Annual Report

2017/2018

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ROTORUA TE ARAWA LAKES PROGRAMME

Bay of Plenty Regional Council, Rotorua Lakes Council and Te Arawa Lakes Trust.
Working as one to protect our lakes with funding assistance from the Ministry for the Environment.

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Purpose

The purpose of this document is to report against the 2017/2018 Annual Work Plan of the Rotorua Te Arawa Lakes Programme. This report is in accordance with Clause 5.1 and 5.2 of the Deed of Funding.

This report provides an update on deed funded projects, including their financial status. It also provides an update on non-deed funded projects that fall under the Programme.

The overarching goal of the Deed of Funding is to reach community aspirations for water quality in four deed funded lakes: Rotorua, Rotoiti, Ōkāreka and Rotoehu. To show the status of reaching this goal, there is an update on how each priority lake is tracking in terms of water quality.

Overview

Lake Rotorua

RLC and BOPRC Annual Plan Budget 2017/2018 ($000)	Actual end of year Expenditure ($000)	Approved Crown Funding 2017/2018 ($000)	Crown Funding received to date ($000)	Crown Funding applied to date ($000)
9,804	4,154	4,902	2,498	2,077

The components of the Integrated Framework for Lake Rotorua continue to be very resource intensive. The Commissioners' decision on Proposed Plan Change 10 was received in August 2017 and appeals to the Environment Court closed at the end of September. Four appeals to the Commissioners' decision were received (from CNI Iwi Holdings, Federated Farmers, Te Tumu Paeroa and Ngāti Uenukukōpako). The Ngāti Uenukukōpako appeal is now withdrawn. A variety of parties joined these appeals under s274 of the Resource Management Act. The first Environment Court led mediation was undertaken in early February 2018 and staff have continued to participate in the appeal process as now directed by the Environment Court, including expert witness conferencing. Hearing dates are now set for the Environment Court hearing, with evidence in chief to be circulated by 3 December 2018 and the first hearing dates set for the weeks of 4 and 11 March 2019.

The Commissioners decision on Plan Change 10 means that Plan Change as it stands has legal effect, the Regional Council are now implementing the plan change. Reworking of the Nutrient Management Plans to provide identification of Critical Source Areas for phosphorus and identifying mitigation measures is progressing. Advice and support staff continue to work closely with landowners to provide information on their obligations under the plan change. Three consents have been granted for properties over 40ha with further applications being processed. In total, 143 landowners have engaged with advice and support.

The Gorse Conversion Implementation Plan has been revised after ground truthing and aerial photography established gorse wasn't as big a problem as first thought in the Lake Rotorua Catchment. The Plan estimates a Nitrogen reduction of 12.8 tonnes at the root zone instead of the previous reduction of 30 tonnes. The programme will be look at alternative solutions to make up any shortfall. Work has continued on existing gorse agreements and also working with landowners to sign up new agreements. 203 ha of gorse in the catchment is now either covered by an agreement under the gorse scheme or has an agreement pending. Difficulties have arisen with getting some owners of Maori land to engage in the gorse scheme because of the 999 year encumbrance. In-particular, Te Tumu Paeroa will not support any of their landowners entering into the gorse scheme because of this requirement.

A paper was presented to the Strategy Group in March which set out the 2018 work plan and recommended completion of further research on the identified gaps, extension of information and education on all Low Nitrogen Land Use Fund tools and land uses. During the financial year being reported on here the Land Use Innovation Series was planned, along with an Expressions of Interest for trialling innovative low nitrogen land uses in the catchment. These have now been successfully run but in the new financial year, not reported on here.

The Incentives Scheme has secured deals of approximately 20 tonnes. There was a delay in the first half of the year due to the rework of the Nutrient Management Plans required to account for the Commissioners decision on Plan Change 10. Staff are continuing to engage with landowners and actively developing pipeline opportunities. The Incentives Committee have requested a report to their Committee meeting in November, staff are to advise on the properties with sufficient nitrogen available in the catchment and each individuals landowners interest in selling and likely timing on that. This will give the Committee the information required to inform the likelihood of achieving their target and the next steps in strategy for that. Staff resources to the Incentives Committee were increased during the year to assist in ensure that as much progress as possible was being made. The main barrier to the scheme remains capital value of land and borrowing against that, primarily for land in European title.

A joint letter from the Regional Council and Rotorua Lakes Council has gone to all unconnected properties (to sewerage reticulation) in the Rotokawa/Brunswick area asking them to connect and advising that if they don't Council will make the connection and recover costs from them. The letter has had a good response, most of the connections have not been made due to financial difficulty. Staff at both organisations will work out an appropriate approach for these properties.

A project team has been established to action preferred options for the 50 tonne engineering solutions, this work will largely focus on wetland retention, enhancement and perhaps construction. There will be a focus on ensuring that District and Regional Policy protects existing 'wet-land' which provides an important nutrient sink, particularly in the urban area. Urban stormwater management will also provide opportunities. The Tikitere project is looking to be cost-prohibitive given the benefits, recommendations to the Programme Steering Group and Rotorua Te Arawa Lakes Strategy Group are pending on this.

Lake Rotoehu

RLC and BOPRC Annual Plan Budget 2017/2018 ($000)	Actual end of year Expenditure ($000)	Approved Crown Funding 2017/2018 ($000)	Crown Funding received to date ($000)	Crown Funding applied to date ($000)
236	175	118	93	88

Planned actions on Lake Rotoehu include phosphorous locking (alum dosing) and weed harvesting.

Due to little weed growth this season the weed harvester wasn't operational. The Alum Dosing plant has been switched off as it is currently not considered effective. Research on phosphorus locking in Lake Rotoehu has indicated that lake weed growth may be limiting the effectiveness of alum dosing.

A workshop with the Water Quality Technical Advisory Group is planned in October to consider appropriate next steps for Rotoehu given the challenges faced with water quality and interventions on that lake.

Lake Okareka

RLC and BOPRC Annual Plan Budget 2017/2018 ($000)	Actual end of year Expenditure ($000)	Approved Crown Funding 2017/2018 ($000)	Crown Funding received to date ($000)	Crown Funding applied to date ($000)
50	35	0	25	18

The Rotorua Te Arawa Lakes Strategy Group approved a further land use change project in the Lake Ōkāreka Catchment at the end of 2016. This project had three streams to it: completing a full check of compliance with Rule 11, contributing to the Lakes A Zone District Plan review and securing further nutrient purchase from landowners in the catchment. Since then, the programme has offered funding for further land use change and nutrient purchase to all owners of sufficient land in the catchment. As a result we are in discussions with interested parties to secure further change with one large land use change project pending.

An audit of the catchment land use has been completed to assess compliance with the Rule 11 Benchmark. All bar one property audited are below their benchmark, support is being offered to this landowner to come back into compliance.

The funding set aside for the Lakes A Plan Zone District Plan review has not yet been progressed.

Lake Rotoiti

RLC and BOPRC Annual Plan Budget 2017/2018 ($000)	Actual end of year Expenditure ($000)	Approved Crown Funding 2017/2018 ($000)	Crown Funding received to date ($000)	Crown Funding applied to date ($000)
5,434	3,115	2,717	128	1,558

Ongoing projects on Lake Rotoiti include the final sewerage reticulation between Curtis Road and Hinehopu (part of the Lake Rotomā-Rotoiti Reticulation Project) and maintenance and monitoring works to deal with corrosion of the Ōhau Wall. Good progress has been made on the reticulation and the contract for the construction of the Wastewater Treatment Plant and Land Disposal Site has been let and will be completed in April 2019. Four fish passes have been installed in the Ōhau Wall and a structural management plan has been finalised to deal with corrosion, components to be installed during 2018/2019. Staff are working with iwi to undertake restoration works in the Ōhau Channel area.

Summary of TLI results

None of the twelve Rotorua Te Arawa Lakes met their Regional Natural Resources Plan (RNRP) TLI objective for the 2017/2018 year.

Annual trophic status has been impacted by climate, with record increases in lake level occurring and a shortened stratification season. This may help explain the overall increase in TLI for many lakes with the exception of Lake Rotokakahi (although the TLI is calculated without Secchi water clarity data). In some cases a shortened stratification season has resulted in two winter turnovers occurring in the same lake analysis year (July to June), which can increase all TLI parameters.

Blue-green algae (cyanobacteria) blooms resulted in health warnings being issued by Toi Te Ora for Lakes Rotoehu and Ōkaro. Lakes Rotoiti, Tarawera and Rotorua reached orange alert levels for some sites over the 2017/2018 summer.

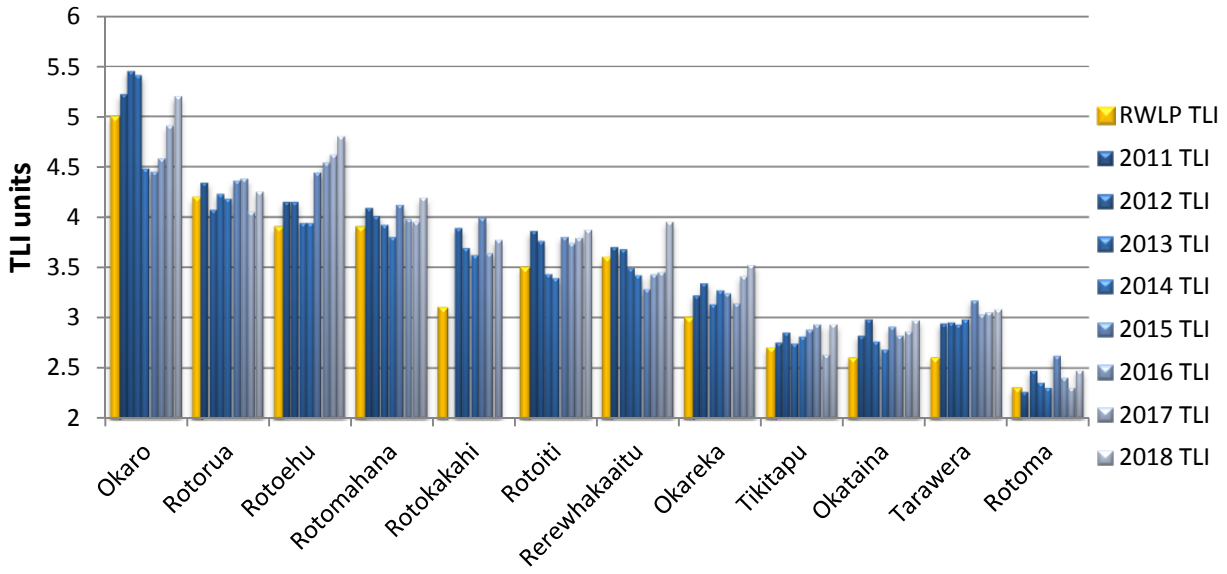

Figure 1: Regional Natural Resources Plan (RNRP) TLI Objectives and average annual TLI results, 2011 to 2018.

