the *Dairying and Clean Streams Accord*. While valuable, these initiatives are unlikely to fully address water quality issues where there are high water quality risks or a significant reduction in discharges is required. Education and information programmes are most effective where they lead to better dissemination of “win-win” practices, but are likely to be less effective when changes impose costs on land users.

Regional councils have made limited use of the regulatory tools available under the RMA to address water quality (eg, the power to make rules in plans). When used these tools have specifically prescribed land use and intensity and/or farming and management practices (eg, requiring riparian fencing, particular nutrient management arrangements). The nature of diffuse discharges, combined with current legislation, make it difficult for councils to directly regulate discharge levels and at the same time allow flexibility for land users as to how they reduce discharges to comply with limits. These factors, combined with legislative restrictions on the transferability of discharge permits,<sup>11</sup> also impede regional councils using “cap and trade” arrangements to manage discharges, such as the nitrogen trading arrangement which is currently being explored by Environment Waikato for Lake Taupo. The limitations of the tools available to regional councils are likely to increase the costs of securing desired water quality objectives.

### 4.6 Community awareness

There is a need to increase public understanding of the impacts of land use on water quality and the desirability of improving degraded water quality as much as possible at the source of contaminants.

The current lack of public awareness of the link between land use and water quality problems makes it difficult for those who have to make the ‘hard’ political decisions required to effectively address water quality issues through controls on land use. However, water quality problems in some lakes are becoming more significant and are receiving increasing media attention, particularly those lakes which are considered to be major New Zealand icons (ie, Lake Taupo).

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<sup>11</sup> This is the subject of discussion under the Resource Management Act review.

## 4.7 Capacity

There is a shortage of personnel both in central and local government with the technical skills and practical experience needed for managing land use effects on water quality. This may also be an issue for Māori and stakeholders. This shortage of capacity is likely to increase as more emphasis is placed on addressing the issues raised, and implementing new approaches and tools.

### Summary of current framework issues

- Ongoing pressure for the intensification of and changing rural land use is likely.
- There are problems with identifying and measuring diffuse discharges and difficulties due to the often long time lags between cause and effect.
- Management and planning relating to the impacts of diffuse discharges on water quality is evolving.
- Strategic planning is limited and decision making for sustainable development outcomes is complex and therefore often not addressed well.
- Difficult decisions need to be made between the benefits of further land use intensification and costs.
- Key problems are identifying complementarities between values and ways to optimise the benefits across all values; identifying innovative solutions to meet this challenge; and making explicit and transparent decisions when trade-offs need to be made.
- Under current legislation, discharges of contaminants into water must be authorised in a regional plan, consent or regulation, but there appears to be uncertainty over interpretation relating to diffuse discharges.
- There can be a reluctance to face the associated politically contentious issues, particularly those which may impinge on rural sector perceived property rights.
- Uninformed expectations of the level of scientific information needed in decision making and reluctance to accept traditional Māori knowledge.
- Regional councils have an incomplete tool kit to manage water quality impacts at lowest cost.
- Insufficient public awareness of the links between land use and water quality problems.
- Restricted opportunity for Māori participation.
- A need to continue improving the technical skills and practical experience of those involved in managing land use effects on water quality.

## 5 Gap Analysis

The gap analysis draws from sections 2.0, 3.0 and 4.0 of this paper to compare the essential features for a water quality framework with the current situation. Section 6.0 examines actions for going forward.

Essential features (from Section 2.0)	Current framework (from Section 4.0) and existing gaps
<p>Roles and relationships</p> <ul style="list-style-type: none"> <li>• clear roles and accountabilities</li> <li>• partnerships and engagement</li> </ul>	<p>Response to and accountability for land use effects on water quality is unclear between some territorial authorities and regional councils. What's missing:</p> <ul style="list-style-type: none"> <li>• clarification of mandates</li> <li>• Crown guidance and expectations to regional councils</li> <li>• addressing/mitigating potentially contentious political issues.</li> </ul> <p>There is patchy engagement with Māori. This has the implication of insufficient consideration being given to the cultural aspects and implications for implementing water management. What's missing:</p> <ul style="list-style-type: none"> <li>• better engagement with Māori (note: this issue may be addressed through the current RMA review and work under the WPoA would need aligning with the RMA review outcomes).</li> </ul> <p>Partnerships are occurring but only to a limited extent. What's missing:</p> <ul style="list-style-type: none"> <li>• more effective partnerships to address water quality issues.</li> </ul>
<p>Strategic direction</p>	<p>The national interest in water quality is not well articulated in addressing strategic planning issues (ie, adaptive management, optimising SD outcomes, acknowledgement of trade-offs). What's missing:</p> <ul style="list-style-type: none"> <li>• articulation of national interest by central government</li> <li>• strategic planning to occur nationally, regionally and at industry level.</li> </ul> <p>The management of land use to sustain water quality has only been addressed to a limited degree in regional planning which has been discretionary. What's missing:</p> <ul style="list-style-type: none"> <li>• mandatory planning and water quality management by local government (Note: the RMA review may allow the Government to require regional councils to develop plans addressing specific issues. The WPoA work will need aligning with the RMA review outcomes)</li> <li>• identification of community outcomes.</li> </ul>
<p>Consultation</p>	<p>The state of consultation appears generally acceptable, although there are concerns regarding how much the ideas/feedback from consultation flows through into decision-making. There are also concerns by developers and people being consulted over the costs and time commitments required during consultation.</p>
<p>Information/research/technology</p>	<p>Smaller councils have less access to information and research that enables innovation. Innovation is essential to identifying better solutions taking a sustainable development approach. Science and information is incomplete and not widely disseminated. What's missing:</p> <ul style="list-style-type: none"> <li>• better dissemination and uptake of information and science to water quality decision makers</li> <li>• integration of science and policy and guidance on acceptable levels of certainty around use of information</li> <li>• understanding time delays in cause/effect/fix</li> <li>• better understanding of diffuse discharges</li> <li>• addressing the fact that pressure to intensify land use is likely to continue/increase and how to deal with the impacts</li> <li>• better understanding and integration of social science and traditional Māori knowledge</li> <li>• research that fosters innovation and holistic solutions to water quality issues.</li> </ul>

