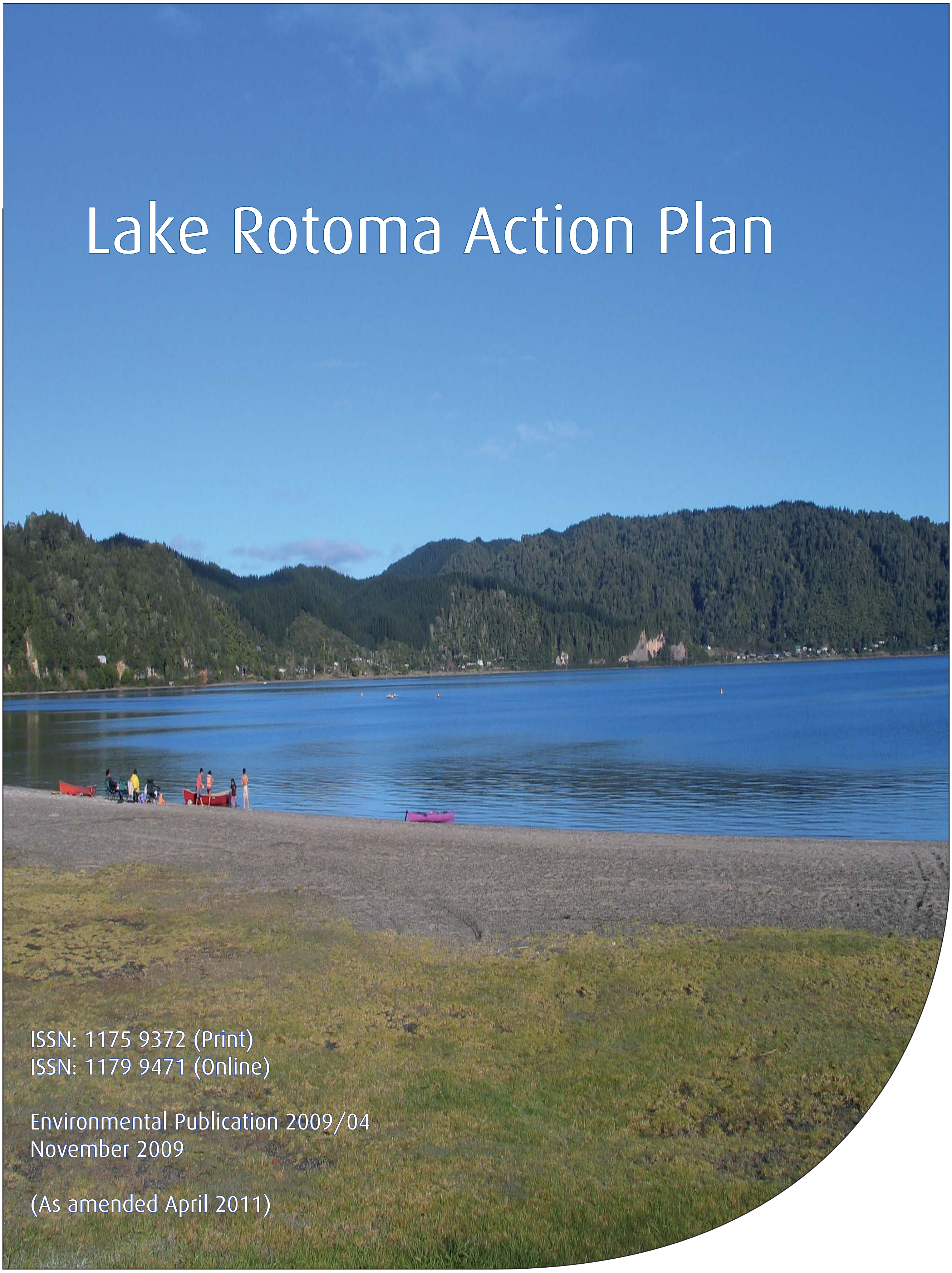
Lake Rotoma Action Plan



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THE ROTORUA LAKES

Protection and Restoration Action Programme

A **Bay of Plenty Regional Council, Rotorua District Council** and **Te Arawa Lakes Trust** joint project

Contents

Status of Action Plan

This Action Plan is a non-statutory document. This means that it does not contain rules and cannot require changes to other statutory documents. It provides guidance for the management of Lake Rotomā. It may or may not result in changes to planning documents. Some of the actions may require resource consent. Any such decision will be made at the discretion of individual agencies and will follow statutory process.

The Action Plan is a live document and regular reviews will be undertaken to keep it up to date with science, technology and community expectations.

Chapter 1: Introduction

1.1 Lake Rotomā

1.1.1 Overview

This Action Plan encompasses Lakes Rotomā and its catchment (refer Figure 2). It sets out what interventions (or actions) should be undertaken to reduce nutrient (phosphorus and nitrogen) inputs to Lake Rotomā. The Action Plan is a community document as all parts of the community are working together to improve water quality in Lake Rotomā.

This Action Plan outlines current known actions and sets out processes to identify future actions to improve water quality in Lake Rotomā.

1.1.2 Background information

Formed by volcanic eruptions approximately 8,500 years ago, this eastern-most of the Rotorua Lakes has two distinct basins. The northern basin is the deepest at 83 metres, and the southern basin has a maximum depth of 73.5 metres. The lake surface area is about 1,112 hectares.

The lake has a small outflow through porous pumice substrate to Lake Rotoehu, and has some outflow to groundwater.

Lake Rotomā means clear water. Lake Rotomā is the cleanest of all the Rotorua Lakes, with around 11 metres water clarity.

Figure 1 View from Matahi Bay – southern end of Lake Rotomā

Table 1 Lake Rotomā at a glance

Population	Catchment area (km²)	Lake area (km²)	Max depth (m)	Mean depth (m)
258	29	11	83	37

1.1.3 Tangata whenua

"The relationships of tangata whenua with Lake Rotomā and its catchment are longstanding and endure. Recognition and provision for their active, ongoing involvement as kaitiaki is a matter of national importance." – *Ngati Awa and Te Arawa.*

1.1.4 Community perspective

Rotomā is valued by its community for its clean water, healthy ecosystems, recreational and cultural values.

"It's vital that the lake stays in good nick because so much business comes from people who are out here waterskiing and fishing and so on. Rotomā is in good shape but it's also deteriorating – far better to spend the money now to keep it clear than to clean it up down the track." – *Keith Marx*

"Every landowner and leaseholder should be aware that if Lake Rotomā deteriorates to a stage where it is closed for algal blooms then their life style of water skiing fishing etc is no longer available plus the down value of their properties so its up to everybody to make an effort to save the lake not waiting for somebody else to do it or hoping the problem will go away." - *Rae Green*

1.2 What's the problem?

The Rotorua Lakes are under pressure from development, land use and other activities that have resulted in a deterioration of lake quality. Twelve of the lakes are in a state of long term deterioration, primarily due to excess nutrient inputs.

Lake water quality will continue to deteriorate for the foreseeable future unless the causes are permanently addressed.