Note: Lake Rotokakahi TLI's are based on Te Wairoa Stream monitoring and a three-parameter TLI (no Secchi disk).

Key achievements

An overview of key achievements for 2017/2018 financial year are shown in the table below. The Deed funded activities are shown in bold.

For more detailed information about deed projects (including financials), please refer to the later sections of this report.

Lake operations

Lake Operations as shown in 2017/2018 Annual Work Plan	Lake operations achievements 2017/2018
Continue Lake Rotoehu Weed Harvesting.	**Due to lack of weed this season the weed harvester wasn't operational. Harvesting normally occurs in late summer early autumn period, so this will be revisited in April 2019.**
Investigate the feasibility of weed harvesting on Lake Rotorua for nitrogen reduction (as part of the 50 t engineering solutions).	**This project has been delayed due to staff priorities related to Plan Change 10. Staff are currently working to get this project back on track so appropriate actions can be implemented for the 2022 deadline.**
Continue phosphorous locking to maintain water quality (Lakes Rotoehu and Rotorua).	**Phosphorus locking continues to be undertaken. The resource consent renewal application has been accepted for the two plants on Lake Rotorua and is now working through the consent process.**
Continue to pursue resource consents, prepare site and review engineering and cost feasibility of Tikitere Zeolite Plant, in time for scheduled 2018/2019 construction.	**Detailed design and costs have been completed. Construction has been pushed out to 2019/2020 in the Regional Council's draft Long Term Plan. However, due to build cost and ongoing annual operational costs the project isn't likely viable. Recommendations to Programme Steering Group and Strategy Group are pending.**
Undertake mitigation works as agreed in the Ohau Wall consenting process.	**Four fish passes have been installed. Staff have commenced working with iwi to undertake restoration works in the Ōhau Channel area.**
Responsive weed management as required for amenity purposes across all lakes.	Continuing to work with partners, including Land Information New Zealand on this matter as required. Aquatic Plant Management Plans are being developed for the lakes.

Lake Operations as shown in 2017/2018 Annual Work Plan	Lake operations achievements 2017/2018
Initiate catchment and lake modelling work with the University of Waikato to identify potential phosphorus sources and water quality solutions at Lake Tarawera.	Lake Tarawera water quality modelling is underway and due to be completed by August 2018. This is a delay to the initial deadline due to other Plan Change 10 modelling taking priority.
Once catchment and lake modelling is available consider a review of action plans for Ōkaro and Ōkāreka to establish whether further intervention is necessary in these catchments, e.g. gorse removal, land use change.	Modelling for Lake Ōkāreka is due to be completed by August 2018. Modelling for Lake Ōkaro has been delayed due to resourcing issues. Pursuit of further land use change has progressed in Ōkāreka in the meantime as mentioned above.
The University of Waikato Chair of Science and the Water Quality Technical Advisory Group will continue to provide expert advice and scientific rigour for the Programme.	Technical Advisory Group (TAG) advice continues. TAG is close to releasing a paper on the impact of climate change to the Lakes Programme. Four meetings held during the reporting period, including two targeted workshops. Plan Change 10 Science Review is well underway and the final report is expected in October 2018.
Land Technical Advisory Group to provide technical support for land use and land management decisions.	Land TAG operating in a workshop mode. No workshops held during the reporting period.
Continue work to refine function of the Trout Barrier at Hamurana Springs by investigating options to alleviate algae issues above the barrier and prevent trout from passing above the barrier.	Communication with iwi is underway and staff are discussing options with consultants and contractors to find solutions to the issue.
Apply the structural management plan to manage the corrosion of the Ohau Wall.	Structural management plan has been developed and finalised with structural components to be installed in 2018/2019 financial year.
Manage the Ohau diversion wall as per new resource consent.	Monitoring is programmed and undertaken on a regular basis to check the integrity of the wall as well as undertake a range of environmental monitoring as required.
Continue to monitor forest harvest impact on groundwater and Lake Rotomā – a 4 year project.	Monitoring continues. The harvest operation has been completed. More detailed results will be available at the completion of the monitoring project in December 2019.

Lake Operations as shown in 2017/2018 Annual Work Plan	Lake operations achievements 2017/2018
Continue koura monitoring programme on all 12 lakes.	Koura monitoring is underway. Tikitapu and Rotomahana were monitored in the 2017/2018 period. All 12 lakes will be monitored on a five yearly rotation.
Install monitoring buoy in the Lake Tarawera and also either in the east of Lake Rotoiti or Lake Ōkāreka, subject to approvals.	Staff are awaiting detailed maintenance plan from the University of Waikato before installing additional buoys to ensure servicing and data collection is maintained.

Land management

Land Management as shown in 2017/2018 Annual Work Plan	Land Management achievements 2017/2018
Continue to implement the Lake Rotorua Gorse Programme, including signing up new agreements and implementing existing ones.	Staff are continuing to work with the owners of eligible gorse blocks to promote the Lake Rotorua Gorse Programme. There are two agreements currently under negotiation which, if successful, will result in the removal of 120 ha of gorse from the catchment. However, the requirement for a 999 year encumbrance to be registered on land titles is proving to be a disincentive for some Maori owned land and this is slowing progress. Alternative options for securing nitrogen gains from gorse conversion have been approved in the new Implementation Plan for the Project adopted through the year.
Continue the projects initiated for the first Low Nitrogen Land Use round and initiate a further funding round once the project outputs are assessed.	Round One projects are now complete. A paper was presented to Rotorua Te Arawa Lakes Programme Strategy Group in March which set out the 2018 work programme, this comprises of further research to plug gaps from round one, education and extension of the land use directory. During the financial year being reported on here the Land Use Innovation Series was planned, along with an Expressions of Interest for trialling innovative low nitrogen land uses in the catchment. These have now been successfully run but in the new financial year, not reported on here.
Continue to implement the Lake Rotorua Incentives Scheme, including signing up new agreements and implementing existing ones.	The Incentives Scheme has secured deals of around 20 t, with a recent large deal of 8.5 t secured and a further 1.2 t nearing completion. Several other deals are in the pipeline. Finalising incentives deals and securing Nitrogen in perpetuity is a lengthy process which is added to by the various external variables. Currently, some landowners are reassessing their situations and opportunities given Proposed Plan Change 10 and the recent government forestry initiatives. Monitoring plans aligned to Nutrient Management Plans have been finalised and are being implemented for the completed incentives deals. During this period, to add to the opportunities for success of the Incentives Scheme; business rules were reviewed, a realignment of Incentives team membership was carried out and a new Communications and Marketing Plan was launched to better integrate activities into the wider Rotorua Catchment Programme.

Land Management as shown in 2017/2018 Annual Work Plan	Land Management achievements 2017/2018
Continue to implement the Advice and Support service for landowners affected by Plan Change 10.	To date, 143 landowners have engaged with Advice and Support. There are 94 properties over 40 ha in area in the Lake Rotorua Catchment which require a resource consent this year and, of these, 87 are engaged with Advice and Support. Previously finalised Nutrient Management Plans (NMPs) are currently being re-worked to incorporate a greater emphasis on on-farm phosphorous mitigations as a result of the Commissioners' decisions on Plan Change 10. When completed, landowners will be able to use their NMP to support their application for resource consent and three have already.
Progress the Lake Ōkāreka Land Use Project to reduce nutrient loss in the catchment.	All properties bar one have been audited for compliance with Rule 11 and all are below their benchmarks. The property in non-compliance has been offered support. All large property owners have been approached and offered funding to convert pasture to trees as a result staff are negotiating a further 50ha of mānuka planting which will replace gorse and pasture. This represents 50% of the current land use change target.
Continue Acacia control on land in between Lake Tarawera and Lake Rotomahana to reduce N leaching as required.	14.7 ha of Acacia control was carried out for 17 weeks around Lake Rotomahana's Isthmus Track. This project remains a successful and practical project run in conjunction with the local people and providing local employment. Funding has also been provided this year by Te Ariki Trust.
Support the farming community to develop farm management plans that concentrate on Good Management Practices in the Lakes Rerewhakaaitu, Rotokakahi, Rotomahana and Tarawera catchments and provide support for the implementation of these plans. Quantify the nutrient reductions achieved by the farming community in these catchments.	This action in the Tarawera Lakes Restoration Plan and is a voluntary project with the local farming community, led by the Project Rerewhakaaitu group. The project relies on industry partnerships with Fonterra field staff rolling out the new 'Tiaki' farm plan for dairy farmers and Beef and Lamb NZ supporting its 'Land and Environment Plan' (LEP) for drystock farmers. Council contracted AgFirst and Perrin Ag to help deliver the LEPs. Good progress has been made with farm plans and Overseer nutrient budgets completed for 31 dairy farmers 18 drystock farmers. Only three farmers declined to take part. Fonterra has provided a summary report of nutrient loss rates and work is underway for a similar summary report by Beef and Lamb. A final project report and presentation to farmers is expected in October 2018.

Policy, planning, communications and information technology

Policy, planning, communications and information technology as shown in 2017/2018 Annual Work Plan	Policy, planning, communications and information technology achievements 2017/2018
Continue Schedule 1 RMA (1991) process for Lake Rotorua Nutrient Management rules being made operative.	Mediation has resulted in the appeal lodged by Ngāti Uenukukōpako being resolved and their associated s274 notices being withdrawn. The first Environment Court led mediation was undertaken in early February 2018 and staff have continued to participate in the appeal process as now directed by the Environment Court, including expert witness conferencing. Hearing dates are now set for the Environment Court hearing, with evidence in chief to be circulated by 3 December 2018 and the first hearing dates set for the weeks of 4 and 11 March 2019.
Identify timeframes for rules to be developed for the 'Non-Rule 11' lakes.	A regional water quality plan change is being scoped, taking into account the need for a 'hold the line' approach. This is also dependent on the direction of the new government, this being a key interest of theirs. The implementation programme has been amended to bring the Rotorua Water Management Area (WMA) forward. The stocktake for the Rotorua WMA has now started with this informing community discussions held from July 2019.
Continue working with lake owners to develop an action plan for Lake Rotokakahi.	Due to information gaps an action plan isn't able to be completed at this stage. Progress has been made on filling the information gaps that will lead to more accurate modelling. Staff will make contact with the lake owners to discuss a future action plan as appropriate.
Develop an action plan for Lake Rotomahana if needed.	No action plan for Lake Rotomahana has been required as the TLI has not triggered the Natural Resources Plan target.