Essential features (from Section 2.0)	Current framework (from Section 4.0) and existing gaps
<p>Effective tools</p> <ul style="list-style-type: none"> <li>• legislation</li> <li>• policy tools</li> <li>• economic instruments</li> </ul>	<p>There is uncertainty around the legal interpretation of the discharge provisions in the RMA, and their application to diffuse discharges. Most regional councils have not, to date, directly authorised or regulated diffuse discharges or the related land uses. What's missing:</p> <ul style="list-style-type: none"> <li>• clarity around the interpretation of the legal requirements for diffuse discharges.</li> </ul> <p>The range of policy tools has not been fully utilised. What's missing:</p> <ul style="list-style-type: none"> <li>• the "tool box" of policy instruments for councils to manage water quality impacts is incomplete.</li> </ul>
<p>Community awareness</p>	<p>There is insufficient public awareness regarding the impacts of land use on water quality, and where innovative solutions cannot be found trade-offs may be required between priorities. What's missing:</p> <ul style="list-style-type: none"> <li>• good public awareness of water quality issues, how land use can impact on water quality and what can be done to reduce these impacts.</li> </ul>
<p>Capacity</p> <ul style="list-style-type: none"> <li>• people skills/ experience</li> <li>• funding</li> </ul>	<p>There is a need for more skilled and, experienced staff and practitioners in water quality management. What's missing:</p> <ul style="list-style-type: none"> <li>• strategic training, education, employment of staff to address the gap</li> <li>• ability to efficiently interpret and implement the tools that exist.</li> </ul> <p>Some councils are adequately funded to do water quality work, others are not. What's missing:</p> <ul style="list-style-type: none"> <li>• consideration of the options for the provision of assistance to councils.</li> </ul>

## 6 Ways Forward

This section outlines a range of potential actions for the seven essential features of a water quality management framework, which are:

1. Roles and relationships
2. Strategic direction
3. Consultation
4. Information, research and technology
5. Effective tools (legislation, policy tools, economic instruments)
6. Community awareness
7. Capacity.

The potential actions suggested below are only some of those possible. The list is not intended to be fully comprehensive, but rather gives a flavour of the possible actions.

### 6.1 Roles and relationships

This feature examines the identification of clear roles and accountabilities for all levels of government, with the intent of addressing water quality issues in an interdisciplinary way. The intent is an approach which is co-operative and inclusive, and will enact effective partnerships and engagement between all levels of government, Māori, industry and landowners.

Potential actions for the way forward:

- Central government to provide leadership and guidelines to clarify the mandates, roles and responsibilities of central government, regional councils, territorial authorities and landowners.
- Provide a clear statement of government requirements for Māori engagement and greater Māori input into planning. (Note: A related issue may be addressed through the current RMA review. The WPoA work will need aligning with the RMA review outcomes.)
- Development of partnerships between central government, local government, iwi, industry and landowners on water quality matters.

Risks involved with the above:

- Clarification of roles and responsibilities will serve to outline who should be doing what and where/how it should be done.
- There may be sensitivities around setting requirements for Māori engagement and input into planning.
- Must ensure alignment with the current RMA review.

## 6.2 Strategic direction

This feature highlights the need for clear strategic direction and planning at all levels of government, (national and regional). An overall integrated management approach should be a priority, where water quality issues are integrated with other land uses and allocation objectives. Strategic planning is intended to incorporate concepts, such as flexibility, and adaptive management. It would need to incorporate identifying government and community outcomes and priorities across the four sustainable development values and working through ways to optimise those outcomes. However, trade offs may have to occur between conflicting values and priorities where innovative solutions cannot resolve the conflicts.

Potential actions for the way forward:

- In partnership with local government, identify government and community outcomes and priorities for water bodies and continue to develop improved practice in local government planning, including improving regional policy statements and plans, and consider whether regional plans should be mandatory. (Note: A related issue may be considered through the RMA review. The WPoA work will need aligning with the RMA review outcomes.)
- Central and local government could establish a cluster of water quality managers, planners and scientists to help local government water managers.
- Central government to outline national water quality management outcomes it seeks and examine whether to develop minimum standards to apply to all water bodies.

Risks involved with the above:

- Must ensure alignment with the current RMA review.
- Possible local government resistance to any requirement to prepare regional plans.
- The complexities associated with identifying national water quality outcomes and standards means there is a risk of not achieving the task.
- Possible controversy around national outcomes and standards being outlined to guide local decision making.
- Issues around who should pay for meeting national outcomes and standards could have financial implications.

## 6.3 Consultation

This feature confirms that consultation should continue to play a key role in any water quality management framework. A broad assessment of the level and breadth of consultation shows that the current consultation effort is generally acceptable. Government must continue to ensure this feature is a key ingredient in any future water management processes, and endeavour to ensure meaningful consultation and engagement with Māori and all stakeholder groups.