Although Lake Rotomā has the best lake water quality out of the 12 large Rotorua Lakes in the Bay of Plenty region there are some indicators that lake water quality is slowly getting worse.[1]

1.2.1 Dissolved oxygen

Dissolved oxygen in the bottom waters of the lake has decreased significantly from 1993 to 2006[1]. Although the oxygen levels are still high enough to support bottom-dwelling aquatic life, the decline indicates that water quality is deteriorating.

When a lake becomes oxygen-depleted (anoxic) in its bottom waters (usually around a TLI of 3.1 – 3.5, like Lakes Tikitapu and Okareka)[2], sediment-bound nutrients are released into the water column. This release of nutrients can change

[1] During the 1992 – 2006 water quality analysis period that Environment Bay of Plenty has monitored Scholes, P., Bloxham, M. Rotorua Lakes Water Quality 2006 Report. Environment Bay of Plenty Environmental Publication 2007/12.
[2] An explanation of TLI is given in section 1.2.5.

the nutrient status of the lake. As a lake becomes eutrophic (nutrient enriched), the nutrient cycling from lakebed sediments starts to dominate lake water quality.

Figure 2 Lake Rotomā catchment

1.2.2 Phosphorus

The estimated phosphorus load to Lake Rotomā is 736 kg/yr

Total phosphorus concentrations in the lake have approximately doubled since 1992 in the bottom and surface waters[3]. Lake Rotomā tends to be phosphorus-limited, meaning that phosphorus is the limiting factor that controls the growth of algae.

1.2.3 Nitrogen

The estimated nitrogen load on Lake Rotomā is 18,110 kg/yr.

Total nitrogen concentrations in Lake Rotomā have stayed relatively constant since 1990, despite year-to-year fluctuations. However, since 1992 there has been an increase in ammonium-nitrogen and nitrate-nitrogen concentrations in the bottom waters which mixes throughout the lake in mid-winter each year. Nitrogen levels are increasing in the lake although this increase is not statistically significant at this stage.

1.2.4 The Balance between nitrogen and phosphorus

Maintaining the balance between Nitrogen and Phosphorus is important to restore the lake to its former quality.

In most of the Rotorua lakes, the lower the N:P ratio, the poorer the water quality. The nitrogen:phosphorus (N:P) ratio in Lake Rotomā has decreased from about 40 in 1994 to 25 in 2008 which is another indicator that water quality is declining. Phosphorus is the more limiting nutrient in Lake Rotomā and so it is important to reduce its input, but equally important is to reduce nitrogen inputs.

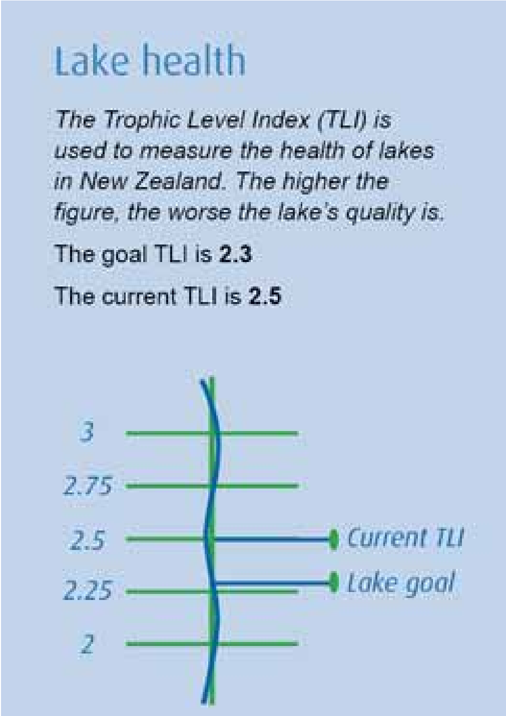
1.2.5 The Trophic Level Index (TLI)

Each of the 12 Rotorua Lakes has a water quality goal that is identified in objective 11 of the Regional Water and Land Plan. These targets are based on a Trophic Level Index (TLI) [4], which is an indicator of lake water quality. The higher the TLI, the lower the lake water quality.

TLIs are used in the Regional Water and Land Plan as objectives for lake water quality, for example, exceedance of the TLI triggers other actions in the plan such as the development of lake water quality action plans. The TLI has a fixed protocol for measurement, has national acceptance and is readily understood by the community. The TLI has also been adopted by the Ministry for the Environment as a national level lake water quality indicator. In addition to the use of the TLI as an indicator of lake water quality, Environment Bay of Plenty carries out extensive monitoring of lake quality, including ecological factors, plants and biota. Monitoring information

[3] During the 1992 – 2006 water quality analysis period that Environment Bay of Plenty has monitored Scholes, P., Bloxham, M. Rotorua Lakes Water Quality 2006 Report. Environment Bay of Plenty Environmental Publication 2007/12.
[4] See Appendix 1 for information on how the TLI is calculated.

reported to the public is often summarised and refers to the TLI rather than the more detailed water quality information from which the TLI has been derived.



The target TLI of 2.3 reflects the lake's TLI level in 1994, the level which the Bay of Plenty community has agreed that Rotoma's water quality should not exceed. The lake's current three year average TLI (a measure of lake water quality) is 2.5.

1.3 What's causing the problem?

The greatest contribution of nutrients to Lake Rotomā currently comes from disposal of wastewater in the catchment, rural land use (in particular sheep and beef grazing) and rainfall[5].

Table 1 Top three sources of nutrient losses to Lake Rotomā

Land Use	**Area**	**Load**			
		TN	**%**	**TP**	**%**
	ha	**kg/year**		**kg/year**	
Septic tanks (251 HUE)[6]		2530	14	250	34
Sheep/beef + dairy-grazing	431	8425	47	190	26
Rainfall to lake[7]	1,115	4014	22	178	24
Other[8]	1,237	3141	17	118	16
Catchment total	**2,783**	**18,110**	**100**	**736**	**100**

TN = Total Nitrogen
TP = Total Phosphorus

[5] See Appendix 2 for further details on nutrient loss to Lake Rotomā from surrounding land use.
[6] Rotorua District Council: Estimate of Household Unit Equivalents, maximum loading rate for 2014. 1 HUE = 2.8 fulltime residents. While this summer maximum may overestimate annual loads, the overestimate in the resident population may balance out the unaccounted load from lake visitors.
[7] Pers. Comm. Max Gibbs (NIWA), 2006.
[8] See table in Appendix 2 for other land use categories.

The effects of nutrient inputs have continued to increase around the lake. The lakeside community relies on the use of septic tanks to dispose and treat their wastewater. The systems in use are of variable effectiveness and the discharge of wastewater is the major contributing factor to phosphorus and bacteria levels in the lake.

Land use intensification into sheep, beef, dairy-grazing, deer, cropping and lifestyle properties has increased nutrient runoff to the lake over time. Sheep and beef farming is the predominant farming land use currently occurring in the catchment. Conversion to other forms of agriculture, such as dairying could increase nutrient loads to Lake Rotomā as typically this form of land use results in a higher nutrient loss per hectare.

Mitigation actions such as fencing-off streams and lake edges from livestock and planting gullies and riparian margins may have offset some of the increase in nutrient loss. The benefit may take some years to be realised.