Policy, planning, communications and information technology as shown in 2017/2018 Annual Work Plan	Policy, planning, communications and information technology achievements 2017/2018
Continue with the implementation of the Te Tuapapa or ngā wai o Te Arawa - Te Arawa Values Framework that was adopted by the Programme Strategy Group in October 2015.	The focus has been on re-engaging with, and encouraging, hapū and iwi to be involved with and in some cases, take ownership of freshwater and land-based projects. Te Arawa Lakes Trust have been taking a bottom-up approach to embedding Te Tuapapa within their work and the Programme. Projects such as the cultural mapping project for lakes structures, the development of the Cultural Indicators Project for the Tarawera Lakes Catchment and the employment of a Community Engagement Coordinator are all projects undertaken by Te Arawa Lakes Trust (with funding from the Regional Council) as part of the implementation of Te Tuapapa. Staff training for Regional Council staff working the Programme, on Te Tuapapa is planned for October. This will be a pilot which can be rolled out more broadly once refined. Te Arawa Lakes Trust have made a three year funding request to the Programme to enable further work in this workstream, which is currently under consideration.
Implement the Communications Plan approved by the programme, with a focus on Integrated Framework, the RMA process in relation to the Lake Rotorua Nutrient Management package and raising the profile of the Programme.	Communications support has been provided for Plan Change 10, incentives scheme, Chair in Lake and Freshwater Science, messaging on maritime signage and the installation of a pipeline and pump to manage the water levels of Lake Ōkāreka. Programme Facebook page continues to grow in popularity with 1,981 likes and 193 following the Instagram page. E-Newsletters delivered quarterly and a presence at the Rotorua Home Show in July. A communications plan is in place and being implemented, this includes a refresh of the Programme's website and an advertising campaign covering Programme activities over summer.
Establish the Nutrient Discharge Management System for nutrient management across all lake catchments.	Phase One of the Nutrient Discharge Management System is now live and the development of Phase Two is underway, with a scheduled completion date of 21 December 2018. Phase Three is scheduled for completion by 30 June 2019. This system automates a significant part of nutrient allocation and management associated with the Rotorua Te Arawa Lakes.

Sewerage

Sewerage as shown in 2017/2018 Annual Work Plan	Sewerage achievements 2017/18
Complete the remaining sewerage connections at Brunswick/Rotokawa, Lake Rotorua.	Bay of Plenty Regional Council and Rotorua Lakes Council agreed on a strategy to implement the connections. A joint notice from RLC and BOPRC was sent to un-reticulated properties outlining their responsibilities and staff are working through the responses to these.
Commence with detailed design of the Wastewater Treatment Plant and the Rotoiti Sewerage Scheme.	Detailed design of the Rotomā/Rotoiti Wastewater Treatment Plant and Land Disposal System and the Rotomā reticulation system has been completed.
Start with the construction of Rotomā/Rotoiti Wastewater Treatment Plant, the Land Disposal System and Rotomā reticulation.	Construction of the Rotomā/Rotoiti Wastewater Treatment Plant and Land Disposal System and Rotomā reticulation is well underway. 2 km of the main pipeline has been installed along the Rotomā waterfront.
Start the detailed design of Rotoiti reticulation.	Trial for the Biolytix system is complete.
Lodge resource consent application for Rotorua Wastewater Treatment Plant, alternative disposal system.	The resource consent application was submitted to Bay of Plenty Regional Council 20 August 2018.
Continue community engagement at Rotoehu in relation to sewerage, with the aim of agreeing on preferred options.	The Rotoehu Project Steering Group continue to evaluate sewerage options for the community.

Rotorua Te Arawa Lakes annual water quality results

Introduction

The Regional Natural Resources Plan (RNRP) includes policies designed to manage the water quality of the 12 the Rotorua Te Arawa lakes. Each of these lakes has an objective Trophic Level Index (TLI) based on past water quality (RL O1 (Objective 11) of the RNRP). The TLI is a numerical index that represents the water quality aspirations of the regional community.

Monitoring programmes have been developed to identify changes in lake water quality and ecology. These include physio-chemical water quality monitoring to generate the TLI, algal monitoring with a focus on cyanobacteria, and macrophyte monitoring using the LakeSPI index.

The objective of this report is to update the annual TLIs for each of the lakes and compare values against the objectives set in the RNRP. The TLI is made up of four measures; Total Phosphorus, Total Nitrogen, Chlorophyll-a and Secchi depth (water clarity).

The table below summarises the TLI data for the Rotorua Lakes for the period July 2017 to June 2018.

Lake *Regional Water & Land Plan Objective* *TLI units*	3-yearly average TLI to 2018 *TLI units*	2013/14 Annual TLI *TLI units*	2014/15 Annual TLI *TLI units*	2015/16 Annual TLI *TLI units*	2016/17 Annual TLI *TLI units*	**2017/18 Annual TLI**	Lake Type *based on Trophic Status*	LakeSPI Condition 2016/2017[1]
Ōkaro **5.0**	4.9	4.5	4.6	4.6	4.9	5.2	Eutrophic	Moderate
Rotorua **4.2**	4.2	4.2	4.4	4.4	4.1	4.3	Eutrophic	Moderate
Rotoehu **3.9**	4.7	4.0	4.5	4.6	4.6	4.8	Eutrophic	Poor
Rotomahana **3.9**	4.1	3.8	4.0	4.0	4.0	4.2	Mesotrophic	High
Rotoiti **3.5**	3.6	3.4	3.7	3.8	3.8	3.9	Mesotrophic	Poor
Rerewhakaaitu **3.6**	3.8	3.4	3.3	3.4	3.5	4.0	Mesotrophic	Moderate
Okareka **3.0**	3.4	3.3	3.3	3.2	3.4	3.5	Mesotrophic	Moderate

Lake *Regional Water & Land Plan Objective* *TLI units*	3-yearly average TLI to 2018 *TLI units*	2013/14 Annual TLI *TLI units*	2014/15 Annual TLI *TLI units*	2015/16 Annual TLI *TLI units*	2016/17 Annual TLI *TLI units*	**2017/18 Annual TLI**	Lake Type *based on Trophic Status*	LakeSPI Condition 2016/2017[1]
Tikitapu **2.7**	2.8	2.8	2.9	2.9	2.6	2.9	Oligotrophic	Moderate
Ōkataina **2.6**	2.9	2.7	2.8	2.8	2.9	3.0	Oligotrophic	Moderate
Tarawera **2.6**	3.1	3.0	3.1	3.0	3.1	3.1	Oligotrophic	Moderate
Rotoma **2.3**	2.4	2.3	2.5	2.4	2.3	2.5	Oligotrophic	High
*Rotokakahi** ***3.1***	*3.7*	*3.6*	*4.0*	*3.7*	*3.8*	***3.7***	Mesotrophic	Moderate

Figure 2: Three yearly average TLI values, annual TLI, trophic status category and LakeSPI condition for the Rotorua Lakes

*Italicised figures are based on Te Wairoa Stream monitoring and a three-parameter TLI (no Secchi disk).

Monitoring of the of the 12 Rotorua lakes shows that:

- Lake Ōkaro exceeded its target TLI for first time in five years, most probably due to climatic influences.
- The TLI for Lake Rotorua moved to just above its RNRP objective, however cyanobacteria activity remained at a low level.
- Lake Rotoehu water quality continues to decline after almost reaching its TLI target in 2014. Severe cyanobacteria blooms were experienced for a prolonged period. Like Rotorua, Lake Rotoehu is vulnerable to climatic conditions and longer stratification events which were experienced throughout the summer.
- Lake Rotoiti TLI continued to increase since exceeding its target TLI in 2014. However, other indicators such as cyanobacteria biovolumes and oxygen depletion rate continue to show the lake has remained resilient to further degradation since the installation of the Ohau Channel diversion wall.
- In Lake Ōkāreka, increased phosphorus levels as a result of multiple rain events and rising lake levels are the biggest contributors to a further increase in the TLI. Despite this the oxygen depletion rate in the hypolimnion has improved.
- After a large improvement last year, the TLI in Lake Tikitapu increased back to 2015/2016 levels. Increased rainfall and a short stratification season influence this result.
- Lakes Ōkataina, Rerewhakaaitu, and Rotomahana all displayed an increase in annual average TLI. While these lakes have had stable TLI results over the previous decade, this year's increase is climate influenced.
- Lake Tarawera's TLI has been stable over the last four years, but has increased relative to TLI results prior to 2014. This is due to an increase in phosphorus levels.
- After a rapid decline until 2010, Lake Rotokakahi has shown improvement but continues to exceed its TLI target.

Lake Rotorua

The annual TLI moved from being just under the objective TLI (4.2 TLI units) to above the objective, at 4.3 TLI units. The three-year average TLI was 4.2. Total nitrogen and total phosphorus concentrations were up slightly on the previous year, as was chlorophyll-a concentration.

Several stratification events occurred from mid-December to early autumn. The most significant seems to have been over late January, lasting around a week.

Cyanobacteria levels remained relatively low, similar to the previous summer. Also, like the previous summer, orange alert levels occurred in late January early February, but red alert levels did not. Consequently, no cyanobacteria health warnings were issued for the lake.

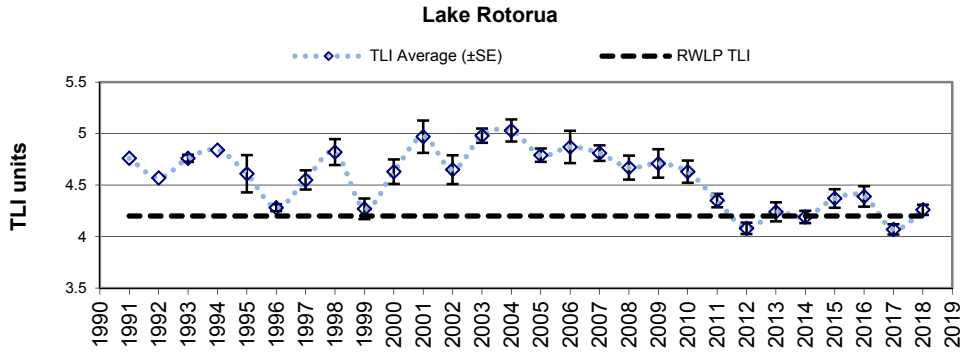

Figure 3: *Lake Rotorua annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Lake Rotoehu

A significant increase in total nitrogen and chlorophyll-a concentrations has caused Lake Rotoehu's annual average TLI to increase for the fourth year running. The TLI moved from 4.6 to 4.8. Both ammoniacal-nitrogen and dissolved reactive phosphorus also showed significant increases, peaking over the summer stratification event.

Strong stratification resulting in anoxia (low dissolved oxygen), occurred from early December through to early January, and then again from mid-January to mid-February. Both dissolved nitrogen and phosphorus appears to have been released from sediments at these times, resulting in increased chlorophyll-a concentrations

Cyanobacteria concentrations were at orange alert levels for much of the summer and into autumn, reaching red action levels from mid-January. Health warnings continued from the previous season and were only lifted in June 2018.