Potential actions for the way forward:

- Government to foster the ongoing development of more effective consultation practices.
- Recognition of the outcomes and priorities articulated by communities through the Local Government Act 2002 and other processes, and the implications of these for water quality standards and priorities.

- Engagement of communities and stakeholders in the development of specific water quality management proposals to enable alignment with their views on setting priorities and assessing values, and promote public ownership of initiatives.

Risks involved with the above:

- Consultation fatigue, through repeated consultation on same/similar issues. This can be avoided by more interactive processes and greater acknowledgement of the outcomes of previous consultation.
- Expectations of what consultation is to achieve and contribute towards policy development must be managed.

## 6.4 Information/research/technology

This feature highlights issues covering information, research and technology. In particular the need for assessing what information exists, strategically planning research to address the gaps, and developing new and innovative technology to assist management processes and to achieve better solutions to water quality problems.

Science providers, and central and local government need to work closely together to ensure research is targeted, practical, and meaningful to decision-makers but is still scientifically robust. Groups need to work together to ensure research is disseminated, rather than lost as new projects are developed.

Potential actions for the way forward:

- Review arrangements to lead to more effective and applicable research; better ways to disseminate information; and to get better uptake by water quality decision makers and farmers.
- Encourage the use of traditional Māori knowledge in decision making and planning.

Risks involved with the above:

- Robust science and research can be resource intensive and involve long timeframes. The short term costs may be perceived to be too high compared to the long term research benefits.
- Balancing the fact that science cannot provide 100 percent certainty with the need to base policy on good science and vice versa.
- Given the timeframes for research, the interim need to make decisions to manage water quality in the absence of full scientific data.



## 6.5 Effective tools (legislation, policy tools, economic instruments)

This feature examines changes required for effective implementation of processes to manage diffuse discharges (including clear legislation; access to an appropriate range of policy tools and economic instruments) to enable effective water quality management.

Potential actions for the way forward:

- Explore methods and options for the management of diffuse discharge requirements under section 15 of the Resource Management Act.
- Explore the scope to expand the range of policy tools available to regional councils by:
  - facilitating more direct regulation/specification of acceptable discharge levels through the use of proxies based on computer models
  - providing for appropriate suasive tools, best management practices, voluntary agreements, economic instruments and other potential new tools, including transferability of discharge permits and nutrient trading.

Risks involved with the above:

- Exploring methods and options for management of diffuse discharges may have implications for some existing land uses and may mean regional plans need amending.
- Expanding the range of policy tools requires legislative action. It is also too early to make a full assessment of whether these tools will represent viable and cost effective options for regional councils and land managers.

## 6.6 Community awareness

In order for councils to successfully and efficiently manage water systems, public input and support will be needed. Understanding the impacts of land use on water quality, and understanding different perspectives will be needed.

Potential actions for the way forward:

- Develop a national awareness campaign in association with local government, Māori and industry aimed at increasing public understanding of the impacts of land use on water quality, and approaches to mitigating these impacts at the source.
- Encourage the Landcare Trust, Māori, stakeholder groups and regional councils to develop co-ordinated education packages and programmes, and to examine funding options to assist this work (eg, through the Sustainable Management Fund).
- Increase understanding by local authorities of Māori perspectives on resource management, in particular the Māori cultural significance of water, to enable more robust participation by each party during consultation (eg, have an education programme on Māori perspectives [ie, the five states of water] for councillors and decision makers before consultation and engagement begins; institute certification and auditing of best practices for decision making, which could include guidelines and parameters on Māori engagement and incorporation of Māori issues).
- Encourage landowners to use and share new innovations, technology and practices aimed at mitigating discharges. Taking a proactive approach, where possible, at the source will be more effective than being forced to be reactive.

- Manage expectations of science via broad communication that 100 percent certainty from science for decision making is impossible. In practice decision makers need to act on the best possible information from the best available sources at the time.

Risks involved with the above:

- Increased understanding of stakeholder perspectives and public awareness of the issues at hand will contribute towards efficient decision making that is more widely supported. Meaningful engagement in decision making will lend a sense of ownership towards future actions and solutions.

## 6.7 Capacity

Capacity, and lack thereof, is a major issue at all levels of government, and for Māori and stakeholders. There is a need for experienced and skilled people working on water management, and adequate financial resources.

Potential actions for the way forward:

- Access and capitalise on other government programmes geared towards capacity-building and public outreach.
- Consider methods such as:
  - whether there is a need for some form of subsidy schemes for less advantaged councils (eg, on a similar basis to the Sanitary Works Subsidy Scheme)
  - establishing a network of water planners, scientists and managers as a mobile team of specialist advisors.
- Capacity building and associated resourcing for Māori to improve understanding of local government processes and resource management skills, along the lines of programmes happening in some regional councils currently (eg, Environment Bay of Plenty).

Risks involved with the above:

- With the exception of costs, there are limited risks in this feature with respect to training and capacity building.
- Transparency and accountability will be key to any decisions to provide financial assistance to councils.
- Large investment of financial and human resources may be difficult in the short-term, but the long-term benefits are significant.

## 6.8 Summary

Local government cannot significantly improve good water quality management in isolation. Partnerships with central government, Māori, landowners and stakeholder groups are necessary and should be integrated throughout future actions in order to increase the efficiency of activities and avoid duplication.

## 7 The Overall Way Forward

As outlined in section 6.0, there is a range of possible actions to improve water quality management in relation to each of the seven essential features. This section examines how those actions can be combined to take water quality management forward.