Other human activities, such as residential settlement, forestry and recreation have also affected nutrient levels in the lake and may have contributed to the deterioration of lake quality. Historical nutrient discharges have created nutrient enriched lakebed sediments and groundwater aquifers.

If the levels of nutrients in Lake Rotomā continue to increase, then short-term ‘events’ like algal blooms may start to occur. In the worst case scenario the lake condition can be seriously affected for much of the year (like Lake Rotoiti 2003).

1.4 Why has this Action Plan been developed?

Te Arawa Lakes Trust, Rotorua District Council and Environment Bay of Plenty have worked together (as part of the Rotorua Te Arawa Lakes Strategy Group[9]) to develop a strategy to restore water quality in the Rotorua Lakes - the Rotorua Lakes Protection and Restoration Action Programme (the Restoration Programme).

Environment Bay of Plenty is developing ‘Action Plans’ for each of the 12 Rotorua Lakes that are included in the Restoration Programme. The key drivers for the development of these Action Plans are Method 41 of the Regional Water and Land Plan (Appendix 4) and the Strategy for the Lakes of the Rotorua District (the Strategy). Method 41 of the Regional Water and Land Plan sets out four stages for the development of an action plan, and requires that an action plan is developed for each of the lakes to improve or protect lake water quality. Action plans focus on interventions (or actions) to reduce nutrients in the lakes.

This Action Plan, which has been developed in consultation with the Rotomā community, sets out what interventions (or actions) should be taken to reduce nutrient (phosphorus and nitrogen) inputs into Lake Rotomā. The Action Plan is an evolving document and will be reviewed and updated, for example, to allow for developments in technology or best management practices.

[9] Rotorua Te Arawa Lakes Strategy Group - a Joint Committee under the Local Government Act 2002 comprising members of Te Arawa Lakes Trust, Rotorua District Council and Environment Bay of Plenty.

To reach the target TLI of 2.3, the amount of phosphorus entering Lake Rotomā needs to be reduced by at least 250 kg/yr (about 35%) and the amount of nitrogen by at least 1,320 kg/yr (about 7%)[10]. It is important that any actions taken to reduce nutrient loads to the lake don't further decrease the N:P ratio; therefore any proposed actions to reduce nutrients must take into account the potential effect on both phosphorus and nitrogen levels in Lake Rotomā.

The nutrient reduction target for Lake Rotomā is 250 kg/yr Phosphorus and 1,320 kg/yr Nitrogen.

The required nutrient reductions have been calculated by Environment Bay of Plenty using a process reviewed and approved by the water quality Technical Advisory Group (TAG) - a collection of eminent New Zealand water quality scientists that provide independent specialist advice.

In order to achieve the TLI this Action Plan includes actions covering four different areas:

- Reducing and preventing nutrient loading from point sources
- Reducing and preventing nutrient loading from diffuse sources
- Improving knowledge of nutrient sources
- Reviewing regulatory interventions

1.5 Delivering the Action Plan

1.5.1 Implementing the Action Plan

Once the Lake Rotomā Action Plan is finalised an implementation plan will be developed that includes a timeline for delivery of the actions through the ten year and annual plan processes. Delivery of actions will depend on funding and resources being made available in future annual plan budgets (local government) and/or central government funding.

The ongoing programme is one of adaptive management based on the outcomes of research, implementation of actions and monitoring within the Lake and its catchment. The timeline to see the benefit of a particular action will vary.

1.5.2 Monitoring and Reporting on the Action Plan

The Lake Rotomā Action Plan will be an evolving plan that is reviewed and updated to allow for developments in technology, best management practices and existing regulatory frameworks (regional and national).

During the implementation of this Action Plan our knowledge about nutrient management and lake water quality will increase. For example, the University of Waikato is developing lake water quality models for the Rotorua Lakes. This, and other research, will give a better understanding about groundwater flows, nutrient attenuation, lakebed sediment/water column interactions, lake fluctuations and lake outflows. Consequently, we may need to alter the methods for calculating estimated reductions, and this may result in some actions no longer being required, or conversely in more stringent actions being introduced.

[10] See Appendix 2 for more information on how these reduction targets were calculated.

An action plan reporting template will be developed to provide an annual progress update on the Action Plan to councillors and the community. The Rotorua Lakes Annual Report Cards provide a good basis for this reporting. Active monitoring of the effect of the Action Plan will ensure that areas needing more attention or improvement can be identified. This will enable any necessary adjustments to be carried out immediately, rather than allowing lake water quality to deteriorate. An assessment will be made as to whether a set of easily understood indicators needs to be developed for the community to measure progress. This will be in addition to Environment Bay of Plenty's Water Quality Monitoring.

Chapter 2: Reducing and preventing nutrient loading from point sources

2.1 Nutrients from wastewater entering Lake Rotomā

2.1.1 What is the problem?

Nutrients from point source discharges[11] may have increased significantly over the last 15 years. About 14% of the nitrogen load and 34% of the phosphorus load entering Lake Rotomā is derived from wastewater from the Lake Rotomā community.

Septic tank technology is old and is not designed to remove nutrients from wastewater. Nitrogen from existing septic tank use does not currently appear to be adversely affecting Lake Rotomā's water quality. However, phosphate from septic tanks may be having a negative effect on water quality. Removing some nitrogen and phosphorus through improved community wastewater treatment will help protect Lake Rotomā's water quality.

If the Rotomā community remains a quiet, small community of holiday baches and low-occupancy residences (280 existing homes), Lake Rotomā is unlikely to be significantly affected by community wastewater discharges.

It is likely that occupancy rates will increase, visitor numbers will keep increasing, and more houses will be built. Under existing zoning, the settlement could host 435 houses. Any new houses or bedrooms built in the catchment will add an extra nitrogen load to Lake Rotomā.

Locals recall that 30 years ago only about 50 people visited the lake on a nice summer day. Now they say the numbers are closer to 500 with more active recreation like boating, jet-skiing, and angling taking place. Treatment of wastewater from public amenities to remove nutrients is important.

The community is concerned at the inadequacy of the public toilets, especially given the increasing popularity of Lake Rotomā. Provision of adequately treated public toilet facilities is required to ensure that visitors to Lake Rotomā are not adding to the nutrient load.

[11] Point source discharges – a discharge of contaminants from a specific and identifiable outlet onto or into land, air, or water.

2.1.2 Action 1: Reticulate along southern shore and upgrade on-site effluent treatment systems

Rotorua District Council has committed to reticulation of all residences and amenities along the southern shore of Lake Rotomā to a small treatment plant in its Long Term Council Community Plan (LTCCP), 2009-2019. Any reticulation project should consider the uncertainties relating to treatment system design, affordability, funding sources and the feasibility of:

- Reticulation to Okopua Point (Doctor's Point on the western shore)
- Reticulation of the north-western shore.

The treatment plant should remove all of nitrogen and phosphorus derived from septic tanks along the southern shore from the catchment.

The remaining septic tanks in the catchment will need to be upgraded to advanced on-site effluent treatment systems, or apply for resource consent, in line with the On-Site Effluent Treatment Regional Plan. This should occur by 1 December 2014[12].