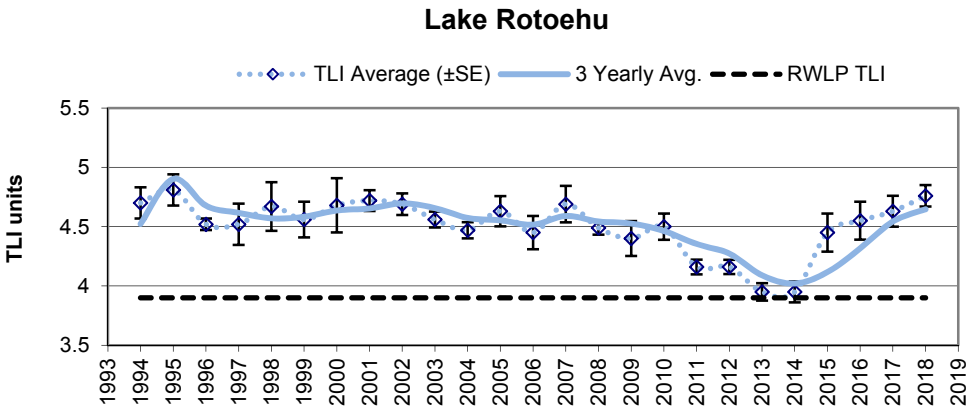

Figure 4: Lake Rotoehu annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Rotoiti

Lake Rotoiti's annual average TLI continues to increase since reaching its lowest recorded TLI in 2012/2013, remaining above its objective TLI of 3.5. The annual average TLI sits at 3.9 TLI units with a three-year average TLI of 3.8. This year's increase can be attributed mostly to an increase in chlorophyll concentrations and a decrease in water clarity. TP showed some improvement, while TN increased marginally.

Dissolved reactive phosphorus showed a slight decrease in the epilimnion, but dissolved nitrogen species showed a slight increase. Hypolimnetic oxygen demand has remained stable over the past six years.

Cyanobacteria biovolumes were relatively low, with the exception of Okawa Bay. Here, orange alert levels were reached in mid-January for one week and again in March for the entire month.

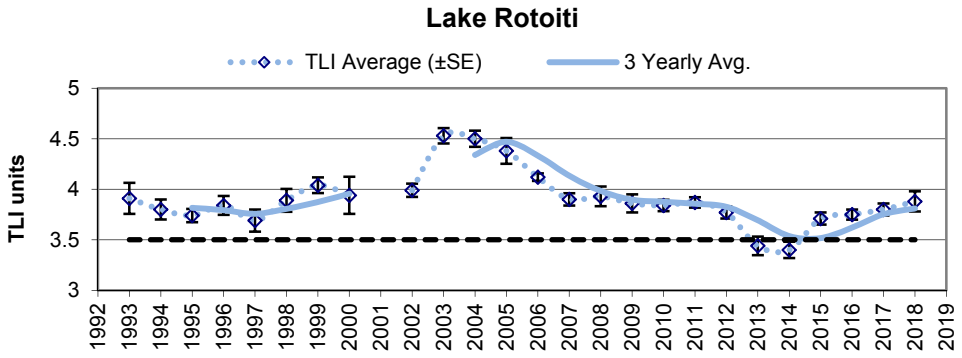

Figure 5: Lake Rotoiti annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Ōkāreka

Lake Ōkāreka's annual average TLI increased from 3.2 last year to 3.5 for 2017/2018. The three year annual average was 3.4 TLI units. The increase in the last two years has been primarily due to increases in chlorophyll-a and TP. TN decreased on average compared to last year.

Hypolimnetic oxygen levels did improve on the last two years, with a slower rate of oxygen consumption over the stratification period. Ammoniacal-nitrogen concentrations did increase in the hypoliminion over the stratification period, although dissolved reactive phosphorus and nitrate-nitrite-nitrogen did not. A dramatic increase in lake level over the year will have had some influence on nutrient concentrations, particularly an increase in particulate phosphorus.

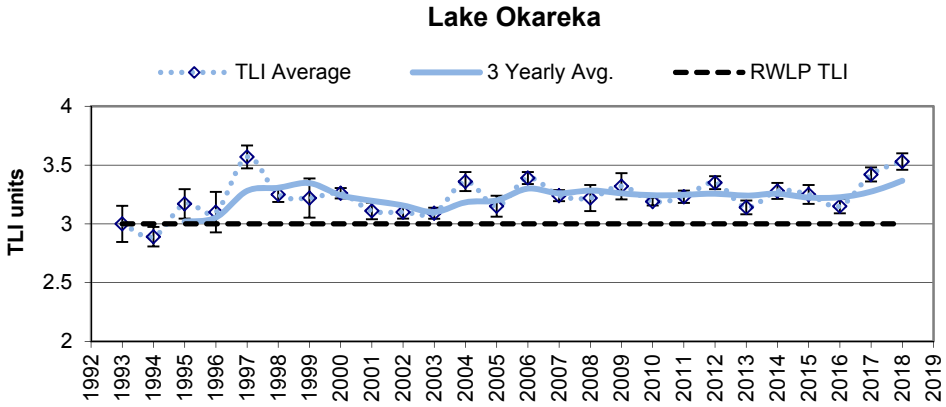

Figure 6: Lake Okareka annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Tarawera

The annual average TLI in Lake Tarawera remained the same as 2016/2017 at 3.1. The TLI remains almost 0.5 above the RNRP objective of 2.6, with the three year average at 3.1.

Like many of the other lakes, the chlorophyll-a annual average concentration increased compared to the previous nine years, with a corresponding decrease in water clarity. Both total and dissolved phosphorus concentrations decreased moderately compared to last year's annual average. Annual average nitrogen concentrations were similar to last year, with nitrate-nitrite-nitrogen showing an increase in both the epilimnion and hypolimnion. The annual average Secchi depth (water clarity) has increased compared to the previous five years.

Cyanobacteria biovolumes for the most part did not reach alert levels, with the exception of one sample taken near the Tarawera outlet (Te Tapahoro) which did reach the orange alert level in early February. No health warnings were posted over the 2017/2018 season.

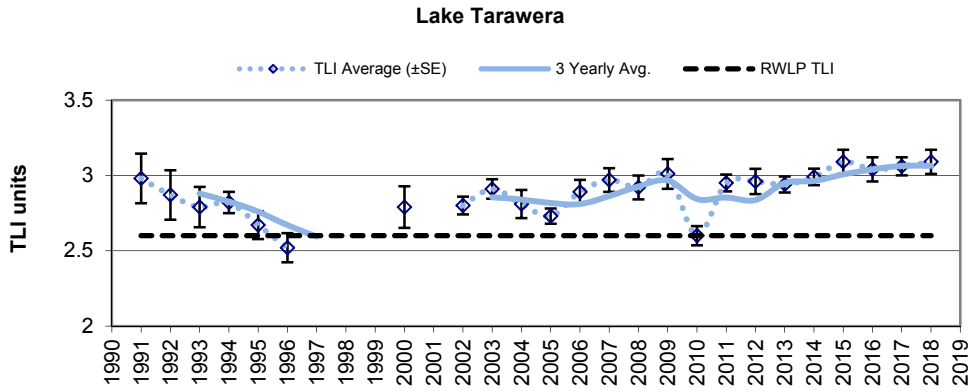

Figure 7: Lake Tarawera annual average and three year average TLI results, compared to the RNRP Objective TLI

Lake Okaro

Lake Ōkaro's annual average TLI for 2017/2018 increased above the RNRP objective of 5.0 TLI units, sitting at 5.2 TLI units. The three-year average TLI is at 4.9. The TLI has been progressively increasing since a noticeable improvement in 2013/2014. While all TLI parameters increased, the main increase was in the chlorophyll-a concentration, but with a notable increase also in total phosphorus. A marked increase in total and dissolved reactive phosphorus in the hypolimnion (bottom waters) is observed.

Water clarity was the lowest in five years, being on average half a metre less than last year.

Cyanobacteria were present at red action levels when summer monitoring began in November 2017, continuing into early January. Cyanobacteria biovolumes dropped off until mid-March then increased to near amber alert levels, tapering off again in late autumn.

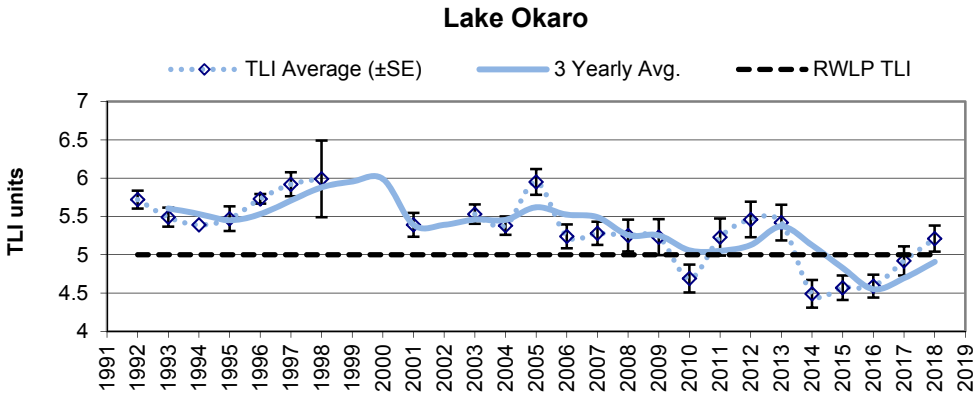

Figure 8: Lake Okaro annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Rotomahana

Lake Rotomahana's annual average TLI increased to over 4.0 (eutrophic classification) reaching 4.2 for the first time since monitoring began. This places the TLI above the RNRP objective of 3.9.

All TLI parameters, with the exception of TP, increased markedly. Secchi depth decreased at a time of increased chlorophyll-a concentrations. Dissolved reactive phosphorus (DRP) concentrations showed a slight decrease and ammoniacal-nitrogen was low. Nitrate-nitrite-nitrogen concentrations reached the highest annual average observed for this lake since observations begun, remaining elevated after winter turnover. This has impacted total nitrogen with the highest total nitrogen in eight years observed.

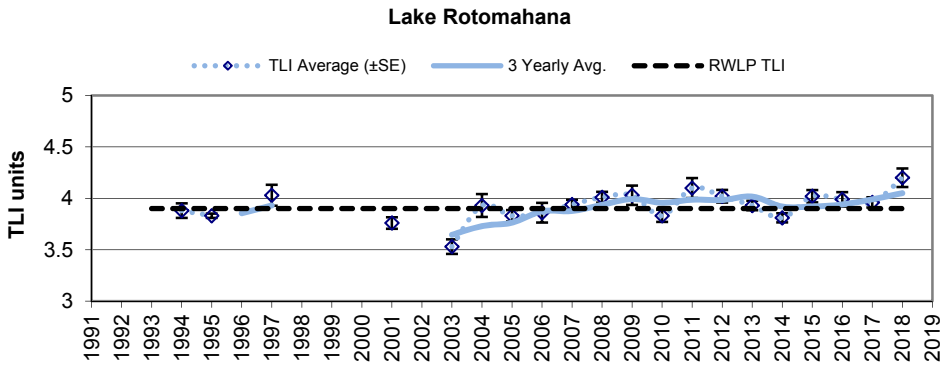

Figure 9: Lake Rotomahana annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Rerewhakaaitu

Lake Rerewhakaaitu's annual average TLI rose above the RNRP objective of 3.6 for the first time in six years. The annual average TLI for Rerewhakaaitu was 4.0 for 2017/2018 with the three year average at 3.6 TLI units.