There is no uniform solution to water quality management in a sustainable development context; it is a matter of prioritising between different values based on the outcomes sought by government and communities for each water body. The seven essential features together form a total package of possible actions to be undertaken. The decisions on what action will be done, where, and to what extent, will be directed by the extent and nature of the problem, the importance of the water body and the level of intervention needed.

Having good strategic direction and planning at both the national and regional levels is the core essential feature and the cornerstone for any other action. Effective strategic planning must include identifying government and community outcomes for water bodies, an integrated flexible and adaptive management approach, and improving planning practices.

A range of other actions is needed to enable effective strategic planning to enhance water management, planning and implementation processes, including:

- clear identification of roles and relationships for all levels of government and landowners
- collaborative and inclusive processes leading to effective consultation undertaken in a robust and meaningful manner
- information and strategic research to identify water quality problems within catchment areas and to identify government and community outcomes
- actions to promote education and community awareness are required throughout the process to determine community outcomes for water quality management, to identify and understand the problems, and to implement solutions
- building skills and experience in water management is necessary to maintain capacity to undertake strategic planning and to maintain effective partnerships.

Other actions are needed to provide water quality managers with a range of implementation tools they can use to improve water quality management and achieve community outcomes. These tools include:

- providing clear and enabling legislation and regulatory framework
- access to a wider range of policy tools and economic instruments (including suasive measures, best management practices, voluntary agreements, and market based instruments like transferability of discharge permits and nutrient trading)
- research into development of new technology to identify innovative solutions to issues and problems.

There are interdependencies between the actions which mean that they cannot succeed in isolation. For example, in order to apply economic instruments to water quality problems, the legislation needs to enable such instruments to be used.

## 7.1 Summary

As noted above, there is no uniform solution to improving water quality management – the nature of the issues being faced in water quality is such that the seven essential features described form the total package of possible actions towards improving water quality management. Good strategic planning is the starting point to improve current management and it needs to be underpinned by a range of other actions. Once strategic planning has been done, water quality managers will need a range of implementation tools they can use to achieve identified outcomes and priorities for water quality.

## Appendices

### Appendix 1: Process to date: Water Programme of Action Water Quality Working Group

The Water Quality Working Group recognised that the impacts of rural land use on water quality covered a range of issues, effects, agencies and stakeholders. The Working Group worked closely with, and contains members that are involved in, the Lake Taupo special project (see Appendix 3), which has provided useful ‘on-ground’ work to inform the water programme of action.

The group also identified the need to consider how reform of management of land use effects on water quality would interact with Māori interests in water quality, and worked with the Māori Reference Group.

Further, the group is aware that technological remediation of degraded water bodies is practiced in some parts of the world (for example: providing for continued land use effects on water quality through chemical treatment of water to render it suitable for domestic use, or, recycling of nitrate-contaminated groundwater for use in irrigation). The group also recognises that freshwater quality issues are not isolated to impacts from rural land use, and that impacts from urban land use are not insignificant.

However, the group has not specifically considered remediation nor urban land use impacts in order to necessarily narrow the scope of work for this phase of the water programme. It may be useful in the future to assess how remediation approaches and urban land use issues relate to current legislation, governance and management frameworks, and the principles set out in the Sustainable Development Programme of Action. These issues are potential work streams for the future.

The Water Quality Working Group is comprised of the following central government departments:

- Department of Internal Affairs
- Department of Conservation
- Ministry of Agriculture and Forestry (co-lead)
- Ministry of Economic Development
- Ministry for the Environment (co-lead)
- Ministry of Health
- Te Puni Kokiri
- The Treasury.

As well as officials from:

- Marlborough District Council
- Environment Waikato

## Appendix 2: Water quality in New Zealand: The current situation<sup>12</sup>

For rural lowland water bodies in New Zealand, agriculture is considered to be the primary source of diffuse (non-point) source discharges. Materials used in agricultural production – such as fertilisers and pesticides – as well as discharges from the soil and animals move into both surface and groundwater systems at higher rates than would be the case under natural systems, leading to problems of nutrient and microbial contamination, and sediment accumulation.

### Rivers

In addition to regular regional council monitoring at designated sites on particular rivers, the River Environment Classification (REC) system enables assumptions about the overall health of rivers to be drawn. The system uses the physical characteristics<sup>13</sup> of rivers to group them, and also groups them at a range of scales. Findings are:

- In terms of climate:
  - rivers in wet climates, which are regularly flushed, generally have higher water quality compared to rivers in drier climate areas.
- In terms of land use:
  - rivers surrounded by natural land use (eg, native bush and tussock) or exotic forestry have good water quality
  - there is also good water quality in areas of low intensity agriculture such as sheep farming
  - poor water quality is found in catchments dominated by intensive agriculture, or in urban land use. Urban and agricultural land use is predominantly found in lowland areas.
- In geographical terms:
  - mountain, lake-fed and many hill-sourced rivers generally have good water quality
  - rivers in hill areas have variable quality
  - lowland rivers suffer the most from poor water quality – the effect is magnified in lowland water with a drier climate.

In summary, urban and intensive agricultural land use is predominantly found in lowland areas and it is lowland areas that are suffering the most from poor water quality. The effect is magnified in lowland water with a drier climate. Approximately 44 percent of New Zealand’s rivers lengths are low elevation water courses and half of these consistently fail guidelines for:

- *E. Coli*
- nutrients (nitrogen, phosphorus, ammonia)
- clarity (except in extremely wet areas).

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<sup>12</sup> See [www.mfe.govt.nz](http://www.mfe.govt.nz) for full report.