2.1.3 Action 2: Rotorua District Council review the adequacy of the existing public toilet facilities

Rotorua District Council is to review the adequacy of the existing public toilet facilities (taking into account any anticipated increase to visitor numbers) and to develop a strategy for the consistent provision of appropriate facilities.

2.1.4 Expected outcomes

Development of the Lake Rotomā community and visitors to the lake will not result in increased nutrient discharges to the lake.

The nutrient reduction target for Lake Rotomā is 250 kg/yr Phosphorus and 1,320 kg/yr Nitrogen.

The majority of septic tanks in the catchment are located along the southern shore of Lake Rotomā. Reticulation along the southern shore to a treatment plant located outside the Lake Rotomā catchment will remove the primary source of phosphorus inputs into Lake Rotomā by 2011/12[13]. This action will meet most of the nutrient reduction target set for Lake Rotomā of 250 kg/yr phosphorus and 1,320 kg/yr nitrogen and allow for further development.

If suitable land cannot be found outside the Lake Rotomā catchment, then a treatment plant may be located within the lake catchment. As a treatment plant can only remove up to 90% of TN, this will mean about 10% of sewage-derived nitrogen may continue to enter the lake – assuming that the treated wastewater does not undergo any further treatment.

The treatment plant may also treat sewage from Rotoiti and Rotoehu, possibly resulting in a net reduction of only 50% of Rotoma's current sewage derived nutrients as a whole.

[12] Previous indicative date was 2013. Date has been changed as a consequence of Plan Cange 1 to the Operative On-Site Effluent Treatment (OSET) Regional Plan. Plan Change 1 became Operative on the 1 March 2011.
[13] Reticulation for Rotomā is schedule for completion in 2011/12.

Chapter 3: Reducing and preventing nutrient loading from diffuse sources

3.1 Nutrients leached to Lake Rotomā as a result of farming

3.1.1 What is the problem?

The greatest contribution of nitrogen to Lake Rotomā is from pastoral farming, in particular from sheep, beef and dairy-grazing. About 47% of the nitrogen load and 24% of the phosphorus load comes from these diffuse sources[14]. Other land uses such as Forestry also contribute to nutrients entering Rotomā but to a much lesser extent (Appendix 2).

3.1.2 Action 3: Adopt stewardship approach to farm land management

To reduce the nitrogen and phosphorus inputs from farmland Environment Bay of Plenty will trial the use of a Stewardship Management Approach with the landowners of the two farm blocks, Glenmarie Holdings and Taharoto Holdings. This is a voluntary approach which allows landowners to work co-operatively with Environment Bay of Plenty to choose which nutrient management options to implement on their land. Environment Bay of Plenty can help with advice and financial assistance. Some form of formal agreement, such as a Memorandum of Understanding or covenant will be required to protect any financial contribution from Environment Bay of Plenty and to ensure that a process for monitoring and reviewing implementation is in place. The use of Stewardship Management Agreements is consistent with Method 47 of the Regional Water and Land Plan (Appendix 4) and land use may still be subject to additional regulation if a stewardship approach is not delivering results.

Current options that could help reduce nutrients entering the lake include:

- Vegetated filter strips and filter patches to settle out particulates from farm run-off. For example, landowners in the Lake Rotomā catchment have already undertaken successful wetland planting in two lagoons on the eastern side of the lake.
- Nutrient budgeting tailored for specific parcels of land (that specifies accurately the amount of fertiliser to be applied on land and the method of application).
- The use of herd homes and feeding pads to reduce nutrient flows onto land.

[14] Diffuse sources – sources that do not originate from a specific point.

- The use of slow-release fertiliser when a phosphorus fertiliser is needed.
- Small detention ponds in central locations.
- Retirement of pasture to land use with less nutrient loading e.g. forestry.

The above list of options for reducing nutrients is by no means exhaustive and the advice of a qualified professional should be sought as to the suitability of options for a particular farm, which may include modelling of different scenarios. The *Land and Environment Planning Tool Kit* (developed by Meat and Wool NZ) provides useful guidance to landowners wishing to develop land management plans. Phosphorus loss from soil erosion and surface run-off is well understood, and potentially easier to manage on the farm than nitrogen.

3.1.3 Expected outcome

The amount of nutrients lost to Lake Rotomā is reduced, with reductions of up to 190 kilograms of phosphorus per year, and the amount of nutrients currently lost to Lake Rotomā as a result of farming activities does not increase.

Environment Bay of Plenty, as a partner in any stewardship agreement, will be able to closely monitor progress made toward implementing nutrient management practices and their success. If sufficient progress is not made then changes to the existing regulatory system (the Regional Water and Land Plan) remains a 'live' option. Action 9 requires that a review of the current regulatory interventions is undertaken by 2013, and that changes to the regulatory regime introduced, via a plan change, if analysis shows that this is appropriate.

The nutrient reduction target for Lake Rotomā is 250 kg/yr Phosphorus and 1,320 kg/yr Nitrogen.

3.2 New advances in technology

3.2.1 Why consider new technologies?

There are constant advances in farming and management of nutrients. These advances may present new options and technologies that can be used to further or more efficiently, reduce phosphorus (as well as other nutrients) entering Rotomā. For example, significant advances are being made in effluent treatment and processing of effluent (e.g. biogas conversion). Some of these new technologies are not readily available in New Zealand on a farm scale but will become available in the long-term.

Environment Bay of Plenty is responsible for sustainable water and land management and have a particular responsibility to keep abreast of developments with regard to nutrient management in order to educate the community (as required by the policies and methods of the Regional Water and Land Plan[15]) and adapt our management strategies where appropriate.

[15] These include: Policy 27, Methods 24, 25, 29, 36, 38

New technologies and nutrient management tools will be assessed by Environment Bay of Plenty using the *Interventions Framework*. Environment Bay of Plenty has developed a framework for the assessment of interventions. This provides for an evaluation of the characteristics of the intervention, an assessment of how it will work for given scenarios and also a cost-benefit analysis. This assessment will provide valuable information regarding their suitability for use in the Lake Rotomā catchment.

3.2.2 Action 4: Investigate and monitor the use of innovative technologies

Landowners and Environment Bay of Plenty staff will monitor the emergence of new technologies and can adopt these if found to be suitable for reducing nutrient inputs into Lake Rotomā.

3.2.3 Expected outcome

New technologies are adopted, where appropriate, to reduce the amount of nutrients entering Lake Rotomā.

3.3 Exploring wetland enhancement

3.3.1 What is the problem?

Following rain fall events, water flowing over land carries nutrients and contaminants that are deposited into Lake Rotomā. Slowing the flow of water by means of vegetative filter strips and wetland areas allows deposition of these nutrients and contaminants on the land, or in wetland areas where they can be utilised by plants.

Rotomā is fortunate to have two large lagoons that act as buffers prior to nutrients entering the lake between two of the three rural landowners from overland flow. There has been positive work by the two adjoining landowners to plant these lagoons with wetland plants that sequester nutrients from the water column[16].

Rotorua District Council has undertaken planting around the southern lakeshore over the past few years, and constructed a walkway. Some of the plants used were not suitable for the fluctuating lake margin areas, and died off when lake level rose.