Chlorophyll-a concentrations were the highest experienced in 17 years, with elevated nitrogen and a decrease in water clarity contributing to the elevated TLI result. Nitrate-nitrite-nitrogen levels were the highest recorded explaining the sudden increase in TN. TP also reached the highest recorded levels, although DRP concentrations remained stable, possibly due to uptake from increased algae. Water clarity did decrease by over two metres on average, probably due to the higher phytoplankton concentrations experienced over the summer, and possibly increased runoff from rain events. Lake level was the highest recorded since 1991, with a 0.5 metre increase recorded in late April 2018 in under 48 hours.

Several sustained stratification events can be observed at 15-minute intervals in data collected by the monitoring buoy. The first event occurred in late December extending to mid-January, and then again in late January and may have extended to early March, although there was several weeks over this period where the buoy was not operating. During this time anoxia has occurred and there was an observed increase in ammoniacal-nitrogen presumably as a result of sediment release during reducing conditions.

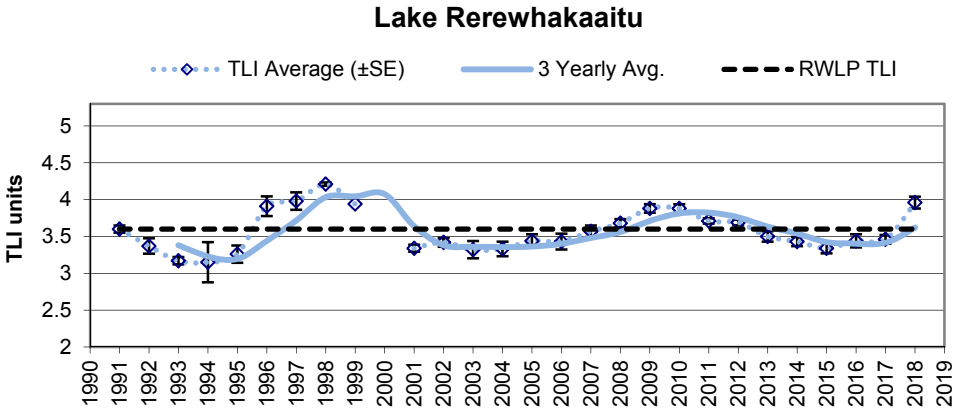

Figure 10: Lake Rerewhakaaitu annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Tikitapu

Lake Tipitapu's annual average TLI increased to 2.9 from 2.6 in 2016/2017. The three-year average TLI moved to 2.8.

Chlorophyll-a average annual concentrations increased to the highest recorded, primarily thanks to a late winter turnover in 2017 and an early one in 2018. Phosphorus also increased to levels similar to those experienced in 2011/2012, which was also a time of increased lake level. Total nitrogen displayed a decrease in the annual average, but there was decrease in water clarity (Secchi depth).

Ammoniacal-nitrogen concentrations increased in the hypoliminion over the stratification period, although dissolved reactive phosphorus and nitrate-nitrite-nitrogen did not. The dissolved oxygen depletion rate in the hypolimnion declined after an elevated depletion rate was observed in the previous year.

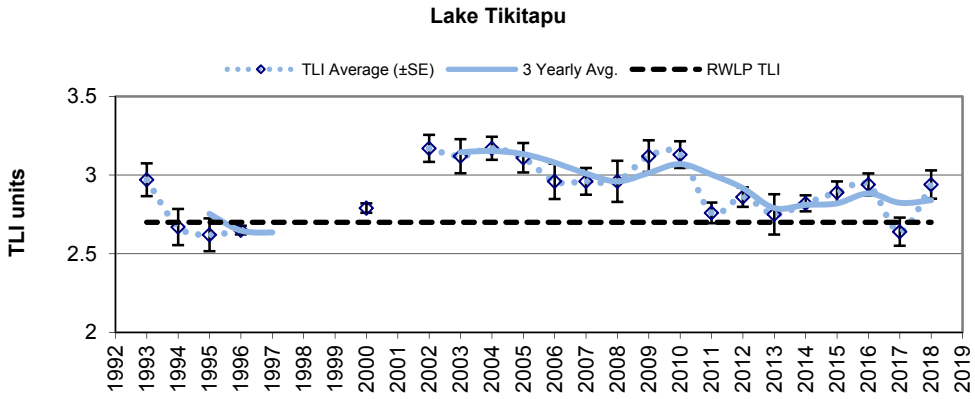

Figure 11: Lake Tikitapu annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Okataina

Lake Ōkataina's annual average TLI increased from the previous five years sitting at 3.0 compared with 2.9 last year. The three-yearly average TLI was 2.9.

Average annual chlorophyll-a concentrations were one of the highest recorded, in part due to a winter peak in 2017 after winter turnover. This corresponds to one of the lowest annual average water clarity measures made in 15 years of monitoring. Both nutrients that make up the TLI decrease slightly compared to the previous two years.

Annual average phosphorus concentrations remain elevated in the lake, and nitrogen remains stable. The oxygen depletion rate increased on previous years, but there was no increase in dissolved nutrients occurring in the hypolimnion compared to the previous year.

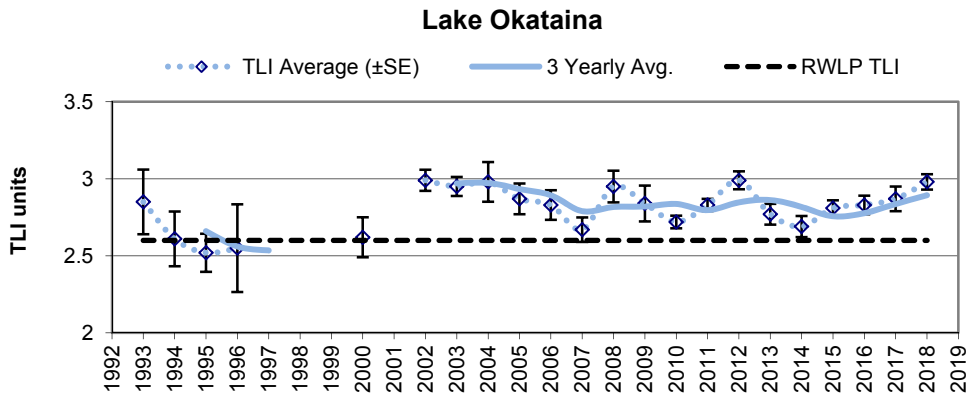

Figure 12: Lake Okataina annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Rotomā

Lake Rotomā's annual average TLI increased compared to last year to be 0.2 TLI units above its RNRP objective of 2.3, sitting at 2.5. The three-year average TLI was to 2.4.

The increase in TLI was driven by increases in phosphorus and chlorophyll-a levels, and an almost 2 metre decrease in annual average water clarity. Total nitrogen remained stable, although ammoniacal-nitrogen in the hypolimnion was the lowest annual average recorded. This may due to the notably shorter stratification season, which also saw the dissolved oxygen depletion rate improve (decrease) compared to last year's result.

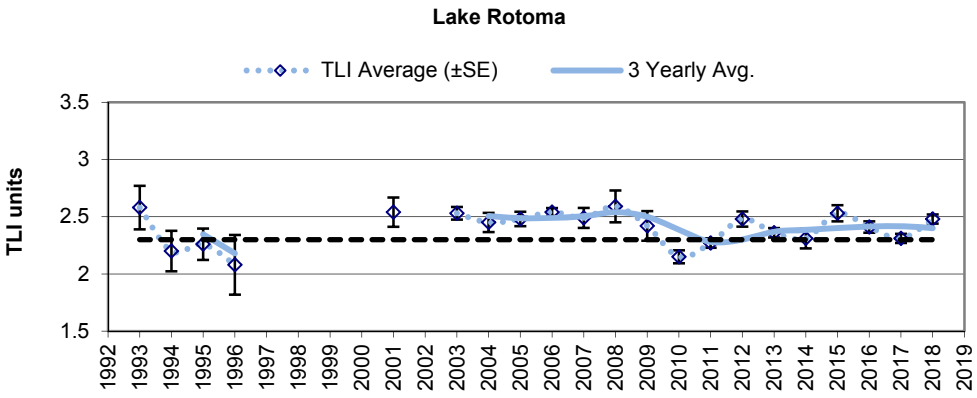

Figure 13: Lake Rotoma annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Rotokakahi

The 2017/2018 TLI measured at Lake Rotokakahi (at the outflow) remains steady at 3.7, slightly reduced from last year's result of 3.8. The TLI still remains well above its RNRP objective of 3.1. The three year average TLI for 2017/2018 (as measured by TP, TN and chlorophyll-a) was 3.7.

Phosphorus concentrations remain stable (dissolved and total), with total nitrogen decreasing. The decrease in the TLI is mainly due to a decrease in chlorophyll-*a* concentrations over the year.

No cyanobacteria blooms were observed over the summer months.

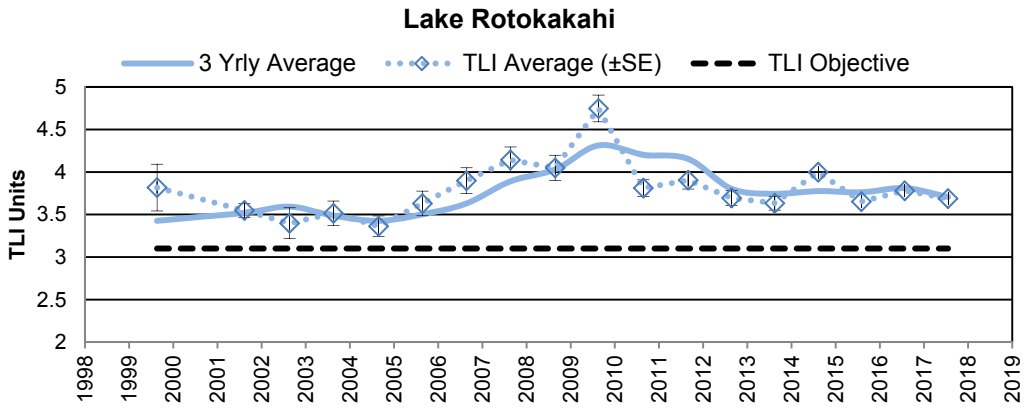

Figure 14: *Lake Rotokakahi annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Annual Plan of Interventions – Deed Funded Lakes

Lake Rotorua

To meet community expectations for water quality in Lake Rotorua, nitrogen inputs must not exceed 435 tonne annually. This limit is set in the Bay of Plenty Regional Policy Statement.