<sup>13</sup> The six factors are climate, topography (source of flow of the river), geology and land cover of each section’s *upstream* catchment, the last two include *local* attributes of the river itself. These 6 factors are used to classify river sections in to a class, eg, a river might be in a “cool dry climate class in a lowland area with a soft sedimentary geology and a pastoral surrounding land use”.

Over the past 20 years, improvements in water quality have resulted from effective management and the reduction of point-source discharges to rivers, though only small changes in quality are apparent over the last six to seven years. However a national and regional trend is shifting from direct discharges being the major contributors of contaminants to diffuse sources such as overland runoff and leaching to groundwater.

For example, *E. Coli* levels in the Waikato River have reduced considerably since the 1970s, which coincides with the time of major improvements to urban wastewater treatment. Since then most of the deteriorating trends have occurred in the lower reaches of the Waikato River where there has been an increase in levels of faecal coliform bacteria. Taupo township stopped discharging sewage waste water to the Waikato River at the end of 1995. Since then the levels of enterococci bacteria in the Waikato River downstream of Lake Taupo have fallen by about 70 percent.

The effect of non-point source contamination on water quality is becoming clear through studies and case studies, for example:

For nutrients, Environment Southland has detected increases in concentrations in major catchments over the last two decades, most noticeably in the last decade. It has found that phosphorus levels generally meet guidelines but levels are increasing in the lower reaches of catchments.

Clarity measurements by Environment Southland show variability in local rivers. While clarity has improved in the lower Waiau, upper Oreti and Mataura Rivers over the last two decades, it is deteriorating in the lower Mararoa. Clarity remains constant and generally meets guideline levels in the Aparima and Matarua Rivers. This suggests an increased contribution from lower catchment sources, because soil conservation efforts have reduced inputs in upper reaches of the catchment. Run-off and stocking rates may be significant factors in the lower catchment. This contrasts with a time when point-source discharges were considered more significant.

## Lakes

Generally, there is a range in lake water quality. It is poor in some of the smaller and shallower lakes, while the large, deep lakes have apparently high quality and visible water quality problems seem rare. The larger deeper lakes are, however, difficult and expensive to monitor and details of their water quality are relatively unknown.

Quality problems in some lakes are becoming more significant. In Lake Taupo and the Rotorua Lakes there is an observed increased growth in certain weeds and nuisance slimes. Lake Brunner is showing evidence of increasing nutrient levels and Lake Hayes is affected by phosphorus enrichment. Lowland lakes such as Lake Waipori and Lake Ellesmere Te Waihora have nutrient problems. Nuisance weeds are apparent in Lake Dunstan and Lake Wanaka. Less is known about the larger lakes in the South Island than those in the North Island.

## Groundwater

Around 50 percent of community water supplies use groundwater either as a sole or partial source, as well as the many domestic wells in the rural community. Interconnections between surface and groundwater mean that contaminated groundwater can recharge surface water and spread the contaminant.

There is no national record of incidents or levels of microbiological contamination of aquifers in New Zealand. Regional councils gather information according to the importance of groundwater to the region and the aquifers susceptibility to microbial contamination. Currently drinking water appears to be free of microbial contamination. This is significant because 80% of the groundwater bores used for community water supplies are not chlorinated before entering the reticulation system,<sup>14</sup> and this includes bores serving the cities of Napier and Hastings, Lower Hutt and Christchurch.

While bore contamination can be a regular occurrence, (and this could be due to the construction of the well heads), shallow unconfined aquifer contamination seems to be largely still a risk than a reality. Otago has recorded microbial contamination in two shallow unconfined aquifers and high faecal coliform counts have been recorded throughout the lower Waitaki Alluvium groundwater system. This is an area in which there are many dairy farms, which are irrigated by both spray and flood irrigation of fresh water, and spray irrigation of dairy-shed effluent. Septic tanks can also contribute to coliform counts.

Nutrient contamination of groundwater from agricultural land use appears to be pronounced in some regions, particularly around areas of processing, intensive horticultural and cropping activity. Trends in groundwater nitrate are difficult to evaluate because data is patchy for some areas and regular sampling over a long periods has not yet occurred. However, the data that is available indicates that nitrate contamination is becoming a problem in all regions of the country, and that nitrate “hotspots” will increase in the future.<sup>15</sup>

Nitrate-nitrogen concentrations in shallow groundwaters also frequently exceed Ministry of Health guidelines in areas where stock densities are high and upper soils permeable. Individual cases are receiving media attention; such as Environment Canterbury’s recent report on high nitrate concentrations in groundwater south-east of Ashburton District’s three meat processing plants and in the coastal region around Dorie/Pendarves, an irrigated arable crop area. In some places, nitrate concentrations have risen over the last 10 years in some wells. Testing shows that none of the groundwater samples from 114 recently tested wells in the Ashburton-Rakaia Plains have exceeded the Ministry of Health’s drinking water standard for nitrates.

Nutrient leaching via groundwater has also been identified as a significant source of nutrient contamination of lakes.

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<sup>14</sup> Sinton LW. 2001. Microbial contamination of New Zealand’s aquifers. Chapter 9 in *Groundwaters of New Zealand*. The Caxton Press, Christchurch, New Zealand.

<sup>15</sup> Close ME, Rosen MR, Smith VR. 2001. Fate and transport of nitrates and pesticides in New Zealand’s aquifers. Chapter 8 in *Groundwaters of New Zealand*. The Caxton Press, Christchurch, New Zealand.



## Appendix 3: Case study on Lake Taupo

The following is a case study on the issue of protecting Lake Taupo water quality. It should be noted that this process is still active, and it will be some time before it is complete. This paper highlights some lessons for central government, both at a policy and operational level, and issues on the horizon.