Appropriate planting between State Highway 30 and the lake will help protect lake water quality. Dry-land plant filter strips help trap run-off, removing contaminants from the road and catchment like phosphates, poly-aromatic hydrocarbons, hydrocarbons and heavy metals. Emergent lake plants like reed beds absorb nutrients and remove dissolved nitrogen. These plants also improve the general amenity of the area.

3.3.2 Action 5: Continue lakeside wetland planting programme and explore enhancements

Rotorua District Council has committed to continue its wetland planting programme along the southern lake edge, removing plant pests and planting appropriate native species that can survive periodic ‘wet feet’.

Environment Bay of Plenty and Rotorua District Council will explore the suitability of enhancing the existing Planting Programme.

[16] Pers. Comm. Environment Bay of Plenty Land Management Officers and John McIntosh (science and monitoring consultant).

3.3.3 Expected outcome

Planting around the southern lakeshore reduces nutrients and contaminants entering Lake Rotomā as a result of rainfall events and stormwater run-off from State Highway 30 and nearby properties.

3.4 Preventing nutrient release as result of land use

3.4.1 What is the problem?

The Rotomā No 1 Incorporation forestry blocks are protecting lake water quality, as forestry has a very low nutrient loss over its rotation period. In the current economic climate, forestry may not be the highest-value land use, which creates economic pressure for land use change. If this forestry block is converted to pasture, or some other intensive land use, nutrient loss could increase resulting in an associated decline in water quality.

Any land use change must remain a low-nutrient land use, or alternatively must be accompanied by land use change elsewhere in the catchment that results in reduced nutrient loss.

3.4.2 Action 6: Adopt stewardship approach to forestry management

As described in more detail under Action 3 with regard to farm land management, this is a voluntary approach which allows owners of forestry blocks in the Lake Rotomā catchment to reach an agreement (Memorandum of Understanding) with Environment Bay of Plenty on future nutrient loss to ensure no overall increase in nutrient load. A voluntary stewardship approach is consistent with Method 47 of the Regional Water and Land Plan.

3.4.3 Action 7: Investigating alternative land uses

Environment Bay of Plenty and Rotorua District Council will continue investigating alternative land uses that have low-nutrient impacts on the lake, that help meet the landowners' economic and social goals, and that are consistent with the regional and district planning documents.

3.4.4 Expected outcome

Land use management change in the catchment does not result in a net increase in nutrients lost to Lake Rotomā.

The nutrient reduction target for Lake Rotomā is 250 kg/yr Phosphorus and 1,320 kg/yr Nitrogen.

Chapter 4: Improving knowledge of nutrient sources

4.1 Uncertainty regarding phosphorus entering Lake Rotomā in groundwater

4.1.1 What is the problem?

The release of phosphorus to groundwater from farming activities undertaken on porous young volcanic soils could potentially be a significant source of nutrient leaching to Lake Rotomā. However, this area of nutrient management is not well understood.

For the majority of the Lake Rotomā catchment it appears that the surface water catchment is the same as the groundwater catchment, i.e. water in = water out.

The north-western corner of the catchment may be an exception. It is an enclosed basin with no apparent outlet. It is 98 ha in size – 5.8% of the surface water catchment (excluding the lake). Groundwater could either flow to Lake Rotomā, north to the Morepara Stream, or elsewhere.

4.1.2 Action 8: Support research on phosphorus loss via groundwater and subsurface water flows and sample waterbodies in catchment for phosphorus levels

Over the next ten years, Environment Bay of Plenty will support research that will help determine the proportion of phosphorus loss to Lake Rotomā via groundwater and the direction of subsurface water flows. Any subsurface flow to Lake Rotomā should have the land (suspected to be the source) assessed for ways to reduce nutrient loss from its land use.

Environment Bay of Plenty will sample the lagoons, springs and ephemeral flow-paths on land around Lake Rotomā to quantify the amount of phosphorus leached from pastoral land in comparison to forestry and native bush cover.

4.1.3 Expected outcome

Environment Bay of Plenty, the Rotomā community and other lake users have a better understanding of the sources and nature of nutrients entering Lake Rotomā and how to further reduce inputs.

Chapter 5: Reviewing regulatory interventions

5.1 Statutory regulatory methods

There are a variety of permitted land uses in rural zones surrounding Lake Rotomā. Voluntary approaches to managing land use may not sufficiently reduce nutrient loading to Lake Rotomā or prevent increased nutrient loading as a result of land use change. The community need some certainty that lake water quality will be protected. This certainty can be provided by way of regulations.

Rule 12 of the Regional Water and Land Plan signals that, if the TLI[17] of Lake Rotomā exceeds the target by 0.2 for two years, a plan change will be initiated to incorporate rules specific to the Lake Rotomā catchment. At present the TLI of Lake Rotomā exceeds the target by more than 0.2 and is therefore “at risk”.

The Plan states that a review of regulatory interventions should be undertaken when lakes are at risk (Rule 13). The process for implementing regulations is governed by Schedule 1 of the Resource Management Act 1991.

5.1.1 Action 9: Review and develop regulatory rules

Under the Resource Management Act 1991(RMA) you cannot impose new rules for Lake Rotomā to manage nutrient discharges without going through a full change to the Bay of Plenty Regional Water and Land Plan. This includes justifying why this plan change is required through a section 32 Analysis. Any change will require full public consultation and input.

Environment Bay of Plenty will investigate developing a Rule to manage nutrient discharges from land use. This will include an analysis to assess the feasibility and appropriateness of a Rule 11 type regulation for the Rotomā catchment.

Rotorua lakes water quality remains a significant resource management issue for the region. Directive policy on managing and reducing nutrient discharges (from land use) relating to the lakes of the Rotorua district including Lake Rotomā will in the first instance be considered in the second generation Regional Policy Statement. A draft Regional Policy Statement will be released for public comment in February 2010.

5.1.2 Expected outcome

A comprehensive regulatory impact assessment will be undertaken. The outcome of the assessment may be that a rule is required, or is not required. If the result of the assessment is that regulation is required then a plan change will be initiated.

[17] Measured as a three-year moving average.

Chapter 6: Action Plan implementation timeline

6.1 Implementation timeline

A summary of the actions and an implementation timeline for these is presented in Table 2. At this stage it is difficult to anticipate when nutrient reduction targets will be reached, or when the target TLI is expected to be achieved.

Monitoring indicates that the deterioration in the TLI has taken place since 1994, and that the residence time for water in the lake is approximately 10 years. Therefore, it is assumed that once interventions (such as sewage reticulation works and good land management) are implemented that are sufficient to meet the nutrient reduction target of 250kg/yr Phosphorus and 1,320 kg/yr Nitrogen, that the target TLI of 2.3 is likely to be reached within 15 – 20 years (pers. comm. John McIntosh).

Table 2 Lake Rotomā Action Plan implementation timeline

<table>
<tr><th>2009-12 (3-years)</th><th>2012-17 (5 years)</th><th>2018-27 (10 years)</th></tr>
<tr><td>Action 3: Adopt stewardship approach to farm land management.