The annual Trophic Level Index (TLI) for Lake Rotorua has moved from being just under the objective TLI of 4.2 to above the objective at 4.3 TLI units.

To achieve the objective TLI of 4.2 for Lake Rotorua, the programme is undertaking both short-term and long term interventions. Phosphorus locking (alum dosing) is a short-term intervention to help lower the lake TLI while long term interventions take effect. The lake will decline again if alum dosing is not carried out annually and this is not considered a long term solution to lake water quality. The solution to sustainable improvements is long term reduction of nutrients entering the lake, i.e. the Integrated Framework and Engineering Solutions, detailed as follows.

Planned and completed activities – Lake Rotorua

Project	Deed funded	Total target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Gorse	Yes	30 t (Reduction of nitrogen entering the lake)	4.0 t N	0.41 t N	Staff are continuing to work with the owners of eligible gorse blocks to promote the Lake Rotorua Gorse Programme. There are two agreements currently under negotiation which, if successful, will result in the removal of 120 ha of gorse from the catchment. However, the requirement for a 999 year encumbrance to be registered on land titles is proving to be a disincentive for some Maori owned land and this is slowing progress. A new implementation policy for this project was adopted during the year which identified that less gorse is present in the catchment than originally estimated. Consideration is being given to alternative options for securing nitrogen as part of the engineering solutions project.	**Budget** $547 **Spend** $118	
Rotorua Wastewater Treatment Plant – alternative disposal site	No	N/A	N/A	N/A	The resource consent application was submitted to Bay of Plenty Regional Council 20 August 2018.	**Budget** $0 **Spend** $0	N/A
Brunswick /Rotokawa sewage Connections	Yes	0.67 t N 0.553 t P	0.67 t N 0.553 t P	0 t N 0. t P	All unconnected properties have been written to and staff are working through the responses to that letter with relevant landowners.	**Budget** $320 **Spend** $30	

Project	Deed funded	Total target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Completed Lake Rotorua reticulation	Yes	9.74 t N 0.3 t P	9.74 t N 0.3 t P	9.74 t N 0.80 t P	Previously completed, reductions achieved annually.	**Budget** $0 **Spend** $0	N/A
Incentives	Yes	100 t N (Reduction of nitrogen entering the lake)	18.0 t N	11.36 t N	The Incentives Scheme has secured deals of around 20 tonnes of Nitrogen. Existing agreements continue to be implemented as per agreement conditions. Total reductions achieved to date through Incentives 18.89 t N to be put into effect over the next 4 years as activation dates fall due within the individual agreements.	**Budget Payments** $6,000 **Spend Payments** $1,477 **Budget Administration** $500 **Spend Administration** $444	
Tikitere Zeolite Plant	Yes	20-25 t N 0.0 T P	N/A	N/A	Detailed design and costs have been completed. Construction has been pushed out to 2019/2020 in the Regional Council's draft Long Term Plan. However, due to build cost and ongoing annual operational costs the project isn't likely viable.	**Budget** $684 **Spend** $833	

Project	Deed funded	Total target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Further engineering solutions	Yes	25-30 t N 0.0 t P	N/A	N/A	This project stalled in the first half of the financial year due to staff priorities in Plan Change 10 and related activities. Staff are currently working to get this project back on track so appropriate actions can be implemented for the 2022 deadline. The main opportunities for this are wetlands.	**Budget** $0	
Landowner support under PC10: Advice and Support Service	Yes	N/A	N/A	N/A	To date, 143 landowners have engaged with Advice and Support. There are 94 properties over 40 ha in area in the Lake Rotorua Catchment which require a resource consent this year and, of these, 87 are engaged with Advice and Support. Previously finalised Nutrient Management Plans (NMPs) are currently being re-worked to incorporate a greater emphasis on on-farm phosphorous mitigations as a result of the Commissioners' decisions on Plan Change 10. When completed, landowners will be able to use their NMP to support their application for resource consent.	**Advice and Support Budget** $501 **Spend** $337	
Landowner support under PC10 Low Nitrogen Land Use Fund	Yes	N/A	N/A	N/A	The first round of funding has been completed. Strategy Group have approved the second round plus an education campaign and these are being implemented.	**Budget** $501 **Spend** $194	
Phosphorous locking (Utuhina and Puarenga)	Yes	As required	As required	9.13 t P	Ongoing dosing maintained the lake total phosphorus within the range required.	**Budget** $750 **Spend** $720	

Project	Deed funded	Total target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Lake Rotorua Regional Water and Land Plan – Proposed Plan Change 10	No	140 t N (Reduction of nitrogen entering the lake)	NA	NA	Commissioner's decision released in August 2017. Appeals to that decision received and Environment Court hearing scheduled as detailed above. Plan Change has legal effect and is now being implemented with first consents granted.	**Budget** $0	
Nutrient Agreements (not Incentives Scheme)	No	N/A	3.9 t N 0.07 t N	1.23 t N 0.08 t P	Historical agreements in effect, nutrient reductions realised annually. Changes to versions of Overseer, density analysis 2001-2004 and applying in lake ratio means less nitrogen gains than originally reported.	**Budget** $0	N/A
			Total t N **Total t P**	**22.74 t N** **10.01 t P**	**Total budget 2017/2018** **Total expenditure 2017/2018**	**$9,804** **$4,154**	

Lake Rotoehu

To meet community expectations for water quality in Lake Rotoehu, a reduction of 8.9 tonne of nitrogen and 0.708 tonne of phosphorus is required on an annual basis.

The annual TLI for Lake Rotoehu has increased from 4.6 in 2016/2017 to 4.8 in 2017/2018. A significant increase in total nitrogen and chlorophyll-a concentrations has caused this increase.

Short term interventions of alum dosing have been put on hold due to inefficiencies. A Technical Advisory Group workshop is planned for late 2018 to establish next steps for Lake Rotoehu alum dosing. Another short term intervention, weed harvesting, progresses when required but due to little weed growth no weed harvesting was undertaken in the reporting period. A potential long term intervention for Lake Rotoehu is a sewerage scheme. Rotoehu Steering Group are in the process of evaluating options for the Rotoehu community.

Planned and completed activities – Lake Rotoehu

Project	Deed funded	Total target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Land use and land management change	Yes	6.6 t N 0.46 t P	8.45 t N 0.8 t P	8.45 t N 0.8 t P	Change completed previously, benefits realised annually. Figures reported are at the root zone.	**Budget** $0 **Spend** $0	N/A
Weed harvesting	Yes	3.5 t N 0.0 t P	3.5 t N 0.0 t P	0 t N 0 t P	Weed Harvester wasn't operational this season due to an algal bloom which inhibited weed growth.	**Budget** $100 **Spend** $39	

Project	Deed funded	Total target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Phosphorus locking	Yes	As required	As required	0 t N 2.00 t P	Research on p-locking in Lake Rotoehu has indicated that lake weed growth may be limiting the effectiveness of p-locking. Staff are investigating options to improve locking efficiency. A special WQTAG workshop is planned to address this matter. Alum dosing has been suspended until the workshop is completed. Resource consent application will need to be made during 2018/2019 to cover expiry of old consent.	**Budget** $136 **Spend** $134	
			Total t N **Total t P**	**8.45 t N** **2.8 t P**	**Total budget 2017/2018** **Total expenditure 2017/2018**	**$236** **$175**	

Lake Rotoiti

To meet community expectations for water quality, Lake Rotoiti needs a reduction of 130 tonne of nitrogen and 19 tonne of phosphorus.

Lake Rotoiti's annual average TLI continues to increase and now sits at a TLI of 3.9. Phosphorus levels have shown some improvement, while Nitrogen increased marginally.

The Ohau Diversion Wall has been in place since 2008 to help improve water quality by diverting Lake Rotorua nutrients from Lake Rotoiti while long term nutrient reductions into Lake Rotorua are achieved. A structural management plan for the Wall was has been finalised, with structural components being installed during 2018/19. Construction of the Wastewater Treatment Plant and Land Disposal system for the Gisborne Point/Hinehopu area is well underway and commissioning is expected later in 2018/19. This will complete sewerage reticulation for Rotoiti.

Planned and completed activities – Lake Rotoiti

Project	Deed funded	Total target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Sewerage reticulation Curtis Road to Hinehopu	Yes	4.9 t N 1.1 t P	0 t N 0 t P	0 t N 0 t P	Construction of the Rotomā/Rotoiti Wastewater Treatment Plant and Land Disposal System is well underway. Biolytix system trial is complete.	**Budget** $4,920 **Spend** $3,093	
Ohau diversion wall	Yes	150 t N 15 t P	150.0 t N 15.0 t P	150 t N 15 t P	Structural management plan has been finalised with structural components to be installed in 2018/2019 financial year. Four fish passes have been installed. Staff are working with iwi to undertake restoration works in the Ōhau Channel area.	**Budget** $514 **Spend** $22	

Project	Deed funded	Total target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Completed Rotoiti reticulation: Okere, Otaramarae, Whangamarino, Mourea, Okawa Bay	Yes	9.3 t N 0..78 t P	5.82 t N 0.48 t P	5.82 t N 0.48 t P	Completed reticulation for 62% of households – reduction ongoing annually. Construction of remaining reticulation underway as identified above.	**Budget** $0	
			Total t N **Total t P**	**155.82 t N** **15.48 t P**	**Total budget 2017/2018** **Total expenditure 2017/2018**	**$5,434** **$3,115**	

Lake Ōkāreka

To meet community expectations for water quality annual nutrient reductions of 2.5 t nitrogen and 0.08 t of phosphorus are required.

While all the previously planned actions for Lake Ōkāreka are complete, the lake hasn't reached its target TLI of 3.0 and has seen an increase over the last two years.

A project was undertaken to audit the current nutrient discharges from properties in the catchment and ensure they are complying with their nutrient Benchmark. The audit has identified that all but one property is complying with its Benchmark. Support has been offered to that property. Incentives for further land use change in the catchment have been offered to all owners of sufficient land and staff are negotiating with interested parties. Professor Hamilton from University of Waikato presented modelling progress results to the community in March. Monitoring is still ongoing.