While Taupo could be considered a unique situation because of its iconic nature, it does provide a good study on a sustainable development process. It is also somewhat unique in that it is a preventative exercise rather than a restorative one.

### Background

Lake Taupo is New Zealand's largest lake, known for its dramatic vistas, deep clear waters, superb trout fishing and volcanic heritage. It is at the heart of the local economy, which is largely based on forestry, electricity generation and tourism.

Scientific evidence shows that the health of the Lake is declining as a result of nitrogen flowing from surrounding land. To protect the Lake, Environment Waikato proposes to promulgate a Variation to their Regional Plan. In essence this will cap the nitrogen inflow at current levels from all sources, and reduce the manageable nitrogen by 20 percent. This equates to a 9 percent reduction in total nitrogen inflow.

It is thought that this reduction in nitrogen would hold water quality in the Lake at its present level. As much of the nitrogen inflows are via groundwater sources, there is a significant time lag on this. Therefore the Lake is likely to continue to deteriorate for several decades before it improves back to its 2000 condition.

### Process

Research over several years has highlighted the issue of nitrogen inflows and its impact on Lake Taupo. As the regional council with responsibility for managing the water quality in Lake Taupo, in 2000 Environment Waikato (EW) formally began a process to develop a variation to its regional plan to protect the Lake. This involved:

- commissioning further research and development on the issue
- seeking cooperation with Taupo District Council (TDC)
- extensive consultation with stakeholder groups to develop community support for action
- commissioning a cost benefit analysis to establish costs versus benefits
- commissioning an analysis on possible cost sharing between Government, EW and TDC.

In mid-2003 EW and TDC formally approached government for its involvement and assistance with the project. This was agreed by Cabinet in July 2003.

Currently there are three sets of parallel discussions/negotiations:

- (i) six-way discussion involving EW, TDC, government, Tuwharetoa, forestry interests, and pastoral land owner interests
- (ii) two-way discussions involving government and Tuwharetoa on Treaty-related issues
- (iii) three-way discussion involving EW, TDC, and government on funding, RMA, and administrative issues.

The current timeline is:

- proposed Regional Plan Variation promulgated by EW; September 2004
- public submissions on the Variation through to August 2005
- hearings September/October 2005
- council decision December 2005
- possible Environment Court appeal hearings.

## **Lessons learned**

The process to find an effective solution highlighted a number of challenges created by the current framework, as discussed below.

### **1. Effective community goal setting**

Until a community has agreed upon specific objectives for the future condition of a water body, it is difficult to reach agreement about the content of any programme to achieve those goals, as well as how the costs and foregone opportunities should be shared.

Environment Waikato has led a consultative process of informing the communities about the issues facing the Lake and catchment land use patterns, together with options for addressing these issues. A facilitated debate about the intended future state of the Lake, and the implications of this for land use, led to a consensus to adopt the goal of returning the Lake to its 2000 condition within several decades, while rejecting the option of full restoration or unconstrained eutrophication.

### **2. Use of cost benefit analysis to aid decision making**

This approach directly contributes to the ability to make decisions about trade offs. While in many such instances it is not possible to quantify costs and/or benefits in monetary terms, it does give a direct appreciation of the “positives” versus “negatives” and allows for a greater transparency of decision making. This reinforces the need for a good analysis under section 32 of the RMA.

Environment Waikato commissioned a cost benefit analysis on protecting the Lake, in order to gain some indication of costs versus benefits. While this analysis had its limitations, it did give a direct indication that the benefits were well in excess of the cost; the cost (mostly to farming) was put at \$116m, while the benefit (to tourism) was \$394 million.

### **3. Science to underpin policy decisions**

Environment Waikato has good research findings to back-up the claim of deteriorating water quality, the cause of this (eg, nitrogen inflows) and the required solution (eg, a minimum of 20 percent reduction in nitrogen inflows from manageable sources).

### **4. Central Government Involvement**

There is a need to have clear criteria or rationale as to why and how central government should be involved in protection of water bodies. This should be developed as part of the water bodies of national importance work.

Given Lake Taupo's relatively unique iconic status, there were a number of clear rationales to justify central government involvement. Examples were:

- Lake Taupo is nationally, if not internationally important for its natural and cultural values.
- There are Treaty obligations to actively protect the Lake as a taonga and to meet Māori expectations to manage their own land.
- There was a legacy of past government involvement via development of much of the pasture land in the catchment through the 1950s–1970s.

### **5. Guidelines for funding**

There is a need to develop guidelines as to the share of funding which central government could assume in similar situations. This needs to draw on the “exacerbators and beneficiaries” approach as used in other areas such as Biosecurity.

A basis for cost sharing between the government, EW and TDC was commissioned by Environment Waikato under the auspices of section 122 of the Local Government Act.

While there were weaknesses in this, it still provided a good basis on which to start discussions on the funding split between the three partners. In the end, the decision was made to split the funding 45 percent to central government, 33 percent to EW, and 22 percent to TDC.

### **6. Consultation**

#### **Māori**

There are political sensitivities requiring any negotiating group from Government to be sufficiently “high powered” to be able to make some decisions. Such negotiations take time and resources, which Government and the Ministries involved need to appreciate and fund. In the discussions on Lake Taupo, care has been taken to differentiate the Lake Taupo issue away from any historical Treaty claims.

Tuwharetoa are the local iwi, and own approximately 70–75 percent of the entire Lake Taupo catchment. Tuwharetoa preferred to deal directly with Government, seeing the situation as a Treaty Partners issue and wanted a relatively high powered Government delegation to deal with.