Action 6: Adopt stewardship approach to forestry management.

Action 9: Review and develop regulatory rules.</td><td>Action 1: Reticulate along southern shore (2011/12) and upgrade on-site effluent treatment systems (2013).

Action 2: Rotorua District Council review the adequacy of the existing public toilet facilities (2011/12).

Action 8: Support research on phosphorus loss via groundwater and subsurface water flows and sample waterbodies in catchment for phosphorus levels.</td><td></td></tr>
<tr><td colspan="2">← Action 5: Continue lakeside wetland planting → programme and explore enhancements.</td><td></td></tr>
<tr><td colspan="3">←Action 4: Investigate and monitor the use of innovative technologies →
← Action 7: Investigating alternative land uses →</td></tr>
</table>

Appendices

Appendix 1 - Trophic Level Index (TLI) and other indicators

The Trophic Level Index (TLI) is an indicator of lake water quality. Burns, Rutherford and Clayton developed this index for New Zealand conditions because other international indices were not adequate to deal with NZ lakes[18]. The Ministry for the Environment has adopted the TLI as a national indicator for New Zealand state of the environment reporting, and a TLI goal has been set for each of the Rotorua Lakes in the Regional Water and Land Plan.

Four parameters are combined to construct the TLI: total nitrogen, total phosphorus, clarity and chlorophyll *a*. The parameters reflect the dynamics of the annual lake cycle.

Nitrogen and phosphorus are essential plant nutrients. In large quantities they can encourage the growth of nuisance aquatic plants such as algal blooms. High levels of water-bound nitrogen and phosphorus most often come from agricultural runoff and urban wastewater, but can also come from geothermal inputs and deep springs that leach phosphorus from the rock geology.

Clarity is measured using a Secchi disc attached to a tape measure. The depth at which the disc disappears from sight is recorded by the tape measure.

Chlorophyll *a* is the green pigment in plants which is used for photosynthesis. It is a good indicator of the total quantity ('biomass') of algae in a lake. Algae are a natural part of any lake system, but large amounts of algae decrease water clarity, make the water look green, can form surface scums, reduce dissolved oxygen levels, alter pH levels, can produce unpleasant tastes and smells, and are more likely to result in algal blooms.

Calculations for the TLI:

- $TLn = -3.61 + 3.01\log(TN)$
- $TLp = 0.218 + 2.92\log(TP)$
- $TLs = 5.10 + 2.27\log(1/SD - 1/40)$
- $TLc = 2.22 + 2.54\log(Chla)$
- $TLI = \Sigma\,(TLn + TLp + TLs + TLc)/4$

Trophic states

The higher the TLI, the lower the water quality, and the greater risk of environmental 'problems' like algal blooms and unusual foams. High TLI levels are more likely to result in deoxygenation (anoxia) of the bottom water and nutrient release from the sediment. Trophic level bands are grouped into trophic states for quantitative description: microtrophic to hypertrophic as shown below.

[18] Burns, N.M., Rutherford, J.C. and Clayton, J.S. (1999): A monitoring and classification system for New Zealand lakes and reservoirs. Journal of Lake and Reservoir Management 15 (4):255 – 271, 1999.

Trophic state	Nutrient enrichment category	Trophic level	Chla (mg/m^3)	Secchi depth (m)	TP (mg/m^3)	TN (mg/m^3)
Ultra-microtrophic	Extremely low	0.0 to 1.0	< 0.33	> 25	< 1.8	< 34
Microtrophic	Very low	1.0 to 2.0	0.33 – 0.82	25 – 15	1.8 – 4.1	34 –73
Oligotrophic	Low	2.0 to 3.0	0.82 – 2.0	15 – 7.0	4.1 – 9.0	73 – 157
Mesotrophic	Medium	3.0 to 4.0	2 – 5	7.0 – 2.8	9 – 20	157 – 337
Eutrophic	High	4.0 to 5.0	5 – 12	2.8 – 1.1	20 – 43	337 – 725
Supertrophic	Very high	5.0 to 6.0	12 – 31	1.1 – 0.4	43 – 96	725 – 1558
Hypertrophic	Extremely high	6.0 to 7.0	> 31	< 0.4	> 96	> 1558

Trophic states, as determined by the four key variables

Ultra-microtrophic lakes are rare. The Pupu Spring in the Abel Tasman National Park is ultra-microtrophic.

Microtrophic lakes are very clean, and often have snow or glacial sources. Lake Sumner in North Canterbury is a microtrophic lake.

Oligotrophic lakes are clear and blue, with low levels of nutrients and algae. Lake Rotomā is an oligotrophic lake.

Mesotrophic lakes have moderate levels of nutrients and algae. Lake Rerewhakaaitu is a mesotrophic lake.

Eutrophic lakes are green and murky, with higher amounts of nutrients and algae. Lakes Rotorua and Rotoiti are now both eutrophic lakes.

Supertrophic lakes are fertile and saturated in phosphorus and nitrogen, and have very high algae growth and blooms during calm sunny periods. Lake Okaro is a supertrophic lake.

Hypertropic lakes are highly fertile and supersaturated in phosphorus and nitrogen. They are rarely suitable for recreation and habitat for desirable aquatic species is limited. Many lakes in the Waikato are hypertrophic, like Lakes Hakanoa, Ngaroto, Mangahia, Waahi and Waikare.

Cyanobacteria (Blue-green algae)

Cyanobacterial blooms occur more frequently above a certain TLI level. The worst quality waters experience the cyanobacteria blooms e.g. Okawa Bay (TLI 5.3), Lake Okaro (TLI 5.7). Lake Rotoehu began to experience algal blooms in 1994 when the quality of the lake deteriorated and the TLI increased from 3.7 to 4.8. Lake Rotoehu's TLI has fallen slowly since then and in 2004 no blue-green blooms occurred. The 2004 TLI will likely be closer to 3.7 than 4.8.

Cyanobacterial blooms can form in lakes with good water quality, like Lake Tarawera. Here a large inflow of water with low nitrogen to phosphorus ratio enters the lake along the shoreline adjacent to Rotomāhana. This favours cyanobacteria and when conditions are calm they can assume bloom proportions.

Other lake water quality indicators

Dissolved oxygen

Dissolved oxygen is important for fish and other aquatic life to breathe. Water should be more than 80 percent saturated with dissolved oxygen for aquatic plants and animals to live in it.

In deep lakes, where the waters don't mix for several months over the summer, reduced dissolved oxygen in the stagnant bottom waters is of concern, especially for fish and aquatic animals. The rate of decrease in dissolved oxygen in the hypolimnion (lower layer) water when a lake stratified is a useful indicator of how much decaying material is available for consumption, and therefore how productive a lake is. This value, known as the hypolimnetic oxygen demand, can provide a useful comparative measure of trophic state between deep lakes, or with time in individual lakes. For example, the hypolimnetic oxygen demand in Lake Rotoiti is now approximately three times higher than when the lake was first sampled comprehensively in the 1950s. Decaying algal material that falls out of the surface water uses up dissolved oxygen in the bottom waters. When this happens, nitrogen and phosphorus are released from the lake bed sediments. When the lake waters re-mix in winter these nutrients are available for plants and algae in the surface waters.