Completed activities – Lake Ōkāreka

Project	Deed funded	Total target	Annual target	Annual reduction achieved	Update	Budget $000	Project status
Sewerage scheme	Yes	2.83 t N 0..23 t P	2.83 t N 0.3 t P	2.83 t N 0.23 t P	Reticulation complete, nutrient reductions recognised annually.	**Budget** $0	N/A
Previous land use change	Yes	1.18 t N 0.22 t P	1.18 T N 0.22 T P	1.18 t N 0.22 t P	Land use change complete, nutrient reductions recognised annually. Negotiations are underway to increase nutrient reduction to Lake Ōkāreka through further land use change. These figures are reported at the root zone.	**Budget** $0	N/A
Lake Ōkāreka land use change	Yes	NA	NA	NA	Following an audit all but one property has been found to be compliant with its Benchmark. All large property owners have been approached and offered funding to convert pasture to trees, as a result staff are negotiating a further 50 ha of mānuka planting which will replace gorse and pasture. This represents 50% of the current land use change target.	**Budget** $50	
			Total t N **Total t P**	**4.01 t N** **0.45 t P**	**Total budget 2017/2018** **Total expenditure 2017/2018**	**$50** **$35**	

Te Tuapapa o ngā Wai o Te Arawa/Te Arawa Cultural Values Framework

Te Tuapapa o nga wai o Te Arawa (Te Tuapapa) is a high level cultural values framework that describes the relationship between Te Arawa and the Te Arawa Lakes. It provides a framework to ensure that Te Arawa values are reflected in the management and restoration of the lakes.

The focus during 2017/2018 has been on re-engaging with, and encouraging, hapū and iwi to be involved with, and in some cases, take ownership of projects. We have been taking a bottom-up approach to embedding Te Tūāpapa within the work that we do. The Regional Council has also funded a number of projects to support the implementation of Te Tuapapa.

Stronger working relationships with hapū and iwi in relation to:	• Statutory responsibilities - lake structure consent renewals, wastewater projects, Plan Changes 9 and 10 to the Regional Water and Land Plan, Te Arawa Freshwater Fisheries Regulations (released January 2018). • Progressing a cultural mapping project, associated with lake structure consent renewals (Lakes Rotorua, Rotoma and Rotoehu). • Environmental enhancement projects: ▪ Support to Ohinemutu Pā (Te Kōmiro o Utuhina) residents to progress clean-up of Lakefront and Utuhina Stream. ▪ Engagement with Mokoia Island Trust Board and erosion control project for Hinemoa's pool – Waikimihia. ▪ Connecting Rotorua Lakes Council and Otaramarae Trustees regarding lakes access to Rotoiti. ▪ Support to Ngati Ngararanui regarding restoration of the Waiteti Stream.
Bringing hapū and iwi together:	• Establishment of a Te Arawa Kaitiaki/Hunga Tiaki Forum as a way of bringing the Trust, iwi and hapū together to share, learn and build capacity. Two wānanga were held 2017 with a further two planned for 2018. • Establishment of a Te Arawa Climate Change (Technical) Working Group. It is intended that a Te Arawa Freshwater (Technical) Working Group will be established in 2018. • Developing the methodology and programme for a cultural health assessment of all lakes within the Tarawera System. An action in the Tarawera Lakes Restoration Plan.

Communicating our values and technical information in a useful, visual and meaningful way:	• Development of information sheets for each lake – uploaded to the Trust's website. • Increased use of Facebook as our primary method of sharing information. • Development of an Iwi Management Plan for the Trust. Discussion document completed and released. • Employment of Te Hunga Hika ahi – Hapori (Community Action Coordinator) for the Catfish reduction programme. Funded by the Bay of Plenty Regional Council's Biosecurity Activity.
Identifying opportunities to apply a collective impact model to our work:	• Working with hapū to identify river and wetland restoration projects for Lake Rotorua. • Sowing the seed to apply a collective impact model for Tarawera 8 Lakes System. Interest from Maori landowners with regards to pest control, biodiversity enhancement, water quality improvement.
Supporting research projects:	• PhD student Tracey Takuira is researching the impacts of land use and nutrients on wetlands and how this effects kuta – a traditional weaving material found in wetlands. • Scion scientist Marie Joo Guen is undertaking research around contaminant filtering in the lakes. • A joint project with Ngati Tarawhai regarding a fisheries-related project within Lake Okataina has been funded by WaiOra. • Scion and the Te Arawa Lakes Trust have secured funding for a research project to support development of a Te Arawa Climate Change Strategy for the Te Arawa Climate Change Working Group • Support to Waikato University for a research project that seeks to understand how to prevent catfish eating koura.

Annual Plan of Interventions - Non-Deed Funded

Work has continued on the non-deed lakes to protect and enhance their water quality. Action plans for these non-deed funded lakes are all in various stages of formation and implementation. The implementation of the National Policy Statement for Freshwater Management (NPS-FM) process has commenced with a stocktake of the information collected previously for these lakes. This will inform upcoming policy development for these lakes.

Lake Tarawera

Lake Tarawera	Lake Tarawera achievements 2017/2018
Action 1 – Wastewater management	The Tarawera Sewage Steering Committee has secured funding from the Government's Freshwater Improvement Fund. However, further funding will need to be secured to enable the scheme to go ahead and the Committee is currently pursuing this. The planning process of the Scheme has continued in anticipation of further funds becoming available. The preferred option is currently to connect the reticulation at Tarawera to the Ōkāreka scheme, taking it back to the Rotorua Wastewater Treatment Plant. To ensure that the benefits of the large investment in this Scheme are maintained, a 'hold the line' style rule will be required in the Tarawera Catchment and is being investigated as part of region wide work on the NPS-FM.
Action 2 and 4 – Farm Environment Plans for inner and outer catchment farms: Lakes Ōkaro, Rerewhakaaitu, Rotokakahi and Rotomahana	A partnership project including the local farming collective - Project Rerewakaiitu, Fonterra and Beef and Lamb New Zealand is currently making excellent progress in establishing Farm Environment Plans for larger farms in the inner and outer catchment of Lake Tarawera. Farmer uptake is voluntary but despite this, only three farmers have declined to take part, 31 dairy farms and 18 drystock farms now having plans. A final project report and presentation to famers for direction on next steps is pending.
Action 3 – Control of nitrogen fixing plants	14.7 ha of Acacia control was carried out for 17 weeks around Lake Rotomahana's Isthmus Track. This project remains a successful and practical project run in conjunction with the local people and providing local employment. Funding has also been provided this year by Te Ariki Trust.
Action 5 – Limit on land use change	A regional water quality plan change is being scoped, taking into account the need for a 'hold the line' approach across many of the water bodies in the region, including Lake Tarawera. This is also dependent on the direction of the new Government, this being a key interest of theirs.

Lake Tarawera	Lake Tarawera achievements 2017/2018
Action 6 – Groundwater modelling	This work is underway by the University of Waikato and is expected to be completed later in 2018.
Action 7 – Cultural health assessment	This project is being led by Te Arawa Lakes Trust. Currently developing the methodology and programme for a cultural health assessment of all lakes within the Tarawera System.

Lake Ōkaro

Lake Okaro	Lake Okaro achievements 2017/2018
Action Plan	Water quality in Lake Okaro has fluctuated over the last 10 years. All actions in the action plan have been completed. The lake reached its target TLI in 2010, 2014, 2015, 2016 and 2017. The target of 5.0 is still classified as a eutrophic lake and as such, algal blooms are likely to be a regular annual feature.
Lake modelling – University of Waikato	The University are assisting with modelling land use scenarios and the effect on lake water quality. This project has been delayed due to other priorities.

Lake Rotomā

Lake Rotomā	Lake Rotomā achievements 2017/2018
Sewerage reticulation	Construction of the wastewater treatment plant and reticulation is well underway. The resource consent application for the Land Treatment System has been submitted to Bay of Plenty Regional Council.
Forest harvesting effects investigations	The harvest operation has been completed. More detailed results will be available at the completion of the monitoring project in December 2019.

Lake Rotokakahi

Lake Rotokakahi	Lake Rotokakahi achievements 2017/2018
Action Plan	This lake is privately owned, more information has been collected to help inform an action plan for the lake. Staff will progress with the owners whether an action plan is necessary.

Lake Tikitapu

Lake Tikitapu	Lake Tikitapu 2017/2018
Sewerage reticulation	Sewerage reticulation has been completed for Lake Tikitapu in 2010. No further work has been required for the Lake this financial year.

Financials

This section provides financial information as per the Deed of Funding with the Ministry for the Environment. The information contained here aligns with the content of the Annual Plan 2017/2018 for both Rotorua Lakes Council and Bay of Plenty Regional Council.

Rotorua Te Arawa Lakes Programme - Report B

Draft - Financial Progress Statement - Annual Report 2017/18 (July to June 2018)