### **Consultation with other bodies (land owners, Environment Waikato, Taupo District Council)**

Assuming that it is the regional council who is taking the lead, there are direct advantages for Government officials to consult with other affected parties as part of the regional council/Government team, rather than directly. This may well differ if Government initiates any direct action. There can be significant synergies in having Government officials and regional council staff working together.

## **7. Research to find solutions**

The issue here is for all funding bodies to consult and coordinate their efforts, particularly with the “regulatory bodies” involved in such situations. This is likely to give a much better focus to the research and development and hopefully more positive outcomes. Research and development to find solutions is the best option to identify possible “win-win” solutions.

Currently there is a Sustainable Farming Fund (SFF) project underway in conjunction with Tuwharetoa (Puketapu Blocks), to look at on-farm management systems that can be used to reduce nitrogen outflows. A further SFF-funded project is developing codes of practice in conjunction with local farmers.

Recently, the Foundation for Research, Science and Technology announced funding of \$13 million to AgResearch and \$5 million to National Institute of Water and Atmospheric Research (NIWA) to research further issues relating to Lake Taupo, including investigating possible land use options.

## **Issues on the horizon**

### **RMA issues**

A number of issues relating to the RMA have come to light as a result of the Lake Taupo work. These include:

- (i) Under section 15 of the RMA, a farmer would be deemed to be discharging a contaminant into a water body if their livestock urinated onto the land, resulting in nitrate leaching through into groundwater or into streams. This would breach the Act unless expressly permitted by the Regional Plan or allowed by a resource consent. No regional plans in New Zealand expressly permit such discharges, and resource consents have not been required by Councils to date.
- (ii) Economic instruments – nutrient trading. Trading of nitrogen is being considered for the Taupo catchment, as this would enhance the flexibility of land use after the introduction of the Regional Plan Variation. The transfer of discharge permits is not allowed under the RMA. It appears that nutrient trading is possible via the cancellation of current consents and the granting of a new consent. This would be a relatively bureaucratic system, which is not likely to facilitate a trading system.

- (iii) Measuring, monitoring and enforcement of diffuse discharges. Measurement of diffuse discharges can be done in a physical sense, but is relatively impractical and expensive. A more practical means of doing so is the use of computer models such as *Overseer*. The issue is that such models have an error margin of  $\pm 20$ –30 percent, which would adversely affect the use of these models for enforcement purposes. This raises an issue of the flexibility of potential rules and resultant land use. A farmer with a set allowable nitrogen leaching figure of  $x$  kgN/ha would have much greater flexibility in achieving this level. If a set figure (as determined by a computer model) could not be used, then a much more prescriptive approach would be required – the farmer would be prescribed as to the number and type of stock that could be run, maximum fertiliser levels, maximum supplement inputs into the farm, and possibly some restrictions on management.

## Summary

1. Environment Waikato has taken a clear leadership role, and instigated a significant programme of consultation, analysis, and research.
2. This consultation has led to the community accepting the proposed plan of action.
3. A clear rationale for Government involvement was established.
4. There is good science to underpin policies.
5. A cost benefit analysis gave a direct indication of costs versus benefits.
6. A formula for funding by the different bodies was established.
7. Ongoing consultation is being carried out to maintain stakeholder/community support.
8. A partnership arrangement was developed between EW, TDC, Tuwharetoa, and Government.
9. Research was initiated to find solutions.

## Appendix 4: Case study on Lake Alexandrina<sup>16</sup>

### Jonet Ward, Environmental Management and Design Division, Lincoln University

Lake Alexandrina is a relatively shallow lake, with a maximum depth of 27 m, situated in the Mackenzie basin. It is 7.2 km long and 0.9 km wide with an area of 640 ha, and shows strong visual signs of its glacial origin. It has high landscape, wildlife and recreational values (fishing, birds, aesthetic), and is situated in a catchment where farming has been the principal land use. Aquatic macrophyte communities have grown to 10-11 m with 100% cover, and *Chara coralline* continues sparsely down to 16 m.

Sources of water to the lake (cumecs/year x 10<sup>6</sup>) include:

- surface streams: 5.72 (27%)
- overland flows: 1.11 (5%)
- ground water: 10.1 (48%)
- precipitation: 4.11 (20%).

Water is retained in the lake for approximately four years.

The lake has mesotrophic status (Vant and Davies-Colley 1984). Hayes (1980) recorded chlorophyll at levels of 0.4–3.8 mg/l between November 1978 and March 1979, and total phosphorus at 1 m of 0.009–0.015 mg/l in March 1979. Nutrients from the catchment enter the Lake attached to soil particles, as organic matter and in solution from inflow streams, groundwater and diffuse sources. Nutrients originate from:

- stock access to the trout-spawning streams
- grazing at the Lake edge
- hut settlements
- aerial topdressing
- underground sources.

The main management concern for the Lake has been the frequency of algal (*Anabaena*) blooms caused by increased nutrient levels in the Lake, which began to cause concern after 1980 due to their potential effects on wildlife and recreational fishery.

Hoare (1982) modelled the phosphorus in the Lake and concluded that the nutrient status was probably the result of nutrient loads coming in with the bulk of the water rather than from sewage, which is a relatively minor contributor. Lovegrove (1985) estimated that up to 50 percent of the phosphorus entering the lake may come from groundwater, 32 percent from surface water inflows and only 3–9 percent from hut settlements. Water from springs entering the bottom of the Lake was sampled in 1987 and found to contain phosphorus and nitrogen in higher quantities than in water nearby (Ward 1989).