E-coli

Escherichia coli (*E. coli*) is an indicator organism for disease-causing organisms in the water. E-coli come from human and animal faeces, so if they are present in water there are likely to be other pathogens that make the water unsafe for drinking or swimming. Drinking water should have no detectable E-coli bacteria in it at all. Water used for recreation should have less than 126 E-coli colonies per 100 ml of water.

Appendix 2 - Estimated nutrient loss from the catchment

The following table shows the estimated nutrient loss from the differing types of land use around Lake Rotomā. Nutrient loss coefficients for each land use type. The sources of the coefficients are listed as footnotes beneath the table.

Table 2008 land use export coefficients for the Lake Rotomā catchment

Land cover	Area	Export		Load			
		TN	TP	TN	%	TP	%
	ha	kg/ha/year		kg/year		kg/year	
Bare ground	8	5	1.0	40	0	8	1.1
Native forest	643	3[19]	0.075[20]	1,929	11	48	6.5
-with sheep/beef grazing[21]	24	5	0.15	120	1	4	0.5
-with dairy grazing	18	10	0.15	180	1	3	0.4
Exotic forest	265	3	0.095[22]	795	4	25	3.4
-with dairy grazing	126	10	0.15	1260	7	19	2.6
Scrub	59	3	0.04	177	1	2	0.3
Sheep/beef	415	15[23]	0.38[24]	6,225	34	158	21.5
Dairy grazing	16	40[25]	0.38	640	4	6	0.8
Recreation area[26]	14	4	0.1	56	0	1	0.1
Wetlands	32	0	0	0	0	0	0.0
Urban built[27]	48	3	0.7	144	1	34	4.6
Septic tanks (251 HUE)[28]				2,530	14	250	34.0
Rainfall to lake[29]	1,115	3.6	0.16	4014	22	178	24.2
Waterfowl[30]				*100*	*1*	*60*	*2*
Catchment total	**2,783**			**18,110**	**100**	**736**	**100**

[19] Standard values for native bush/exotic forest/scrub. Research indicates values ranging ~1.5 – 4.0 kg/ha/yr.

[20] Macaskill et. al. (1997), Nitrogen and Phosphorus in Streams Draining Catchments of Different Land use in the Rotorua Lakes Region. Table 19 states that P loss from native forest around Rotorua Lakes that P loss from native bush is about 80% less than from exotic forest.

[21] "with dairy/sheep/beef grazing" = mid-range estimate assuming 3/4 months grazing pasture equivalent.

[22] Cooper, A.B., Thomsen, C.E. (1988), Nitrogen and phosphorus in stream waters from adjacent pasture, pine and native forest catchments. *New Zealand Journal of Marine and Freshwater Research* 22, 279-291. Sampled from sites similar to Rotomā: central volcanic plateau, average slope 17˚, porous pumice and ash soils.

[23] Average values generated by OVERSEER and NPLAS from benchmark data around Lakes Rotomā, Rotoehu and Rotoiti.

[24] OVERSEER prediction for sheep/beef farm in Rotomā catchment, 'easy hill' 15˚ - 25˚ slope, default pumice soils. Same figure applied to dairy grazing.

[25] Average Rotorua dairy farm N loss = 50 kg-N/ha/yr. Dairy grazing assumes slightly less intense land use.

[26] Estimate values only.

[27] Standard values sourced from Rotorua city's stormwater sampling 2005/06.

[28] Rotorua District Council: Estimate of Household Unit Equivalents, maximum loading rate for 2014. 1 HUE = 2.8 fulltime residents. While this summer maximum may overestimate annual loads, the overestimate in the resident population may balance out the unaccounted load from lake visitors. One fulltime resident's average wastewater nutrients from septic tank = ~3.6 kg-N/yr, ~0.7 kg-P/yr. N estimate is from NIWA literature review; includes ~10% N removal in tank/soils. P estimate is from Environment Bay of Plenty's Water Quality Technical Advisory Group's review of P export research from septic tanks near the Rotorua Lakes margins in November 2007.

[29] Pers. Comm. Max Gibbs (NIWA), 2006.

[30] Some of the nutrients consumed by waterfowl come from the lake, so are termed 'nutrient recycling'. The nutrient input is included in the budget for comparison only.

The above method estimates nutrient loss from the land use, but doesn't necessarily account for nutrient attenuation between the land use and the lake. However, the balance between estimating the lake nutrient load from land use and from in-lake nutrient levels is quite close.

Another way to estimate nutrient loss from the catchment is to work back from in-lake concentrations. This method uses the nutrient concentrations, lake attenuation percentages and lake water retention times recorded in Appendix 3. Using this method, the estimated nutrient loss from the catchment is:

- TN = 19,730 kg-N/yr.
- TP = 720 kg-P/yr.

These figures indicate that there is likely to be some attenuation of nutrients in the catchment itself, especially for phosphorus. Wetland areas may transform some nitrates into nitrogen gas. It's expected that some phosphorus is settling out in the two lagoons on Lake Rotomā's eastern shoreline, as a significant area of farmland drains to these lagoons. Both are still estimates, but together give a reasonable reflection of the actual nutrient inputs to Lake Rotomā. They also highlight the relative importance of reducing the phosphorus inputs to the lake.

Future water quality modelling of Lake Rotomā will refine these input estimates, as well as the nutrient reduction targets.

Appendix 3 - Calculation of Lake Rotomā's nutrient reduction target

The TLI target accommodates a 9.2 year lake water retention time (average), and a nutrient attenuation rate of 70%. The Water Quality Technical Advisory Group[31] approved this target calculation.

Rainfall	2100 mm			
	Area	Evaporation[32]	Rain minus Evaporation	Volume
Forest	1,022 ha	1000 mm	1100 mm	11,242,000 m^3/yr
Pasture	646 ha	800 mm	1300 mm	83,980,000 m^3/yr
Total from land	1,668 ha			19,640,000 m^3/yr
Lake	1,110 ha		2,100 mm	23,310,000 m^3/yr
Lake area	11,100,000 m^2		Catchment runoff	19,640,000 m^3/yr
Lake volume	395,000,000 m^3		Rainfall on lake	23,310,000 m^3/yr
Residence time	9.2 years		Total input	42,950,000 m^3/yr
Median N & P concentration from 2003 - 2006	137.8 mg-N/m^3	5.00 mg-P/m^3		
Target (1994)	128.6 mg-N/m^3	3.22 mg-P/m^3		
Estimated current load	19,730 kg-N/yr	720 kg-P/yr		Load (M) = CQ/(1-R)
Estimated target load	18,410 kg-N/yr	460 kg-P/yr		R ~ 0.7[33]
Estimated load reduction	**1,320 kg-N/yr**	**250 kg-P/yr**		

[31] The water quality Technical Advisory Group (TAG) is a collection of eminent New Zealand water quality scientists coordinated by Environment Bay of Plenty. They provide independent specialist advice, peer-review research, and help align water quality research and outcomes among the research organisations represented in the TAG.
[32] Evaporation rates are from Freshwater of New Zealand, Chapter 3.
[33] Based on non-specific discussion from Hoare.