Interventions	(A) Council Annual Plan Budget	(B) Actual year to date expenditure	(B - A) Variance to date over/(under) spend	Provision for signed agreement not yet released	(B / A) Actual progress to date	Intervention Financial progress indicator	Financial status to date	Intervention project progress indicator	(D) Council funding excluding Crown grants (50% of B)	(E) Approved Crown funding 2017/18	(F) Crown funding received to date	(G) = (B - D) 50% Crown funding applied to date	(H) Reserve interest accrued	(I) Other funding sources	(J) 2017/18 Agreements Provision	
	Funding deed clause 5.4.1								5.4.2 (a) Note 1	5.4.2 (b) / 5.2.2 (d)			5.4.2 (c)	5.4.2 (d) Note 2		
Lake Rotoehu	$000	$000	$000	$000	%				$000	$000	$000	$000	$000	$000	$000	
Weed Harvesting	100	39	(61)	0	39%		At risk		20	50	25	20	0	0	0	Change Request CR060 underspend of $90,000 approved by PSG 3 April 2018. Since that time contract for harvester renegotiated to pay retainer to operator, also maintenance costs and vessel manual update costs.
Land Management Change	0	0	0	0					0	0	0	0	0	0	0	
Phosphorus Locking Soda Springs	136	134	(2)	0	98%		On track		67	68	68	67	0	0	0	
Aeration	0	1	1	0					1	0	0	1	0	0	0	
Sediment	0	1	1	0					1	0	0	1	0	0	0	
Wetlands	0	0	0	0					0	0	0	0	0	0	0	
Total Lake Rotoehu	**236**	**175**	**(61)**	**0**					**88**	**118**	**93**	**88**	**0**	**0**	**0**	
Lake Ōkāreka																
Sewerage Reticulation	0	0	0	0					0	0	0	0	0	0	0	
Land Management Change	50	35	(15)	0	71%		Moderate risk		18	0	25	18	0	0	0	Change Request 58 approved to include budget as approved in 206 Strategy Group Report. Expenditure on Benchmark auditing only, agreements still pending.
Outlet Structure	0	0	0	0					0	0	0	0	0	0	0	
Total Lake Ōkāreka	**50**	**35**	**(15)**	**0**					**18**	**0**	**25**	**18**	**0**	**0**	**0**	
Lake Rotorua																
Advice and Support	501	337	(165)	0	67%		At risk		168	251	251	168	0	0	0	Advice and Support on track with all willing landowners over 40 ha now enrolled. Change request?
Phosphorus Locking	750	720	(30)	0	96%		On track		360	375	375	360	0	0	0	
Tikitere Diversions	684	833	149	0	122%		Moderate risk		417	342	342	417	0	0	0	Overspent at year end due to design, costing and preparation works being ahead of schedule. Change request?
Gorse	547	118	(430)	0	21%		At risk		59	274	137	59	0	0	0	Less gorse available for conversion than originally estimated. Change request?
Wetlands	0	0	0	0					0	0	0	0	0	0	0	
Land Incentive Payments	6,000	1,477	(4,523)	2,698	70%		Moderate risk		739	3,000	1,018	739	0	0	0	Less agreements signed/paid than budgeted. Change request?
Land Incentive Board Administration	500	444	(56)	0	89%		On track		222	250	251	222	0	0	0	Change request?
Low Nutrient Land Use Fund	501	194	(307)	0	39%		At risk		97	251	126	97	0	0	0	Underspent due to key staff member on maternity leave during period. Significant work/expenditure occurring now. Change request?
Sewerage Reticulation	320	30	(290)	0	9%		At risk		15	160	0	15	0	0	0	
Total Lake Rotorua	**9,804**	**4,154**	**(5,650)**	**2,698**					**2,077**	**4,902**	**2,499**	**2,077**	**0**	**0**	**0**	
Lake Rotoiti																
Sewerage Reticulation	4,920	3,093	(1,827)	0	63%		At risk		1,547	2,460	0	1,547	0	0	0	Underspent due to the delay in agreement with land owners (lease from Maori Trust), which setback the start date for construction of the treatment plant.
Ohau Wall Reconsenting	514	22	(492)	0	4%		At risk		11	257	128	11	0	0	0	Underspent due to environment court hearing for reconsenting not required. Change request?
Total Lake Rotoiti	**5,434**	**3,115**	**(2,319)**	**0**					**1,558**	**2,717**	**128**	**1,558**	**0**	**0**	**0**	
Rotorua District																
Treatment and Disposal	0	0	0	0	0%		At risk		0	0	0	0	0	0	0	
Total Rotorua District	**0**	**0**	**0**	**0**					**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Total Programme by Council																
Rotorua Lakes Council	5,240	3,123	(2,117)	0					1,562	2,620	0	1,562	84	0	0	
Bay of Plenty Regional Council	10,284	4,356	(5,928)	2,698					2,178	5,117	2,745	2,178	48	0	0	
	15,524	**7,479**	**(8,045)**	**2,698**					**3,740**	**7,737**	**2,745**	**3,740**	**132**	**0**	**0**	
Total Programme Expenditure	**15,524**	**7,479**	**(8,045)**	**2,698**					**3,740**	**7,737**	**2,745**	**3,740**	**132**	**0**	**0**	

Indicator Key		
Less than 20%		On track
Between 21 - 29%		Moderate risk
Greater than 30%		At risk

Programme reserve account interest accrued

5.4.2 (a) Note 1: Funding detail - Council (includes provision)		
RLC general funding	1,562	2,620
RLC reserve	1,562	84
BoPRC reserves	3,527	0
BoPRC targeted rates	1,764	0
BoPRC general funding	1,764	0
Total funding detail - Council	**10,177**	**2,704**
5.4.2 (b) Note 2: Funding detail - any other source	0	0
Miscellaneous income	**0**	**0**
Total funding from any other source		

Rotorua Te Arawa Lakes Programme - Report C

Draft - CFO Forum Financial Detailed Statement - Annual Report 2017/18 Year End

Clause 5.2 / 5.4.2 (e) Interventions	(A) Council Annual Plan Budget	(B) Actual expenditure to date 2017/18	(C) Remaining forecast expenditure to year end	D = (B+C) 5.2.2 a Total actual + forecast expenditure to year end 2017/18	E = (A-D) Forecast variance to Annual Plan over/(under) spend 2017/18	Provision for signed agreement not yet released	Year end forecast under/overspend status	(F) Council funding 5.2.2 C (i) Council funding	Council reserve	(G) Crown Funding 5.2.2 D Forecast Annual Work Programme Crown Funding 2017/18	Programme reserves MfE surplus / (deficit)	Reserve interest received	(H) Funding from any other sources	(I) = (F-G) Total funding required	(J) = (A-I) Total Programme over/(under) spend	2016/17 Opening reserve balance commitment	5.4.2 (e) Forecast funding committed to deferred works
Lake Rotoehu	$000	$000	$000	$000	$000	$000		$000	$000	$000	$000	$000	$000	$000	$000	$000	$000
Weed Harvesting	100	39	0	39	(61)	0	Underspend	10	10	25	5		0	39	(61)	0	0
Land Management Change	0	0	0	0	0	0		0	0	0	0		0	0	0	0	0
Phosphorus Locking Soda Springs	136	134	0	134	(2)	0	Underspend	33	33	68	1		0	134	(2)	0	0
Aeration	0	1	0	1	1	0		0	0	0	(1)		0	1	1	0	0
Sediment capping	0	1	0	1	1	0		0	0	0	(1)		0	1	1	0	0
Wetlands	0	0	0	0	0	0		0	0	0	0		0	0	0	0	0
Total Lake Rotoehu	**236**	**175**	**0**	**175**	**(61)**	**0**		**44**	**44**	**93**	**5**		**0**	**175**	**(61)**	**0**	**0**
Lake Ōkāreka																	
Sewerage Reticulation	0	0	0	0	0	0		0	0	0	0		0	0	0	0	0
Land Management Change	50	35	0	35	(15)	0	Underspend	9	9	25	7		0	35	(15)	0	0
Outlet Structure	0	0	0	0	0	0		0	0	0	0		0	0	0	0	0
Total Lake Ōkāreka	**50**	**35**	**0**	**35**	**(15)**	**0**		**9**	**9**	**25**	**7**		**0**	**35**	**(15)**	**0**	**0**
Lake Rotorua																	
Advice and Support	501	337	0	337	(165)	0	Underspend	84	84	251	82		0	337	(165)	50	0
Phosphorus Locking	750	720	0	720	(30)	0	Underspend	180	180	375	15		0	720	(30)	0	0
Tikitere Diversions	684	833	0	833	149	0	Overspend	208	208	342	(75)		0	833	149	0	0
Gorse	547	118	0	118	(430)	0	Underspend	29	29	137	78		0	118	(430)	200	0
Wetlands	0	0	0	0	0	0		0	0	0	0		0	0	0	0	0
Land Incentive Payments	6,000	1,477	0	1,477	(4,523)	2,698	Underspend	369	369	1,018	279		0	1,477	(4,523)	750	928
Land Incentive Board Administration	500	444	0	444	(56)	0	Underspend	111	111	250	28		0	444	(56)	0	0
Low Nutrient Land Use Fund	501	194	0	194	(307)	0	Underspend	49	49	126	28		0	194	(307)	0	0
Sewerage Reticulation	320	30	0	30	(290)	0	Underspend	8	8	0	(15)		0	30	(290)	160	0
Total Lake Rotorua	**9,804**	**4,154**	**0**	**4,154**	**(5,650)**	**2,698**		**1,038**	**1,038**	**2,498**	**421**		**0**	**4,154**	**(5,650)**	**1,160**	**928**
Lake Rotoiti																	
Sewerage Reticulation	4,920	3,093	0	3,093	(1,827)	0	Underspend	773	773	0	(1,547)		0	3,093	(1,827)	4,103	2,476
Ohau Wall Reconsenting	514	22	0	22	(492)	0	Underspend	6	6	128	117		0	22	(492)	0	0
Total Lake Rotorua	**5,434**	**3,115**	**0**	**3,115**	**(2,319)**	**0**		**779**	**779**	**128**	**(1,430)**		**0**	**3,115**	**(2,319)**	**4,103**	**2,476**
Rotorua District																	
Treatment and Disposal	0	0	0	0	0	0		0	0	0	0		0	0	0	0	0
Total Rotorua District	**0**	**0**	**0**	**0**	**0**	**0**		**0**	**0**	**0**	**0**		**0**	**0**	**0**	**0**	**0**
Total Programme - Expenditure	**15,524**	**7,479**	**0**	**7,479**	**(8,045)**	**2,698**		**1,870**	**1,870**	**2,744**	**(996)**		**0**	**7,479**	**(8,045)**	**5,263**	**3,405**
Programme Expenditure by Council including interest																	
Rotorua Lakes Council	5,240	3,123	0	3,123	(2,117)	0		781	781	0	(1,562)	84	0	3,123	(2,033)	4,263	2,476
Bay of Plenty Regional Council	10,284	4,356	0	4,356	(5,928)	2,698		1,089	1,089	2,744	566	48	0	4,356	(5,880)	1,000	928
Total Programme	**15,524**	**7,479**	**0**	**7,479**	**(8,045)**	**2,698**		**1,870**	**1,870**	**2,744**	**(996)**	**132**	**0**	**7,479**	**(7,913)**	**5,263**	**3,405**
Funding by Authority including interest																	
MfE	7,762	3,740	0	3,740	(4,022)	0		0	0	2,744	0	132	0	(1,128)	0	5,263	
Rotorua Lakes Council	2,620	1,562	0	1,562	(1,059)	0		781	781	0	0	0	0	0	0	(4,263)	
Bay of Plenty Regional Council	5,117	2,178	0	2,178	(2,964)	2,698		1,089	1,089	0	0	0	0	0	0	(1,000)	
Total Funding by Authority	**15,499**	**7,479**	**0**	**7,479**	**(8,045)**	**2,698**		**1,870**	**1,870**	**2,744**	**0**	**132**	**0**	**(1,128)**	**0**	**(0)**	

Report movement summary comments:	Opening Reserve Balance 2017/18	1st Qtr. Report - Forecast year end movement (expenditure & revenue)	6 Month Report - Forecast year end movement (expenditure & revenue)	Qtr 3 Report - Forecast year end movement (expenditure & revenue)	Qtr 4 Report - Year end movement (expenditure & revenue)	2017/18 Year end reserves balance	Comments
By Intervention							
Lake Rotoehu	0	0	10	59	(5)	5	
Lake Ōkāreka	0	1	0	0	(7)	7	
Lake Rotorua	1,595	1,131	1,020	993	(421)	2,016	
Lake Rotoiti	4,022	2,460	2,439	1,139	1,430	2,592	
Rotorua District	0	0	0	0	0	0	
	5,617	**3,592**	**3,469**	**2,192**	**996**	**4,621**	
By Council							
Rotorua Lakes Council	3,954	2,620	2,485	1,185	1,562	2,392	
Bay of Plenty Regional Council	1,664	972	984	1,007	(566)	2,229	
	5,617	**3,592**	**3,469**	**2,192**	**996**	**4,621**	
Accrued interest	0	116	119	144	132	(132)	
Provision funded	0	0	0	0	1,349	(1,349)	
Forecast reserve balance	**5,617**	**3,476**	**3,350**	**2,048**	**2,213**	**3,405**	