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<sup>16</sup> Lake Manager's Handbook: Land-Water Interactions. June 2002. Prepared for the Ministry for the Environment by Sandy Elliott and Brian Sorrell, National Institute of Water and Atmospheric Research, June 2002 by the Ministry for the Environment, New Zealand, <http://www.mfe.govt.nz/publications/water/lm-land-water-jun02.html>.

The Lake Alexandrina Steering Committee was set up in 1984 following a meeting of interested parties. Phosphorus was identified as the major factor causing deterioration of water quality (Ward-Smith et al 1985). Two main sources of phosphorus were identified: one from the hut settlements at the outlet and south end, the other from agricultural sources.

A report by the Taranaki Catchment Commission to the Waitaki Catchment Commission (1987) states that while inflows exceed outflows, much will be permanently lost to the sediments when the annual mass contribution to the lake is low. They recorded total phosphorus levels in the Lake of 0.014–0.032 mg/l from June 1984 to June 1985. Concerns over the blooms and the potential effects on wildlife and the recreational fishery resulted in interim guidelines for management of the Lake (Ward-Smith et al 1985).

To control phosphorus from agricultural sources, the interim guidelines of the steering committee (Ward-Smith et al 1985) recommended:

- a moratorium on top dressing – there should be no aerial top dressing within 500 m of the eastern shore or 800 m of the western shore, or around the water sources to the lake
- runholders restrict the use of fertiliser, and refrain from supplementary feeding of livestock along the lake and stream margins
- farmers be asked to minimise stock access to the lake and spawning streams, and a deer fence be installed around the north end wetland (the South Canterbury Acclimatisation Society also improved spawning streams)
- the Department of Lands and Survey should not allow earthworks, tracking or cultivation near the lake shore or near any watercourse that may lead to sediment entering the water; they should also ensure that no more than one paddock on a property is cultivated at any one time in the area excluded from top dressing, then only when there is minimum risk of wind erosion
- the Waitaki Catchment Commission completes its study of the relationship between land use and lake-water quality. This study was considered essential to determine the source of the large percentage (48%) of groundwater entering the lake and its phosphorus content.

Subsequent studies suggest that the Cass fan to the northeast of the lake catchment is the source of the groundwater inflow (Waitaki Catchment Commission and Regional Water Board 1987).

In 1987 the Mt John Station run that occupies the southern part of the Lake catchment was purchased by the New Zealand Defence Force (NZDF), so stock were removed from this land. However, the NZDF are in the process of negotiating with a runholder to exchange this land for land adjacent to their live-fire area, so it is likely that grazing will be re-established on the Mt John run. The Department of Conservation, however, now have a reserve/buffer strip around Lake Alexandrina on the Mt John run, so stock intrusion to the southern lake margins is controlled. Around the northern margins, on the Glenmore run, stock intrusion continues to be a problem as sheep are drawn to the lake edge by the shade of the willow trees.

To control phosphorus deriving from the settlements, the interim guidelines (Ward-Smith et al 1985) recommended that:

- the Department of Lands and Survey act immediately to maintain a moratorium on building at the hut settlements, but permit the installation of household effluent-holding tanks
- the Mackenzie County Council investigate a system for sewage disposal outside the catchment for each settlement; sewage tanks had already been installed at the south end settlement by 1989 (Ward and Stewart 1989).

Lake Alexandrina Management Guidelines, prepared by the Mackenzie District Council, were adopted in August 1999 following a consultative process with stakeholders at the lake. These provide assistance to applicants seeking resource consents in relation to building development. All liquid waste must be discharged into a holding tank, which is to be emptied by an approved septic maintenance contractor. The holding tank installation has been very successful, with 90 percent completed by June 2001 and a cut-off date for the remainder by January 2002 (A Shuker, Outlet Hut Holders Committee Chairman, personal communication).

The Mackenzie District Council has included a Lake Side Protection Area around Lake Alexandrina in the *Proposed District Plan 1997*, to protect the visual amenity of the lake-side environment from inappropriate building development. It has discretionary status on new buildings and extensions to existing buildings around the lake.

Although management guidelines and controls in the lake catchment have been progressively implemented since 1985 to reduce phosphorus levels in surface inflows, an increase in total phosphorus from 1992 to 1996 of about 6 percent has been recorded (Burns and Rutherford 1998). Total nitrogen and chlorophyll values showed little change over this period. However, the heavy algal blooms of the 1980s seem to have disappeared and are now seen on the Lake only about every three years (A Shuker, Outlet Hut Holders Committee Chairman, personal communication).



## Glossary

Diffuse discharges:	A general discharge or seepage, either over or under ground, of water borne material, which is not from any readily identifiable point. Also known as non-point source discharges.
Point source discharges:	A discharge from a readily identifiable source, such as from the end of a pipe.
Value:	Value is defined in its holistic sense and not just in reference to economic value. It encompasses all aspects of sustainable development: environmental, social, cultural, economic.
Intensification (of agriculture):	An increase in the stocking rate of animals, or increase in the level of production, from a given area of land.
Policy tools:	
1. Suasive measures:	Suasive measures fall into two broad groups: education and the provision of information and voluntary agreements. This latter group includes industry agreements, such as environmental management systems, and negotiated agreements between industry and government.
2. Command and control:	These measures (or direct regulation) are “Institutional measures aimed directly at influencing the environmental performance of polluters by regulating processes and products used, by banning or limiting the discharge of certain pollutants, and/or restricting activities to certain times, areas etc”. (OECD)
3. Economic instruments:	Market type levers used by natural resource managers to change the behaviour of polluters.