Appendix 4 - Regional Water and Land Plan Methods 41, 42, 47 and 52 (as applicable to Lake Rotomā)

Method 41

Develop and implement Action Plans to maintain or improve lake water quality to meet the Trophic Level Index set in Objective 11. Action Plans will be developed according to the following process.

Action Plan Stages

1 Stage 1 – Risk Assessment and Problem Evaluation

(a) Identify lakes that exceed the Trophic Level Index (TLI) set in Objective 11, and initiate Stage 3.

3 Stage 3 – Development of Action Plan for Lake Catchment

(a) Where lake water quality exceeds the TLI:
- (i) Identify and quantify the lake water quality problem and any necessary research.
- (ii) Identify and quantify the reduction of nitrogen and phosphorus required in the catchment to achieve the TLI in Objective 11.
- (iii) Estimate the contributing sources of nitrogen and phosphorus in the catchment, and the effects of existing land uses and activities in the catchment on the lake's nutrient load.
- (iv) Estimate the lag between actual land use change and lake water quality effects.
- (v) Establish a timeline for developing an Action Plan for the lake catchment.

(b) Disseminate information and research findings to the community.

(c) Develop and implement Stage 3 and 4 of the Action Plan in conjunction with an Action Plan Working Group comprising appropriate parties from the individual catchment. The Action Plan Working Group will include, but is not limited to, Rotorua District Council, iwi, community groups, landowners, and relevant resource management agencies and industry representative groups. The main aims of Stage 3 of the Action Plan are:
- (i) Identify factors that affect lake water quality and any necessary research.
- (ii) Include equitable and workable provisions to address effects on existing land uses where it is necessary to restrict land use to maintain or improve water quality. Such provisions include, but are not limited to, criteria for possible financial assistance and land acquisition.
- (iii) Identify efficient, cost-effective and equitable measures and options to reduce inputs of nitrogen and phosphorus from the lake catchment to maintain or improve lake water quality.
- (iv) Determine if the TLI in Objective 11 can be realistically achieved, and a practicable timeline for achieving the target TLI.

(d) Identify the costs and benefits of different nutrient management and reduction methods. Such methods include, but are not limited to:
- (i) Education on nutrient management;
- (ii) Riparian retirement;

(iii) Constructed wetlands;
(iv) Sewage reticulation;
(v) Review of existing discharge consents in the catchment;
(vi) Land use changes;
(vii) Land purchase or lease;
(viii) Engineering works;
(ix) Nutrient trading systems.

(e) Take into account the macro-economic and micro-economic effects of lake water quality maintenance or improvement measures, including the value of land use and lake water quality to the catchment, district, region and wider community.

(f) Apply existing funding policies and other funding options for lake water quality maintenance or improvement works, including, but not limited to:
(i) Differential rating as a means of paying for works within the catchment.
(ii) Central government funding.
(iii) User charges.
(iv) Environmental Programmes.

(g) Determine if regulatory measures are necessary to control the discharge of nitrogen or phosphorus, or both, from land use activities in the lake catchment (Refer to Method 42).

(h) Document a timetable for implementing nutrient management and reduction options.

4 Stage 4 – Implementation and Monitoring of Action Plans

(a) Implement the lake water quality improvement measures identified and agreed to in Stage 3.

(b) Evaluate and report progress towards achieving the TLI in Objective 11 to all parties, and the community.

Method 42 In conjunction with the Action Plan Working Group (refer to Method 41), review the necessity and application of the Rules in section 9.4 of this regional plan to individual lake catchments.

1 The review will:

(a) Consider matters from the Action Plans developed in accordance with Method 41.

(b) Consider how to achieve the long-term sustainable management of nitrogen and phosphorus use and discharges in the individual lake catchment.

(c) Recognise that it may be efficient, effective, and appropriate to develop and implement specific rule(s) for each of the lake catchments.

(d) Recognise that the Action Plan Working Group may recommend to Environment Bay of Plenty any changes to the rules in section 9.4, but Environment Bay of Plenty retains control over the plan change process. Members of the Action Plan Working Group and individuals retain the right of submission and appeal.

(e) Include any changes to the rules in section 9.4 through a plan change process in accordance with the requirements of Schedule One to the Act.

2 The review will be discussed during the development of the Action Plans.

Method 47 In partnership with landowners, develop, trial and implement where appropriate, voluntary Stewardship Management Agreements within the framework of this regional plan to give effects to the Act, to:

(a) Promote a co-operative approach with positive, ongoing relationships with people as stewards of their land.
(b) Have particular regard to the ethic of stewardship.
(c) Recognise that stewardship involves both:
  (i) The use and development of land and water resources; and
  (ii) The protection of significant sites and of natural resources.
(d) Enable people and communities to provide for their social, economic and cultural well-being.
(e) Address the specific resource management issues of a property.
(f) Promote and encourage the adoption of best management practices that are suitable for the property to achieve sustainable management of resources.
(g) Include a process for monitoring the implementation and also reviewing the appropriateness of agreed Stewardship Management Agreements.

Method 52 Use the following process to include regulatory measures in this regional plan to control the export of nitrogen and phosphorus from land use activities in the catchment of lakes that:

1 Exceed their TLI specified in Objective 11, where the 3-year moving average TLI for the lake exceeds its designated TLI specified in Objective 11 by 0.2 for 2 years; OR
2 Are at risk of declining water quality, as identified by Method 41 Stage 1(b)(i).

Process for Regulatory Measures

(a) Investigate the cause or risk of the decline in water quality and report to Environment Bay of Plenty.
(b) Develop an action plan for the lake catchment in accordance with Method 41.
(c) Initiate a plan change in accordance with the Act to include regulatory measures in this regional plan to address the export of nitrogen and phosphorus from land use activities, including land use changes, in the specific lake catchment.

Appendix 5 - Working Party

This Action Plan was drafted with the assistance of a working party made up of community and landowner representatives. This working party has met eight times, from 12 July 2006 to 26 November 2008. The working party members who have been involved with this process are:

- Graeme Shirley: Rural landowner – Working Party Chairman
- Anne Shirley: Rural landowner
- Peter Davies: Rural landowner
- Penny Davies: Rural landowner
- Councillor Geoff Kenny: Rotorua District Council
- Tai Eru: Former councillor Environment Bay of Plenty
- Rob Pitkethley: Fish & Game (Eastern Region) New Zealand
- Colleen Skerrett-White: Trustee of Maori Trust Block, Ngati Pikiao
- Edwin MacKinnon: Ngati Pikiao
- Kaiawhiti Tahana: Ngati Pikiao
- Nepia Dewes-Green: Ngati Pikiao
- Leo Meharry: Community resident
- Helen Shaw: Community resident
- Dawn Carter: Community resident
- Rae Green: Community resident
- Keith Marx: Rotomā former Trading Post owner and operator
- Anthony Olsen: Ngati Tuwharetoa Bay of Plenty Settlement Trust
- Beverley Hughes: Ngati Awa
- Tony Markham – Community resident
- Councillor Hawea Vercoe – Environment Bay of Plenty